



UNIVERSITI PUTRA MALAYSIA

***FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG
STUDENTS IN MATRICULATION COLLEGES***

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**FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG
STUDENTS IN MATRICULATION COLLEGES**

BY

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ABSTRACT

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG STUDENTS IN MATRICULATION COLLEGES

Nur Syuhada binti Ahamad Nawawi

Unhealthy body weight status often become hot issues worldwide as the prevalence keep increasing day by day. Adolescents always have the attention regarding this issue as it might affect them in the future. Many studies have been done to find out the main factors that can contribute in having unhealthy body weight status. However, some factors discovered from the studies might not related for adolescents. Thus, this study aims to determine the factors associated with body weight status among adolescents in matriculation colleges. A cross-sectional study was conducted in 2 selected matriculation colleges which were Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor. A set of validated questionnaire was used to determine socio-demographic factors, sleep quality and anthropometric measurement. Dietary intake was determined using 24 hour dietary recall while physical activity level was assessed using physical activity record. There were 164 respondents which consisted of 23.8% of male students and 76.2% of female students with the mean age of 18.91 ± 0.29 years old became a part of this study. Majority of the respondents were Malay (81.7%), had 6 to 10 family members (50.0%), the mean of allowance was $RM310 \pm 136$ and the mean of household income was $RM2765 \pm 3191$. Moreover, most of the student's parental education level was in tertiary level which 50.6% for fathers' educational and 54.4% for mothers' educational and had parental occupation in white collar/self-employed sector which 90.0% for fathers and 98.6% for mothers. The prevalence of overweight and obese was 14.0% while the prevalence of thinness/severe thinness was 6.7%. The mean energy expenditure of the respondents was 1896.07 ± 447.45 , 90.2% of the respondents had negative energy balance and about 76.8% of the respondents were categorized in poor sleep quality category. Findings revealed that there was a significant association between sex and BMI-for age ($X^2=15.618$, $p<0.001$). Besides, energy intake ($r=-0.240$, $p=0.002$) and carbohydrate ($r=-0.246$, $p=0.002$) as well as fat ($r=-0.201$, $p=0.010$) had inverse significant association with BMI-for age. Meanwhile, there was a significant association between energy expenditure and BMI-for age ($r=0.651$, $p<0.001$). As a conclusion, the prevalence of unhealthy body weight status among matriculation students was in moderate level. However, awareness and knowledge regarding the unhealthy body weight status issue need to be addressed and spreaded among students in matriculation colleges for better quality of life.

ABSTRAK

FAKTOR-FAKTOR YANG BERKAITAN DENGAN STATUS BERAT BADAN DALAM KALANGAN PELAJAR DI KOLEJ-KOLEJ MATRIKULASI

Nur Syuhada binti Ahamad Nawawi

Isu status berat badan yang tidak sihat sering menjadi topik hangat diperkatakan kerana peratusan kecenderungan isu ini meningkat dari hari ke hari. Pelbagai penyelidikan telah dijalankan untuk mengetahui apakah faktor-faktor yang menyumbang kepada berlakunya masalah ini. Namun, sesetengah faktor tidak mempunyai kaitan dengan remaja. Justeru itu, tujuan penyelidikan ini dijalankan adalah untuk menentukan faktor-faktor yang berkaitan dengan status berat badan dalam kalangan remaja di kolej matrikulasi. Satu kajian keratan rentas telah dijalankan di 2 kolej matrikulasi yang terpilih iaitu Kolej Matrikulasi Negeri Sembilan dan Kolej Matrikulasi Selangor. Satu set soalan yang telah diiktiraf digunakan untuk menentukan maklumat mengenai ciri-ciri sosiodemografi, kualiti tidur dan ukuran antropometri. Pengambilan makanan ditentukan dengan menggunakan 24 jam imbas kembali diet dan tahap aktiviti fizikal ditentukan dengan rekod aktiviti fizikal. Seramai 164 orang responden yang terdiri daripada 23.8% lelaki dan 76.2% perempuan dengan min usia 18.91 ± 0.29 tahun menjadi sebahagian daripada kajian ini. Majoriti daripada responden adalah Melayu (81.7%), mempunyai ahli keluarga seramai 6 hingga 10 orang (50.0%), min elaun sebanyak $RM310 \pm 136$ dan min isi pendapatan rumah sebanyak $RM2765 \pm 3191$. Selain itu, kebanyakan daripada ibu bapa pelajar mempunyai pelajaran tahap ketiga, di mana 50.6% adalah untuk pendidikan bapa dan 54.4% bagi pendidikan ibu dan mempunyai ibu bapa yang bekerja dalam sektor kolar putih/bekerja sendiri, di mana 90.0% untuk bapa dan 98.6% bagi ibu. Kelaziman bagi berat badan berlebihan dan obes adalah sebanyak 14.0% dan kelaziman bagi kekurangan berat badan adalah sebanyak 6.7%. Min tenaga yang dikeluarkan adalah sebanyak 1896.07 ± 447.45 kcal, 90.2% daripada responden mempunyai negatif keseimbangan tenaga dan 76.8% daripada responden dikategorikan dalam kategori rendah kualiti tidur. Hasil kajian menunjukkan bahawa terdapat perkaitan yang signifikan antara jantina dan BMI untuk umur ($X^2=15.618$, $p<0.001$). Selain itu, tenaga yang diambil ($r=-0.240$, $p=0.002$) dan karbohidrat ($r=-0.246$, $p=0.002$) serta lemak ($r=-0.201$, $p=0.010$) mempunyai perkaitan songsang yang signifikan dengan BMI untuk umur. Manakala, terdapat perkaitan yang signifikan antara tenaga yang dikeluarkan dengan BMI untuk umur ($r=0.651$, $p<0.001$). Sebagai konklusi, kelaziman bagi status berat badan yang tidak sihat dalam kalangan pelajar matrikulasi adalah di tahap sederhana. Namun, kesedaran

dan pengetahuan mengenai isu status berat badan yang tidak sihat perlulah diambil kira untuk kualiti hidup yang lebih baik.



- CHAPTER 1

INTRODUCTION

1.1 Background

As the world evolves and emerges rapidly, health issues always becoming the major problem worldwide and adolescent is one of the population who tend to suffer from it. The main health issue that always encounters the adolescent population is on having healthy body weight status. Nowadays, the prevalence of having an unhealthy body weight status keeps rising annually. Body mass index (BMI) is one of the indicator used to identify body weight status. The most critical problem is on becoming overweight or obese and underweight for an adolescent.

Overweight or obese is defined as abnormal or excessive fat accumulation that contributes bad effect towards our health (World Health Organization, 2000). These terms also can be defined as ranges of weight which is greater from what is considered healthy for a given height (The U.S Center for Disease Control and Prevention, 2011). Obesity or overweight can be recognized manually by two ways which are from body mass index (BMI) and waist circumference or waist to hip ratio. Body mass index can be calculated from one's height and weight, which the person's weight in kilograms is divided square of the height in meters (kg/m^2). The classification of BMI is divided into three main categories which are underweight, normal and overweight or obese. For general population age 20 years old and above, the range of 25.0 kg/m^2 to 29.9 kg/m^2 is considered as overweight while BMI of more or equal to 30.0 kg/m^2 is classified as obese. For 5 to 19 years old, z-score is used for their BMI classification. Overweight and obese fall under more than +1SD (WHO, 2004).

Moreover, obesity is the main risk factor of non-communicable diseases. WHO (2018) stated that ischaemic heart disease and diabetes mellitus are two of top 10 causes of worldwide death in 2016. About 15.2 million people died due to ischaemic heart disease while 1.6 million people died to suffer diabetes mellitus. As the prevalence of overweight or obesity increase, the number of people suffering from non-communicable diseases also increases as well.

It is reported that worldwide obesity has tripled the number since 1975 which is more 650 million adults are obese in 2016. The number of overweight adults also increases to 1.9 billion in 2016. These facts show that about half of the adult population in this world suffer from having healthy body weight status. The obesity problem is not only happening to the adult, children and adolescents also face the same reality. Over 340 million children and adolescents aged 5-19 years old were revealed to be in the obese and overweight category (WHO, 2016). Meanwhile, the prevalence of overweight and obese among late adolescents in Malaysia reported from the fourth National and Health Morbidity Survey (2015) was about 16.6% and 11.7% respectively. The worst part is Malaysia also one of the countries that contribute to a high number of overweight and obese people. This fact is quite worrisome towards Malaysian's government since there is an increasing number of the overweight and obese person, the productivity of the person will decrease gradually. Besides, the high number of non-communicable diseases might happen and lead to increase morbidity and mortality rates of the country. Thus, the economic state of the country might affect in a negative way.

Besides, underweight can be defined as below a weight considered normal or desirable (Medical Dictionary for the Health Professions and Nursing, 2012). BMI value for underweight is below than 18.5 kg/m² while a range of 18.5 kg/m² to 24.9

kg/m² fall under the normal category. Thinness and severe thinness can be classified when the value is under than -2SD while normal class is between -2SD until +1SD (WHO, 2006). The incident of underweight can be seen happen all over the world. WHO (2016) reported that about 75 million girls and 117 million boys were underweight worldwide and India was the country that had the highest prevalence of moderate and severe underweight (22.7% girls and 30.7% boys) which represented 97 million from the total of 192 million of the underweight people. Finding from NHMS IV (2015) reported the prevalence of underweight among Malaysian adolescents aged 18 to 19 years old was 18.7%. Besides, a study from Fara Wahida et al. (2012) on adolescent in Kajang district, the prevalence of underweight was reported to be about 10.5%. Even though Malaysia is a developing country, the underweight problem also occurred in the community. Underweight incidence can lead to inadequate growth and development as well as loss of bone mass. As adolescence is the stage where rapid development will happen, sufficient amount of nutrients is a must for them to grow well. However, there were limited studies conducted on underweight adolescents as the underweight issue is concerned to be a major problem among children rather than adolescents.

The main factor of unhealthy body weight status is due to the imbalance between the energy intake and energy expenditure of a person. Nowadays, there has been a trend of eating fast food which contains of high fat and the modernization in human lifestyle make them life sedentarily which lead to low expended energy (Chaput, Klingenberg, Astrup & Sjödén, 2011). A study from Nik Nairan Abdullah et al. (2015) support the facts which stated that about 21.3% of the respondents from her study become obese due to high-frequency fast food consumption. Besides, there was a study from Li et al. (2014) that proved physical activity had an association with body

weight status. It was a non-randomized controlled which involved about 921 children and adolescents aged 7 – 15 years old in China. The intervention group of the study was exposed to multicomponent physical activity intervention which included extracurricular physical activity for overweight and obese as well as health education lectures. After the study, it found out that the decrease in BMI for the intervention group was significant rather than the control group.

In addition, sleep quality also can affect the body weight status of a person. Vargas, Flores & Robles (2014) revealed that sleep disturbance which was one of the components from Pittsburgh Sleep Quality Index had significantly associated with becoming overweight and obesity. This study also was supported with another study from Peltzer & Pengpid (2017) which had been done on undergraduate university students from 26 universities across 26 countries that revealed poor sleep quality can lead to abdominal obesity.

There was also a relationship on the socio-demographic factors with obesity. A study by Nizar, Tin, Vincent & Wee (2015) found out that there was an association between gender and body mass index where male university students were at high risk to become overweight and obese while female university students were susceptible to be in the underweight category. The findings from NHMS III and also Wang et al. (2012) exposed that female has a higher risk to become abdominal obesity rather than male. Zainuddin et al. (2016) also concluded that ethnicity and age group were the socio-demographic factors that associated with body weight status. Other studies from Chee et al. (2004) and Rosnah et al. (2009) also revealed the same outcome and supported the facts. Therefore, this study aims to further research on the factors that associated with body weight status among students in Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor.

1.2 Problem statement

Having and maintaining healthy body weight status nowadays is not an easy task as it requires effort and sacrifice from oneself. One tends to expose to many health problems due to unhealthy body weight status. A review article on the complications of obesity from Kinlen et al. (2017) stated that obesity not only associated with diabetes, heart disease, dementia, and cancer, it also increased the mortality rate of the population. The American College of Obstetricians and Gynaecologists (2017) stated obese adolescents might have a problem in breathing which can affect their sleep quality. They also face a higher risk of having low self-esteem, depression, anxiety and discrimination as they have "bigger" body image compared to others. These situations will then lead to suicidal as the society neglect them to be their own.

Students' busy lives in matriculation make them find it hassle to have or maintain healthy body weight status. Many factors can lead to a problem such as socio-demographic factors, dietary intake, physical activity level, sleep quality and the energy balance of the students. The aim of this study is to find contributing factors to the body weight status of adolescents.

There are some reasons why this study is going to be conducted on matriculation students. Firstly, there were not many studies that focused on 18 – 20 years old age range only. Most of the previous studies were conducted among primary school children and secondary school students. This range of age is where the first time students are on their own without the surveillance of their family. Thus, they will find it hard to well-adapt in the current situation to search for food by themselves.

Besides, there were inconsistency findings on the association between the sleep quality and body weight status. Rahe et al (2015) found out there was a significant

association of poorer sleep quality assessed by the continuous PSQI score with general obesity and high body fat while Lai & Say (2013) revealed that BMI was not significantly correlated with PSQI ($r=0.043$, $p=0.152$). Besides, the association between physical activity and body weight status also cannot be seen clearly as there were studies reported the association while others did not find the association between them. Sakinah, Seong-Ting, Rosniza, & Jayah (2012) revealed that there was a significant association between physical activity and BMI ($\chi^2=11.15$, $p=0.001$) whereas Gaylis, Levy, Kviatkovsky, DeHamer & Hong (2017) stated that there was no difference in physical activity found out between healthy and overweight or obese teens. The reason for the inconsistent findings was due to poor response rate of the participants as the number of sample was quite big. Poor response rate led to increase bias in the study. Thus, further research needs to be done in order to fulfil the gap. Therefore, the study will answer these following questions:

Research questions:

1. Are socio-demographic factors (age, sex, ethnicity, family size, monthly allowance, family income, parental education, and parental occupation), dietary intake, physical activity level, energy balance and sleep quality associated with body weight status among students in matriculation colleges?

1.3 Significance of the study

Healthy body weight status is a must for adolescents as they are still growing and it is the most crucial phase in their lives. Many factors can affect the body weight status such as socio-demographic factors, dietary intake, physical activity level, energy balance and sleep quality which are proven from the previous study on body weight status among adults and young adolescents. However, there were only a

number of studies that focused on late adolescents. We should bear in mind that late adolescent phase is the first time they be apart from their family which every decision is made by their own. They might unable to suit themselves in a new surrounding which then lead to having unhealthy body weight status such as obese or underweight. Besides, this study will be new baseline knowledge for other researchers to further investigate these relationships towards same target group but different population.

In addition, policymakers, health agencies, non-government organizations can be benefitted from the study in order to plan and implement effective policy and intervention programs for the adolescents in the future. This study also can be helpful for colleges and universities administrations as the data obtained from the study can be a guide for them to revise their curriculum and co-curriculum during matriculation studies in order to have the students become more physically active. Besides, this study can provide feedback from students regarding the allowance given from the Ministry of Education Malaysia for students throughout the matriculation studies period.

1.4 Objectives

1.4.1 General objective:

1. To determine the factors associated with body weight status among students in matriculation colleges.

1.4.2 Specific objectives:

1. To determine the socio-demographic factors (age, sex, ethnicity, family size, monthly allowance, family income, parental education, and parental occupation), dietary intake, physical activity level, energy balance and sleep quality among students in matriculation colleges.
2. To assess body weight status among students in matriculation colleges.

3. To determine the association of socio-demographic factors, dietary intake, physical activity level, energy balance and sleep quality with body weight status among students in matriculation colleges.

1.5 Null Hypotheses:

1. H_0 : There are no significant associations between socio-demographic factors and body weight status among students in matriculation colleges.
2. H_0 : There are no associations significant between dietary intake and body weight status among students in matriculation colleges.
3. H_0 : There are no significant associations between physical activity level and body weight status among students in matriculation colleges.
4. H_0 : There are no significant associations between energy balance and body weight status among students in matriculation colleges.
5. H_0 : There are no significant associations between sleep quality and body weight status among students in matriculation colleges.

1.6 Conceptual framework:

This study aims to determine the relationship between socio-demographic factors, dietary intake, physical activity, energy balance and sleep quality with body weight status among adolescents. A conceptual framework for this study is made by using variables available from other studies (Figure 1), where the independent variables are socio-demographic factors, dietary intake, physical activity level, energy balance, and sleep quality while the dependent variable is the body weight status of adolescents.

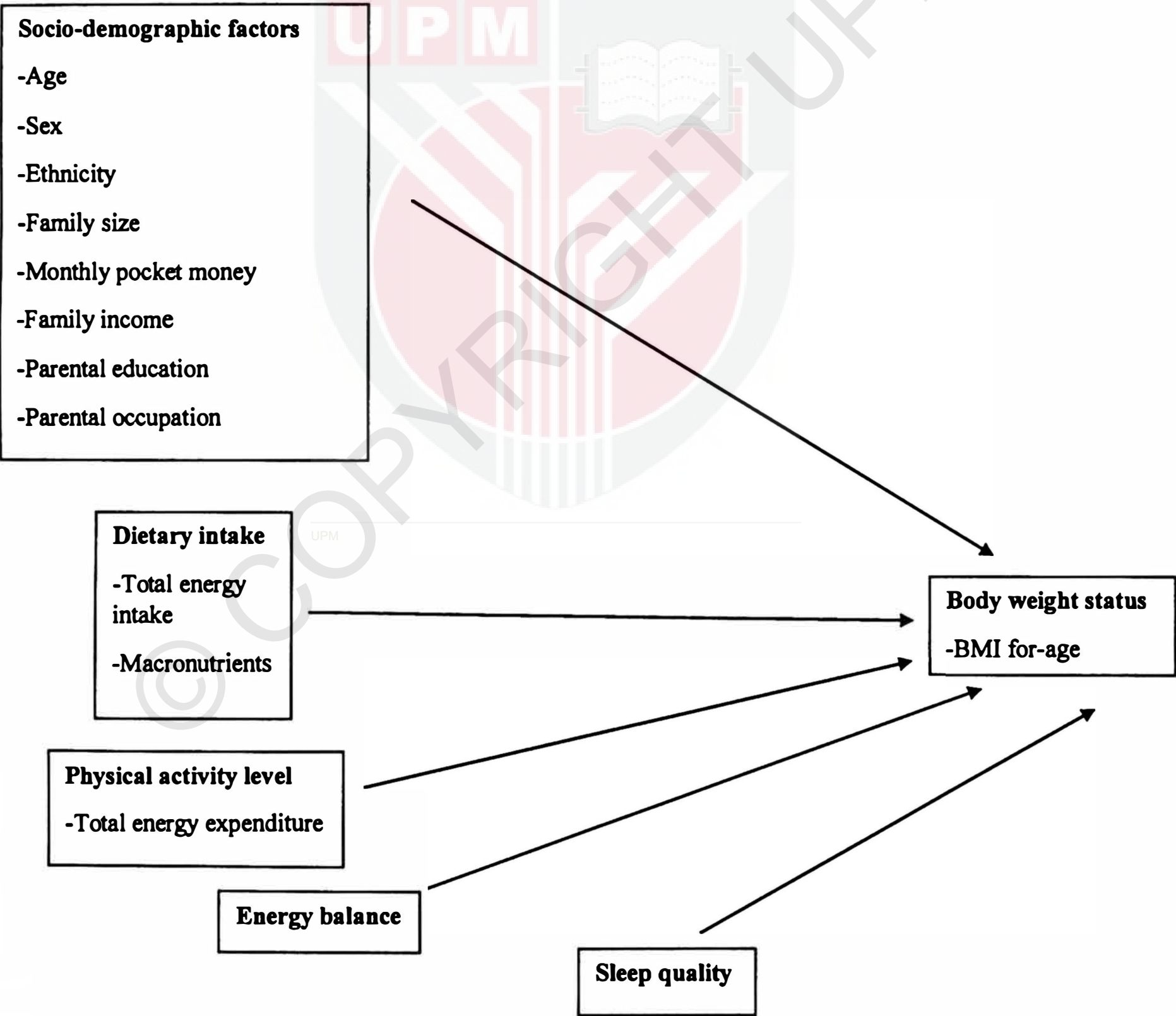


Figure 1.1: Conceptual framework of the study

The socio-demographic factors have the link with the body weight status. Selected socio-demographic factors such as age, gender, ethnicity, family size, monthly pocket money and family income, parental education, and parental occupation were given more attention. A study from Zarei et al. (2013) found out that gender has a significant association with body weight status. Another study from Tahereh et al. (2015) revealed that age and gender can affect the body weight status.

Besides, dietary intake also associated with body weight status. The study from Zarei et al. (2013) also stated that dietary intake has a higher association with body weight status. Besides, physical activity level seems to have some connection with body weight status. Lower physical activity level has the risk of getting overweight or obese (Salma et al., 2016).

In addition, the energy balance of the person also plays a role for a healthy body weight status. Blake et al. (2015) stated that poor energy balance is directly associated with lower lean and higher fat mass. Sleep quality also has an association with body weight status. Poor sleep quality allows a person to have the tendency to becoming overweight or obese (Ferranti et al., 2016). Similar studies from (Hung et al., 2016; Vargas et al., 2014) also revealed the same outcome.

CHAPTER 2

LITERATURE REVIEW

2.1 OVERVIEW OF BODY WEIGHT STATUS

Body weight status usually known be measured by body mass index (BMI) of someone. There are three main classifications of BMI which are underweight, normal and overweight or obese. For general population, BMI value for underweight is below than 18.5 kg/m² while a range of 18.5 kg/m² to 24.9 kg/m² fall under the normal category (WHO, 2004). The range of 25.0 kg/m² to 29.9 kg/m² is considered as overweight while BMI of more or equal to 30.0 kg/m² is classified as obese. For 5 to 19 years old, z-score is used for their BMI classification. Overweight and obese fall under more than +1SD, thinness and severe thinness can be classified when the value is under than -2SD while normal class is between -2SD until +1SD (WHO, 2004). Unhealthy body weight can lead to many negative health outcomes such as diabetes, cardiovascular disease for obese person and also iron deficiency anaemia for underweight person. Obesity also not associated with dementia and cancer, it also elevated the mortality rate of the population (Kinlen et al., 2017). Underweight adolescents more prone to get any infection due to their weakened immune system (Dobner & Kaser, 2017). Besides, Zhang et al (2011) stated that they also tend to have high risk of surgical complication than normal when performing any surgery. The prevalence of overweight or obesity worldwide keeps increasing day by day. Based on the fourth National and Health Morbidity Survey (2015), the prevalence of overweight and obese among late adolescents in Malaysia reported from was about 16.6% and 11.7% respectively while the prevalence of underweight among adolescents aged 18-19 years old was 18.7%. A cross-sectional study conducted

among 22 universities in 22 countries from Peltzer et al. (2014) revealed that the prevalence of overweight or obesity was 22% for both gender while the prevalence of underweight for male and female were 10.8% and 17.6% respectively. A local study from Gopalakrishnan, Ganeskumar, Prakash, Christopher & Amalraj (2012) found that 14.8% of the students were overweight, 5.2% of them were obese while another 14.8% were recognized as underweight. Another local study by Boo, Chia, Wong, Chew, Chong & Loo (2010) which was conducted in International Medical University Malaysia concluded that the prevalence of overweight or obese among the students was 30.1%. These local studies strengthen the previous study which produced the similar outcome to show that university or college students tend to have unhealthy body weight status. There are several factors that found to have association with body weight status among students which are socio-demographic factors, dietary intake, physical activity level, energy balance, and sleep quality.

2.2 SLEEP QUALITY

Sleep quality and body weight status

A cross-sectional study on sleep quality was conducted among Malaysian medical students in International Medical University (IMU) by Zalinawati and other researchers in 2009. About 799 students were participated in the study. It found out that the prevalence of poor sleep quality among the respondents was 16.1%. Other study conducted among secondary school students in Gombak, Selangor revealed that the prevalence of poor sleep quality among them was 24.0% (Kesintha, Rampal, Sherina & Kalaiselvam, 2018). Another study was conducted among medical university students in China found out that about 27.8% of the respondents were fall under poor sleeper category (Wang et al, 2016). Almojali, Almalki, Allothman,

Masuadi & Alaqeel (2017) also revealed that the prevalence of poor sleep quality among medical students in King Saud bin Abdulaziz University in Riyadh was 76%.

Kristić, Štefan, & Sporiš (2018) conducted a cross-sectional study in Zagreb, Croatia among early adults. It found out that poor sleep quality was associated (OR = 1.45; 95% CI 1.14 to 1.83) with the higher likelihood of being overweight/obese. A study from Hung, Yang, Ou, & Wu (2013) in Taiwan, China also produced the same outcome. They used Pittsburgh Sleep Quality Index (PSQI) which was a validated questionnaire to measure the sleep quality. The global PSQI scores for overweight and obese were 6.61 ± 2.96 , and 7.02 ± 2.95 while for normal weight, the global PSQI scores was 6.30 ± 2.56 ($P < 0.001$). The result for global PSQI significantly associated with body weight status. Another study conducted in Münster, Germany by Rahe et al (2015) that also investigate the association between sleep quality and body weight status revealed that there was a significant association of poorer sleep quality assessed by the continuous PSQI score with general obesity and high body fat (for both, odds ratio=1.07, 95% confidence interval=1.01–1.13). A study from Alfarhan, Al Matrouk, AlGaowba, AlHamely & Tork (2018) revealed that there was not a significant association between poor sleep and body mass index. However, from the observation of the trend, it can be concluded that overweight and obese students from all health colleges had higher frequency of poor sleep rather than normal students. Another study from Al-Otaibi (2017) proved that there was an association between sleep quality and body mass index. It revealed that poor sleep quality had higher risk of being overweight or obese (OR=4.210, $p=0.001$).

2.3 PHYSICAL ACTIVITY

Physical activity and body weight status

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure (World Health Organization, 2018).

A non-randomized controlled trial study by Li et al (2014) which was conducted in Beijing, China found out that physical activity does has relationship with body weight status. It revealed that the decrease of BMI was statistically significant in intervention group ($-0.02 \pm 0.06 \text{ kg/m}^2$), compared with elevation of BMI in control group ($0.41 \pm 0.08 \text{ kg/m}^2$; adjusted mean difference, -0.43 kg/m^2 ; 95% CI, -0.63 to -0.23 kg/m^2 ; $P < 0.001$). Besides, the incidence of overweight/obesity in intervention group was significantly lower compared with those in control group (2.7% vs. 7.1%, adjusted OR (95% CI), 0.34(0.15 to 0.80); $P = 0.015$). A local study by Sakinah, Seong-Ting, Rosniza, & Jayah KP (2012) which was conducted in Kelantan, Malaysia also produced the same outcome. This cross-sectional study proved that there was a significant association between physical activity and BMI ($\chi^2=11.15$, $p=0.001$). Another local cross-sectional study conducted in one of the universities in Kuala Lumpur by Salma, Hazizi, & Rosita (2016) concluded the same finding that physical activity has significant relationship with body weight status. The crude analysis of the study found engaging in transport-related, recreational related and vigorous physical activity, showed approximately 50% protection against overweight / obese status (crude OR = 0.58, 95% CI = 0.35 – 0.95, crude OR = 0.50, 95% CI = 0.30 = 0.81 and crude OR = 0.42, 95% CI = 0.26 – 0.69 respectively). Shi, Jiang, Sim, Chum, Ali & Toh (2014) found out that lack of performing exercise during weekdays had positive association with obesity (OR=2.97, $p<0.01$). Topera et al. (2017) found out that physical activity and body weight status have an association. Students who were used to engage in physical activity were 0.40 times less likely to become overweight and obese (OR=0.40, 95% CI: 0.39-0.78).

2.4 DIETARY INTAKE

-Energy intake and body weight status

Energy intake per day can be defined by the total energy intake which was mainly come from food and drinks. A study on dietary intake among university students by Zamaliah, Shamsul & Mirnalini (1999) in Universiti Putra Malaysia. It found out that the mean energy intake of the students was 1230 kcal per day. Another study was conducted among university students in Malaysia revealed that the mean energy intake for male was 1938.50 kcal per day while the mean energy intake for female was 1681.84 kcal per day (Abdull Hakim, Muniandy & Danish, 2012).

Woon, Chin, Taib, & Nasir (2015) revealed that the level of energy intake does affected body weight status. Result obtained from the study showed low energy intake ($p < 0.05$) and low energy expenditure ($p < 0.05$) were associated with high BMI-for-age. Besides, another cross-sectional study by Fara Wahida, Chin, Barakatun & Mohd in year 2012 that investigate the relationship between these two variables also produced the same finding which was energy intake was found to be significantly correlated with body mass index (BMI) ($r = 0.153$, $P < 0.05$). A study from Boonchoo, Takemi, Hayashi, Koiwai, & Ogata (2017) found out those participants who were overweight and obese had higher energy intake compared to normal group.

Macronutrients and body weight status

Macronutrients are the nutrients that supply most of the energy for the body which are carbohydrate, protein as well as fat. A local study by Firouzi, Koon, Noor & Sadeghilar in year 2014 revealed that the consumption of carbohydrate is significantly correlated with BMI ($r = 0.188$, $p < 0.05$). This finding also be supported by a study from Serd (2012) that found out there was an inverse relationship between

carbohydrate intake and body mass index. However, a study from Sturhman, Nucci, Hopkins & Henes (2015) reported that the amount of total protein intake had no association with body mass index.

2.5 ENERGY BALANCE

Energy balance and body weight status

Energy balance can be determined by the value obtained from energy intake minus total energy expenditure which produced either positive or negative as well as zero. The association between energy balance and body weight status cannot be seen clearly as there were limited study that focused on this relationship. A study from Nande, Mudafale & Vali (2008) was conducted in Nagpur, Maharashtra among athletes found out that all players engaged in different sports disciplines showed negative energy balance. The minimum value were for badminton group for females & judo & gymnastics for males (-113.51 & -84.6 kcal respectively) and the maximum was recorded for half marathon group among females & volleyball among males (-1157.65 & -934.84 kcal respectively). This result concluded that mostly athlete with normal BMI will lose weight instead of gaining weight. Another cross-sectional study conducted in Agroha among adolescent girls revealed that 68.50% of the girls with negative energy balance were underweight while 57.53% of the girls with positive energy balance also revealed to be underweight ($p>0.05$). From the results obtained, we can conclude that underweight person can be from someone who either positive or negative energy balance.

2.6 SOCIO-DEMOGRAPHIC FACTORS

Sex and body weight status

A cross-sectional study conducted by Zarei, Nasir, Taib, Zarei, & Saad (2013) found out that sex showed a significant association with body weight status than other socio-demographic factors ($P=0.02$). The mean values of BMI for the female was lower than male (22.8 vs. 23.9). Another local study by Zainudin, Manickam & Kee (2016) demonstrated that being female has higher risk of becoming obese (OR: 1.4, 95% CI: 1.2-1.6). Suleiman, Alboqai, Yasein, El-Qudah, Bateinah & Obeidat (2009) revealed that there was a significant association between sex and body weight status ($p=0.0001$). The results from the study showed that females tend to become overweight and obese. Study from Sofia, Maria, Pilar, Dario, Adame & Guillermo (2015) revealed that there was a statistically significant association between male sex and obesity prevalence ($p<0.01$). The prevalence of obese males was 17.3% while the prevalence of obese female was about 4.9%. A study conducted by Ahmed, Ahmed, Huque, Abdulhameed, Khan & Muttappallymyalil (2015) reported that there was a statistically significant association between sex and body weight status ($p<0.05$). Male students tend to become overweight and obese with prevalence value were 34.6% rather than female students with the prevalence value of 21.5%. A study from Back, Oliveira, Silva & Marcon (2018) revealed that male was a significant risk of being overweight (OR: 2.161, CI: 1.49-3.12; $p<0.001$) and obese (OR: 3.057, CI: 1.68-5.55; $p<0.001$). A study from Sen, Mondal & Dutta (2013) found out that female was a significant risk of becoming obese (OR: 3.88, 95% CI: 2.54-6.12; $p<0.01$).

Age and body weight status

A study from Suleiman, Alboqai, Yasein, El-Qudah, Bateinah & Obeidat (2009) that was conducted in Jordan University, Amman found out that there was a significant association between age and body weight ($p=0.0001$). It revealed that the prevalence of overweight and obese increase along with the age. The higher the age

group, the prevalence was getting increasing. Study from Topera et al. (2017) that was conducted in University of Botswana revealed that the older the students the higher the prevalence of becoming overweight and obesity (OR: 1.72, 95% CI: 1.06-4.46).

Ethnicity and body weight status

Zainudin, Manickam & Kee (2016) revealed that being Indian has higher risk of becoming overweight (OR: 1.8, 95% CI: 1.2-2.8) and obese (OR: 1.7, 95% CI: 0.9-3.2). However, a study from Tan, Steven & Mustapha (2012) found out a very contradict findings. It revealed that Malay was the ethnic that prone to be overweight and obese. A study from Jiang et al. (2014) that was conducted among young adult Singaporean males revealed that Indian was positively associated with obesity (OR: 2.22, $p < 0.01$).

Household income and body weight status

A study conducted by Zainudin, Manickam & Kee in year 2016 also discovered the relationship between level of household income and body weight status. It concluded that high household income has higher risk of being overweight (OR: 1.3, 95% CI: 1.2-1.6) while middle household income has higher risk of being obese (OR: 1.3, 95% CI: 1.2-1.6). A cross-sectional study by Suleiman, Alboqai, Yasein, El-Qudah, Bateinah & Obeidat (2009) showed that monthly family income had a significant association with body weight status ($p = 0.0001$). The study found out that prevalence rates of overweight and obese was higher among low income students (<500 JD) rather than high income students. Sen, Mondal & Dutta (2013) reported that $\geq$ Rs 10,000 monthly income was a significant risk of individual to become obese (OR: 2.65, 95% CI: 1.47-4.89; $p < 0.01$).

Parental education and occupation

Ferranti et al (2016) conducted a cross-sectional study among adolescents in Sicily, Southern Italy. They discovered that students with higher parents' education and occupation ($p=0.024$ and $p=0.026$) were significantly less likely to overweight and obese ($p<0.05$). This kind of parents seems to feed their children with only nutritious food. The results obtained from cross-sectional study by Shi et al. (2014) showed that parental occupation was positively associated with obesity of the child. Fathers with nonmanagerial/professional jobs were positively correlated with obesity (OR 1.52, $p<0.01$) while mothers who worked at managerial/professional positions were positively correlated with obesity (OR=2.02, $p<0.01$).

CHAPTER 3

METHODOLOGY

3.1 Study design

This was a cross-sectional study aimed to determine the association between socio-demographic factors, dietary intake, physical activity, energy balance and sleep quality with body weight status among adolescents in matriculation colleges.

3.2 Study location

This study was conducted in Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor.

3.3 Sample size determination

The sample size was determined by using the following formula for correlation:

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

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

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

where;

$$\alpha = Z\alpha = 1.96$$

$$\beta = Z\beta = 0.84$$

r = the expected correlation coefficient

Table 3.3: Sample size calculation

Correlation studies	Coefficient, r	Sample size, n
Energy expenditure with BMI (Fara Wahida et al. (2012))	0.747	$C = 0.5 * \ln[(1+r)/(1-r)]$ $C = 0.966$ $N = [(Z\alpha + Z\beta)/C]^2 + 3$ $N = 11.4$ $N = 12$
Physical activity with BMI (Fara Wahida et al. (2012))	0.463	$C = 0.5 * \ln[(1+r)/(1-r)]$ $C = 0.501$ $N = [(Z\alpha + Z\beta)/C]^2 + 3$ $N = 34.2$ $N = 35$
Physical activity with BMI (Geok et al. (2014))	0.24	$C = 0.5 * \ln[(1+r)/(1-r)]$ $C = 0.244$ $N = [(Z\alpha + Z\beta)/C]^2 + 3$ $N = 134.6$ $N = 135$

In this study, the sample size was determined using r, correlation from a study conducted by (Geok et al., 2014) with $r = 0.24$ with 135 participants.

Additional 20% of sample size calculation was added to account for nonresponse and those who might not complete the questionnaire. Hence, the total number of respondents for this study was 162.

3.4 Sample design

The sample design used for this study was non-probability sampling which was purposive sampling. Non-probability sampling leads to unknown probability of selection for every single unit to participate in the study. Mainly, the study location was at Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Negeri Sembilan. Subjects were then further selected for the study follow according to the inclusion and exclusion criteria stated.

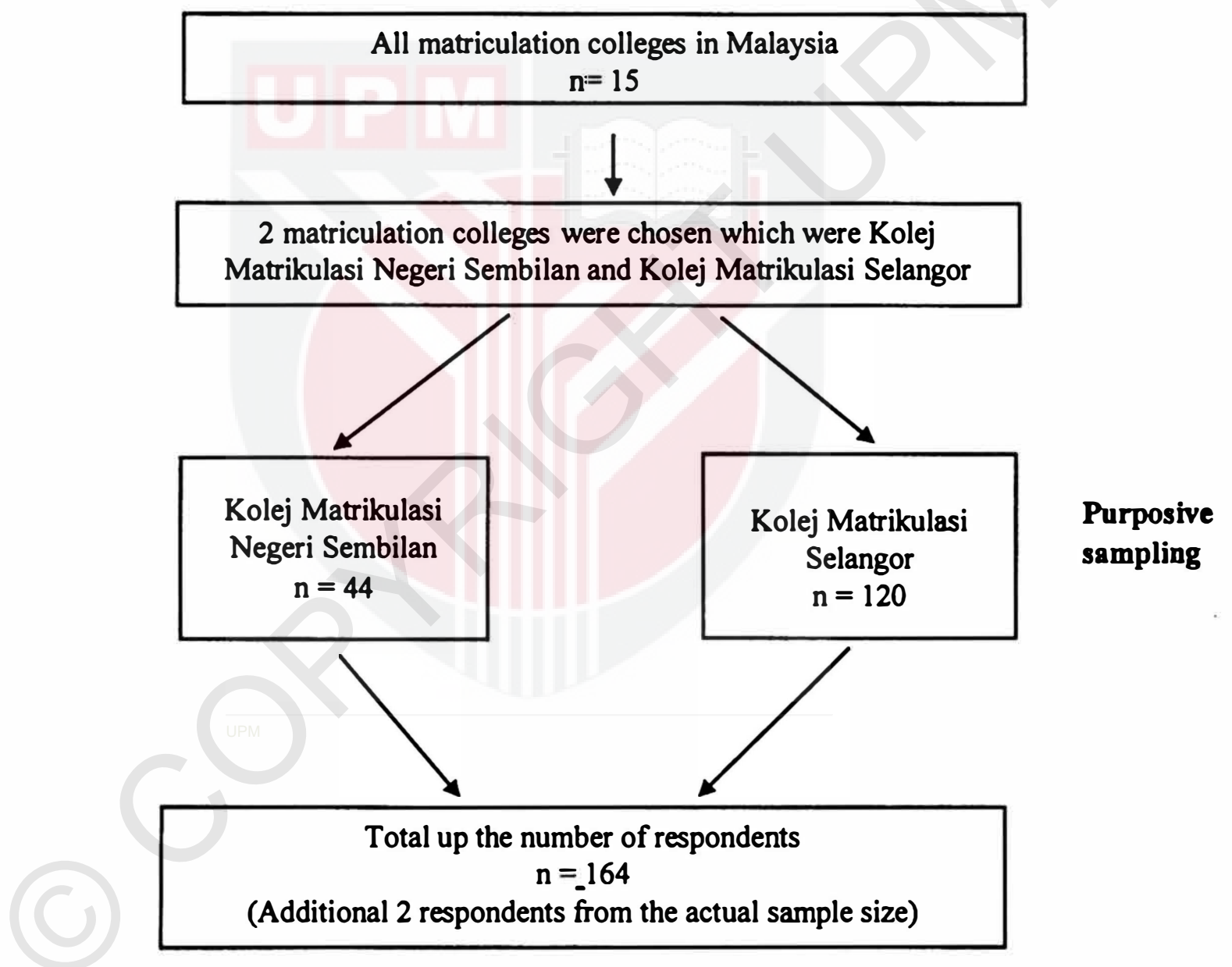


Figure 3.1: Sampling design for the study

The number of participants in Kolej Matrikulasi Selangor was higher than the number of participants in Kolej Matrikulasi Negeri Sembilan. The reason for the situation was due to the number of days for data collection. Data collection conducted

in Kolej Matrikulasi Selangor was for two days as the location of the college was near and easy to go back and forth while data collection conducted in Kolej Matrikulasi Negeri Sembilan was for one day only.

3.5 Subjects

The subjects for this study were students who study in Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor. The inclusion and exclusion criteria's follow as below:

Table 3.5: Inclusion and exclusion criteria of the study

Inclusion criteria	Exclusion criteria
Malaysian	Students with a physical disability
All ethnicity	Students on medication
Both gender	Students with chronic diseases
Age 18-19 years old	

3.6 Measures

Subjects were assessed on socio-demographic factors, dietary intake, physical activity, energy balance, and sleep quality. For body weight status, anthropometric measurements were taken towards the subjects which were weight and height. A bilingual questionnaire was prepared for subjects to answer it in order to assess each measure.

Socio-demographic factors

The information on age, sex, ethnicity, family size, family's income, monthly allowance, parent's education, and parent's occupation were taken to assess the socio-demographic factors. There was also a question on medical history included in this section.

2 Day 24-hr dietary recall

24-hr dietary recall for 2 days (a weekday and a weekend) were obtained from the subjects. This method was used in order to get the approximate amount of nutrient and energy intake of the subjects for a day. This session was done in an interview with subjects and also with the aid of household measurements for the estimation of portion size of the food taken. All foods and drinks taken from previous 2 days was recorded including the details such as the brand of the food and cooking method. Subjects also needed to state if they took any nutritional supplements during the recall. The total energy intake, macronutrients (carbohydrates, proteins, and fats) intake were calculated from the 24-hr dietary recall. The data were keyed in and Nutritionist Pro software was used to analyse the data obtained. The final result was compared with 2017 Recommended Nutrient Intakes (RNI) for Malaysia. The ratio of total energy intake (EI) and basal metabolic rate (BMR) was used to determine under-reporting dietary intake where the value below 1.2 categorized as under-reporting and above 1.8 categorized as over-reporting (Goldberg et al, 1991). Basal metabolic rate was calculated using Harris-benedict equation.

2 days of physical activity record

Physical activity record was used to calculate energy expenditure of the subjects. They were required to record their activities done in every 15 minutes period for 2 days which happened on the same day of 2 days dietary record. Each activity has its own MET value which 1 MET 3.5ml O₂/kg body weight/minute/resting metabolic rate), based on the Compendium of Physical Activities (Ainsworth et al. 1993). The formula for energy expenditure is:

$$\text{Energy expenditure} = \text{MET value} \times \text{duration activity (hr)} \times \text{body weight (kg)}$$

(Ainsworth et al. 1993)

The physical activity level of the subjects also were obtained through this study by dividing the total daily energy expenditure (TDEE) with basal metabolic rate (BMR) (Food and Agriculture Organization/World Health Organization/United Nations University [FAO/WHO/UNU], 2004). The physical activity level was further classified into four categories which are sedentary, light activity, moderately active and vigorously active. Classification of physical activity in the table below:

Table 3.6.1: Classification of physical activity level

Categories	Physical activity value
Sedentary	<1.40
Light activity	1.40-1.69
Moderately active	1.70-1.99
Vigorously active	2.00-2.40

([FAO/WHO/UNU], 2004)

Energy balance was determined from the mean of 2 days energy intake minus with the mean of 2 days energy expenditure. Positive energy balance indicated high energy intake whereas negative energy balance showed high energy expenditure.

Sleep quality questionnaire

The Pittsburgh Sleep Quality Index (PSQI) was used to measure the sleep quality of the subject. It was a well-validated questionnaire designed to subjectively measure sleep quality, disturbances, and typical sleeping habits retrospectively over the previous month (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). There were a total of 9 items which are categorized into 7 components being evaluated. The scoring was shown below:

Table 3.6.2: Scoring of PSQI

Components	Item No.	Scoring
C1 - Subjective sleep quality	#9	Take score as point
C2 - Sleep latency	#2 + #5a	<15 min = 0 points, 16-30 min = 1 point, 31-60 min = 2 points, >60 min = 3 points
C3 - Sleep duration	#4	>7 hours = 0 point, 6-7 hours = 1 point, 5-6 hours = 2 points,
C4 - Habitual sleep efficiency	#4	(total # of hours asleep) / (total # of hours in bed) x 100 >85% = 0 point, 75%-84% = 1 point, 65%-74% = 2 points, <65% = 3 points
C5 - Sleep disturbances	#5b to #5j	sum of scores #5b to #5j: 0 score = 0 point, 1-9 score = 1point, 10-18 score = 2 points, 19-27 score = 3 points
C6 - Use of sleeping medication	#6	Take score as point
C7 - Daytime dysfunction	#7 + #8	#7 Score + #8 score: 0 score = 0 point, 1-2 score = 1 point, 3-4 = 2 points, 5-6 score = 3 points

Then all the points from all 7 components were summing up to indicate the sleep quality of the participants. A total point of equal to or larger than "5" indicated poor sleep quality.

Item 4, “During the past month, how many hours of *actual sleep* did you get a night? (This may be different than the number of hours you spend in bed.)”, was used as the subjective total sleep time variable. The subjective time in bed variable was calculated by subtracting usual bedtime (Item 1, “During the past month, when have you usually gone to bed at night?”) from usual wake time (Item 3, “During the past month, when have you usually gotten up in the morning?”). This questionnaire had concurrent validity and discriminative validity (Grandner et al., 2006). The reliability of this questionnaire was satisfactory (Cronbach’s $\alpha = 0.73$) (Kristi, Štefan & Sporiš, 2018).

Anthropometric measurements

Anthropometry measurements that were taken throughout this study were height, weight, and body mass index (BMI). SECA body meter and Tanita digital weighing scale were used to measure the height and weight of the subjects. World Health Organization (2004) provided BMI classification for 5 to 19 years old using z-score. Overweight and obese fall under more than +1SD, thinness and severe thinness can be classified when the value is under than -2SD while normal class is between -2SD until +1SD. The data were keyed-in and WHO Anthroplus Software was used to identify the BMI classification of the respondents.

3.7 Pre-testing

Prior to the study, 10 subjects from who meet the study criteria were chosen to pre-test the questionnaire. The subjects for pretesting had the same characteristics as the real study sample. The pre-testing of the questionnaire was aimed to identify the time needed to complete the questionnaire as well as to check if the instruction given is clear, direct and understanding of the subjects. Hence, the questionnaire was improvised based on the problems or errors that arise.

The feasibility of the questionnaire was re-assessed after pre-testing so that appropriate information was obtained during the data collection later. The subjects who have involved in pre-testing were not be included in the data collection of the study.

3.8 Data collection

The study was conducted from January 2019 to February 2019. For subject recruitment, the subjects who matched the study criteria and gave consent to participate in the study were interviewed. Thus, all the measures were based on interviewer administrated questionnaire. There are five main sections of the questionnaire, where the first section was about socio-demographic characteristics, the second section was about 2 days 24-hr dietary recall, the third section was about 2 days physical activity record and the fourth section was about sleep quality. For the last page, the information on anthropometric measurement were recorded such as height and weight which were taken on that time.

3.9 Ethical approval

Prior to commencement of the study, ethical clearance was sought from UPM's Ethics Committee for Research Involving Human Subjects (JKEUPM). The approval of the study protocol was obtained from the Ministry of Education and Matriculation Division. Furthermore, the permission to conduct the study in Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor was obtained prior to data collection.

Subjects were given an information sheet that explaining the purpose of the study and consent to take part will be sought prior to the administration of the questionnaire. All the information were kept confidentially by ensuring no personal details were written in the questionnaire

3.10 Data analysis

The data were keyed in and analysed by using SPSS software. Descriptive statistics which comprise frequencies, percentage, means and standard deviation were used to analyse all the variables. Hence, the association between socio-demographic factors, dietary intake, physical activity, sleep quality and energy balance with body mass index were further investigated by using Pearson correlation coefficients for continuous variables. Categorical variables was analysed using Chi-square test to find the association between them. Statistical significance was set at $p < 0.05$.

CHAPTER 4

RESULTS AND DISCUSSION

There were 164 students from Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor participated in this study. Based on table 4.1, the mean age of the respondents was 18.91 ± 0.29 . Most of the respondents age 19 years old, which 91.2% (n=114) were female and 89.7% (n=35) were male. All ethnicities had participated in this study with majority of them were Malay (81.7%; n=134), followed by Chinese (10.4%; n=17), Indian (5.5%; n=9) and others (2.4%; n=4). About half of the respondents (50.0%; n=82) had family members in a range of 6 to 10 members. Most of the female students had family members in the range of 6 to 10 members whereas most of the male students had family members in range of 1-5 members. For the monthly allowance, majority of the student were in the group of below RM250.

Most of the students' fathers had tertiary education (50.6%) which female students contribute 45.4% (n=54) while male students 66.7% (n=26). The same pattern also applied to mothers' educational level where most of the students' mothers had tertiary education (54.4%; n=86), followed by secondary education (41.8%; n=66), primary education (3.2%; n=5) and no formal education (0.8%; n=1). For parental occupational, most of the students fell in white collar/self-employed category while the rest were in blue collar category. For household income, majority of the students were in below and equal to B40 group (76.8%; n=126), followed by M40 group (20.7%; n=34) and T20 group (2.4%; n=4).

Generally, the population in Malaysia consisted 69.1% of Bumiputera, 23.0% of Chinese, 6.9% of Indians while the rest were others ethnicity. The proportion of the ethnicity in study was differ than the general population. Thus, the result obtained from this study cannot be generalized to the real population. Besides, the proportion

of male and female was also differ as the real population had higher proportion for male instead of female where the ratio was 107 males : 100 females (Department of Statistics Malaysia, 2018).

Table 4.1: Socio-demographic characteristic of the respondents

Characteristics	Mean±SD/Median(IQR:Q1-Q3)		
	Male (n=39)	Female (n=125)	Total (n=164)
Age (years)	18.90±0.31	18.91±0.29	18.91±0.29
No. of family members	5.49±1.55	5.77±1.74	5.70±1.70
Allowance (RM)	349.74±176.37	297.68±119.50	310.06±136.42
Household income (RM)	2500(IQR:1250-4500)	2000(IQR:850-3500)	2000(IQR:1000-3500)
Characteristics	Male (n=39)	Female (n=125)	Total (n=164)
Age (years)			
18	4(10.3)	11(8.8)	15(9.1)
19	35(89.7)	114(91.2)	149(90.9)
Ethnicity			
Malay	31(79.5)	103(82.4)	134(81.7)
Chinese	6(15.4)	11(8.8)	17(10.4)
Indian	1(2.6)	8(6.4)	9(5.5)
Others	1(2.6)	3(2.4)	4(2.4)
No of family members			
1-5	20(51.3)	59(47.2)	79(48.2)
6-10	19(48.7)	63(50.4)	82(50.0)
11-15		3(2.4)	3(1.8)
Allowance per month (RM)			
<250	18(46.2)	75(60.0)	93(56.7)
251-500	17(43.6)	45(36.0)	62(37.8)
501-750	2(5.1)	3(2.4)	5(3.1)
751-1000	2(5.1)	2(1.6)	4(2.4)
Father education			
No formal education	-	2(1.7)	2(1.3)
Primary education	-	6(5.0)	6(3.8)
Secondary education	13(33.3)	57(47.9)	70(44.3)
Tertiary education	26(66.7)	54(45.4)	80(50.6)

Mother education			
No formal education		1(0.8)	1(0.6)
Primary education	1(2.6)	4(3.3)	5(3.2)
Secondary education	11(28.9)	55(45.8)	66(41.8)
Tertiary education	26(68.4)	60(50.1)	86(54.4)
Father's occupation			
White collar/Self-employed	31(96.9)	86(87.8)	117(90.0)
Blue collar	1(2.6)	12(12.2)	13(10.0)
Mother's occupation			
White collar/Self-employed	16(94.1)	55(100.0)	71(98.6)
Blue collar	1(5.9)	-	1(1.4)
Household income			
≤B40 (≤RM3860.00)	26(66.7)	100(80)	126(76.8)
M40 (RM3860.00-RM8319.00)	11(28.2)	23(18.4)	34(20.7)
T20 (≥RM8319.00)	2(5.1)	2(1.6)	4(2.4)

*references from Household Income Expenditure Survey (HIES) 2014

Table 4.2 showed the mean value for energy and macronutrients intake of the students for weekday, weekend and the average two days. For weekday, male students had higher mean energy intake which was 1189 ± 284 kcal while female students' mean energy intake was 1080 ± 310 kcal. The mean carbohydrate, protein and fat intake for weekday were 577 ± 173 kcal, 175 ± 70 kcal and 341 ± 125 kcal.

For weekend, male students also had higher mean energy intake which was 1251 ± 379 kcal whereas female students' mean energy intake was 1113 ± 372 kcal. The mean carbohydrate, protein and fat intake for weekend were 601 ± 203 kcal, 182 ± 84 kcal and 362 ± 158 kcal. In average, the mean energy intake for the students was 1126 ± 337 kcal. Male students had higher carbohydrate, protein and fat intake which were 651 ± 175 kcal, 194 ± 70 kcal and 389 ± 134 kcal than female students.

Previous study was conducted among university students in Malaysia revealed that the mean energy intake for male was 1938.50 kcal per day while the mean energy intake for female was 1681.84 kcal per day (Abdull Hakim, Muniandy & Danish, 2012).

Table 4.2: Dietary intake of the respondents

Items	Mean±SD		
	Male (n=39)	Female (n=125)	Total (n=164)
Weekday (kcal)			
Energy intake	1189±284	1080±310	1106±307
Carbohydrate	627±144	561±179	577±173
Protein	187±61	171±73	175±70
Fat	363±113	334±129	341±125
Weekend (kcal)			
Energy intake	1251±379	1113±372	1146±377
Carbohydrate	674±214	579±194	601±203
Protein	200±81	176±84	182±84
Fat	414±175	346±149	362±158
Average (kcal)			
Energy intake	1220±326	1096±336	1126±337
Carbohydrate	651±175	574±182	592±183
Protein	194±69	174±77	179±76
Fat	389±134	340±136	351±137

Based on table 4.3, there were none students that achieve the adequate amount of recommended energy intake for students aged 18 years old. The mean energy intake for students aged 18 years old was 994±254 kcal. Both male and female students had adequate amount of carbohydrate (50-60%) which were 50.0% (n=2) and 54.5% (n=6) respectively. For protein intake, male students were higher in below than 15% category which was 50.0% (n=20) whereas female students were higher in 15-20% category which was 54.5% (n=6).The mean fat intake for students aged 18 years old

was 288±90 kcal. Most of the female students were in 25-30% category which was 54.5% (n=6).

For students aged 19 years old, the mean energy intake was 1139±342 kcal. 3.5% of the female students achieve adequate energy intake while the rest fell in inadequate category. All of the male students were in inadequate category. Majority of male and female students had adequate carbohydrate intake which were 60.0% (n=21) and 42.1% (n=48) respectively. The mean intake of protein for 19 years old students was 181±77 kcal. Most of the male students were in 15-20% category (51.4%; n=18) however higher number of female students were in below than 15% category (44.7%; n=51) for protein intake. For fat intake, majority of both sex were fell in more 30% category.

Table 4.3: Distribution of respondents by dietary intake (18 years old)

Items	Male (n=4)	Female (n=11)	Mean±SD
Energy intake (kcal)			994±254
≥RNI (M: 2340, F:1890)	-	-	
<RNI	4(100)	11(100)	
Under-reporting	4(100)	11(100)	
CHO intake (kcal)			540±148
<50%	1(25.0)	3(27.3)	
50-60%	2(50.0)	6(54.5)	
>60%	1(25.0)	2(18.2)	
Protein intake (kcal)			157±51
<15%	2(50.0)	5(45.5)	
15-20%	1(25.0)	6(54.5)	
>20%	1(25.0)		
Fat intake (kcal)			288±90
<25%	2(50.0)	1(9.1)	
25-30%	1(25.0)	6(54.5)	
>30%	1(25.0)	4(36.4)	

Table 4.4: Distribution of respondents by dietary intake (19 years old)

Items	Male (n=35)	Female (n=114)	Mean±SD
Energy intake (kcal)			1139±342
≥RNI (M: 2240, F:1840)	-	4(3.5)	
<RNI	35(100)	110(96.5)	
Under-reporting	34(97.1)	97(85.1)	
Implausible	1(0.3)	17(14.9)	
CHO intake (kcal)			597±186
<50%	8(22.9)	45(39.5)	
50-60%	21(60.0)	48(42.1)	
>60%	6(17.1)	21(18.4)	
Protein intake (kcal)			181±77
<15%	15(42.9)	51(44.7)	
15-20%	18(51.4)	36(31.6)	
>20%	2(5.7)	27(23.7)	
Fat intake (kcal)			358±140
<25%	4(11.4)	19(16.7)	
25-30%	9(25.7)	35(30.7)	
>30%	22(62.9)	60(52.6)	

RNI: Recommended Nutrient Intake according to Nutritional Coordinating Committee on Food and Nutrition (2017)

All 18 years old respondents were under-reporters on their dietary intake, while 97.1% of male students and 85.1% of female aged 19 years old respondents were under-reporting their dietary intake. A cross-sectional study among adolescents by Santos, Pascoal, Fisberg, Cintra & Martini (2010) also produced high number of under-reporters which was 65.6%. The reason for high number of under-reporters was due to the short number of days taken for 24 hour dietary recall. Marr (1986) & Nelson (1989) concluded that dietary intake measurement needed to correctly assess the energy intake of an individual was between 7 and 32 days.

Table 4.5 showed the mean of energy expenditure of the students. For weekday, male students had higher mean energy expenditure (2172 ± 526 kcal) than female energy expenditure (1908 ± 409 kcal). The mean energy expenditure during weekend in total was 1822 ± 541 kcal. In average, male students yielded higher energy expenditure which was 2101 ± 468 kcal than female students which was 1832 ± 422 kcal. Previous study by Machado-Rodrigues et al (2012) revealed that the mean energy expenditure for adolescents aged 13-14 years old was 2144 ± 543 kcal while the mean energy expenditure for adolescents aged 15-16 years old was 2662 ± 574 kcal. Present findings cannot be compared with other previous findings that were conducted among late adolescents as they were using different methods such as doubly labelled water. Doubly labelled water was considered as the gold standard for the measurement of energy expenditure due to its high accuracy (Buchowski, 2014). Thus, it was not able to do proper comparison with the present finding.

Table 4.5: Energy expenditure of the respondents

Items	Mean $\pm$ SD		
	Male (n=39)	Female (n=125)	Total (n=164)
Energy expenditure (weekday)(kcal)	2172 $\pm$ 526	1908 $\pm$ 409	1971 $\pm$ 452
Energy expenditure (weekend)(kcal)	1998 $\pm$ 583	1768 $\pm$ 518	1822 $\pm$ 541
Energy expenditure (average)(kcal)	2101 $\pm$ 468	1832 $\pm$ 423	1896 $\pm$ 448

Table 4.6 showed the distribution of physical activity level of the students. Majority of the students fell under sedentary category which were 69.2% (n=27) of male students and 52.0% (n=65) of female students. 39.2% of female students and 20.5% of male students were classified under light activity physical activity level.

Only 9.1% of the students belong to moderately active and vigorously active category. Previous study conducted in Terengganu, Malaysia among students by Yusoff et al (2018) found out that 66.3% of the students were categorized as sedentary, 28.4% of the students were light active and the rest fell under moderate and vigorous active category. The findings were similar where most of the students belonged to sedentary physical activity level. The main reason was due to their limited time to really perform physical activity as they have a lot of assignments and projects with deadline to meet.

Table 4.6: Distribution of respondents by physical activity level

Items	n (%)		
	Male (n=39)	Female (n=125)	Total (n=164)
Sedentary	27(69.2)	65(52.0)	92(56.1)
Light activity	8(20.5)	49(39.2)	57(34.8)
Moderately active	4(10.3)	10(8.0)	14(8.5)
Vigorously active	-	1(0.8)	1(0.6)

Based on table 4.7, most of the students were in negative energy balance category which 89.7% of them were male students while 90.4% were female students. Only 9.8% (n=16) were in positive energy balance category. None of the students fell in equal energy balance. Negative energy balance means that the students were most likely to lose weight whereas positive energy balance indicated an increase in their weight.

Table 4.7: Distribution of respondents by energy balance

Items	n(%)		
	Male (n=39)	Female (n=125)	Total (n=164)
Energy balance			
Positive	4(10.3)	12(9.6)	16(9.8)
Equal	-	-	-
Negative	35(89.7)	113(90.4)	148(90.2)

Table 4.8 showed the distribution of students based on the result of Pittsburgh Sleep Quality Index. Majority of the students had poor sleep quality which were 66.7% (n=26) of male and 80.0% (n=100) of female. About one-fifth of the students had normal or good sleep quality. Previous study conducted among secondary school students in Gombak, Selangor revealed that the prevalence of poor sleep quality among them was 24.0% (Kesintha, Rampal, Sherina & Kalaiselvam, 2018). The prevalence obtained from this study was about three times higher than the previous. The main reason that can be highlighted was the difference study environment. Matriculation students have a packed schedule from day till night. Thus, this condition might affect their sleep quality.

Table 4.8: Distribution of respondents by Pittsburgh Sleep Quality Index

Items	n(%)		
	Male (n=39)	Female (n=125)	Total (n=164)
Pittsburgh Sleep Quality Index			
Normal	13(33.3)	25(20.0)	38(23.2)
Poor sleep quality	26(66.7)	100(80.0)	126(76.8)

Table 4.9 showed the distribution of respondents on sleep quality and sleep disturbances. 26.2% of the respondents had very good sleep quality, 54.3% of them had fairly good sleep while the rest classified their sleep quality as fairly bad (15.9%) and very bad (3.7). Previous study by Lai & Say (2013) revealed that only 8.7% of the students had very good sleep quality, 58% of them had fairly good sleep quality and the rest of them fall under poor sleeper. For sleep disturbances, majority of the respondents either experienced them once or none during the past month. Fortunately, only 9.1% (n=15) of them ever took medicine to sleep. 57.9% of the respondents had

no problem to stay awake during their activities and 61.0% of them felt disturbed due to their problems.

Table 4.9: Distribution of respondents by PSQI questions

PSQI Items	n(%)			
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
Cannot get to sleep within 30 minutes	72(43.9)	34(20.7)	30(18.3)	28(17.1)
Wake up in the middle of the night or early morning	61(37.2)	37(22.6)	41(25.0)	25(15.2)
Have to get up to use bathroom	98(59.8)	34(20.7)	22(13.4)	10(6.1)
Cannot breathe comfortably	132(80.5)	19(11.6)	8(4.9)	5(3.0)
Cough or snore loudly	128(78)	17(10.4)	11(6.7)	8(4.9)
Feel too cold	78(47.6)	30(18.3)	43(26.2)	13(7.9)
Feel too hot	53(32.3)	32(19.5)	40(24.4)	39(23.8)
Have bad dreams	88(53.7)	44(26.8)	18(11.0)	14(8.5)
Have pain	103(62.8)	39(23.8)	14(8.5)	8(4.9)
Other reasons	140(85.4)	13(7.9)	8(4.9)	3(1.8)
During the past month, how often have you taken medicine to help you sleep?	149(90.9)	11(6.7)	3(1.8)	1(0.6)
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	95(57.9)	32(19.5)	20(12.2)	17(10.4)
During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?	64(39.0)	39(23.8)	40(24.4)	21(12.8)
Sleep Quality	Very good	Fairly good	Fairly bad	Very bad
During the past month, how would you rate your sleep quality overall?	43(26.2)	89(54.3)	26(15.9)	6(3.7)

Based on table 4.10, the mean weight for male students was 59.80±11.55 kg while the mean weight for female students was 54.03±10.09 kg. Male students had

higher mean for height which was 168.35 ± 8.46 cm than female students which was 158.14 ± 6.18 cm. The mean BMI-for age in total was in normal category which was -2.07 ± 1.16 . -2 standard deviation until +1 standard deviation for BMI-for age was categorised in normal BMI category. This can be seen clearly as majority of the students fell under normal category while 14% of them were overweight and obese whereas the rest were in thinness and severe thinness category. Previous study by Yadav et al. (2015) reported that 25.4% of the undergraduate medical students were overweight and obese while 1.5% of them were underweight. Female students had higher prevalence of overweight and obese which was 14.4% (n=18) while male students had higher prevalence of thinness or severe thinness which was 20.5% (n=8).

Table 4.10: Distribution of respondents by anthropometric measurements

Items	Mean±SD		
	Male (n=39)	Female (n=125)	Total (n=164)
Weight	59.80±11.55	54.03±10.09	55.46±10.73
Height	168.35±8.46	158.14±6.18	159.71±14.89
BMI-for age	-0.54±1.36	-1.03±1.08	- 2.07±1.16

Items	n(%)		
	Male (n=39)	Female (n=125)	Total (n=164)
Overweight/obese	5(12.8)	18(14.4)	23(14.0)
Normal	26(66.7)	104(83.2)	130(79.3)
Thinness/severe thinness	8(20.5)	3(2.4)	11(6.7)

4.7 Hypothesis Testing

4.7.1 Association between socio-demographic factors and body weight status

H₀1: There is no association between socio-demographic factors and body weight status among students in matriculation colleges.

Table 4.11 showed the association between socio-demographic factor and BMI-for age. The finding revealed that there was no significant association between age

and BMI-for age ($r=-0.107$, $p=0.173$). This finding is contrary from the previous study where they found a significant association between age and BMI for-age (Cheong et al., 2010). Possible reason for the inconsistency finding might due to the wide age group between the respondents as compared to this study which only have two ages which were 18 and 19 years old. Then, no significant association was found between monthly allowance and BMI-for age ($r=0.034$, $p=0.667$). This finding is contrary from the previous study where they found a significant association between allowance and BMI for-age (Li et al., 2017). The associations between pocket money with unhealthy eating and overweight or obese were weaker with school that have unhealthy food restriction.

Besides, there was no significant association between household income and BMI-for age ($r=-0.063$, $p=0.425$). This finding is contrary from the previous study where they found a significant association between household income and BMI categories (Ahmad et al., 2018). The possible reason might due to matriculation students already have their own monthly allowance given by the government. Thus, the household income of the family doesn't give impact for the students to buy food during their studies period. No significant association was found between number of family members and BMI-for age ($r=-0.055$, $p=0.483$). This finding is contrary from the previous study where they found a significant association between number of family members and BMI for-age (Al-Agha et al., 2015). It might due to different socio-economic growth of the country as the previous study was done in Middle East country where the higher number of family member will then lead to under-nutrition issue towards the children of the family.

Furthermore, the findings also revealed there was a significant association between sex and BMI-for age ($X^2=15.618$, $p<0.001$). The finding is consistent with

the previous study where they found out that only gender showed the significant association with body weight status than other socio-demographic factors ($P=0.02$) (Zarei et al, 2013). Then, no significant association was found between ethnicity and BMI-for age ($p=0.381$). This finding is contrary from the previous study where they found a significant association between ethnicity and BMI categories (Jiang et al., 2014). It might due to the different quota was given for entrance of non-Malay students which is lesser than Malay students. Majority of the respondents which were Malay students (81.7%) and the rest were other ethnicity. The unbalance proportion of the ethnicity could be one of the reason on why there was no significant association between ethnicity and BMI-for age.

Findings found out that father's educational level was not significantly associated with BMI-for age ($X^2=0.568$, $p=0.451$). Besides, there was also no significant association between mother's educational level and BMI-for age ($p=0.196$). The previous studies also revealed the same findings. There were no significant relation between BMI categories and father's education level ($p=0.226$) and mother's education level ($p=0.291$) (Fahad, Mohammed, Abdulrahman & Ahmed, 2017). Then, no significant association were found between father's occupation ($p=0.693$) and mother's occupation ($p=1.000$) and BMI-for age. The findings were consistence with previous studies where significant associations was not found between parental occupation and BMI for-age (Jalali-Farhani, Chin, Mohd Nasir & Parisa, 2017).

Table 4.11: Association between socio-demographic characteristics and BMI

Variables	r	p-value
Age ^a	-0.107	0.173
Allowance ^a	0.034	0.667
Household income ^a	-0.063	0.425
	-0.055	0.483

Number of family members^a

^a: Pearson correlation test

	Overweight/obese	Normal	Thinness/severe thinness	X ²	p-value
Sex^b					
Male	5 (12.8)	26 (66.7)	8 (20.5)	15.618	<0.001
Female	18 (14.4)	104 (83.2)	3 (2.4)		
	Overweight/obese	Normal/Thinness/Severe thinness		X ²	p-value
Ethnicity^b					
Malay	17(12.7)	117(87.3)			*0.381
Non-malay	6(20.0)	24(80.0)			
Father's educational level^b				0.568	0.451
No formal education/	13(16.7)	65(83.3)			
Primary education/					
Secondary education					
Tertiary education	9(11.3)	71(88.7)			
Mother's educational level^b					
No formal education/Primary education	2(33.3)	4(66.7)			*0.196
Secondary education/Tertiary education	20(13.2)	132(86.8)			
Father's occupation^b					
White collar/Self employed	17(14.5)	100(85.5)			*0.693
Blue collar	1(7.7)	12(92.3)			
Mother's occupation^b					
White collar/Self-employed	9(12.7)	62(87.3)			*1.000
Blue collar	0	1(100.0)			

^b:Chi-square test , *Fisher exact test

4.7.2 Association between dietary intake and body weight status

H₀2: There is no association between dietary intake and body weight status among students in matriculation colleges.

According to table 4.12, it revealed that energy intake had negative significant associated with BMI-for age ($r=-0.240$, $p=0.002$). The finding was similar with the previous where they found out a quite strong and inverse association between energy intake and BMI z scores ($r=-0.59$, $p<0.001$) (Yang, 2017). The result might be happened due to the high number of under-reporting dietary intake as the previous study also obtained about 50% of under-reporters. Positive association can be found if the number of plausible reporters higher than under-reporters. Moreover, carbohydrate ($r=-0.246$, $p= 0.002$) and fat ($r=-0.201$, $p=0.010$) were found to have inverse significant association with BMI-for age. The previous study supported the finding where they also revealed that carbohydrate was negatively associated with BMI (Lee, 2019). However, the findings was inconsistence as there was also study that stated dietary intake was not significantly associated with BMI (Boon, 2012).

Table 4.12: Association between dietary intake and BMI

Variables	r	p-value
Energy intake	-0.240	0.002
Carbohydrate	-0.246	0.002
Protein	-0.103	0.191
Fat	-0.201	0.010

^a: Pearson correlation test

The association between dietary intake and BMI cannot be detected through this study since there was a high percentages of under-reporters which was 89.1% in total. Thus, the result obtained from this study was not reliable. However, this limitation can make future researchers become more aware and alert about under-reporting issue and conduct further study accordingly.

4.7.3 Association between physical activity level and body weight status

H₀3: There is no association between physical activity level and body weight status among students in matriculation colleges.

Table 4.13 showed the association between physical activity level and BMI-for age. The finding revealed that physical activity level was significantly associated with BMI-for age ($r=0.651$, $p<0.001$). Previous study also found out that total energy expenditure and activity energy expenditure were positively related with BMI z-scores (Bandini, Must, Phillips, Naumova & Dietz, 2004). However, other studies produced different results between physical activity level and BMI. Negative significant association was found between physical activity level and BMI (Amira et al., 2019; Iskandar et al., 2017). Powers & Howley (2014) stated that high physical activity level can help to elevate the rate of metabolism of the body which later contribute to maintain normal body weight status. Negative association between these two variables was the most logical association should occurred as regard to the statement from Powers & Howley (2014). The present finding might be influenced by the method used during data collection which was totally self-reported from the physical activity diary until anthropometry information. Thus, the information obtained had high chance of biases from the respondents and were not too reliable.

Table 4.13: Association between physical activity level and BMI

Variables	r	p-value
Physical activity level	0.651	<0.001

^a: Pearson correlation test

4.7.4 Association between energy balance and body weight status

H₀4: There is no association between energy balance and body weight status among students in matriculation colleges.

Based on table 4.14, there was no association between energy balance and BMI ($p=0.131$). There was no previous study that discover the association between these two variables. A study by Zulaikha (2011) only revealed that obese and overweight people tend to have negative energy balance. Guyenet & Schwartz (2012) revealed that negative and positive energy balance was influenced by the hormonal and biological cues which then later affected body weight as well as the composition.

Table 4.14: Association between energy balance and BMI

Energy balance ^b	Overweight/obese	Normal/Thinness/Severe thinness	X ²	p-value
Positive	0	16(100)		*0.131
Negative	23(15.5)	125(84.5)		

^b:Chi-square test , *Fisher exact test

4.7.5 Association between sleep quality and body weight status

H₀5: There is no association between sleep quality and body weight status among students in matriculation colleges.

Table 4.15 showed the association between sleep quality and BMI-for age. It revealed that there was no significant association between sleep quality and BMI-for age ($X^2=4.960$, $p=0.084$). Kondracki (2012) revealed that sleep deprivation allows weight gain as it induces genes expression that can contribute to obesity which can cause sleep disturbance in reducing sleeping time. Other than that, higher BMI also can influence physiological and psychological functions, which affected the sleep quality of certain individual (Cappucio et al., 2008). However, present finding was

similar with previous studies which found out that there was no significant association between these two variables (Lai et al., 2013; Nurismadiana et al., 2018). A meta-analysis by Fatima, Doi & Mamun (2016) concluded that poor sleep quality seem likely to be associated with being overweight or obese, but a causal relationship cannot be established since most of the studies reviewed were cross-sectional studies.

Table 4.15: Association between sleep quality and BMI

Sleep quality ^b	Overweight/obese	Normal	Thinness/Severe thinness	X ²	p-value
Normal sleep	2(5.3)	35(92.1)	1(2.6)	4.960	0.084
Poor sleep	21(16.7)	95(75.4)	10(7.9)		

^b:Chi-square test

CHAPTER 5

CONCLUSION AND RECOMMENDATION

Conclusion

The aim of this study was to determine the factors associated with body weight status among students in matriculation colleges. This study revealed that the prevalence of overweight and obese was 14% while the prevalence of thinness and severe thinness was 6.7% among students in Kolej Matrikulasi Negeri Sembilan and Kolej Matrikulasi Selangor. Female students had higher prevalence on becoming overweight and obese whereas male students had higher prevalence on becoming thinness and severe thinness. These dual body weight problem can become big issue if not be handled in the initial stage.

About 80% of the students were classified under poor sleep quality. The highest number of students that scored 3 was for sleep duration component. Matriculation students have short sleep duration at night due to homework and assignments that need to be done in one night. This statement can be verified from the physical activity record where most of them allocated about 3 to 4 hours to complete their works. There were also a few of them utilize their sleeping hours to get the work done.

Most of the independent variables used for this study had no significant association with body weight status. Fortunately, there was a significant association between sex and body weight status. Meanwhile, energy intake, carbohydrate and fat also had significant association with body weight status even though the relationship

was negative. There was also a significant association between physical activity level and body weight status reported in this study.

Overall, the prevalence of unhealthy body weight status among matriculation students was in moderate level. However, awareness and knowledge regarding the unhealthy body weight status issue need to be addressed and spreaded among students in matriculation colleges for better quality of life.

Limitations

All research studies must have their own limitation and same goes with this study. There are a few limitations that need to be highlighted in this study. Firstly, a causal relationship cannot be established between independent variables and dependent variable due to the cross-sectional study design. We cannot conclude either the independent variable affected the dependent variable or vice versa. Besides, the information obtained from the study was self-reported by the respondents due to time constraint during the data collection process. Thus, the information given by the respondents might not too reliable. However, the findings from this study can be baseline knowledge for future researcher to further analyse the relationship.

Then, the data on dietary intake and physical activity were taken using 24 hour dietary recall and physical activity record. These method surely produce recall bias as the respondents might forgotten about what they eat and how much the amount of the food as well as what they do throughout the day to complete the form. As a result, the percentage of under-reporters were much higher as compared to implausible reporters.

Recommendations

There were some recommendation can be done in order to obtain much reliable and valid data. Firstly, longitudinal study can be conducted in order to find out the

causal relationship between the variables. Future researcher can conduct a follow up study towards matriculation colleges' student throughout their one year or two years studies period. Furthermore, the number of days for 24-hour dietary recall and physical activity record need to be up to 3 to 7 days in order to see the pattern of the dietary intake and physical activity of the students. The present study which covered only for two days might not represent their daily dietary intake and physical activity.

Besides, trained personnel can be a big help in conducting this study as it required an interview session for 24 hour dietary recall and physical activity record. Trained personnel can reduce the interviewer biases when conducting the session. Besides, future researchers should done further analysis or tests on the under-reporting data in order to obtain more reliable data. Lastly, an early engagement can be made up between the researcher and the respondents in order to introduce them on food record and physical activity record. 24 hour dietary recall can be replaced with food record if the information were for several days. Thus, the students can be familiarized to write up what they eat and the portion size as well as what they do throughout the day. This method can help to reduce the recall bias in obtaining the data.

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**ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA**

Research title	: Factors Associated with Body Weight Status Among Adolescents in Kolej Matrikulasi Selangor
Study Site	: Kolej Matrikulasi Selangor
JKEUPM Ref No.	: JKEUPM-2018-330
Researcher	: Nur Syuhada binti Ahamad Nawawi
Supervisor	: Assoc Prof. Dr. Hazizi Abu Saad

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 23/10/2018
2. Respondent Information Sheet & Consent (English), Version 2 dated 13/11/2018
3. Respondent Information Sheet & Consent (Malay), Version 2 dated 13/11/2018
4. Proposal (English), Version 2 dated 27/11/2018
5. Questionnaires/ Interviews (English), Version 2 dated 27/11/2018
6. Questionnaires/ Interviews (Malay), Version 2 dated 27/11/2018
7. Curriculum Vitae of:
 - a. Assoc Prof. Dr. Hazizi Abu Saad

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

☒

Approved

☒

Permission **MUST BE OBTAINED** from the respective hospitals/ institutions before conducting the research

☐

Disapproved

Please note that the approval is **VALID UNTIL 26 DECEMBER 2019**

Researchers should comply with the following:

- I. Complete a Study Final Report upon study completion (Form 3.2).
- II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.
- III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report



KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
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Ruj. Kami : KPM.600-3/2/3-eras(2533)
Tarikh : 7 Disember 2018

NUR SYUHADA BINTI AHAMAD NAWAWI
NO. KP : 960225145824

KG. BATU NERING, PADANG TENGGU, KUALA LIPIS
27100 KUALA LIPIS
PAHANG

Tuan,

**KELULUSAN BERSYARAT UNTUK MENJALANKAN KAJIAN :
FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG ADOLESCENTS IN KOLEJ MATRIKULASI SELANGOR**

Perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa permohonan tuan untuk menjalankan kajian seperti di bawah telah diluluskan dengan syarat :

" KELULUSAN INI BERGANTUNG KEPADA PERTIMBANGAN PENGARAH BAHAGIAN MATRIKULASI "

Kelulusan adalah berdasarkan kepada kertas cadangan penyelidikan dan instrumen kajian yang dikemukakan oleh tuan kepada bahagian ini. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Jabatan Pendidikan Negeri dan Pengetua / Guru Besar yang berkenaan.

Surat kelulusan ini sah digunakan bermula dari **14 Januari 2019** hingga **28 Februari 2019**

Tuan dikehendaki menyerahkan senaskhah laporan akhir kajian dalam bentuk *hardcopy* bersama salinan *softcopy* berformat pdf dalam CD kepada Bahagian ini. Tuan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak diterbitkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Ketua Sektor
Sektor Penyelidikan dan Penilaian
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia

salinan kepada:-

BAHAGIAN MATRIKULASI
JABATAN PENDIDIKAN SELANGOR

• SURAT INI DIJANA OLEH KOMPUTER DAN TIADA TANDATANGAN DIPERLUKAN •

for permission for using PSQI questionnaire
ages

uhada <nsyuhada014@gmail.com>
ssedj@upmc.edu

7 December 2018 at 12:19

, Dr.

Nur Syuhada, a student from Universiti Putra Malaysia, Malaysia. I am going to conduct a study among adolescents in matriculation college on factors that associated with body weight status. One of the factors I am analyzing is sleep quality. Thus, I am considering to use PSQI questionnaire in order to analyze the quality of the adolescents.

Therefore, I would like to ask for your permission to use this questionnaire in order to assess the sleep quality of adolescents before I officially starting my data collection. This study actually one of the condition for me to conduct it in order to graduate by next year. Hope to hear from you soon regarding this issue.

Thank you in advance.

Gasiorowski, Mary <GasiorowskiMJ@upmc.edu>
Nur Syuhada <nsyuhada014@gmail.com>

10 December 2018 at 23:39

on behalf of Dr. Buysse

Nur Syuhada,

I have my permission to use the PSQI for your research study. You can find the document, scoring instructions, the original article, links to available translations, and other useful information at www.sleep.pitt.edu under the Research/Instruments tab. Please ensure the PSQI is accurately reproduced in any on-line version (including copyright information). We request that you do cite the 1989 paper in any publications that result.

Please note that Question 10 is not used in scoring the PSQI. This question is for informational purposes only, and may be omitted during data collection per requirements of the particular study.

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Nur Syuhada <nsyuhada014@gmail.com>

Ask for permission for using PSQI questionnaire

messages

Nur Syuhada <nsyuhada014@gmail.com>
buyssej@upmc.edu

7 December 2018 at 12:

Hello, Dr.

I am Nur Syuhada, a student from Universiti Putra Malaysia, Malaysia. I am going to conduct a study among adolescents in matriculation college on factors that associated with body weight status. One of the factors that I am analyzing is sleep quality. Thus, I am considering to use PSQI questionnaire in order to analyze sleep quality of the adolescents.

Therefore, I would like to ask for your permission to use this questionnaire in order to assess the sleep quality of the adolescents before I officially starting my data collection. This study actually one of the condition for me to conduct it in order to graduate by next year. Hope to hear from you soon regarding this issue.

Thank you in advance.

Gasiorowski, Mary <GasiorowskiMJ@upmc.edu>
"nsyuhada014@gmail.com" <nsyuhada014@gmail.com>

10 December 2018 at 23:39

Sent on behalf of Dr. Buysse

Dear Nur Syuhada,

You have my permission to use the PSQI for your research study. You can find the instrument, scoring instructions, the original article, links to available translations, and other useful information at www.sleep.pitt.edu under the Research/Instruments tab. Please ensure that the PSQI is accurately reproduced in any on-line version (including copyright information). We request that you do cite the 1989 paper in any publications that result.

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for commercially sponsored research, please contact the Office of Technology Management at the University of Pittsburgh at 412-648-2206 for licensing information.

Good luck with your research.

Sincerely,

Daniel J. Buysse, M.D.

Professor of Psychiatry and Clinical and Translational Science

University of Pittsburgh School of Medicine

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From: Buysse, Daniel

Sent: Thursday, December 06, 2018 6:16 AM

To: Gasiorowski, Mary <GasiorowskiMJ@upmc.edu>

Subject: Fwd: Ask for permission for using PSQI questionnaire



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

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

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

1. STUDY TITLE :

Factors Associated with Body Weight Status among Students in Matriculation Colleges.

2. INTRODUCTION:

Unhealthy body weight status often become hot issues worldwide as the prevalence keep increasing day by day. Adolescents always have the attention regarding this issue as it might affect them in the future. Many studies have been done to find out the main factors that can contribute in having unhealthy body weight status. However, some factors discovered from the studies might not related for adolescents. Thus, this study aims to determine the factors associated with body weight status among students in matriculation colleges.

3. WHAT WILL YOU HAVE TO DO?

You need to read and understand about the study which were stated in Respondent's Information Sheet. If you voluntarily agree to participate in this study, you are required to sign the respondent's informed consent form. After completing the respondent's informed consent form, please return it to researcher.

Things that you need to do are as follows;

- a) Fill in the questionnaire provided which comprises section for socio demographics factors, physical activity, and sleep quality.
- b) Your height and weight will be measured by the researcher.
- c) Respondents will be interviewed by the researcher on the dietary intake.

You have the right to withdraw from this study at any time without giving any reasons and no penalty will be applied upon your withdrawal.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Individuals who are age less than 18 and more than 20 years old, non-Malaysian and physically disable will be excluded from this study.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

Get to know your measurement of weight, height and body mass index

(b) TO THE INVESTIGATOR?

This study will provide updated information on the factors associated with body weight status among adolescents. Moreover, the information obtained may be useful for future research in the related field.

6. WHAT ARE THE POSSIBLE RISKS?

The respondents will not face any physical or psychological risks by taking part in this study as it only involves measurements on weight, height, waist circumference and completing the questionnaire. If you are found out to have any nutritional problems, you will be referred to counselor.

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

All the information obtained from the respondents will remain strictly confidential. Any publication of result obtained will be reported in general (collectively) while respondent's identity will not be identified.

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

If there are any enquiries regarding this study, you can contact as follow;

Researcher

Nur Syuhada binti Ahamad Nawawi
Saad
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Email: nsyuhada014@gmail.com
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Faculty of Medicine and Health Sciences,
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Department of Nutrition and Dietetics,
Faculty of Medicine and Health
Universiti Putra Malaysia

Please initial here if you have read and understood the contents of this page_____

9. CONSENT

I Identity Card No.
address.....
.....hereby voluntarily agree to take part in the
research stated above *(clinical /drug trial/video recording/ focus group/interview-based/
questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse
effects and complications (as written in the Respondent's Information Sheet). I understand that I
have the right to withdraw from this research at any time without giving any reason whatsoever. I
also understand that this study is confidential and all information provided with regard to my identity
will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used
in any form of publication or presentation (if applicable)

* delete where necessary

Signature	Signature
(Respondent)	(Witness)
Date :	Name :
	I/C No. :

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned
research.

Date	Signature
	(Researcher)



BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1.TAJUK KAJIAN:

Faktor-faktor yang berkaitan dengan status berat badan dalam kalangan pelajar di kolej-kolej matrikulasi.

2. PENGENALAN:

Isu status berat badan yang tidak sihat sering menjadi topik hangat diperkatakan kerana peratusan kecenderungan isu ini meningkat dari hari ke hari. Pelbagai penyelidikan telah dijalankan untuk mengetahui apakah faktor-faktor yang menyumbang kepada berlakunya masalah ini. Namun, sesetengah faktor tidak mempunyai kaitan dengan remaja. Justeru itu, tujuan penyelidikan ini dijalankan adalah untuk menentukan faktor-faktor yang berkaitan dengan status berat badan dalam kalangan pelajar di kolej-kolej matrikulasi.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Responden hendaklah membaca dan memahami mengenai kajian ini pada borang penerangan dan persetujuan responden. Jika anda bersetuju untuk menyertai kajian ini secara sukarela, anda dikehendaki untuk menandatangani borang persetujuan responden. Setelah anda selesai mengisi borang persetujuan responden, borang itu perlu diserahkan kepada penyelidik. Perkara yang perlu anda lakukan adalah seperti berikut:

- a) Responden perlu mengisi borang soal selidik yang mempunyai soalan-soalan yang berkaitan dengan sosio-demografik, aktiviti fizikal dan kualiti tidur.
- b) Penyelidik akan mengambil ukuran berat dan tinggi responden.
- c) Responden akan ditanya mengenai pengambilan pemakanannya oleh penyelidik.

Anda berhak untuk menarik diri daripada menyertai kajian ini pada bila-bila masa tanpa sebarang alasan dan tiada denda akan dikenakan terhadap anda.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Individu yang berumur kurang daripada 18 tahun dan lebih daripada 20 tahun, bukan warganegara Malaysia dan mempunyai kecacatan fizikal tidak boleh menyertai kajian ini.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI:

a) KEPADA ANDA SEBAGAI PESERTA?

Dapat mengetahui ukuran berat badan, ketinggian dan indeks jisim badan.

b) KEPADA PENYELIDIK?

Kajian ini dapat menjana maklumat yang terkini mengenai faktor-faktor yang berkaitan dengan status berat badan dalam kalangan remaja. Seterusnya, maklumat ini akan berguna kepada penyelidik-penyelidik yang lain dalam bidang yang berkaitan.

6. ADAKAH IA BERISIKO?

Responden tidak akan menghadapi sebarang risiko sama ada dari sudut fizikal dan psikologi dalam mengikuti kajian ini kerana ia hanya melibatkan pengukuran berat badan, ketinggian, lilitan pinggang, peratus lemak badan dan melengkapkan borang soal selidik. Sekiranya anda didapati mempunyai sebarang masalah status nutrisi, anda akan dirujuk kepada pakar pemakanan.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Segala maklumat yang diberikan akan kekal rahsia. Hasil daripada kajian ini akan digarapkan menjadi umum dan identiti responden tidak akan dikenali.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Sekiranya anda mempunyai sebarang pertanyaan, anda boleh berhubung dengan;

Penyelidik

Nur Syuhada binti Ahamad Nawawi
Saad

H/P: 014-537 4370

Emel: nsyuhada014@gmail.com

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

Penyelia

Profesor Madya Dr. Hazizi bin Abu

H/P: 012-2126020

Emel: hazizi@upm.edu.my

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

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini

9. PERSETUJUAN

Saya..... No Kad Pengenalan.
beralamat.....

.....dengan ini 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 Penerangan Responden). 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 identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan Tandatangan
(Responden) (Saksi)

Tarikh :..... Nama :.....

No. K/P:

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

Tarikh Tandatangan
(Penyelidik)

Reference No.



**DEPARTMENT OF NUTRITION AND DIETETICS
FACULTY OF MEDICINE AND HEALTH SCIENCES
UNIVERSITI PUTRA MALAYSIA**

QUESTIONNAIRE

**FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG STUDENTS IN
MATRICULATION COLLEGES**

RESEARCHER: NUR SYUHADA BINTI AHAMAD NAWAWI

MATRIC NO: 182720

B.SC (NUTRITION AND COMMUNITY HEALTH)

CLASS:

Notes:

An information provided is confidential and is for research purposes only. Your honesty and sincerity in providing information is expected. All cooperation is greatly appreciated and is preceded by deepest gratitude.

Part 1

1. Age : ____
2. Gender : Male / Female
3. Ethnicity : Malay / Chinese / Indian / Others
4. No. of family members : ____
5. Monthly pocket money : _____

Statement	Respondent's father	Respondent's mother
Education level	No formal education ☐ Primary school ☐ PMR ☐ SPM ☐ STPM / Diploma ☐ Degree ☐ Master ☐ PhD ☐	No formal education ☐ Primary school ☐ PMR ☐ SPM ☐ STPM / Diploma ☐ Degree ☐ Master ☐ PhD ☐
Occupation		
Monthly income (RM)		

6. Suffer from any chronic disease :
- ☐ Diabetes

☐ Hypertension

☐ Cardiovascular disease

☐ Others: _____

Part 2

24-hr Dietary Recall

Date:

Day:

Time	Foods/drinks (serving size)	Method of cooking	Weight of food (gram/ml)

24-hr Dietary Recall

Date:

Day:

Time	Foods/drinks (serving size)	Method of cooking	Weight of food (gram/ml)

Part 3

Daily Activity Diary

Date:

Day:

Time	0-15 min	15-30 min	30-45 min	45-60 min
00.00 am				
01.00 am				
02.00 am				
03.00 am				
04.00 am				
05.00 am				
06.00 am				
07.00 am				
08.00 am				
09.00 am				
10.00 am				
11.00 am				
12.00 pm				
01.00 pm				
02.00 pm				
03.00 pm				
04.00 pm				
05.00 pm				
06.00 pm				
07.00 pm				
08.00 pm				

09.00 pm				
10.00 pm				
11.00 pm				



UPM

Daily Activity Diary

Date:

Day:

Time	0-15 min	15-30 min	30-45 min	45-60 min
00.00 am				
01.00 am				
02.00 am				
03.00 am				
04.00 am				
05.00 am				
06.00 am				
07.00 am				
08.00 am				
09.00 am				
10.00 am				
11.00 am				
12.00 pm				
01.00 pm				
02.00 pm				
03.00 pm				
04.00 pm				
05.00 pm				
06.00 pm				
07.00 pm				
08.00 pm				
09.00 pm				

10.00 pm				
11.00 pm				



UPM

Part 4: Sleep quality questionnaire (Buysse et al., 1989)

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,

1. When have you usually gone to bed?
2. How many minutes has it taken you to fall asleep each night?
3. What time have you usually gotten up in the morning?
4. A. How many hours of actual sleep did you get at night?

_____hours

B. How many hours were you in bed?

_____hours
- | During the past month, how often have you had trouble sleeping because you | Not during the past month (0) | Less than once a week (1) | Once or twice a week (2) | Three more times a week (3) |
|---|-------------------------------|---------------------------|--------------------------|-----------------------------|
| Cannot get to sleep within 30 minutes | | | | |
| Wake up in the middle of the night or early morning | | | | |
| Have to get up to use the bathroom | | | | |
| Cannot breathe comfortably | | | | |
| Cough or snore loudly | | | | |
| Feel too cold | | | | |
| Feel too hot | | | | |
| H. Have bad dreams | | | | |
| I. Have pain | | | | |
| Other reason (s), please describe, including how often you have had trouble sleeping because of this reason (s): | | | | |
| During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep? | | | | |
| 7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity? | | | | |
| 8. During the past month, how much of a problem has it been you to keep up enthusiasm to get things done? | | | | |
| 9. During the past month, how would you rate your sleep quality overall? | Very good (0) | Fairly good (1) | Fairly bad (2) | Very bad (3) |

Part 5

Anthropometric measurement

Body weight status	Measurement
Weight (kg)	1. 2. Mean :
Height (cm)	1. 2. Mean :
Body mass index (BMI) (kgm^{-2})	

-END OF THE QUESTIONS-
Thank you for your cooperation

No. Rujukan



**JA BATAN PEMAKANAN DAN DIETETIK
FAKULTI PERUBATAN DAN SAINS KESIHATAN
UNIVERSITI PUTRA MALAYSIA**

BORANG SOAL SELIDIK

**FAKTOR-FAKTOR YANG MEMPENGARUHI STATUS BERAT BADAN DALAM
KALANGAN PELAJAR DI KOLEJ-KOLEJ MATRIKULASI**

PENYELIDIK: NUR SYUHADA BINTI AHAMAD NAWAWI

NO. MATRIK: 182720

B.SAINS (PEMAKANAN DAN KESIHATAN KOMUNITI)

KELAS:

Nota:

Segala maklumat yang diberikan hanya untuk kegunaan penyelidikan sahaja. Kejujuran dan keikhlasan responden dalam memberikan maklumat amatlah diharapkan. Kerjasama dari pihak responden amatlah dihargai dan didahului dengan ucapan terima kasih.

Bahagian 1

- 1. Umur : _____
- 2. Jantina : Lelaki / perempuan
- 3. Bangsa : Melayu / Cina / India / Lain-lain
- 4. Bilangan ahli keluarga : _____
- 5. Elaun / duit poket bulanan (RM) : _____

Kenyataan	Bapa responden	Ibu responden
Peringkat pendidikan	Tiada pendidikan formal ☐ Sekolah rendah ☐ PMR ☐ SPM ☐ STPM / Diploma ☐ Ijazah ☐ Master ☐ PhD ☐	Tiada pendidikan formal ☐ Sekolah rendah ☐ PMR ☐ SPM ☐ STPM / Diploma ☐ Ijazah ☐ Master ☐ PhD ☐
Pekerjaan		
Gaji bulanan (RM)		

6. Mengalami penyakit kronik:
- ☐ Kencing manis
- ☐ Hipertensi
- ☐ Sakit jantung
- ☐ Lain-lain: _____

Bahagian 2

24 Jam Imbas Kembali Diet

Tarikh:

Hari:

Masa	Makanan/minuman (saiz hidangan)	Cara masakan	Berat makanan (gram/ml)

24 Jam Imbas Kembali Diet

Tarikh:

Hari:

Masa	Makanan/minuman (saiz hidangan)	Cara masakan	Berat makanan (gram/ml)

Bahagian 3

Diari Aktiviti Harian

Tarikh:

Hari:

Masa	0-15 min	15-30 min	30-45 min	45-60 min
00.00 pagi				
01.00 pagi				
02.00 pagi				
03.00 pagi				
04.00 pagi				
05.00 pagi				
06.00 pagi				
07.00 pagi				
08.00 pagi				
09.00 pagi				
10.00 pagi				
11.00 pagi				
12.00 tgh hari				
01.00 petang				
02.00 petang				
03.00 petang				
04.00 petang				
05.00 petang				
06.00 petang				
07.00 malam				
08.00 malam				

09.00 malam				
10.00 malam				
11.00 malam				



UPM

Diari Aktiviti Harian

Tarikh:

Hari:

Masa	0-15 min	15-30 min	30-45 min	45-60 min
00.00 pagi				
01.00 pagi				
02.00 pagi				
03.00 pagi				
04.00 pagi				
05.00 pagi				
06.00 pagi				
07.00 pagi				
08.00 pagi				
09.00 pagi				
10.00 pagi				
11.00 pagi				
12.00 tgh hari				
01.00 petang				
02.00 petang				
03.00 petang				
04.00 petang				
05.00 petang				
06.00 petang				
07.00 malam				
08.00 malam				
09.00 malam				

10.00 malam				
11.00 malam				



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Bahagian 4: Soal selidik mengenai kualiti tidur (Buysse et al., 1989)

Berikut merupakan soalan-soalan berkaitan dengan cara tidur anda sepanjang sebulan lepas. Jawapan anda perlu menunjukkan respon yang paling tepat untuk kebanyakan hari dan malam anda sepanjang sebulan yang lepas. Sila jawab semua soalan.

Sepanjang sebulan yang lepas,

5. Pada jam berapakah anda akan masuk ke bilik tidur? _____
6. Berapa minit yang anda perlu untuk tidur pada setiap malam? _____
7. Kebiasaannya, pada jam berapakah anda akan bangun pada waktu pagi? _____
8. A. Berapa jam tidur sebenar yang anda dapat pada waktu malam? _____ jam
- B. Berapa jam anda berada di atas katil? _____ jam

. Sepanjang sebulan yang lepas, berapa kerapkah anda mengalami masalah tidur kerana anda	Tiada sepanjang sebulan yang lepas (0)	Kurang daripada sekali dalam tempoh seminggu (1)	Sekali atau dua kali seminggu (2)	Tiga kali atau lebih dalam seminggu (3)
A. Tidak boleh tidur dalam masa 30 minit				
B. Terjaga pada tengah malam atau awal pagi				
C. Perlu bangun untuk menggunakan tandas				
D. Tidak boleh bernafas dengan selesa				
E. Batuk atau berdengkur dengan kuat				
F. Rasa terlalu sejuk				
G. Rasa terlalu panas				
H. Mengalami mimpi buruk				
I. Terasa sakit				
J. Lain-lain sebab, jelaskan dan sertakan berapa kerapkah anda mengalami masalah tidur disebabkan alasan ini:				
6. Sepanjang sebulan yang lepas, berapa kerapkah anda perlu mengambil ubat tidur (disarankan atau kehendak sendiri) untuk tidur?				
7. Sepanjang sebulan yang lepas, berapa kerapkah anda mengalami masalah untuk sentiasa terjaga semasa anda memandu, makan dan mengambil bahagian dalam aktiviti sosial?				

8. Sepanjang sebulan yang lepas, berapa kuatkah satu masalah itu menjadikan anda sentiasa bersemangat untuk menyelesaikannya?				
9. Sepanjang sebulan yang lepas, bagaimana anda menilai kualiti tidur anda secara keseluruhan?	Sangat bagus (0)	Baik (1)	Tidak baik (2)	Sangat tidak baik (3)

Bahagian 5

Ukuran antropometri

Status berat badan	Ukuran
Berat (kg)	1. 2. Purata :
Tinggi (cm)	1. 2. Purata :
Indeks jisim badan (BMI) (kgm^{-2})	

-SOALAN BERAKHIR-
 Terima kasih atas kerjasama anda