UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH BODY MASS INDEX AMONG EMPLOYEES IN PUBLIC HOSPITALS IN THE FEDERAL TERRITORIES, MALAYSIA

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
NCD	Non-communicable disease
WHO	World Health Organisation
CDC	Center for Disease Control and Prevention
NHMS	National Health and Morbidity Survey
EI	Energy intake
GPAQ	Global Physical Activity Questionnaire
WC	Waist circumference
RNI	Recommended Nutrient Intake
MANS	Malaysian Adults Nutrition Survey
BMR	Basal metabolic rate
METs	Metabolic Equivalents

ABSTRACT

Overweight and obesity are known to be a considerable risk factor for diabetes mellitus, cardiovascular diseases and cancer. The body mass index of employees in an organisation is believed to be greatly influenced by socio-demographic characteristics, body composition, physical activity level and dietary intake. The main aim of this study therefore was to bring light the associations between the above-mentioned factors and body mass index among healthcare employees. This cross-sectional study was conducted among healthcare employees in Hospital Kuala Lumpur and Hospital Putrajaya. The 122 subjects from this study were selected through purposive sampling method and the data was collected through a questionnaire comprising of four sections aimed at identifying the subjects' socio-demographic characteristics, body composition, physical activity level and dietary intake. Majority of the subjects were female (78.7%), Malay (93.4%), married (77.0%), had monthly income between RM2001 to RM4000 (41.0%) and had university education level (73.8%). Most of the subjects were overweight (50.8%) followed by obese (41.8%) and normal body weight (7.4%). The results of the study indicated that there were significant associations between BMI and waist circumference (rho=0.677, p=0.000) and body fat percentage (rho=0.645, p=0.000) of the subjects. There was also a significant association between waist circumference and gender (X^2=1.000, p=0.043). In conclusion, the prevalence of overweight and obesity is very high among the employees. Investigation of the factors associated with body mass index is a necessary consideration in planning obesity interventions.

ABSTRAK

Berat badan berlebihan atau obes boleh meningkatkan risiko kepada beberapa penyakit yang kronik seperti diabetes, penyakit jantung dan kanser. Indeks jisim tubuh (IJT) pekerja di organisasi dipercayai amat dipengaruhi oleh faktor sosio-demografi, komposisi badan, tahap aktiviti fizikal dan pengambilan diet. Tujuan utama kajian ini adalah untuk menghubungkaitkan faktor-faktor tersebut dengan IJT kakitangan penjagaan kesihatan. Kajian rentas keratan dalam kalangan kakitangan penjagaan kesihatan telah dijalankan di Hospital Kuala Lumpur dan Hospital Putrajaya. Seramai 122 pekerja dipilih melalui persampelan bertujuan untuk kajian ini dan data dikumpulkan melalui soal selidik yang terdiri daripada empat bahagian bertujuan untuk mengenalpasti faktor sosio-demografi, komposisi badan, tahap aktiviti fizikal dan pengambilan diet pekerja. Majoriti subjek adalah perempuan (78.7%), Melayu (93.4%), berkahwin (77.0%), mempunyai pendapatan bulanan dari RM2001 hingga RM4000 (41.0%) dan mempunyai tahap pendidikan universiti (73.8%). Kebanyakan subjek mempunyai berat badan berlebihan (50.8%), diikuti obes (41.8%) dan berat badan normal (7.4%). Dalam kajian ini, didapati bahawa terdapat perkaitan yang signifikan antara IJT dan lilitan pinggang (rho=0.677, p=0.000) dan peratusan lemak badan (rho=0.645, p=0.000) pekerja. Selain itu, didapati bahawa terdapat perkaitan yang signifikan antara lilitan pinggang dan jantina (X^2=1.000, p=0.043). Kesimpulannya, kadar obesiti dan berat badan berlebihan dalam kalangan pekerja amat tinggi. Kajian terhadap faktor yang berkaitan dengan IJT perlu dipertimbangkan dalam menangani obesiti.

CHAPTER 1

INTRODUCTION

1.1 Background

World Health Organisation (2006) defined the terms overweight and obesity as abnormal or excessive fat accumulation in the adipose tissue that may affect someone's health. Overweight and obesity are defined as "weight that is higher than what is considered as a healthy weight for a given height" (The U.S Center for Disease Control and Prevention, 2011).

Body mass index (BMI) is a simple parameter or tool of weight-for-height for determining whether someone may be defined as underweight, normal, overweight or obese in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). The World Health Organisation (WHO) has classified BMI cut-off points for underweight: below than $18.5kg/m^2$, normal: 18.5 to $24.9kg/m^2$, overweight: 25 to $29.9kg/m^2$ and obese: more than $29.9kg/m^2$. According to U.S. Centers for Disease Control and Prevention (2011), BMI appears to be as strongly correlated with various metabolic disorders and disease outcomes as these are more direct measures of body fatness.

WHO (2013) stated that overweight and obesity are considered as one of ten leading factors for high death in both developing or developed countries. Globally, at least 300 million people are clinically obese. Alarmingly, non-communicable diseases (NCDs) are now the largest causes of mortality in many low-income and middle-income countries (WHO, 2013). NCD is a condition where duration is long but generally slow progression, non-infectious and not passed from one person to another. Four major risk factors of NCD for being overweight or obese are cardiovascular disease, cancer, type 2 diabetes mellitus, and chronic lung disease (WHO, 2013).

Furthermore, overweight and obesity are also strongly associated with morbidities such as stroke, hypertension and dyslipidemia (Moghaddam, Woodward & Huxley, 2007). Many prospective studies reported that there is a relationship between overweight or obesity and cardiovascular morbidity and mortality and total mortality (McGee, 2005; Zhou, 2002; Wilson et al., 2002). Chronically overweight and obese also contributes to osteoarthritis (WHO, 2009), thus a moderate decrease in weight about 10% to 15% has been shown to significantly improve the health of 90% of the obese patients (Willett et al., 1995). Other than that, mortality rates increase with BMI and they are greatly increased above a BMI of 30 kg/m^2. For example, a study among women in the US estimated that among people with a BMI >29 kg/m^2, 53% of all deaths could be directly related to obesity.

Since 1975, obesity has tripled worldwide and reaching epidemic proportions in both developing and developed countries and as of 2018, 39% of adults are overweight and 13% of adults are obese (World Health Organization, 2018). The worldwide prevalence of obesity nearly doubled between 1980 and 2014. In 2014, 11% of men and 15% of women worldwide were obese. Thus, more than half a billion adults worldwide are classed as obese (WHO, 2014). According to The Global Burden of Disease Study, the prevalence of overweight and obesity in Southeast Asia is 22.1% among men and 28.3% among women (Ng et al., 2013). Malaysia has the highest rate of overweight and obesity with 48.3% for men and 48.6% for women (Ng et al., 2013). A more recent study by the Malaysian National Health and Morbidity Survey 2019 (NHMS), reported that 30.4% of adults are overweight and 19.7% of adults are obese.

Poor dietary quality and insufficient physical activity are the two significant contributors to the development of obesity and many NCDs (Lachat et al., 2013). World Health Organization (WHO, 2018; WHO, 2016) states that physically inactive is one of the modifiable behavioural risk

factors which increases the risk of obesity and NCDs and makes up 1% to 3% of national health care costs, excluding costs associated with mental health and musculoskeletal conditions. On the contrary, regular physical activity of moderate and vigorous-intensity prevents excessive weight gain by increasing lean body mass and resting metabolic rate (U.S. Department of Health and Human Services, 2018). It also contributes to a reduced risk of mortality, NCDs, dementia, depression, and promotes a better quality of life (U.S. Department of Health and Human Services, 2018). Recent findings from NHMS (2019) showed that the 25.1% of adults in Malaysia are physically inactive.

Studies on weight status among healthcare workers are scarce. However, several studies were conducted among government employees in other employment sectors. Wan Nudri et al. (2009) found that men who reported having no exercise were significantly more overweight than men who regularly exercised and sportsmen who actively participated in competition, based from a cross-sectional study of randomly selected men from government departments in Kota Bharu. Low physical activity was also correlated to obesity in studies among staff in a military hospital and individuals attending health clinics in Sepang (Ayiesah et al., 2013 & Hejar et al., 2003) respectively and similarly in government employees in Penang, Hazizi et al. (2012) found that low of physical activity among government employees is correlated to obesity. Other than that, according to NHMS (2019), government employees (39.5%) had the highest prevalence of overweight.

Based on WHO classifications, the national prevalence of overweight was 30.4% and the prevalence of obesity was 19.7% (NHMS, 2019). By state, Wilayah Persekutuan Putrajaya had the highest prevalence of overweight (NHMS, 2019). However, future research is needed to confirm the association between BMI with socio-demographic characteristics.

1.2 Problem Statement

Overweight and obesity is a major public health problem in Malaysia. Excessive body fat can have negative effect on someone's self-confidence and can lead to a wide range of co-morbidities such as hypertension, type 2 diabetes mellitus, cardiovascular disease and multiple cancers which can cause low quality of life and life expectation and results in people spending billions of dollars in health care expenses (Swinburn, 2004). Overweight and obesity have been linked to various factors, including physical inactivity, unhealthy dietary habits, alcohol intake, socioeconomic conditions and genetic factors. The global trend of increased dietary fat and increased sugar and low fiber intake, as well as reduced physical activity in much of the world's population, has resulted in major health problems like overweight and obesity (Popkin et al., 2016). A higher prevalence of obesity is observed in Malaysia in comparison with other South East Asian Countries (NHMS, 2006).

Research shows that across industries, the highest rates of overweight and obesity are among employees in healthcare, followed by public administration and social service industries (Luckhaupt, Cohen, Li, & Calvert, 2014). Among healthcare employees, the age standardized prevalence of BMI-defined obesity is approximately 32% (Luckhaupt et al., 2014). However, the prevalence of overweight and obesity and other health risk factors among employees in hospitals in Malaysia has not yet been addressed. Healthcare workers are considered as professionals who should have a good knowledge about health, and they should act as role models for their patients. However, it has been reported that healthcare workers have a high prevalence of certain health risk behaviours, like smoking and not seeking information on matters related to health risk factors (McEwan, 2000). Factors such as socio-demography, dietary intake, physical inactivity and body composition can have an impact on the employees' weight status.

Changes in work-related lifestyle like computerization and mechanization in the workplace may cause working adults tend to be overweight and obesity (Department of Statistics, Malaysia, 2008). This is because workers spend most of the time in the workplace thus their working environment can influence their dietary patterns, physical activity, and weight control behaviours (Shimotsu et al., 2007). The large amount of sitting time spent in sedentary activities such as working at a desk and using computers has played a role in the development of the overweight and obesity (Jans, Proper & Hildebrandt, 2007). According to National Health and Morbidity Survey 2019 (NHMS), one in four adults in Malaysia are physically not active. Physical inactivity is the 4th leading risk factor for global mortality (World Health Organization, 2019).

There are some studies that showed the association between waist circumference with BMI. For examples, Ahmad et al., (2016) and Wong et al., (2017) found that waist circumference showed strong and positive correlation with BMI. According to Ravensbergen et al., (2014) although BMI was strongly related to abdominal adiposity and total body fat, it was not correlated with the cardiovascular disease risk factors studied or the Framingham risk score. Therefore, future research is needed to confirm the association between BMI with waist circumference and body fat percentage.

Studies on weight related issues among several segments of the population in the country had been conducted but very few were conducted among the healthcare workers in Malaysia. To date, no published data were found on the prevalence of overweight and obesity among the healthcare workers. This study was conducted among employees in public hospitals due to several reasons. Firstly, a review of literature shows that very few studies conducted previously investigates the body weight status of employees in the health care setting in Malaysia.

There are also unclear factors that are associated with BMI among employees in the healthcare setting. Thus, the aim of this study is to fill the research gap in the determining the factors associated with BMI among healthcare employees in public hospitals in Federal Territory, Malaysia.

Research Question

1. What are the associations between socio-demographic characteristics, body composition, physical activity level and dietary intake with BMI among employees in public hospitals in the Federal Territories, Malaysia?

1.3 Significance of the Study

This study will be able to provide a baseline data on the associated factors between socio-demographic characteristics, body composition, dietary intake and physical activity level with BMI among employees in public hospitals in Federal Territory, Malaysia which can be used for future research and intervention. This study also will evaluate and identify the specific risk factors, which could be triggering the increase in BMI among adults in the Federal Territory. This study also can help to increase the knowledge and awareness of community in Malaysia on the issues of BMI by minimizing or eliminating the risk factors of overweight and obesity.

Healthcare workers have important responsibilities in taking care of the health of the population in the country. Thus, their health should not be neglected. If high prevalence of obesity is found in this study and the factors associated with weight is observed, thus interventions may be carried out among these workers in order for them to have a healthier weight and adopt a healthier lifestyle. They should be the exemplary models to the population and portray a good image in the healthcare sector.

1.4 Objectives

1.4.1 General Objective

To determine the associations between socio-demographic characteristics, body composition, physical activity level and dietary intake and BMI among employees in Hospital Putrajaya and Hospital Kuala Lumpur, Malaysia.

1.4.2 Specific Objectives

1. To assess the socio-demographic characteristics, body composition, physical activity level and dietary intake among subjects.
2. To determine the BMI among the subjects.
3. To determine the associations between socio-demographic characteristics, body composition, physical activity level and dietary intake and BMI among subjects.
4. To determine the associations between body composition and gender among subjects.

1.5 Alternative Hypothesis

There are significant associations between BMI and socio-demographic characteristics, body composition, physical activity level and dietary intake among employees in public hospitals in Federal Territory, Malaysia.

1.6 Conceptual Framework

Figure 1.1 shows conceptual framework which shows the association of socio-demographic characteristics, body composition, physical activity level and dietary intake with body mass index among subjects.

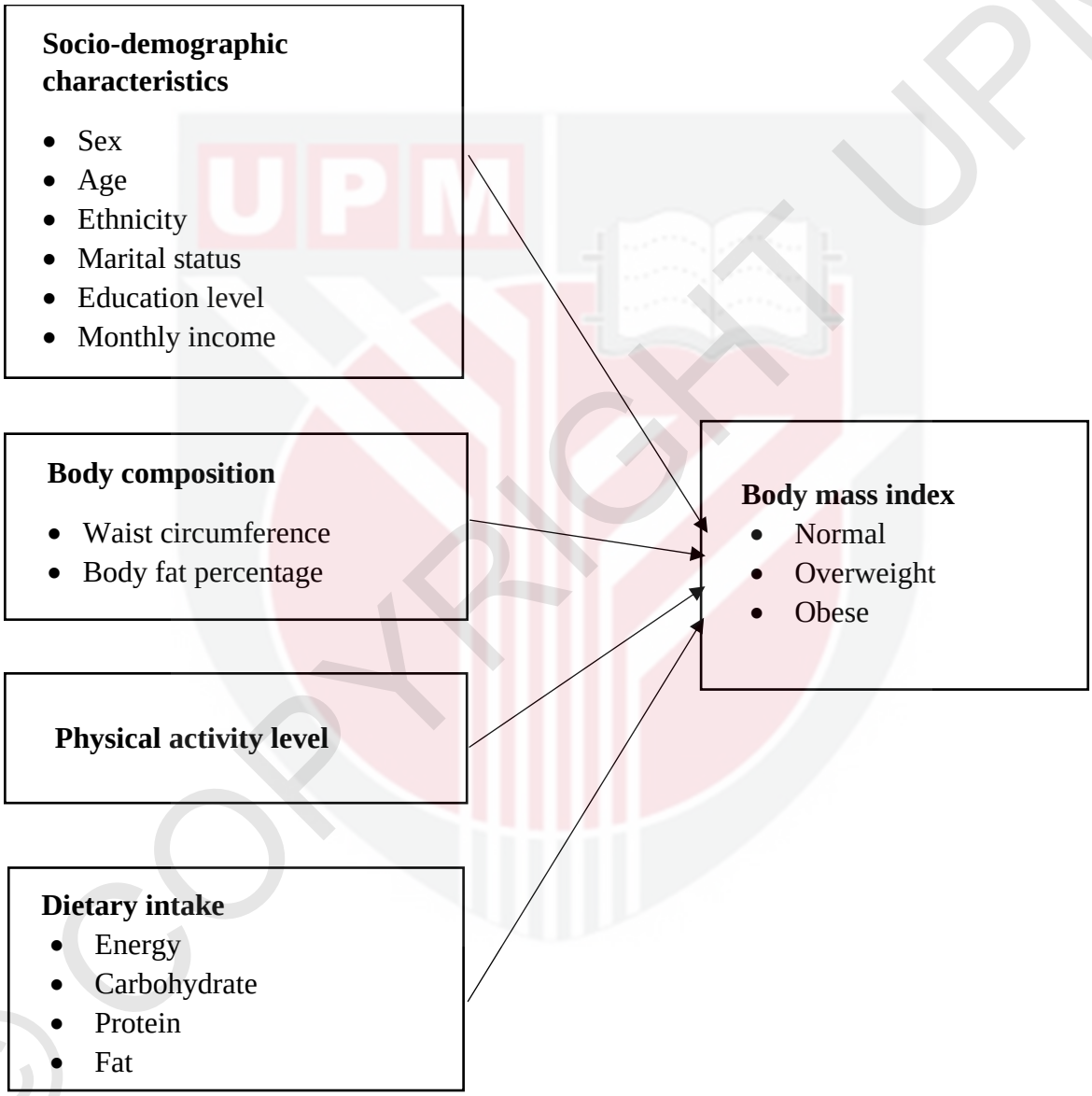

Figure 1.1: Conceptual framework

The conceptual framework shows the relationship between socio-demographic factors, body composition, dietary intake and physical activity level on BMI among employees in public hospitals in Federal Territories, Malaysia. The socio-demographic factors, body composition, dietary intake and physical activity level are the independent variables while BMI among employees is the dependent variable in this study. The socio-demographic characteristics includes age, sex, ethnicity, education level, monthly income, marital status of employees in public hospitals.

A study reported that there is a significant difference between BMI with physical activity level (Firdaus et al., 2006). However, there is a study which shows that physical activity was found to be inversely significant associate with BMI (John, Swartz, Hoelscher, Huber, & Sharma, 2019).

Many researchers have found that foods with higher energy content can contribute to the risk of overweight (Wolongevicz et al., 2010, Jones-Smith et al., 2011). However, there are some contradictory studies about the relationship between dietary pattern and obesity, which is the healthier dietary patterns were found to be inversely associated with obesity (Murtaugh et al., 2007, Esmaillzadeh et al., 2008) and there is a study which also shows no significant difference in the percentage of energy contribution by carbohydrate, protein, and fat between male and female adults (Lee & Muda, 2019).

Many cross-sectional and longitudinal studies have shown that older adults tend to become more obese due to increase in amount of visceral fat and the decline of skeletal muscle mass (Ferrucci, 2017).

CHAPTER 2

LITERATURE REVIEW

2.1 Body mass index

Body mass index (BMI) is the metric for defining anthropometric data for height and weight characteristics in adults and classifying them into groups which are underweight, normal, overweight and obese. BMI is widely used across many countries, populations, races and ethnicities. BMI allows comparison of weights independently of stature across populations except persons who have more lean weight due to intense exercise or resistance training such as bodybuilders (Jackson et al., 2002). BMI correlates well with the percentage of body fat however, this relationship is independently influenced by sex, age, and race (Jackson et al., 2002), especially in South Asians countries which suggests that BMI-adjusted percent body fat is greater than other populations (Andrew, Jackson, Ellis, McFarlin, Sailors, & Bray, 2009). BMI is a wide acceptance in population-based studies because it is defined as specific categories of body mass as a health problem. However, several studies stated that BMI is a rather poor indicator of the percentage of body fat (Nuttall, 2015). BMI does not capture information on the mass of fat in different body sites (Nuttall, 2015).

2.2 Impact of excess body weight

Overweight and obesity is a major public health problem in Malaysia. Cardiovascular diseases, premature death, high blood pressure, osteoarthritis and diabetes have been reported to be associated with overweight and obesity. Overweight and obesity also carry a considerable health burden and will have a significant impact on health expenditures (Guh, 2009). Obesity has

a strong association with the occurrence of chronic medical problems, impairment of health-related quality of life, and increasing the health care and medication spending (Hayward & Colman, 2009).

Many studies show that obesity appears to have a significant positive association with absenteeism. There is a study in Belgium which stated that body fat distribution has been found to be associated with high annual sick leave incidence and long spells of absence in a workforce (Aldana & Pronk, 2001; Bungum et al., 2003; Pronk, 2004). A study by Tucker and Friedman (1998) showed that obese workers were found to be 1.7 times more likely to experience a high level of absenteeism and were 1.6 times more likely to report moderate absenteeism because of illness during the past 6 months. Similarly, Burton and Conti (1999) also reported that obese workers also tend to lose work productivity than non-obese workers. In two analysis study, obesity was shown to be associated with higher health care costs than smoking, drinking, and poverty (Sturm, 2002; Sturm & Wells, 2001).

Majority of studies assessed the annual costs of short-term sick leave from work by comparing sick leave days of employees with normal weight with sick leave days of employees with overweight and obesity. The excess costs of overweight were estimated to be between $54 and $161 and the obesity-related costs between $89 and $1586. Thus, overweight and obesity may affect both work opportunity and performance (Cawley, Rizzo & Haas, 2007).

2.3 Prevalence of overweight and obesity

The National Health Morbidity Survey (NHMS II) in 1996 found that the prevalence of adult population for overweight and obese are 16.6% and 4.4% respectively. Four years later, the Malaysian Adults Nutrition Survey (MANS) carried out a study between October 2000 and July 2003, found that the prevalence of obesity had more than doubled and that the number of adults

overweight increased more than 60%. Following shortly, the NHMS III in 2006 conducted among 33055 adults found that 29.1% were overweight and 14% obese. The NHMS reported the prevalence of overweight among adult in Malaysia was 29.4% (NHMS 2011) and 30.0% (NHMS 2015), while obesity prevalence was 15.1% and 17.7% respectively. NHMS (2019) found that 50.1% adults in Malaysia were overweight or obese. The trends of overweight and obesity continue to rise compared to findings of 2011 and 2015. The Global Burden of Disease Study (2014) reported that the prevalence of overweight and obesity in Southeast Asia was 22.1% of men and 28.3% of women, with the highest rates in Malaysia at 48.3% and 48.6% for men and women respectively.

Taib et. al (2019) reported that high prevalence of overweight (34.3%) and obesity (21.1%) among healthcare workers in Pejabat Kesihatan Daerah Melaka Tengah which was about 1.5 times higher than the national average (30.0% and 17.7%) respectively. Moreover, there is a study which also shows similar results of high prevalence of overweight and obesity among healthcare workers in comparison with the general population. For example, a study conducted in Mexico, among 76 healthcare workers shows that 26% of male and 52% female respondents were reported to be obese. In another study conducted in Nigeria, they found that 72% of healthcare workers in a hospital setting were either obese or overweight. A similar study was also conducted in Nigeria, and they found that 72% of healthcare workers in a hospital setting to be either obese or overweight.

2.4 Factors associated with body mass index

2.4.1 Socio-demographic characteristics

According to previous studies (Biswas T et al., 2017; Ha do, 2011), being middle aged, having secondary education, higher economic status and urban residence were associated with overweight or obesity. Overall, obesity is associated with lower socioeconomic status in developed countries, while it is more often profound in privileged households in lower income countries as shown in the study (Adam, 2003). A study has shown greater prevalence of overweight among Chinese men but among Indian more women were overweight compared to men (Azmi et al., 2009). In another study by Taib et. al (2019), socio-demographic characteristics including gender and family income were not significantly associated with overweight and obesity. The prevalence of overweight and obesity did not differ much between male and female subjects. However, they found that the prevalence of overweight or obese among male subjects (57.4%) were slightly higher than female subjects (55.0%) (Taib et.al, 2019).

In Taib et.al (2019) study showed that aged 40 and above was found to be a significant factor for overweight or obese. Similarly, a study conducted in Tanzania found the older adult had a significantly higher risk of developing overweight or obesity (Shayo & Mugusi, 2011). Another study found that those between 40-49 years old had a-6 times higher odd of developing overweight or obesity as compared to those below 30 years old. This condition might be caused by a combination of a few factors such as decrease in metabolic rate and less of physical activity, in which both factors are strongly associated with ageing (WHO, 1997).

Taib et. al (2019) also stated that Malay and Indian subjects were found to be associated with overweight and obesity. The prevalence of overweight or obesity among Malay and Indian

subjects were 57.2% while the prevalence among Chinese was only 21.2%. They found that higher overweight or obesity prevalence among Malays and Indians might be due to genetics factors or other external and environmental factors such as cultural and behavioral influences on the preparation and consumption of foods.

Family income was found to be not significantly associated with overweight or obesity. The prevalence of overweight or obesity between B40 (family income less than RM3860 per month) and M40/T20 (family income RM3860 and more) was not so much differ (55.2% and 55.6%) respectively (Taib et al., 2019). However, a study done in Tanzania were found that higher socio-economic status has a significant association with overweight or obesity (Shayo & Mugusi, 2011).

Senekal et al (2003) have identified poverty and low education levels as risk factors for overweight or obesity in South Africa. However, according to Skaal & Pengpid (2014), there was no difference in obesity prevalence between medical and nonmedical staff members, regardless of the different levels of education and professions. The prevalence of obesity was still very high for medical and non-medical staff. In a similar study carried out among healthcare workers in Mexico, the prevalence of obesity was also reported to be as high as about 75% (González-Velázquez & Mendez, 2006).

2.4.2 Body composition

BMI and waist circumference are commonly used to determine nutritional status and adiposity for adults in clinical practice. Waist circumference measurement can detect increases in

abdominal fat and would be a better predictor of insulin resistance and type II diabetes mellitus than BMI. Beyond that, abdominal obesity is a major determinant of disability among adults.

According to Suzana et al. (2012), the prevalence of abdominal obesity among Malaysian older adult females was approximately tripled than in male and regardless of gender, decreased with increasing age. The prevalence of abdominal obesity was 20.0% with a significantly higher prevalence among female (31.8%) and male (9.6%) (Lee & Muda, 2019). This is a worrying trend because the increased prevalence of obesity and abdominal obesity among Malaysians has been and will continue to be a significant burden on the medical cost used to treat obesity-related conditions (NHMS, 2014). A more recent study by NHMS (2019) reported that a total of 52.6% of adults were found to have abdominal obesity.

According to Ahmad et al. (2016), waist circumference was moderately and positively correlated with BMI. However, the overall national prevalence of abdominal obesity using waist circumference was 17.4% among adults Malaysian with women at higher risk (26.0%) compared to men (7.2%). Moreover, Cameron et al. (2017) reported that women had a higher percent of body fat (47.65%) than men (40.03%). The findings of the study revealed that, even though male recorded a higher mean body weight of 72.43 kg compared to female who recorded 68.12kg, the female had a higher mean body fat of 28.35% compared to male which was only 17.81%. This shows that female had exceeded the ideal percentage of body fat for their gender while males were within the acceptable range.

There was also a study that observed the type of occupation which influenced subject's percentage of body fat. The results showed that drivers recorded the highest percentage of body fat (36.3%) followed by nurses who had 29.5% then public servants also followed with 27.13% while policemen had the least percentage of body fat at 11.5% (Vuvor, & Harrison, 2017). This

observation is consistent with the literature as more physically engaging professions require more physical activity and higher energy expenditure which is proven to lessen body fat as they are broken down for energy (Reale, Slater & Burke, 2016).

2.4.3 Physical activity level

One of the main contributing factors to overweight and obesity is physical inactivity. Being physically active helps to reduce body fat thus preventing numerous chronic diseases. This indicates that if overweight and obese people could devote more time to physical activity, their health would improve substantially. More than 25% of adults do not meet this requirement. The prevalence of physical inactivity in Malaysia is also alarming. People who are insufficiently active have a 20% to 30% increased risk of death compared to people who are sufficiently active. As the repost shows, in 2015, about 35.5% of adults in Malaysia did not live a physically active lifestyle. According to Dagne et al. (2019) almost all respondents, 744 (99.1%) engaged in low to moderate workplace activities. However, three-fourths (74.8%) of the study participants had no leisure time physical activity and about 55.4% spent three or more hours sitting without any exercise.

A study by Taib et. al (2019) reported that sedentary lifestyle was associated with overweight and obesity among healthcare workers. The prevalence of overweight and obesity among the sedentary group was 57.9% while among physically active group was 47.5%. Hazizi et al. (2012) determined that among 210 Malay employees in the Federal Government Building in Penang, 64.8% had low physical activity, measured by an accelerometer clipped to the subjects' belt or skirt or trousers at the waist. A similar study also showed that 945 post-graduate students in Universiti Putra Malaysia (UPM) that has been surveyed, with a mean age of 27 years, found

that 32% had BMI >25 kg/m^2 (Ismail, Sciences, & Putra, 2014). Taib et al. (2019) supported this finding where 44% had low physical activity and they were twice as likely to be overweight or obese among in their study.

In addition, physical inactivity is a known risk factor for obesity, metabolic syndrome (Church, 2011), and cardiovascular disease (Oldridge, 2008). There is a study which suggested that increased levels of physical activity were significantly associated with a decreased risk of abnormal components of metabolic syndrome (Lee et al., 2013; Jekal et al., 2010).

According to the Korea Centers for Disease Control and Prevention (KNHANES, 2011) report, the percentage of Koreans who exercised at a moderate-to-high intensity, including walking, significantly decreased in both Korean men (from 71.4 % in 2005 to 50.6 % in 2011) and women (from 65.7 % in 2005 to 42.6 % in 2011). Physical inactivity was also differed by age and sex. The highest amount of physical activity were shown in both men and women in their 20s, while men in their 40s and women in their 70s or older showed the lowest amount of physical activity (KNHANES, 2011).

2.4.4 Dietary intake

Malaysia is known for its multi-cultural people and foods. Food choices are known to be associated with the general health and the rapid socio-economic growth in Malaysia has influenced the lifestyle of Malaysian people. Poor dietary habits and inadequate physical activity are the contributing factors to the development of obesity and many NCDs. Based on these results, it seems that the level of overweight and obesity among adults has increased three times compared to the results from Malaysian NHMS II in 1996 (Noor Safiza et al., 2008). However, the Malaysian

Adult Nutrition Survey (MANS) in 2003 reported that the energy intake among adults was lower than RNI 2005, which suggests that the underestimation of dietary intake in some people may be reflected on the energy intake of the population (Mirnalini et al., 2008).

Chee, Ismail and Zawiah (1997) in their study showed that, in general Malaysian adults have increased their fat derived energy intake from 23.0% to 27.0% while the energy intake from carbohydrates decreased from 63.0% to 59.0%. Accordingly, the results of proportional odds model (POM) revealed that the risk of being overweight and overweight in the higher order of nutritional status was 1.52 times higher among adults who had snack intake habit compared to adults who had no habit of snack intake.

According to the Malaysian Adults Nutrition Survey (MANS, 2003), a high prevalence (97.2%) of Malaysian adults consumed white rice twice a day with an average of two plates per day. In 2014, white rice was consumed twice a day at a significantly lower prevalence of 89.8%, with an average of 2.5 plates. Ghee (2016) found that urban subjects consumed high proportion of energy in fats (29%) compared to rural subjects (20%). Urban male subjects consumed significantly more energy (2275kcal) than their rural counterparts (2024kcal), but this was not the case in women. Malay women reported a mean values of 1649-1747kcal which is higher daily calorie intake compared to mean values 1550-1591kcal among Chinese women (Chee et al., 2002).

Several studies reported that employed adults spend a quarter of their lives at work and the pressure and demands of work may affect their eating habits and activity patterns which may lead to overweight and obesity (Yamada, 2011; Niedhammer, Lert & Marne, 1996; Knutsson & Akerstedt, 1992).

2.5 Non-communicable diseases

A non-communicable disease (NCD) is a medical condition or disease that is non-infectious and non-transmissible among people. The World Health Organization (WHO, 2014) reports that, NCDs have been the leading causes of mortality in developed countries but are no longer the health issues limited to high income countries. Globally, deaths due to NCDs are increased by 17% between 2005 and 2015 and while in the African region, deaths due to NCDs are increased by 27% (Skaal & Pengpid, 2011). The main types of NCDs mortality and morbidity are cardiovascular diseases, cancers, chronic respiratory disease and diabetes (WHO, 2014). The Malaysian National Health and Morbidity Survey which monitors NCD risk factors, indicated a three-fold rise in the prevalence of obesity, from 4.4% in 1996 to 15.1% in 2011 for adults aged 18 years and above (NHMS, 2011). Approximately 2.5 million Malaysians are diagnosed with obesity in 2011 (NHMS, 2011). Some groups of people might have a higher risk of developing overweight or obesity relatively to the general population and one of those groups is the healthcare workers. Many studies conducted in some countries such as Mexico and USA have consistently reported that healthcare workers have a higher risk of developing overweight or obesity compared to the general population even though they are working in an environment that allows them to understand and aware of the risks and consequences of overweight and obesity (Chou & Johnson, 2008). The burden of NCDs is not only limited to the general population, but it also occurs among healthcare workers.

CHAPTER 3

METHODOLOGY

3.1 Study design

This is a cross-sectional study aimed to determine the associations between BMI and socio-demographic characteristics, body composition, physical activity level, dietary intake among employees in Hospital Kuala Lumpur and Hospital Putrajaya.

3.2 Study location

The study was conducted in Hospital Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia and Hospital Putrajaya, Wilayah Persekutuan Putrajaya, Malaysia. The location was chosen based on purposive sampling to include two hospitals located in the Federal Territory in Peninsular Malaysia.

Hospital Kuala Lumpur has 53 different departments and units which include administration and finance departments, the pharmaceutical department, training and research, 28 clinical departments and 12 clinical support services. Hospital Kuala Lumpur is the largest hospital under the Ministry of Health of Malaysia.

Hospital Putrajaya has 341 beds and located in the administrative area of Putrajaya. Putrajaya is the federal government administrative centre and is located about 35kilometers south of the capital city of Kuala Lumpur.

3.3 Sample Size Determination

To calculate the sample size in this correlation study, the following formula was used:

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

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

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

Where;

$\alpha = Z\alpha = 1.96$

$\beta = Z\beta = 0.84$

r = the expected correlation coefficient

Table 3.1: Calculation of sample size

Correlation Studies	Correlation, r	Sample Size, n
Body mass index with waist circumference across gender among Malaysian adults (Norfazilah et al., 2016)	0.73	$C = 0.5*\ln[(1+r)/(1-r)]$ $C = 0.93$ $N = [(Z\alpha+Z\beta)/C]^2+3$ $N = 12$
Energy intake and body mass index among Malaysian adults (Tahereh, 2015)	0.281	$C = 0.5*\ln[(1+r)/(1-r)]$ $C = 0.29$ $N = [(Z\alpha+Z\beta)/C]^2+3$ $N = 96$
Energy intake and body mass index among Malay Women in Klang Valley (Lee, Norimah & Ismail, 2010)	0.635	$C = 0.5*\ln[(1+r)/(1-r)]$ $C = 0.75$ $N = [(Z\alpha+Z\beta)/C]^2+3$ $N = 17$

The sample size obtained from the correlation study between energy intake and BMI among Malaysian adults was 96. Therefore:

96% + 20% = 115 subjects

From the correlation coefficient value of 0.281, the sample size calculated was 96. Next, 20% was added up to adjust for estimation of response rate and eligibility of the subjects to meet the study criteria. Hence, the actual sample size calculated was 115 subjects.

3.4 Sampling design

Figure 3.1 shows the flow of sampling design in this study. The sampling method used was purposive sampling, which is a non-probability sampling. Hospital Putrajaya and Hospital Kuala Lumpur were chosen. Next, a list of staff in Hospital Kuala Lumpur and Hospital Putrajaya were obtained. The subjects of this study are the staff who fulfill all the selection criteria of the study.

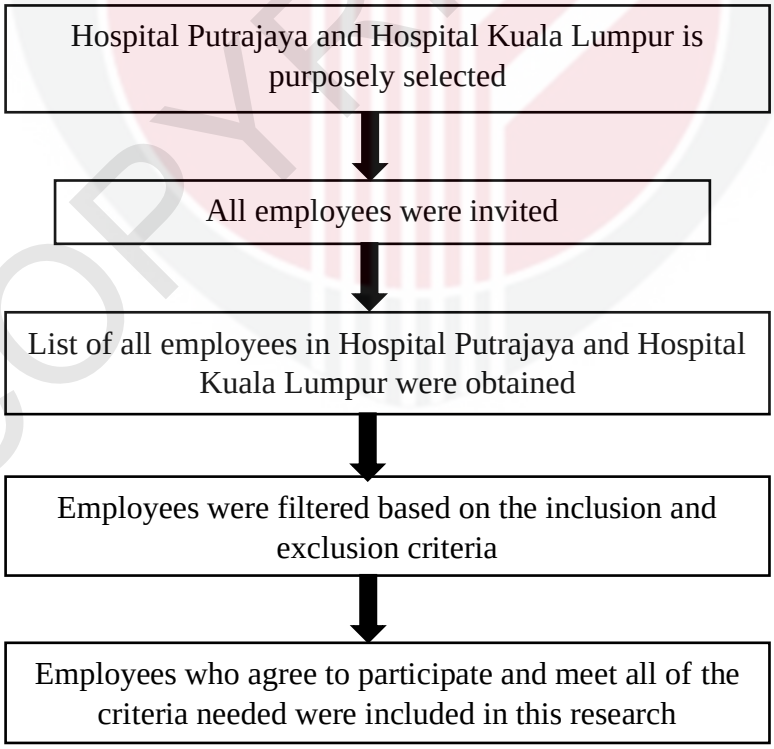

Figure 3.1: Flow chart of sampling design

3.5 Subjects

Subjects for this study were employees from Hospital Kuala Lumpur and Hospital Putrajaya. Subjects that met the inclusion and exclusion criteria were invited to participate in this study.

The inclusion criteria include:

- Malaysian
- Male and female
- Aged 18 to 60 years old

The exclusion criteria include:

- Breastfeeding
- Pregnant woman
- Diagnose with chronic diseases

3.6 Study Measures

Each respondent was given a consent form to sign noting their agreement to take part in the survey at the beginning of the interview. This is to ensure that respondents take part in the survey voluntarily. A self-administered questionnaire was used in this research to obtain the socio-demographic characteristics, dietary intake, physical activity level and body composition of the subjects involved. All interview was conducted in Bahasa Malaysia.

3.6.1 Socio-demographic characteristics

Subjects involved in this study were given a self-administered questionnaire, which consists of information such as age, sex, ethnicity, education level, marital status and monthly income. The data collected were protected and confidential. The consent form also was given to the subjects as an agreement to participate in this research study.

3.6.2 Body composition

Body composition which was assessed in this research were waist circumference and body fat percentage. This part of assessment was conducted by trained dietetics students. Waist circumference was measured to the nearest 0.1cm with a flexible measuring tape (Model SECA-201, SECA, Hamburg, Germany). Waist circumference was measured at the end of a normal expiration directly on the individual's skin at the midpoint between the lower rib and upper iliac crest at the level of the belly button. The measurements were taking in duplicate at the same place and same method each time. Then, the data was analyzed by using Asian population waist circumference cut-off point which is greater than 90cm for male and greater than 80cm for female are classified as having abdominal obesity and high risk for getting metabolic syndrome.

Body fat percentage of respondents was measured by using body composition monitor (OMRON HBF-375 KaradaScan, OMRON HEALTHCARE Co., Kyoto, Japan). It can measure body weight, visceral fat, skeletal muscle, subcutaneous fat, BMI and resting metabolism. Before measuring, the date of birth, gender and height of respondents were being set. Once the main unit displayed "0.0kg", the respondents stepped on the main unit with bare-foot and arm and body should be kept at 90°. Respondents placed their index fingers in the dent the back of the grip

electrodes, hold the inner grip electrodes firmly with their thumb and index finger and hold the outer grip electrodes with their ring finger and small finger. Then, the result of body fat percentage was classified using obesity values as proposed by Lohman (1986) and Nagamine (1972) where the values greater than 25% for male and greater than 35% for female are classified as having very high body fat percentage. Normal body fat percentage are classified as 10% to 20% for male and 20% to 30% for female.

3.6.3 Physical activity level

A validated Global Physical Activity Questionnaire (GPAQ) in Malay version was used to assess the physical activity level of the subjects. GPAQ comprises of 19 questions, grouped to capture physical activity undertaken in different behavioural domains which are the activity at work, travel to and from places and recreational activities. The GPAQ was conducted and recorded by trained dietetics students using face-to-face interviews. METs (Metabolic Equivalents) are used with purpose of analysing GPAQ data and expressing the intensity of physical activities. MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1kcal/kg/hour. The spent MET-min/week in physical activity is obtained based on calculation:

Vigorous activity: MET value = 8.0 x days/week x min/day

Moderate activity: MET value = 4.0 x days/week x min/day

Cycling or walking: MET value = 4.0 x days/week x min/day

The total physical activity MET-min/week = (the computed sum of total MET-min/week for each domain). According to GPAQ analysis framework, subjects were classified into three categories which are high (>1500), moderate (600-1500) and low (<600). WHO recommends throughout a week, including activity for work, during transport and leisure time, adults should do at least 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity physical activity or an equivalent combination of moderate- and vigorous-intensity physical activity achieving at least 600 MET-minutes.

3.6.4 Dietary intake

Three-days diet recall was used to assess the dietary intake of the subjects and was recorded by trained dietetics students. The diet recall was obtained for 3 days (2 days on weekdays and 1 day on weekend). Household measurements were used for the estimation of portion size of food during the interview. Food eaten by the subjects were estimated by using household measurement and converted into weight in gram. Then, Nutritionist Pro Software (Version 3.1.0 Axxya Systems) was used for nutrients analysis to obtain total energy, protein and fat intake of the respondents.

The selected nutrients were then classified into adequate and inadequate according to Recommended Nutrient Intake (RNI, 2017). Recommended energy intake for male adults (18-59 years old) is between 2190 to 2240kcal/day and for female adult (18-59 years old) is between 1840 to 1900kcal/day. Based on RNI (2017), inadequate amount of carbohydrate intake has been set less than 50% from recommended energy intake per day.

To examine the accuracy of the reported energy intake, the ratio between energy intake and basal metabolic rate (EI/BMR) was calculated by which the degree of over-reporting or under-

reporting of energy intakes can be calculated. This equation which was suggested by Ismail et al. (1998) is used among Malaysian adults. Table 3.2 shows BMR predictive equations for adult Malaysians.

Table 3.2: BMR predictive equations for adult Malaysians (Ismail et al., 1998)

Age group (years)	Formula
Male	
18-30	0.0550W + 2.480
30-60	0.0432W + 3.112
Female	
18-30	0.0535W + 1.994
30-60	0.0539W + 2.147

BMR is expressed in MJ/day,
W= body weight in kg

The Goldberg equation was used to identify for cut-off point of EI reporting. Subjects with an EI/BMR ratio between 0.98 and 2.47 are considered as normal reporter. Subject is considered an under-reporter if EI/BMR is <0.98.

3.6.5 Body mass index

The BMI assessed in this research requiring the intake of weight and height of the participants. This part of assessment was conducted by trained dietetics students. Height was measured by using SECA-213 (SECA, Hamburg, Germany) stadiometer to the nearest 0.1cm. Measurement was conducted three times to take the average measurement. Height was measured in centimeters (cm).

Weight was measured by using OMRON HBF-375 KaradaScan (OMRON HEALTHCARE Co., Kyoto, Japan) body composition monitor to the nearest 0.1cm. The measurement was conducted three times to take the average measurement. Weight was measured in kilograms (kg). Both measurements were taken with care to obtain an accurate reading and to avoid any mistakes. Then BMI was calculated by using the below formula:

$$\text{BMI (kg/m}^2\text{)} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$

Next, data were analyzed by using WHO Reference Chart (2016) categories as shown in Table 3.2.

Table 3.3: Classifications of BMI for adult (WHO, 2016)

BMI (kg/m^2)	**Indicator**
≤18.4	Underweight
18.5-24.9	Normal
25-29.9	Overweight
≥30.0	Obese

3.6 Pre-testing

Based on this study, 10 employees from Hospital Kuala Lumpur and Hospital Putrajaya were selected as the subjects in the pre-test of the questionnaire provided. The information of the subjects was confidential. The pre-testing was conducted a month before actual data collection and the results collected during pre-test was not be included in the data analysis. The time taken for the subject to answer the questionnaire was recorded to determine whether it was reasonable. Throughout the pre-testing, the relevance of the questions was assessed from the feedback of our

pre-testing subject. The problem encountered from subjects was identified and corrected. The clarity of the questionnaire, related information and instruction provided were assessed and identified. Finally, the feasibility of the questionnaire was determined at the end of the pre-test.

3.7 Procedures

The study obtained the approval from the Medical Research and Ethics Committee (MREC) and UPM's Ethics Committee for Research Involving Human Respondents (JKEUPM). The approval letter was sent to Hospital Kuala Lumpur and Hospital Putrajaya in order to get the permission to conduct a study in these hospitals. Data collection was conducted from January 2020 until February 2020. Informed consents were obtained prior to the administer of the questionnaire. An information sheet is distributed to each subject to inform the objective of this study.

3.8 Statistical Analysis

Data were analysed by using IBM SPSS Statistics Version 22. Descriptive characteristics of the respondents were obtained as frequency, percentage, mean, and median. Meanwhile, the results for continuous variables were presented as means and standard deviations. The level of significance used for the above analysis was $p<0.05$. Chi-square test was used to determine an association between categorical variables, whereas the correlation between continuous variables were tested by Spearman correlation coefficient.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Socio-demographic characteristics

A total of 122 subjects participated in this study. The distribution of socio-demographic characteristics of the subjects including sex, age, ethnicity, marital status, monthly income and education level are presented in Table 4.1. Majority of the subjects were female (78.7%) followed with male (21.3%) with median aged 34 years old (IQR=8.25). Malay ethnic predominant the study with (93.4%) followed by non-Malay by (6.6%) which consists of Chinese, Indian and others. Majority of the subjects were married (77.0%) followed by single (20.5%), divorced (1.6%) and widow or widower (0.8%). In addition, the results indicated that majority of the subjects were of moderate-income group (41.0%) followed by low-income (33.6%) and high-income (25.4%) with median RM2850.00 (IQR=2125). For educational level, most of the subjects have tertiary education level (73.8%) meanwhile the rest (26.2%) have primary and secondary education level

Table 4.1: Socio-demographic characteristics of subjects (n=122)

Characteristics	n (%)	Median (IQR)
Sex		
Male	26 (21.3)	
Female	96 (78.7)	
Age (years)		34.00 (8.25)
20-29	29 (23.8)	
30-39	64 (52.5)	
40-49	22 (18.0)	
≥50	7 (5.7)	

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)
Widow/widower	1 (0.8)
Divorced	2 (1.6)
Monthly income (RM)	2850.00 (2125)
≤2000	41 (33.6)
2001-4000	50 (41.0)
>4000	31 (25.4)
Education level	
Primary	1 (0.8)
Secondary	31 (25.4)
Tertiary	90 (73.8)

4.2 Body composition

Table 4.2 shows body fat percentage and waist circumference which are considered as the body composition. Based on the table, majority of the subjects were categorized as having very high (75.4%) body fat percentage followed by high (21.3%) and the least subjects as having normal (3.3%) body fat percentage with the median 36.45% (IQR=6.95). In addition, according to waist circumference, majority of the subjects were categorized as being at risk (86.9%) of abdominal

obesity and less than half of subjects were categorized as not at risk of abdominal obesity (13.1%) with a mean (93.96 ± 11.92).

Table 4.2: Body composition of subjects (n=122)

Characteristics	Male (n=26)	Female (n=96)	Total (n=122)
	n (%)		
	Median (IQR)		
Body fat percentage	26.4 (6)	37.70 (4.73)	36.45 (6.95)
Normal	2 (7.7)	2 (2.1)	4 (3.3)
High	7 (26.9)	19 (19.8)	26 (21.3)
Very high	17 (65.4)	75 (78.1)	92 (75.4)
	Mean ± SD		
Waist circumference (cm)	100.68 ± 12.28	92.14 ± 11.20	93.96 ± 11.92
Not at risk of abdominal obesity	7 (26.9)	9 (9.4)	16 (13.1)
At risk of abdominal obesity	19 (73.1)	87 (90.6)	106 (86.9)

4.3 Physical activity level

The distribution of physical activity level of subjects was presented in Table 4.3. Regarding physical activity level, almost half of the subjects reported low and high physical activity (43.45%). Only 13% of subjects were reported having moderate physical activity.

Table 4.3: Physical activity level of subjects (n=122)

Physical activity level	n (%)
Low	53 (43.4)
Moderate	16 (13.2)
High	53 (43.4)

4.4 Dietary intake

The distribution of dietary intake of subjects including energy, carbohydrate, protein and fat are presented in Table 4.4. According to energy intake, majority of subjects had low (84.4%) energy intake below the recommended value. As for macronutrients, most of the subjects had inadequate carbohydrate (80.3%), protein (95.1%) and fat (81.1%). Majority of male subjects consumed inadequate amount of carbohydrate (73.1%), protein (88.5) and fat (76.9%) similarly with majority of female subjects consumed inadequate amount of carbohydrate (82.3%), protein (96.9%) and fat (82.3%) than the amounts recommended by dietary reference intakes.

Table 4.4: Dietary intake of subjects (n=122)

Dietary intake	Male (n=26)	Female (n=96)	Total (n=122)
	n (%)		
	Median (IQR)		
Energy (kcal)	1685 (834)	1326 (459)	1378 (65)
Inadequate	20 (76.9)	83 (86.5)	103 (84.4)
Adequate	6 (23.1)	13 (13.5)	19 (15.6)
Carbohydrate (g)	216.89 (117.09)	171.24 (83.86)	178.40 (89.81)

Inadequate	19 (73.1)	79 (82.3)	98 (80.3)
Adequate	7 (26.9)	17 (17.7)	24 (19.7)
Protein (g)	63.40 (37.09)	51.02 (19.33)	56.7 (21.76)
Inadequate	23 (88.5)	93 (96.9)	116 (95.1)
Adequate	3 (11.5)	3 (3.1)	6 (4.9)
Fat (g)	58.72 (20.32)	45.35 (21.45)	49.10 (21.77)
Inadequate	20 (76.9)	79 (82.3)	99 (81.1)
Adequate	6 (23.1)	17 (17.7)	23 (18.9)

4.5 Accuracy of reported energy intake

The EI/BMR equation was used to identify the accuracy of the reported energy intakes. Table 4.5 indicated reporting of the energy intakes consumed by the subjects. The percentage of the under reporting (57.4%) of the energy intakes was higher than normal reporting (42.6%). Majority of the female subjects (60.4%) and almost half of the male subjects (46.2%) under reported their energy consumption. Several factors appear to be associated with the under-reporting of energy intakes, including obesity, age, gender, social status, controlled eating habits and the consumption of certain food groups (Azizi, Esmaillzadeh & Mirmiran, 2005; Garriguet, 2008; Kye et al., 2014).

Table 4.5: Characteristics of under-reporters and normal-reporters of subjects (n=122)

Energy intake (kcal)	Male (n=26)	Female (n=96)	Total (n=122)
	n (%)		
Under-reporting	12 (46.2)	58 (60.4)	70 (57.4)
Normal-reporting	14 (53.8)	38 (39.6)	52 (42.6)

4.6 Body mass index

The BMI of the subjects is shown in Table 4.5. Most of the subjects were overweight (58.8%) followed by obese (41.8%) and normal (7.4%) with a median 28.95kg/m^2 (IQR=5.93). The prevalence of overweight and obesity for male were (50.0%) and (38.5) respectively while for male the prevalence of overweight and obesity were (51.0%) and (42.7%) which was higher than the female subjects. The prevalence of normal weight among males was higher than female.

Table 4.6: Body mass index of subjects (n=122)

Body mass index (kg/m^2)	Male (n=26)	Female (n=96)	Total (=122)
	n (%)		
Median (IQR)	27.85 (6.73)	29.25 (5.78)	28.95 (5.93)
Normal (18.5-24.9)	3 (11.5)	6 (6.3)	9 (7.4)
Overweight (25.0-29.9)	13 (50.0)	49 (51.0)	62 (50.8)
Obese (≥30.0)	10 (38.5)	41 (42.7)	51 (41.8)

4.7 Associations between sex, ethnicity, marital status and education level and BMI

a) There are no significant associations between sex, ethnicity, marital status and education level and BMI

Table 4.7 shows the association between BMI with socio-demographic characteristics using Chi square analysis. Based on the results, there were no significant associations found between sex, ethnicity, marital status and education level with BMI. Therefore, the null hypothesis failed to be rejected.

In this study, the prevalence of overweight and obesity was found to be 50.8% and 41.8% respectively. According to the findings of this study, female subjects were more obese than male subjects. These results of the study are consistent with that of the studies conducted by Azmi et al. (2009) and Lekhraj Rampal et al. (2006). NHMS 2019 also reported that females (54.7%) was found to be the highest rates of overweight or obesity compared to males (45.3%). Female population was believed to gain their greatest amount of weight during the child bearing period, while some of them might develop overweight or obese due to the retention of gestational weight gain (Siega-Riz, Evenson, & Dole, 2004). This finding was supported by a study conducted in Iran that reported a high prevalence of overweight and obesity in female subjects attributed by differences in degree of physical activity (Hajian-Tilaki & Heidari, 2010).

The analyses showed that no significant relationship between ethnicity and BMI. In contrast, NHMS 2019 stated that Indian (63.9%) ethnicity has the highest rates of overweight or obesity. Similarly findings reported in a previous national study in Malaysia, Indians were associated with the highest risk of overweight/obesity among the different ethnic groups (Zainuddin & Chan, 2016). Genetic predispositions to overweight or obesity among Indians

and other environmental factors, including behavioural and cultural influences on food preparation and consumption, could increase their susceptibility to obesity (Ghosh et al., 2010).

The findings showed that marital status had no statistically significant relationship with BMI and the results were not consistent with previous findings where significant association was found between marital status with body mass index. According to Sidik & Rampal (2009), married adults had significantly higher BMI than single adults. It is suggested that married individuals are more likely to be fat in view of their spouse's social factor effects (Bakhshi et al. 2010). However, a study by Martínez et al. (1999) reported that no significant differences between overweight and obesity with marital status.

This finding was not consistent with previous study because individuals with higher education level tend to adopt healthier lifestyle behaviors, such as consume high fruits and vegetables, less dietary fat intake and engagement in exercise as most of them have a higher awareness of weight control (Martin et el., 2008). There was a study conducted in Korea which reported that men with higher educational levels were more likely to be overweight or obese (Park et al., 2008). This finding may be attributed to the tendency of better-educated men to obtain better jobs or more sedentary occupations, leading to physical inactivity during working days, and live more modern and sedentary lifestyles.

Table 4.7: Associations between sex, ethnicity, marital status and education level and BMI (n=122)

Variables	Body mass index (kg/m^2)			χ^2	*p-value*
	Normal n (%)	Overweight n (%)	Obese n (%)		
Sex					
Male	3 (33.3)	13 (21.0)	10 (19.6)	NA[a]	0.617
Female	6 (66.7)	49 (79.0)	41 (80.4)		
Ethnicity					
Malay	8 (88.9)	58 (93.5)	48 (94.1)	NA[a]	0.715
Non-Malay	1 (11.1)	4 (6.5)	3 (5.9)		
Marital status					
Married	5 (55.6)	50 (80.6)	39 (76.5)	NA[a]	0.253
Other status	4 (44.4)	12 (19.4)	12 (23.5)		
Education level					
Primary & Secondary	4 (44.4)	17 (297.4)	11 (21.6)	NA[a]	0.329
Tertiary	5 (55.6)	45 (72.6)	40 (78.4)		

*Chi-square test *(X^2)*
*p-value is significant when p<0.05
[a]Fisher's exact test
NA: Not applicable

4.8 Correlations between age and monthly income and BMI

a) There is no significant correlation between age and monthly income and BMI

Table 4.8 shows the relationship between age and monthly income with BMI using Spearman's rho correlation coefficient analysis. Age and monthly income were found to be an insignificant factor of high body mass index in this study. Therefore, the null hypothesis failed to be rejected. This result was not in line with a previous study conducted in Tanzania among adult population which reported that older population had a significantly higher risk or developing overweight or obesity (Shayo & Mugusi, 2011). NHMS 2019 also stated that 55-59 years old age (60.9%) group was found to be the highest rates of overweight or obese. However, a study conducted by Asif et al. (2020) among Pakistani adults showed that overweight and obesity were both highest among middle-aged adults (35-64 years of age). This is because of accumulation of body fat known as one of the characteristics of the process of aging which occurs due to physical and behavioral changes of individuals (WHO, 2002).

The findings of this study showed that monthly income and BMI had no statistically significant association which is in line a with study conducted by Ghobani et al. (2015). In contrast, Chang and Lauderdale (2005) revealed that at all income levels, the obesity rate was high nevertheless, individuals with higher income had the highest prevalence of obesity. Similarly, a study conducted by Singh et al. (2011) found that subjects with higher incomes had a faster rate of obesity however, the prevalence of obesity was found to be higher for subjects with lower incomes.

Table 4.8: Correlations between age and monthly income and BMI (n=122)

Variables	Body mass index (kg/m^2)	
	rho	***p*-value**
Socio-demographic characteristics		
Age (years)	0.067	0.466
Monthly income (RM)	-0.028	0.759

**Spearman's rho correlation coefficient
**p-value is significant when p<0.05

4.9 Correlation between body composition and BMI

a) There is significant correlation between body composition and BMI

Table 4.9 shows the association between waist circumference and body fat percentage with BMI using Spearman's rho correlation coefficient analysis. The results showed moderate positive significant relationship between body fat percentage with BMI. Therefore, the null hypothesis is rejected. The result was consistent with previous study by Akindele, Phillips and Igumbor (2016), there was a strong and positive statistical relationship between body fat percentage and BMI.

Waist circumference also was found to be significantly correlated with BMI. Thus, the null hypothesis is rejected. The findings are consistent with several previous studies where waist circumference showed strong and positive correlation with BMI (Ahmad et al, 2016; Lian et al., 2016). According to NMHS 2019 stated that 52.6% of adults have abdominal obesity. Trend of overweight, obesity and abdominal obesity continue to rise compared to NHMS 2011 (29.4%, 15.1%, 45.4%) and 2015 (30.0%, 17.7%, 48.6%) findings.

Table 4.9: Correlations between waist circumference and body fat percentage and body mass index (n=122)

Variables	Body mass index (kg/m^2)	
	rho	***p*-value**
Body composition		
Body fat percentage	0.645**	0.000**
Waist circumference (cm)	0.677**	0.000**

**Spearman's rho correlation coefficient
**p-value is significant when p<0.05

4.10 Association between body composition and gender

a) **There is a significant association between waist circumference and gender.**
b) **There is no significant association between body fat percentage and gender**

Table 4.10 shows the significant association between waist circumference and gender however, no significant association was found between body fat and gender. The associations were using Chi square test. Thus, the null hypothesis is rejected for waist circumference while body fat percentage fail to reject the null hypothesis.

The results were in line with previous study where, a study by Thu Tran et al. (2018) conducted in Vietnam stated that body mass index and waist circumference were highly correlated for men and women. It is suggested that biologically plausible that men have greater central distribution of fat relative to fat mass than women. In Asian population, men are prone to store visceral fat around the abdomen or organs whereas women typically accumulate fat around the hips, buttocks and thighs (Norgan, 1997; Wells, 2007).

There was no significant association between body fat percentage and sex. However, women had higher body fat percentage compared to men. This result was in line with previous studies conducted by Cameron et al. (2017) and Suzana et al. (2012) where they reported that women had more body fat percentage than men. It is suggested that the biological factor of menopause in women affects fat distribution that may increase risk or negative effects of obesity in health (Morita et al., 2006; Regitz-Zagrosek et al., 2007). Furthermore, the fat distribution differs between men and women. Women have more subcutaneous adipose tissue (SAT), creating a "pear shape" distribution, while men predominantly distributed fat to the visceral adipose tissue (VAT) around the abdominal organs creating an "apple shape" body (Fried et al., 2015; Schwartz et al., 1991; Link et al., 2017).

Table 4.10: Association between waist circumference and body fat percentage by gender (n=122)

Variables	**Male**	**Female**	χ^2	***p*-value**
	n (%)			
Waist circumference (cm)			1.000*	0.043*
Not at risk of abdominal obesity	7 (26.9)	9 (9.4)		
High risk of abdominal obesity	19 (73.1)	87 (90.6)		
Body fat percentage			NA[a]	0.199
Normal	2 (7.7)	2 (2.1)		
High	24 (92.3)	94 (97.9)		

*Chi-square test (X^2)
*p-value is significant when p<0.05
[a]Fisher's exact test
[a]NA- Not applicable

4.11 Correlation between physical activity level and BMI

a) There is no significant correlation between physical activity and BMI.

Table 4.11 shows the association between physical activity level with BMI using Spearman's rho correlation coefficient test. The results were not in line with previous study where, they found that sedentary lifestyle seemed to be significantly associated with overweight or obesity among healthcare employees (Jans, Proper & Hidebrandt, 2007; (Butz, 2017). Zarei et al. (2013). Therefore, the null hypothesis failed to be rejected. NHMS 2019 also reported that 25.1% of adults are physically inactive, a reduction compared to 2011 (35.7%) and 2015 (33.5%). It has been suggested that this negative relationship between physical activity and BMI is attributed to the fact that exercising prevents and controls excess weight (Guedes et al., 2013). However, a study by Martín et al. (2016) reported that negative correlation between BMI and time of exercise performance. It has been suggested this association due to the subjects might not have accurately described the intensity of their physical activities.

Table 4.11: Correlation between physical activity level and BMI (n=122)

Variable	**Body mass index (kg/m^2)**	
	rho	***p*-value**
Physical activity level	0.058	0.526

*Spearman's rho correlation coefficient
*p-value is significant when $p<0.05$

4.12 Association between energy intake with BMI

a) There is no significant association between energy intake and BMI

Table 4.12 shows the association between energy intake with BMI among normal-reporters using Chi Square analysis. This result was not in line with previous study by Trichopoulou et al. (2000) that there is a positive association of energy intake with body mass index and inversely with energy expenditure. Thus, the null hypothesis failed to be rejected. A study conducted among Malay women in Klang Valley also showed that there was a significant moderate positive correlation between energy intake and BMI (Lee et al., 2010). Duvigneaud *et al.* (2007) observed at normal energy-reporters and found that there was no difference in percentage of energy intake from fat, carbohydrate and protein in overweight and obese women compared to women with normal weight.

Obese individuals are twice as likely to underreport their energy intake compared to normal weight individuals (Gnardellis et al., 1998). According to Briefel et al. (1997), Garriguet (2008), Hirvonen et al. (1997) and Kye et al. (2014) overweight and obese individuals, women and older people were found to underreport their energy intake. It is believed that women want to be socially acceptable behaviour in order to conform to a healthy diet (Schoeller, 1990) therefore they tend to underreport their energy intake. Women are more concerned about their body weight, food, and eating than men (Macdiarmid & Blundell, 1998).

Table 4.12: Association between energy intake and BMI (n=52)

Variable	Body mass index (kg/m^2)			χ^2	*p*-value
	Normal n (%)	Overweight n (%)	Obese n (%)		
Energy intake (kcal)					
Inadequate	3 (50.0)	23 (74.2)	8 (53.3)	NA [a]	0.293
Adequate	3 (50.0)	8 (25.8)	7 (46.7)		

*Chi-square test *(X^2)*
*p-value is significant when p<0.05
[a]Fisher's exact test
[a]NA- Not applicable

4.13 Correlations between carbohydrate, protein and fat intake with BMI

a) There is no significant correlations between carbohydrate, protein and fat intakes with BMI

Table 4.13 shows the insignificant correlations between carbohydrate, protein and fat intakes with BMI using Spearman's correlation coefficient analysis. This result was in line with previous study conducted among Malay woman in Klang Valley by Lee et al. (2010) that there was no significant difference in carbohydrate, protein or fat intake between BMI.

In addition, according to Duvigneaud et al. (2007), overweight and obese men consumed high amount of fat intake compared to men with normal weight. On the other hand, this observation was not significant in women. Several cross-sectional studies found that there were no association between higher fat intake with obesity (Slattery et al., 1992 & Scali et al.,

2004). However, some studies observed a positive association between higher fat intake and obesity (Stam-Moraga et al., 1999 & Davis et al., 2006). In the study of Garaulet et al. (2001) it is believed that, even though obesity is a multifactorial phenomenon, dietary intake, especially fat intake is the most important factor contributing to high body weight.

Table 4.13: Correlations between carbohydrate, protein and fat intakes with BMI (n=122)

Dietary intake	**Body mass index (kg/m^2)**	
	rho	***p*-value**
Carbohydrate (g)	0.024	0.794
Protein (g)	0.018	0.845
Fat (g)	0.060	0.508

**Spearman's rho correlation coefficient
**p-value is significant when $p<0.05$

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This cross-sectional study was conducted among 122 subjects in Hospital Kuala Lumpur and Hospital Putrajaya. Majority of the subjects were Malay, married, had university educational level and had a monthly income of RM2001 to RM4000 with a median RM2850.00 (IQR=2125). Overall, there was highest percentage of subjects with overweight followed by obese and normal. No underweight subjects were reported in this study. For the body composition, majority of subjects were having very high body fat percentage with a median 36.35% (IQR=6.95) and at risk of abdominal obesity with a mean 93.96 ± 11.92 cm. Although female had higher body fat percentage than male, the body fat percentage was insignificantly associated with gender. However, there is a significant association between waist circumference and gender.

Data for physical activity level showed that overall there was an equal percentage of subject were having low and high physical activity level. However, male subjects were found to be more active than female subjects.

Most of the subjects in this study, reported that they had inadequate amount of energy, carbohydrate, protein and fat intakes below the recommended value. In addition, majority of the subjects under-reported their energy intake. More than half of female subjects (60.4%) and almost half of male subjects (46.2%) under-reported their energy consumption.

Lastly, socio-demographic characteristics, physical activity level and dietary intake were found to not contribute to overweight and obesity among employees in healthcare setting.

However, waist circumference and body fat percentage were found to contribute to high BMI among employees in healthcare setting.

The strength of this study is the use of the validated GPAQ in this study enables comparisons with other study populations locally and internationally. This study also promoted to the body of knowledge for future research and help the healthcare professionals in planning for nutrition intervention strategies.

5.2 Limitations and Recommendations

The limitation of this study is that the data were collected self-reported. Thus, over-estimating or underestimating might be happened due to poor recall effects of the subjects. The results have shown that subjects were underestimate their dietary intake. Furthermore, this study also cannot establish causality as the study was a cross-sectional study. This study population was among healthcare workers therefore, this study findings cannot represent the general population but only can represent those groups of people with similar socio-demographic characteristics. The findings suggest that future study can conduct a longitudinal study to be able establish causality. Next, a need of implementation of workplace intervention that aimed to promote health body weight and to prevent obesity in the workplace. Weight loss programs are required in order to increase physical activity and promote healthier eating plan in the workplace to prevent developing of health problems related to overweight and obesity such as high blood pressure, diabetes, cardiovascular disease and high cholesterol levels.

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APPENDICES

APPENDIX A

Information Sheet

BORANG PERSETUJUAN/ KEIZINAN PESERTA

Saya *bersetuju / tidak bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Maklumat Kajian Peserta). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan. Saya juga memahami bahawa sebarang maklumat yang berkaitan identity saya akan dirahsiakan.

Saya *berminat/tidak berminat untuk mengetahui keputusan kajian yang berkaitan dengan diri saya sahaja.

Saya *setuju/tidak setuju untuk imej/gambar/rakaman video/rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaiatn).

*potong yang tidak berkenaan.

<u>Peserta</u>:

Tandatangan: ……	Nombor K/P:……
Nama:……	Tarikh :……

Saksi:

Tandatangan: ……	Nombor K/P:……
Nama:……	Tarikh :……

Saya mengesahkan bahawa saya telah menerangkan kepada peserta ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tandatangan: ……	Nama: ……

APPENDIX B

Questionnaire

FACULTY OF MEDICINE AND HEALTH SCIENCES
DEPARTMENT OF DIETETICS AND NUTRITION

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

KEBERKESANAN PROGRAM PENDIDIKAN KESIHATAN TERHADAP STATUS BERAT BADAN DI KALANGAN PEKERJA YANG MAKAN DI KAFETERIA SIHAT, HOSPITAL DI WILAYAH PERSEKUTUAN, MALAYSIA.

Researcher's name (*Nama penyelidik)*: Nurin Fariha binti Ahmad Badrin

Programme *(Program)* : Bachelor of Science (Dietetics)

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

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

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

Hospital Awam :

A	Hospital Kuala Lumpur	
B	Hospital Putrajaya	

Soal selidik ini mengandungi:

Seksyen A: Socio-demographic characteristics / Sosio-demografi
Seksyen B: Body mass index / Indeks jisim tubuh
Seksyen C: Body composition / Komposisi badan
Seksyen D: Physical activity level / Tahap fizikal aktiviti
Seksyen E: Dietary intake / Pengambilan diet

(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).

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

SEKSYEN A: KETERANGAN DIRI

Tandakan (✓) 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. Pekerjaan : _____

7. Taraf Pendidikan:

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

8. Adakah tuan/puan mempunyai masalah kesihatan (Jika “Ya”, terus ke soalan 9)

9. Masalah kesihatan: (✓ bagi "YA" dan × bagi "TIDAK")

Cancer / *Barah*		Heart disease/ *Penyakit jantung*	
Diabetes/ *Kencing manis*		Deaf/ *Pekak*	
High blood pressure/ *Darah tinggi*		Mute/ *Bisu*	
Kidney disease/ *Penyakit buah pinggang*		Severe illness/ *Terlantar sakit*	
Penyakit lain, nyatakan: _____			

10. Adakah tuan/puan mengambil sebarang ubat-ubatan?

Ya	
Tidak	

Nyatakan:
_____

11. Adakah tuan/ puan mengambil sebarang suplemen tambahan?

Ya	
Tidak	

Nyatakan:
_____

SECTION B: BODY MASS INDEX (BMI)

SEKSYEN B: INDEKS JISIM TUBUH

1. Height / Tinggi:	m
2. Weight / Berat badan:	kg
3. BMI / Indeks jisim tubuh:	kg/m²

SECTION C: BODY COMPOSITION

SEKSYEN C: KOMPOSISI BADAN

1. Waist circumference / Ukur lilitan pinggang:	Cm
2. Body fat percentage / Peratus lemak badan:	%

SECTION D: PHYSICAL ACTIVITY LEVEL

SEKSYEN D: TAHAP AKTIVITI FIZIKAL

Global Physical Activity Questionnaire (GPAQ)

	Soalan-soalan	Maklumbalas	Kod
Aktiviti Fizikal Berkaitan Pekerjaan			
1	Adakah pekerjaan anda melibatkan aktiviti kerja berat yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung seperti berlari, membawa atau mangangkat barang yang berat, menggali, mencangkul, menuai, berkebun, memburu atau melakukan kerja pembinaan sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke P4	P1

2	Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja berat dalam pekerjaan anda?	Jumlah hari [___]	P2
3	Pada hari biasa yang anda lakukan kerja berat, berapa lamakah anda melakukannya?	Jam : minit [___] [___] : [___] [___]	P3
4	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, memancing, membuat kerja rumah, mencuci kereta atau mengecat rumah sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke P7	P4
5	Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja sederhana dalam pekerjaan anda?	Jumlah hari [___]	P5
6	Pada hari biasa yang anda lakukan kerja sederhana, berapa lamakah anda melakukannya?	Jam : minit [___] [___] : [___] [___]	P6 (a-b)
Aktiviti Fizikal Berkaitan Perjalanan			
Soalan-soalan seterusnya **TIDAK** termasuk aktiviti fizikal semasa 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 sebagainya).			
7	Adakah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?	Ya 1 Tidak 2 Jika 'Tidak', sila ke P10	P7

8	Dalam satu minggu yang biasa, berapa harikah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?	Jumlah hari [___]	P8
9	Dalam satu hari yang biasa, berapa lamakah anda berjalan atau berbasikal untuk bergerak dari satu tempat ke tempat yang lain?	Jam : minit [___] [___] : [___] [___]	P9 (a-b)
Aktiviti Fizikal Pada Waktu Lapang			
Soalan-soalan seterusnya **TIDAK** termasuk aktiviti semasa bekerja dan semasa perjalanan yang telah anda nyatakan. Sekarang, saya ingin bertanya tentang aktiviti yang anda lakukan untuk rekreasi, kecergasan, dan sukan.			
10	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, jogging, aerobik atau bermain bola sepak, sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke P13	P10
11	Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Jumlah hari [___]	P11
12	Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Jam : minit [___] [___] : [___] [___]	P12 (a-b)
13	Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang sederhana yang mengakibatkan peningkatan yang sedikit	Ya 1 Tidak 2	P13

	dalam kadar pernafasan ataupun denyutan jantung, seperti berjalan pantas, berbasikal, berenang, menanam pokok bunga atau bermain bola tampar, sekurang-kurangnya 10 minit secara berterusan?	Jika 'Tidak', sila ke P16	
14	Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?	Jumlah hari [___]	P14
15	Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?	Jam : minit [___] [___] : [___] [___]	P15 (a-b)
Aktiviti Sedentari Atau Tidak Aktif			
Soalan berikut adalah berkaitan dengan aktiviti duduk atau baring/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 membaca, bermain kad atau menonton televisyen, **TETAPI TIDAK TERMASUK** waktu tidur.			
16	Dalam satu hari yang biasa, berapakah jumlah masa yang anda gunakan untuk duduk atau baring/bersandar?	Jam : minit [___] [___] : [___] [___]	P16 (a-b)

SECTION E: DIETARY INTAKE

SEKSYEN E: PENGAMBILAN DIET

- 3 DAYS DIETARY RECALL -

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

Nama : _____

Jabatan : _____

No. telefon : _____

Arahan Merekod Pengambilan Makanan dan Minuman Anda

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

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			

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			

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			

APPENDIX C
Ethics Approval from Medical Research and Ethics Committee (MREC)

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