



**UNIVERSITI PUTRA MALAYSIA**

***RELATIONSHIPS BETWEEN SOCIODEMOGRAPHIC BACKGROUND,  
NUTRITIONAL STATUS, SUPPLEMENT INTAKE AND PHYSICAL  
ACTIVITY WITH FITNESS STATUS AMONG UNDERGRADUATE  
STUDENTS FROM FACULTY OF ENGINEERING, UNIVERSITI PUTRA  
MALAYSIA***

**MUHAMMAD AMIRUL BIN MULIADY**

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FPSK6 2020 7**

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**MUHAMMAD AMIRUL BIN MULIADY**

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

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**BY**

**MUHAMMAD AMIRUL BIN MULIADY**

## DECLARATION

The project entitled “Relationships Between Sociodemographic Background, Nutritional Status, Supplement Intake and Physical Activity with Fitness Status Among Undergraduate Students from Faculty Engineering, Universiti Putra Malaysia” was prepared by Muhammad Amirul bin Muliady to the Faculty of Medicine and Health Sciences as partial fulfillment of the requirement for the degree of Bachelor of Science (Dietetics) from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

Received and examined by:

  
(Assoc. Prof Dr. Hazizi bin Abu Saad)

Date: 24092021

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## LIST OF ABBREVIATIONS

| Abbreviation | Meaning                                                                         |
|--------------|---------------------------------------------------------------------------------|
| UPM          | Universiti Putra Malaysia                                                       |
| GPAQ         | Global Physical Activity Questionnaire                                          |
| BMI          | Body Mass Index                                                                 |
| WHO          | World Health Organization                                                       |
| NCD          | Non-Communicable Disease                                                        |
| JKEUPM       | Jawatankuasa Etika Penyelidikan Melibatkan Manusia<br>Universiti Putra Malaysia |
| BMR          | Basal Metabolic Rate                                                            |
| RNI          | Recommended Nutrient Intake                                                     |
| FFQ          | Food Frequency Questionnaire                                                    |

## ABSTRACT

### RELATIONSHIPS BETWEEN SOCIODEMOGRAPHIC BACKGROUND, NUTRITIONAL STATUS, SUPPLEMENT INTAKE AND PHYSICAL ACTIVITY WITH FITNESS STATUS AMONG UNDERGRADUATE STUDENTS FROM FACULTY ENGINEERING, UNIVERSITI PUTRA MALAYSIA

Amirul Muliady<sup>1</sup> & Hazizi AS<sup>1</sup>

<sup>1</sup>Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

**Introduction:** This cross-sectional study aimed to determine the relationship between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status (flexibility and muscle strength) among undergraduate students from Faculty Engineering, UPM. **Methods:** A self-developed interviewed-administered questionnaire was used to obtain sociodemographic background data. Nutritional status components was assessed including height, weight, BMI, body composition, and food intake. For supplement intake, both medication, vitamin and mineral supplements, and food supplements consumption were recorded. Global Physical Activity Questionnaire (GPAQ) used to assess the physical activity level. For fitness status, Jamar Plus Dynamometer used to assess handgrip strength while Sit and Reach Box for flexibility test. All the data of statistical analysis conducted by IBM SPSS Statistics 22 software. **Results:** A total number of 81 subjects (28.4% male and 65.4% female) aged 19 to 25 years old participated in this study. Mean BMI of subjects  $22.10 \pm 3.80$  which considered a normal category. Mean calories intake/day for male and female were relatively low (1748 kcal/day and 1460 kcal/day). A total of 35.8% of subjects consumed medication, vitamin and mineral supplement consumption, and only 12.3% of subjects consumed food supplements. About 65.4% of subjects had an excellent score in the flexibility test while only 4.9% of subjects had an excellent score in handgrip strength. There was a negative correlation between parent income and handgrip strength test ( $r = -0.381$ ,  $p < 0.001$ ) and a negative correlation between BMI and handgrip strength test ( $r = -0.229$ ,  $p < 0.040$ ). **Conclusion:** Sociodemographic background and nutritional status were found associated with fitness status. Effective strategies and interventions should be done to improve the fitness status among university students.

Keywords: Fitness status, flexibility, Malaysia, muscle strength, university students

## ABSTRAK

### HUBUNGAN ANTARA LATAR BELAKANG SOSIODEMOGRAFI, STATUS PEMAKANAN, PENGAMBILAN SUPLEMEN DAN AKTIVITI FIZIKAL DENGAN STATUS KECERGASAN DALAM KALANGAN PELAJAR SARJANA MUDA DARI KEJURUTERAAN FAKULTI, UNIVERSITI PUTRA MALAYSIA

Amirul Muliady<sup>1</sup> & Hazizi AS<sup>1</sup>

<sup>1</sup>Jabatan Pemakanan dan Dietetik, Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia

**Pengenalan:** Kajian keratan rentas ini bertujuan untuk mengetahui hubungan antara latar belakang sosiodemografi, status pemakanan, pengambilan makanan tambahan dan aktiviti fizikal dengan status kecergasan (fleksibiliti dan kekuatan otot) di kalangan pelajar sarjana Fakulti Kejuruteraan, UPM. **Metodologi:** Soal selidik yang ditadbir sendiri dan ditadbir yang digunakan untuk mendapatkan data latar belakang sosiodemografi. Komponen status pemakanan juga dinilai termasuk tinggi badan, berat badan, BMI, komposisi badan dan pengambilan makanan. Untuk pengambilan suplemen, pengambilan ubat, vitamin dan mineral serta pengambilan makanan tambahan dicatatkan. Soal Selidik Aktiviti Fizikal Global (GPAQ) digunakan untuk menilai tahap aktiviti fizikal. Untuk status kecergasan, Jamar Plus Dynamometer digunakan untuk menilai kekuatan pegangan tangan sementara Sit and Reach Box untuk ujian fleksibiliti. Semua data analisis statistik dilakukan oleh perisian IBM SPSS Statistics 22. **Dapatan Kajian:** Sebanyak 81 subjek (28.4% lelaki dan 65.4% perempuan) berumur 19 hingga 25 tahun mengambil bahagian dalam kajian ini. Purata BMI mata pelajaran  $22.10 \pm 3.80$  yang dianggap sebagai kategori normal. Purata pengambilan kalori / hari untuk lelaki dan wanita agak rendah (1748 kkal / hari dan 1460 kkal / hari). Sebanyak 35.8% subjek menggunakan ubat, vitamin dan mineral tambahan dan hanya 12.3% subjek menggunakan makanan tambahan. Sebanyak 65.4% subjek mempunyai skor yang sangat baik dalam ujian fleksibiliti sementara hanya 4.9% subjek mempunyai skor yang sangat baik dalam kekuatan pegangan tangan. Terdapat hubungan negatif antara pendapatan ibu bapa dan ujian kekuatan pegangan tangan ( $r = -0.381$ ,  $p = <0.001$ ) dan korelasi negatif antara BMI dan ujian kekuatan pegangan tangan ( $r = -0.229$ ,  $p = <0.040$ ). **Kesimpulan:** Latar belakang sosiodemografi dan status pemakanan didapati berkaitan dengan status kecergasan. Strategi dan intervensi yang berkesan harus dilakukan untuk meningkatkan status kecergasan di kalangan pelajar universiti.

Kata kunci: Status kecergasan, fleksibiliti, Malaysia, kekuatan otot, pelajar universiti

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Fitness status can be defined as the set of attributes that every person obtained or achieved. Physically fit can be considered if the person can carry out daily tasks with vigor and alertness without exhaustion and with enough energy to enjoy leisure time and to cope with unforeseen emergencies (Caspersen et al., 1985). Fitness status is a healthy condition with a low risk of premature health conditions and capacity for engaging in a variety of physical activities (Howley & Franks, 1997). While either definition is good, most experts agree that physical fitness is multidimensional as well as hierarchical (Corbin, 1991). Bouchard, Shephard, and Stephens (1994) introduced a comprehensive physical fitness model that includes morphological fitness, bone strength, muscle fitness, flexibility, motor fitness, cardiovascular fitness, and metabolic fitness.

On the other hand, physical activity defined as any bodily movement produced by skeletal muscles requiring energy expenditure that includes activities while working, playing, household chores, traveling, and engaging in recreational pursuits (WHO, 2018). WHO guidelines for physical activity for adults aged 18 to 64 years old are at least 150 minutes of moderate-intensity physical activity through the week, at least 75 minutes of vigorous-intensity physical activity through the week, or a combination of moderate and vigorous-intensity activity. Increase moderate-intensity physical activity to 300 minutes a week or equal for additional health benefits as with major muscle groups can be performed on 2 or more days a week for muscle-strengthening activities.

The prevalence of physical activity globally showed that 1 out of 4 adults is not active enough (WHO, 2018). Meanwhile, the prevalence of physical activity among Malaysian adults was relatively high, National Health and Morbidity Survey 2015 stated that 66.5% of adults are physically active in which male are more active compared to female. The level of physical activity increased among adults from 16-19 years old group to 40-44 years old group. Nevertheless, when reaching the elderly group age, the pattern slowly decline. It also was noted that non-Malaysian had higher physical activity levels compared to major ethnicity in Malaysia. Meanwhile for National Health and Morbidity Survey 2019, it stated that 1 out of 4 adults in Malaysia aged 16 years old and above were not physically active in which the prevalence was higher among females (28%) and students (39%).

## **1.2 Problem Statement**

The term of physical activity and fitness status often confused and however both of the terms had different definitions as mentioned above. As mentioned above, data from National Health and Morbidity Survey 2019 showed us almost 39% of students did not achieve recommendation for physical activity. This showed us that level of physical activity level among students were relatively low. Recently, Paoli & Bianco (2015) claimed that most of the study assessing fitness status is more focused on the athlete and gym user population compared to the normal population. Any physical activity experiencing undergoes with a term of fitness popularly developed over the last decade. Originally, aerobics, step aerobics, jogging, conditioning, and bodybuilding were the most popular gym practices that made it possible for the population to be healthy. Nowadays, we also can consider more complex and more attentive to the needs of active and non-active population behaviours (Paoli & Bianco,

2015). In sports performance, there were few elements of success in the sport being established and the most important aspects were physical ability and mental strength which included elements such as level of stress, anxiety, pressure, and concentration (Parnabas et al., 2013). Although most of the variability in fitness status is genetically determined, fitness status also can be affected by environmental factors and physical activity in particular (Guerra et al., 2006).

World Health Organization reported that physical inactivity is the fourth leading risk factor for global mortality (6%) following high blood pressure (13%), tobacco use (9%), and high blood glucose (6%). It is a major risk for non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes (World Health Organization, 2018). The prevalence of physical inactivity worldwide showed that 23% of adults aged 18 and over were physically inactive in which the number is higher in females (27%) compared to males (20%). 26% of males and 35% of females were found insufficiently physically active in high-income countries while 12% of males and 24% of females were found insufficiently physically active in low-income countries (World Health Organization, 2018). The prevalence of insufficient physical activity in the Americas and the Eastern Mediterranean was at its peak in 2008. Nearly 50% of females were insufficiently active in all these countries while male prevalence was 40% in the Americas and 36% in the Eastern Mediterranean. The lowest rates found in The South East Asian which were 15% for males and 19% for females (World Health Organization, 2018).

In Malaysia, Chan et al. (2017) stated that 36.9% of Malaysian adults were physically inactive which the number is higher in females compared to males (50.0% female and 24.7% male). The findings showed that 1 out of 2 respondents was having BMI

overweight/obese and a majority of the respondents (69.0%) achieved a moderate level of physical activity. (Chan et al., 2017)

The sociodemographic background is a sociological and demographic characteristic that needs to be assessed among subjects. The sociodemographic background factor is important in the study to find out the background of the study as it can contribute to different findings in a study. Rajappan et al. (2015) in a local study claimed that male students (56%) showed a high physical activity level than female students (24%). In contrast, female students showed a high percentage of low levels of physical activity. For the ethnicity differences, Indian students reported a higher percentage (61.8%) of high levels of physical activity (Rajappan et al., 2015).

Nutritional status can be also one of the factors associated with fitness status. A study in Malaysia found that there was a substantial gap in fitness status between the BMI and body fat percentage. The majority of the respondents also had normal BMI and body fat percentage in which increased in body weight measured in BMI was correlated with both increased muscle volume and body fat which most likely due to the close relationship between BMI and body fat percentage (Razak et al., 2013).

Supplement consumption is common in many countries but subpopulations such as university students have little data available on their use. Since university students share a variety of features and similar lifestyles, their use of supplementary intake can differ from the general population. 66% of university students in the USA consumed dietary supplements at least once a week, while 12% consumed 5 or more supplements a week while 42% used multivitamins or multi-minerals at least once a week (Lieberman et al., 2015).

WHO reported that physical inactivity is a primary risk factor for non-communicable diseases (NCDs) such as cardiovascular diseases. The increased number of obesity and levels of non-communicable diseases associated with physical inactivity observed in Malaysia over the last 20 years. Lian et al. (2016) stated that Malaysia is one of the least physically active countries in the world with over 60% of adults being essentially sedentary. Physical activity levels were linked significantly to ethnicity, gender, age, occupation, and educational level. The finding also showed that younger people were more physically active with males were usually more active than females (Lian et al., 2016).

Another study in Malaysia to determine the relationship between body composition and physical fitness among Selangor's Royal Malaysia Police workers showed that body fat, BMI, body weight, and waist circumference were found significantly correlated with all components' fitness status. The majority of the respondents were overweight and obese with a high proportion of body fat percentage and high waist circumference. Physical fitness levels among respondents are relatively poor due to a sedentary working environment (Nasruddin et al., 2018). A cross-sectional evaluation of Malaysian's firefighter physical fitness also found that physical fitness among firefighters was at a poor level. The decreased level of physical fitness affected as the age increased (Atikah et al., 2015).

This study aims to observe the relationships between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia. In this study, the subject's fitness status is the main highlight with the relationships and association of four independent variables which consist of sociodemographic background, nutritional status, supplementation intake, and physical activity. The

subjects are undergraduate students from Faculty Engineering, Universiti Putra Malaysia aged from 19 years old to 25 years old. Therefore, this study conducted to measure any relationship between nutritional status, supplement intake, physical activity, and sociodemographic background with fitness status among undergraduate students in Faculty Engineering, Universiti Putra Malaysia.

### **1.3 Research Questions**

1. What is the nutritional status (BMI, body fat percentage, visceral fat, and calorie intake) of undergraduate students from Faculty Engineering, Universiti Putra Malaysia?
2. What is the supplement intake (medication, vitamin, and mineral supplements, and dietary supplements) status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia?
3. What is the level of physical activity among undergraduate students from Faculty Engineering, Universiti Putra Malaysia?
4. What is the fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia?
5. Are there any relationships between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia?

### **1.4 Significance of the Study**

This study conducted to determine the relationship between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness

status among undergraduate students in Faculty Engineering, Universiti Putra Malaysia. The insufficiency of research of the study will be filled as new data will be taken especially among university students in Malaysia as data can be a good indicator and reflects the targeted population group which is university students.

Besides, based on the findings of this study health practitioners may identify new ways and solutions to improve both physical activity and fitness status among university students particularly in Malaysia. Proper implementation and intervention programs should be introduced when these factors such as sociodemographic background, nutritional status, supplement intake, and physical activity are found to be related to fitness status among university students in Malaysia respectively.

This study also can be used as baseline information for future research to explore these factors in-depth. The information collected can be in use to come out with new studies that solve the higher prevalence of low fitness status among university students by tackling the factors and their associations.

### **1.5 Objectives**

General objective:

To determine the relationships between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students in Faculty Engineering, Universiti Putra Malaysia.

Specific objectives:

1. To assess the sociodemographic background among the undergraduate students in Faculty Engineering, Universiti Putra Malaysia.
2. To assess the nutritional status of the undergraduate students in Faculty Engineering, Universiti Putra Malaysia.
3. To assess the supplement intake among the undergraduate students in Faculty Engineering, Universiti Putra Malaysia.
4. To assess the level of physical activity among undergraduate students in Faculty Engineering, Universiti Putra Malaysia.
5. To assess the fitness status level which included health-related fitness components such as muscle strength and flexibility among undergraduate students in Faculty Engineering, Universiti Putra Malaysia.
6. To determine the association and relationship between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia.

### **1.6 Null Hypothesis**

There are no relationships between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia.

## 1.7 Conceptual Framework

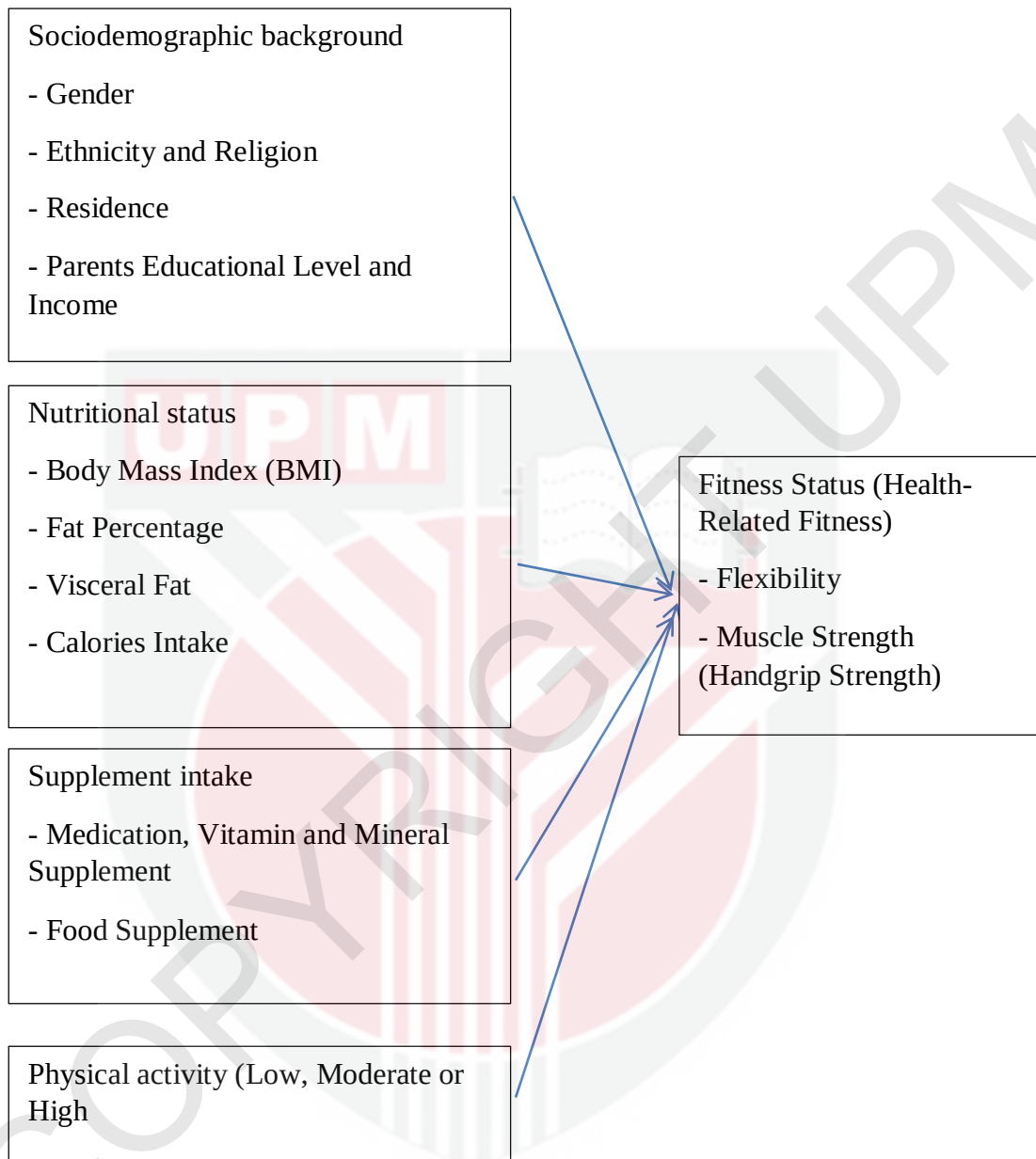


**Figure 1. Conceptual framework of the study**

Fitness status can be significantly related to the sociodemographic background of the individual. Several factors being investigated such as economic status, rural-urban differences, living status, gender, and age which are very closely related to sociodemographic factors and fitness status (Lämmle et al., 2012). On the other

hand, a low level of physical activity that affected the fitness status has a high prevalence in low-income countries. This situation will lead to increase cases of non-communicable diseases (NCD) caused by a low level of physical activity (Moniruzzaman et al., 2017). Fitness status also can be affected by the perception of the individual which has many barriers to perform physical activity. The barriers stated were discomfort, lack of motivation, lack of time, lack of social support, and poor environment (Ishii et al., 2009).

For the nutritional status, it can affect fitness status, especially during school age as it is a major development of nutritional and health status before entering adulthood. There are is no significant difference in the relationship between nutritional status and fitness status in terms of motor performance variables. Nutritional status can be determined by the height and weight of the individual (Chatterjee et al., 2014). Furthermore, the energy intake from daily dietary intake also can be an issue regarding the fitness status of the individual. If the energy intake is higher than the energy expenditure, this does not affect the fitness status but when the energy intake is decreased relative to the energy expenditure, the fitness status will decline due to low energy consumption and high energy expenditure (Westerterp, 2010). Fitness status also can be determined by cardiorespiratory fitness and body composition. Body composition components such as height, weight, and fat percentage are needed to see whether there are any associations regarding body composition and cardiorespiratory fitness. Racial factors also are one of the important components as different individual races have different body composition. Thus, at the end of the result, body composition and race are significantly associated with cardiorespiratory fitness (Zanto et al., 2011).

Next, for supplement intake, the usage of supplements does not give negative effects or reflect the current performances of the athletes but it can also help to enhance their performances. This statement shows us that the usage of supplements must be well instructed and observe by the professionals regarding their age, gender, and needs to prevent any side effects that can cause health problems in the future (Jones, 2014). The supplement intake based on meal modification such as modified starches can be a potential to help athletes reaching their best performances in a certain period. Caffeine and beetroot juice consumption shows the unclear result of the effects on the effect of the athlete's performance and more studies need to perform to confirm that caffeine and beetroot juice can affect the performances of the athletes.

Last but not least, the type of physical activity performed also can affect the fitness status of an individual at a different level of age. (Schmidt et al., 2017) stated that as the individual aged, the level of physical activity declined and it also affects the health status but this statement is for the general population. On the other hand, athletes show some good progress as their performances are better before reaching their peak and prime.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Sociodemographic Background

Sociodemographic factors can be one of the factors for the individual to decide whether they can undergo physical activity or not. In a certain community or population, there are always some of the barriers which lead them to not involving in physical activity. The perception of barriers to exercise needs to be well considered to assess the level of physical fitness. A study in the Japanese demographic, it was found that lack of time to exercise lead to a low level of physical fitness among them. The perception of having a good lifestyle was by earning money rather than having better health by promoting exercise to them. The location of residence also played important roles in determining their level of physical fitness (Ishii et al., 2009). Individuals who lived in rural areas undergo exercise frequently compared to the urban areas which lead to a higher chance of involving in a healthy lifestyle with having a good fitness level.

Fitness status is closely related to cognitive ability, self-control, the executive function, and memory of college students as these skills are critical towards their academic performance. A study in China that targeted college students from medical and dental courses fitness status with academic performance showed that fitness status, library use, and lifestyle regularity are important contributors to academic performance (Hou et al., 2020). Fitness status can be well developed from an early age to obtain good fitness status later in adult age. A study in Ireland assessed adolescents' health-related fitness showed that boys had higher fitness status compared to girls. Findings also

showed that most of the participants had higher BMI, poor cardiorespiratory endurance, and muscular strength. Aside, school socioeconomic status also contributed to a low level of fitness status among adolescents (O’Keeffe et al., 2020).

### **2.1.1 Age**

As we aging, the level of physical fitness will be affected by functional status. This is because the muscle and skeletal function will reduce and eventually elderly cannot perform any activities which can affect their health and body function. For the general population, physical fitness applies to them while functional fitness is the best term to describe physical fitness among the elderly. Tuna et al. (2009) stated that functional fitness can be defined as the adequate physical level to perform daily activities safely and independently without fatigue. during the aging process, a decreasing trend of functional fitness such as strength, endurance, agility, and flexibility can be observed. The elderly also tend to have less physical activity level but it is not as important as performing basic tasks independently (Tuna et al., 2009). The quality of life and prevention of getting chronic problems are their main concern besides their functional loss to perform their daily tasks.

Meanwhile, a study from Bogota, Colombia targeting adults aged 18 to 40 years old claimed that poor muscular fitness can affect cardiometabolic protective effect and body composition. Findings showed that respondents with poor muscular fitness had a higher score on cardiometabolic risk while respondents with normal BMI and excellent muscular fitness had higher scores on cardiometabolic protection (Ramírez-Vélez et al., 2016). This is an important indicator that showed that fitness status can influence cardiovascular health at a later age. Besides, a study in China assessed the

association of obesity and fitness status among college students aged from 18 to 24 years old found that students with normal weight non-obese (NWN) have a poor score on fitness tests. On the other hand, findings also showed that poor fitness scores among normal weight obesity (NWO) students can be explained as they had lower skeletal muscle mass for both male and female students (Zhang et al., 2018).

### **2.1.2 Gender**

For the relationship between gender and physical fitness, these two factors are well-linked to each other because males have higher physical fitness compared to females but it also changed based on the level of physical activity of the individual. Since the physical factor of males which can perform more physical activity compared to females, it can be a good indicator in this study to assess the physical fitness among the subjects whether for males and females.

A study showed that gender and motivational factors for their concern in health functioning showed significance value as both male and female had their reasons for performing physical activity. From this, we can analyze that both male and female have their motivation and concern about performing a physical activity which well-related to their health status (Lippa, 2011).

A study in Sao Paulo, Brazil assessed on weight, height, body mass index, percentage of body fat (BF), heart rate, systolic blood pressure (SBP), diastolic blood pressure, flexibility, strength, and muscular endurance among undergraduate students aged between 18 to 29 years old (Paoli & Bianco, 2015). The study findings showed that male students had higher fitness status compared to female students and it much related

and can be well explained as anthropometry and body composition of genders affect the fitness status.

### **2.1.3 Ethnicity and Religion**

Ethnicity is one of the factors in the sociodemographic background which can give a huge effect on the fitness status of an individual. It is because a different type of ethnicity gives different types of body composition due to genetic factors. In body composition related to the fitness status, components such as fat percentages, bone, water, and muscle mass in the body will be evaluated so that we can see the differences between those body composition components with ethnicity difference. Thus, the rate of physical activity and their performances will hugely affect by ethnicity and eventually will give effect on their fitness status.

In a study, ethnicity difference is one of the effects of cardiorespiratory fitness. Respondents that included both Hispanic and black had lower cardiorespiratory fitness. Body composition components such as BMI in different ethnicities showed significant association as the percentage of fat, muscle, and mass accumulated in the body being compared. It is important to indicate this data as it will provide more evidence towards the level of fitness status and physical status that a person can perform based on his or her ethnicity. Besides, the quality of lifestyle also differs in different ethnicity due to cultural differences and the way of life on performing daily tasks. This also needs to be assessed so that we can understand their challenge and barriers to performing physical activity in which will greatly affect their fitness status. (Pandey et al., 2016).

#### **2.1.4 Residence**

Physical activity levels and fitness are strongly affected by sociodemographic factors. As the level of physical activity decreases, the health status also decreased and leads to many problems especially obesity. In a study in Bangladesh, individuals who lived in rural areas have a very low level of physical activity. This is because the awareness about the importance of having physical activity was very low among them (Moniruzzaman et al., 2017).

Some influential sociodemographic factors can affect the level of physical activity such as economic status, geographical area, background, age, and gender. In this study in Germany, it was a clear statement that having low economic status, lived in rural areas and difficulties in the family background were the factors associated with a low level of physical activity. Age and gender aspects also affected but not as significant as components stated before. Therefore, a full component regarding sociodemographic background needs to be well assessed so that we can truly understand the subject details which can affect the physical fitness among them (Lämmle et al., 2012).

#### **2.1.5 Parent Educational Level and Income**

Parent with a sports background and perform the physical activity as their routine can be a good indicator which then reflects the level of fitness status of the adolescence. Gustafson & Rhodes (2006) claimed that parental support in being active can be the support for their children likeliness to engage in physical activity. The relationship between parents and children is important as it will be build when they perform the physical activity as their usual routine (Gustafson & Rhodes, 2006).

For parent income, as mention above, financial status is one of the supports which can parent give to their children to pursue in their sports and performing physical activity. Parents play a big role in providing resources for their children to perform physical activity. Parental income is positively correlated with the children's fitness status as their children need to get enough resources to increase their performances (Gustafson & Rhodes, 2006).

## **2.2 Nutritional Status**

Nutritional status is one of the most important independant variables in this study as it is the most influential factor which will affect the dependent variable which is the fitness level. In general, nutritional status is required health for the individual that reflects current body status which is influenced by their state of consumption and it can be affected by internal or external factors.

A study determining the relationship between anthropometric and fitness status among university students in Romania stated that the acromial diameter ratio showed a positive relationship with flexibility and the bicoastal diameter ratio showed a negative relationship with muscular strength in female students. For male students, sitting height ratio was found negative relationship with abdominal strength. It can be explained as female students' characteristics as they were slimmer in abdominal parts.

Overall, proportional ratios had the characteristics of a typical population or group of athletes and showed that the students involved in this study were healthy with typical anthropometric variables (Radu et al., 2014).

Dietary intake can determine the body size and level of physical activity of the individual. As a person overeating, it does not have any significant impact on the level

of physical activity even doubling the requirement for undereating, it affects the level of physical activity as the body requires high energy intake from foods as physical activity is done. Undereating can reduce the Basal Metabolic Rate (BMR) and lead to the induction of energy expenditure and activity-induced energy expenditure. As exercise and training prolong, the body needs high energy intake thus proper intake needs to be considered so that our body can adapt to the training and exercise program (Westerterp, 2010).

A study targeting university students aged between 18 to 25 years old in the USA found that dietary intake was significantly correlated with food preferences and body image but this study not mentioned the relationship between dietary intake and fitness status (James, 2010). Aside from that, there was a limited study on micronutrients in dietary intake related to fitness status. A study among Japanese men claimed that micronutrient intake among subjects was still inadequacy. Finding also clearly showed that micronutrients intake and cardiorespiratory fitness has significant associated among subjects (Cao et al., 2012). On the other hand, a study on European adolescents showed the contradict and macronutrients showed a significant relationship with cardiorespiratory fitness with a daily intake of bread and cereals for boy respondents and dairy products for both boy and girl respondents (Cuenca-García et al., 2012).

There was a significant level of the relationship between physical activity and body composition with the cardiorespiratory fitness level. From the study of the cross-sectional, it showed that racial factors also can affect the fitness level along with the combination of fat and fat-free mass. This situation has shown that the sociodemographic factor which is ethnicity gives important roles in determining the fitness level of the subjects (Zanto et al., 2011).

### **2.2.1 Nutritional Status Among Adult**

Proper and adequate dietary intake component is one of the major factors among person which involve in sports to help them in maintaining their health status and promote growth development. It also can help them to minimize their injury and increase their sports performance. The differences between athletes with non-athletes also can differ with their body composition, physiological, metabolic, and biochemical aspects which then give different implications for the nutritional needs (Meyer et al., 2007). A study in China among university students stated that there was a significant relationship between nutritional status which is BMI and fitness status. Normal weight students were generally found to have better physical fitness than underweight, overweight, and obese students which number is higher in males compared to females. (Chen et al., 2020). For the athlete populations especially endurance athletes, higher energy intake was significantly associated with athlete fitness status with males reported high energy intake compared. The reason behind it as they need more energy to maintain their performance. Nutrients including macronutrients and micronutrients need to be inadequate amount so that their performance can be improved and maintained (Nogueira, 2005).

### **2.2.2 Prevalence Obesity, Overweight and Normal Weight**

Based on the World Health Organization (WHO), the prevalence of worldwide obesity has nearly tripled since 1975. About 1.9 billion adults, 18 years and older, were overweight in 2016, and of these, over 650 million were considered obese. 9% of adults aged 18 years and over were overweight in 2016 and 13% were obese. In countries where overweight and obesity kill more people than underweight, much of the world's population lives. The increase in trend occurred more or less evenly among

both men and women. This problem would then lead to the growth of other non-communicable diseases, such as diabetes and cardiovascular diseases. In the worst-case scenario, they will experience breathing difficulties, increased risk of fractures, hypertension, early symptoms of cardiovascular disease, insulin resistance, and physiological effects later in the future.

In Malaysia, The Global Burden of Disease Survey recorded that overweight and obesity prevalence in Southeast Asia was 22.1% for males and 28.3% for females with the highest rates for males and females in Malaysia was 48.3% and 48.6%, respectively. The 2015 Malaysian National Health and Morbidity Survey (NHMS) reported 30.0% for the prevalence of overweight among adults, while the prevalence of obesity was 17.7%. The report suggests that the prevalence of overweight among males was significantly higher, while the prevalence of obesity among females was significantly higher (Lee & Muda, 2019). For university students specifically, based on data collected from 5 different universities, it stated that the prevalence of overweight and obesity among Malaysian university students is 21.2% males and 16.3% females respectively. The prevalence of overweight and obesity among Malaysian university students is higher than in some other countries (Radzi et al., 2019).

### **2.2.3 BMI Status**

Body Mass Index (BMI) is the indicator used to define and interpret anthropometry measurement of height and weight characteristics and classifying them consists of underweight, normal, overweight, and obese. It is widely used to detect early risk factors the development or prevalence of health issues. BMI is a reliable and useful for

population-based studies as it defining specific categories of body mass in any health issue presented in the population-level but it cannot determine specifically on body fat percentage (Nuttall, 2015).

A study from Norway showed that BMI was significantly associated with physical activity. It stated that the majority of university students did not meet the recommendation of physical activity in which lead to an increase in the trend of overweight and obesity globally especially among university students (Grasdalsmoen et al., 2019). A local study targeting Malaysian adults also proposed that BMI was significantly related to the level of physical activity and it can be proven as 1 out of 2 respondents were overweight and obese (Chan et al., 2017).

#### **2.2.4 Dietary Intake**

The dietary intake on energy requirement and nutrient intake is a difference from the normal population compared with those who are considered an athlete. Athlete energy requirement depends on the type of training and competition cycle which include intensity and period of the sports they involved. Carbohydrate and fat intakes are needed in huge amounts compared to the normal requirement as those two macronutrients act as fuel for the athlete to perform sports and maintain their best performance during training and competition. On the other hand, protein also plays important roles in maintaining the cell development of skeletal muscles to prevent any injuries happen in the future. For important micronutrients such as iron, vitamin D, calcium and antioxidants, their roles in maintaining the performance of athlete also important as exercise trigger the stresses from the metabolic pathway in which they are needed at the first place. A systematic review study from Australia that assessed

dietary intakes among the athlete population stated that most of them met or exceeded the nutrient recommendations during training and competition for protein and fat but not for energy and carbohydrate. Thus, it is compulsory to establish a sport-specific dietary recommendation with a focus on energy and intake of carbohydrates for the athlete (Jenner et al., 2019).

A study conducted in Malaysia showed that the overall mean and median energy intakes of Malaysian adults were 1,550 kcal/day and 1,480 kcal/day approximately. The mean intake of energy was lower than the average energy intake recommended by RNI with male participants having a significantly higher energy intake than female participants. The finding also showed that the mean intakes of protein, carbohydrates, and fat between males were also significantly higher (Lee & Muda, 2019).

#### **2.2.5 Body Composition**

Body composition is the proportion of fat and non-fat mass in the human body. There are several components of body composition including fat-free mass (FFM), fat mass (FM), total body water (TBW), fat-free dry mass (FFDM), and bone mass (BM). For a normal individual, the assessments and procedures to apply for them need to have good care and supervision. The proportions of the components also need to be considered as there will be a change in terms of growth and maturation. On the contrary, body composition is important for the individual which involve in sports as it will determine their performances. FFM is the closely related height which then will show the growth development and maturity of young athletes. For FM and fat percentage, they are more variable which then can influence normal growth, maturation, diet, and systematic training. Overall, understanding the body composition

changes can help us to monitor and forecast the growth and maturation development so that we can help them to maintain and increase in terms of their dietary intake and training regime (Malina & Geithner, 2011).

A study about the relationship between body composition and gender, a group with normal body fat percentage, and increased BMI was significantly more in males than females. On the other hand, a group with increased BMI and body fat percentage it was found that there were more females than males. Results also found that the high levels of BMI-for-age are strongly linked with increases in fat mass (Bhatt, 2016).

### **2.3 Supplement Intake**

A dietary supplement defines as a product that is intended to supplement the diet which contains dietary ingredients. These dietary ingredients content are based on the functional or usage of specific intended usage so that the human body can obtain those ingredients in their daily intake. These ingredients contain amino acids, vitamins, minerals, herbs, or substances such as enzymes, organ tissues, and glandular extracts. Most of the supplements are used by oral ingestion and can be found in form of tablets, capsules, liquids, or powders.

Nitrate supplementation can help in increasing exercise performance aspects such as muscle efficiency and oxygenation. Nitrate supplementation may ergogenic status at an early stage and under the precise condition which can be affected by factors such as age, diet, health and fitness status, intensity, duration, and nature of exercise challenge. It is also important to know the side effects of nitrate supplementation towards human health and also differentiate the factors and how it affects the exercise performances in athletes (Jones, 2014).

For protein supplementation, it can give both advantages and disadvantages for the users depends on their demand and intake (Samal & Samal, 2018). For the people who go to the gym, this supplementation will be treated as a meal replacement, weight reduction, and health benefits. This situation leads to the overuse of the supplement which leads to the excessive protein intake in their body. Protein supplements also considered as processed materials and not contain other essential nutrients for a healthy lifestyle but this study does not have enough evidence. Therefore, we also need protein from natural sources as protein supplementation alone cannot be one of the factors which lead to the physical fitness benefits as we need to take proper and adequate amount of protein so that body can achieve adequate protein intake daily.

There are some effects of supplement identification on exercise performance with caffeine supplementation. This can be proved by the study of Randomized Control Trial (RCT) of forty-two trained cyclists age 29 - 45 years. There is an improvement for the placebo group and caffeine group in terms of the performance but there is no significant difference for the placebo group and control group. There is also a significant improvement in terms of performance for those who recognize caffeine (caffeine group). There is no significant difference in the food intake for the groups because total calorie intake is in different priorities. At the end of the trial, the perception of the participants about the usage of caffeine is the most anticipated result compared to their performances. This is truly clear shows that caffeine is not the true effect on the performance of the athlete but the perception of the athlete itself is the strong factor that leads to their point of view based on their performance (Saunders et al., 2017).

### **2.3.1 Prevalence of Supplement Intake Among Adult**

We need to obtain extra macronutrients and micronutrients in the development of their growth and maturation, especially in food sources. We also cannot neglect the consumption of supplement since there are several supplements which can help them to gain extra nutrients from the supplement. Aside from this, we need to learn and understand the side effects of the supplement intake for those who relied on the supplements.

One of the studies in Australia proposed that university students usually consume supplements such as sports drinks, vitamin and mineral supplements, energy drinks, herbal supplements, guarana, creatinine, high protein milk supplements, and coenzyme Q10. The reasons for them to consume supplements including short-term health benefits, illness prevention, improved immunity, parental supply, boost energy, increase sports performance, and balance daily diet. To manage this situation, health educators need to educate them on the proper amount of supplement intake so that they can prevent any underlying disease caused by excessive intake of supplements and also to decrease the reliability of supplements at a very young age (O'Dea, 2003).

In athlete perception, the usage of the supplement also needs to be considered as their general perception about the supplement intake is that it can help to increase and boost their performance. To achieve a normal diet, sport nutrition professionals claimed that dietary supplements did not meet the requirement to compensate for a poor diet but it suggested that consuming whole and natural foods can lead to a better diet for the young athletes. For protein supplementation and energy drinks, it shows an increasing trend among adolescence. They tend to increase their reliability towards protein supplementation as they want to increase their muscle mass and strength but without proper management and excessive intake, it will give negative side effects. They also

really dependable towards energy drinks as their carbohydrate intakes reduce but the amount of their intake on energy drinks is important to be considered as it is high in calories (Parnell et al., 2016).

In Malaysia, a study proposed that the prevalence of the consumption of vitamins, medications, and food supplements intake was higher in females compared to males. It also showed that the prevalence of supplement intake among Malaysian adults increased in trend. The main reasons for dietary supplement intake include, for health reasons, prescription by the doctor, increased energy, and beauty. However, the prevalence of dietary supplements consumption by Malaysian adults was significantly lower compared with other countries (Mohd Zaki et al., 2018).

## **2.4 Physical Activity**

Physical activity defined as any movement of the body by skeletal muscles which then results in energy expenditure. Energy expenditure also varies from low to high levels of physical activity and this shows that physical activity is positively correlated with physical fitness. In this study, the type of physical activity needs to be determined before assessing the level of fitness among the subjects so that the results will vary according to the categories of physical activity. It is important to do to mention before because a different type of physical activity requires a different amount of energy expenditure thus this will affect the level of physical fitness of the subjects.

There was an association between types of physical activity and level of physical fitness. Athletes obtain a high score for the fitness level than others who started exercise as the level of physical fitness can be maintained and improved for a long time. Athletes undergo exercise and training programs which then will help them to

maintain their performances in sports rather than persons who started to exercise as their body just started to adapt to the level of intensity of physical activity (Schmidt et al., 2017).

#### **2.4.1 Prevalence of Physical Activity Among Adult**

World Health Organization reported that physical inactivity is the fourth leading risk factor for global mortality (6%) following high blood pressure (13%), tobacco use (9%), and high blood glucose (6%). It is a major risk for non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes. Individuals who had been physically inactive have an increased risk of death by 20% to 30% increased risk of death compared to those who are sufficiently active. Many factors contribute to this issue such as fear of violence and crime in outdoor areas, high-density traffic especially in an urban area, poor air quality, and pollution, and lack of parks, sidewalks, and sports or recreation facilities.

The physical environment can affect the level of physical activity as the location to perform this activity is important so that we can easily have access to perform physical activity anytime and anywhere. Equipment and facilities are important so that we can perform physical activity without concern about the equipment and facilities' quality as it is well provided by the government. Besides, the social environment can affect the level of physical activity by establishing some kind of competition and creating a culture of sports among them. Their awareness about this issue can be one of the important components so that they can multiple options and choices to join sports as they have a good awareness of the importance of the physical activity. Last but not least, personal experience of involvement was essential so to educate in terms of

independence and freedom during physical activity, goals, and achievement and learning to cope with difficulty were all aspects of physical activity identified as appealing by the delegates. Self-confidence is one of the factors that can be strengthened as a result of physical activity that could be used in promoting it (Kelly et al., 2012).

A cross-sectional study conducted in Malaysia to assess physical activity correlations among adults, it was found that there was a significant difference between gender and physical activity level as more males engaged in physical activity compared to females. It can be explained as most women especially Malaysian women were found less physically active than men due to traditional and cultural beliefs especially from Muslim views where physical activity is seen as unfeminine and associated with lower social status. Findings also showed that Malays tend to engage more in overall physical activity compared to other ethnicities. (Lian et al., 2016).

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

There are two types of physical fitness which are skill-related fitness and health-related fitness. In this study, health-related fitness was chosen and there are five components in health-related fitness which are aerobic fitness, muscle endurance, muscle strength, flexibility, and body composition. In this study, health-related fitness was chosen to assess the fitness status of the subject which covered two components which are flexibility and muscle strength. Health-related fitness being chosen rather than skill-related fitness because it is easier to assess health-related fitness as the instruments that will be used is not as specific as skill-related fitness instruments. Moreover, health-related fitness can reflect the overall current condition of the individual rather than assessing their performances.

#### **3.2 Subjects and Study Design**

The subjects were undergraduate students from Faculty Engineering, Universiti Putra Malaysia. The subjects aged 19 to 25 years old. This was a cross-sectional study that aimed to determine the various factors with fitness status. Cross-sectional studies used to measure the pressure of a population's disease or safety needs and are particularly helpful in advising the preparation and distribution of health services. A cross-sectional study helped this research to achieved and obtained all objectives in this study. Factors such as nutritional status, supplement intake, physical activity, and sociodemographic background among undergraduate students in Faculty Engineering,

Universiti Putra Malaysia being observed to determine the relationship and association with fitness status especially health-related fitness components such as muscle strength and flexibility.

### **3.3 Study Location**

The study conducted at Faculty Engineering, Universiti Putra Malaysia. Faculty of Engineering comprises eight main departments which are Aerospace, Biological and Agricultural, Civil, Electric and Electronic, Chemical and Environment, Computer and Communication Systems, Mechanical and Manufacturing, and Process and Food Departments.

### **3.4 Sample Size Determination**

The correlation coefficient ( $r$ ) value obtained from the study of (Razak et al., 2013) aimed to compare physical activity, exercise time and Body Composition, Body Mass Index (BMI), body fat percentage, and aerobic fitness (VO<sub>2</sub>max) among students in the Faculty of Education Universiti Kebangsaan Malaysia and Faculty of Education Sabha University Libya (SUL). In this study, the correlation coefficient ( $r$ ) between BMI and fitness status was significant ( $r < 0.324$ ). This value is chosen from the article as aerobic fitness (VO<sub>2</sub>max) is one of the components in health-related fitness in the study but in this study, flexibility and muscle strength were assessed. The targeted population of the subjects from the article was the also same as the study which was university students with the same sociodemographic background.

**Formula to calculate sample size in correlation studies:**

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

(Cole, 1997)

Where

n = the calculated sample size

$Z_{1-\alpha/2}$  = z score for level of significance in a two-sided test

$Z_{1-\beta}$  = z score for the power of the test

$d^*$  = correlation

**Table 3.1: Calculation of sample size**

| Correlation studies                                                                                          | Correlation ( $d^*$ ) | Sample size (n)                                                       |
|--------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------|
| Relationship between age with physical fitness among futsal players (Nikolaidis et al., 2019)                | 0.380                 | $n = \frac{(1.94 + 0.84)^2}{0.38^{*2}/(1 - 0.38^{*2})} + 5$<br>= 51   |
| Relationship between Body Mass Index (BMI) and fitness status among university students (Razak et al., 2013) | 0.324                 | $n = \frac{(1.94 + 0.84)^2}{0.324^{*2}/(1 - 0.324^{*2})} + 5$<br>= 71 |

The sample size obtained by the relationship between BMI and fitness status with a p-value 0.324. Thus,

$$71 + 20\% = 81$$

$$\approx 81$$

From the coefficient value, the sample size calculated is 81. Total subjects of 81 were sufficient enough in this study as it is an average number for a general population study to prevent any bias during the process of data collection. 20% is added into the equation as it is a value to adjust for estimation of response rate and eligibility of the subjects to meet the criteria. Therefore, the total sample subjects for this study are 81 subjects.

### 3.5 Sampling Design

The sampling design in the study was simple random sampling. Before the study start, it is a must and eligible for the subjects to be screen first before joining the study. Below are the inclusion and exclusion criteria for the subjects to be recruited in this study:

**Table 3.2: Inclusion and exclusion criteria of subjects**

| <b>Inclusion criteria</b>                                                                                                                                                                                                                                                      | <b>Exclusion criteria</b>                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Malaysian</li> <li>• Aged 19 to 25 years old</li> <li>• Undergraduate students from Faculty Engineering, Universiti Putra Malaysia</li> <li>• Able to read, understand and communicate in both Bahasa Malaysia and English</li> </ul> | <ul style="list-style-type: none"> <li>• Diagnosed with mental illness and injuries</li> </ul> |

### 3.5.1 Sample Selection Process

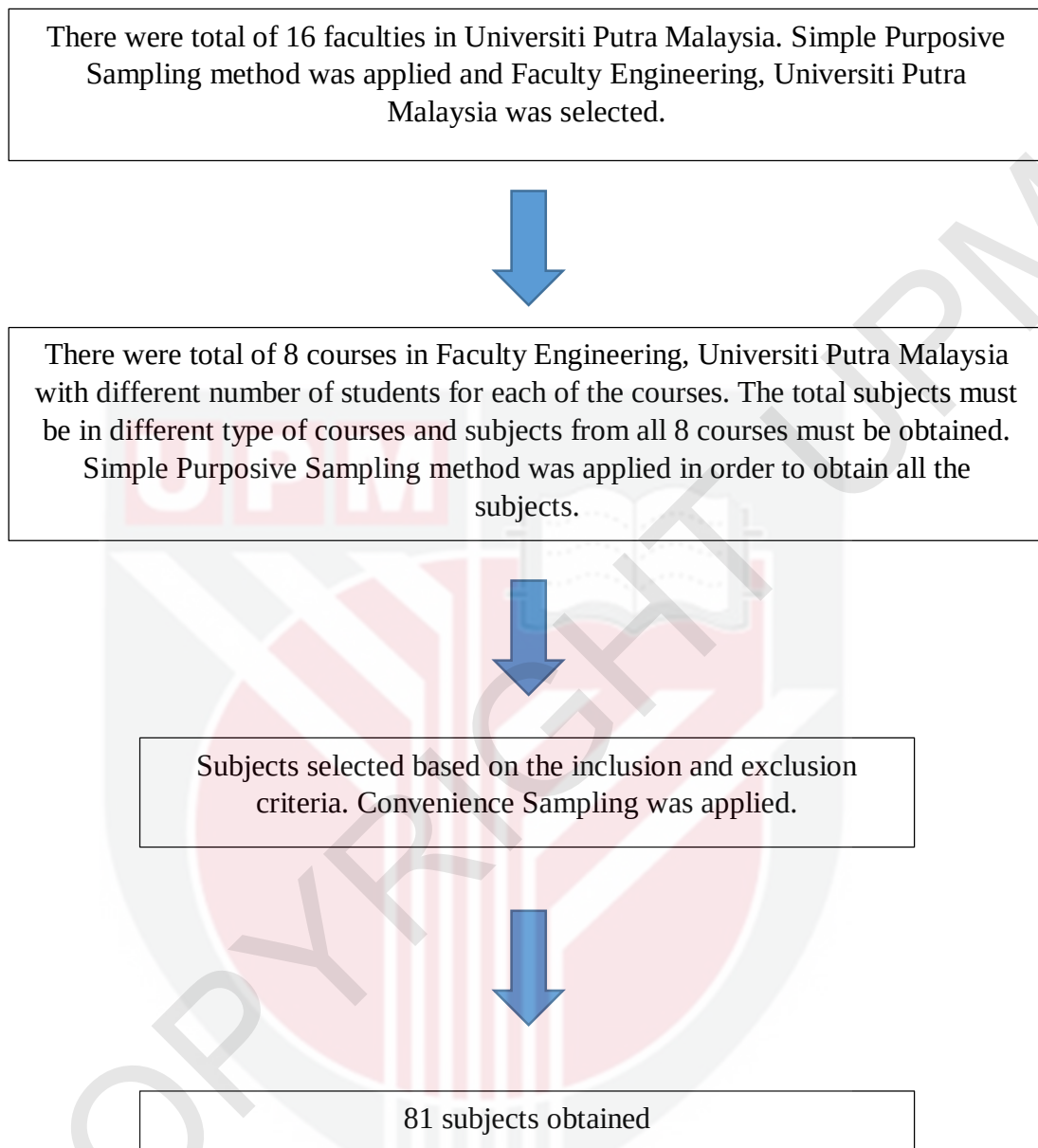


**Figure 2. Flow chart of sampling design**

### 3.6 Instruments

The instruments or measurements used were based on the independent variables which were nutritional status, supplement intake, physical activity, and sociodemographic background. These components assessed by using a self-develop questionnaire and

also a questionnaire obtained from the published articles. The process of an assessment conducted as interviewed-administered questionnaire.

### **3.6.1 Sociodemographic Background**

In this study, the sociodemographic background was important to defined subjects' sociological and demographical status. Sociodemographic groups were used for analyses in the social sciences as well as for marketing and medical studies. The questionnaire that is used is an interviewed-administered questionnaire which was self-developed. The data were either open-ended questions or multiple choices which consist of age, gender, ethnicity, religion, residence, parents' occupation, parents' educational level, parents' income, courses, and year of study.

### **3.6.2 Nutritional Status**

In nutritional status assessment, several components need to assess such as height, weight, BMI, body composition, and food intake. Height of the subjects obtained by using the SECA Portable Stadiometer. For weight, BMI, body fat percentage, and visceral fat, data obtained by using Omron Karada Scan Body Composition Monitor. As for the food intake component, 1 day 24-hour Dietary Recall was used to obtain data about calories intake based on the dietary intake of the subjects. The calories intake of the subjects then compared with Recommended Nutrient Intake for Malaysia to observe whether the subjects meet the recommendation or not meet the recommendation. Database used in this method was Malaysian Food Composition Table. This method was the most appropriate method among other methods on assessing the current dietary intake of the subjects in which reflects their current

nutritional status. The components that needed to assess 24-hour Dietary Recall are the types of foods, the number of foods, and the frequency of food intake of specific foods.

**Table 3.3: Classification of body mass index (WHO, 2000)**

| <b>Classification</b> | <b>BMI (kg/m<sup>2</sup>)</b> |
|-----------------------|-------------------------------|
| Underweight           | <18.50                        |
| Normal                | 18.50 - 24.99                 |
| Overweight            | ≥25.00                        |
| Pre-obese             | 25.00 - 29.99                 |

**Table 3.4: Classification of body fat percentage based on the obesity values proposed by Lohman (1986) and Nagamine (1972)**

| <b>Classification</b> | <b>Male</b> | <b>Female</b> |
|-----------------------|-------------|---------------|
| Low                   | < 10%       | < 20%         |
| Normal                | 10 - 19%    | 20 - 29%      |
| High                  | 20 - 24%    | 30 - 34%      |
| Very high             | > 25%       | > 35%         |

**Table 3.5: Classification of visceral fat level based on data referenced by OMRON Healthcare**

| <b>Classification</b> | <b>Visceral Fat Level (??? Or kg ??)</b> |
|-----------------------|------------------------------------------|
| Normal                | 0.5 – 9.5                                |
| High                  | 10.0 – 14.5                              |
| Very high             | 15.0 – 30.0                              |

### 3.6.3 Supplement Intake

For supplement intake assessment, the questionnaire that is used is the Supplement Intake Questionnaire which is obtained from the Malaysian Adult Nutrition Survey 2003 (MANS 2013) Volume 1. There were two types of supplements covered in the questionnaire which were medication, vitamin and mineral supplements, and food

supplements. In this questionnaire, subjects were required to fill the form on their supplement consumption whether consumed or not the subjects. If the subjects had any history of supplement intake, components such as types, reasons, and frequency of supplement intake need to be filled in, and subjects needed to answer this questionnaire section completely.

### 3.6.4 Physical Activity

In physical activity assessment, the Global Physical Activity Questionnaire (GPAQ) being used to assess the level of physical activity of the subjects. Global Physical Activity Questionnaire (GPAQ) was adapted from (Soo et al., 2015) for the Bahasa Melayu version to assess the general level of physical activity of adults.

**Table 3.6. Physical activity classifications and MET value based on the Global Physical Activity Questionnaire (GPAQ)**

| Domain     | MET value                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------|
| Work       | <ul style="list-style-type: none"> <li>• Moderate MET value = 4.0</li> <li>• Vigorous MET value = 8.0</li> </ul> |
| Transport  | Cycling and walking MET value = 4.0                                                                              |
| Recreation | <ul style="list-style-type: none"> <li>• Moderate MET value = 4.0</li> <li>• Vigorous MET value = 8.0</li> </ul> |

To calculate the level of total physical activity, it calculated as:

Total physical activity MET-minutes/week = the sum of the total MET minutes of activity

$$\text{Equation: Total Physical Activity MET-minutes/week} = [(P2 * P3 * 8) + (P5 * P6 * 4) + (P8 * P9 * 4) + (P11 * P12 * 8) + (P14 * P15 * 4)]$$

**Table 3.7. Level of total physical activity and cut off value based on the Global Physical Activity Questionnaire (GPAQ)**

| Level of total physical activity | Physical activity cut off value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High                             | <ul style="list-style-type: none"> <li>IF <math>(P2+P11) \geq 3</math> days AND total physical activity MET-minutes per week is <math>\geq 1500</math></li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>IF <math>(P2+P5+P8+P11+P14) \geq 7</math> days AND total physical activity MET-minutes per week is <math>\geq 3000</math></li> </ul>                                                                                                                                                                                     |
| Moderate                         | <ul style="list-style-type: none"> <li>IF <math>(P2+P11) \geq 3</math> days AND <math>[(P2*P3) + (P11*P12)] \geq 60</math> minutes</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>IF <math>(P5+P8+P14) \geq 5</math> days AND <math>[(P5*P6) + (P8*P9) + (P14*P15)] \geq 150</math> minutes</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>IF <math>(P2+P5+P8+P11+P14) \geq 5</math> days AND total physical activity MET-minutes per week is <math>\geq 600</math></li> </ul> |
| Low                              | F: the value did not reach the criteria for either high or moderate levels of physical activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 3.6.5 Health-related Fitness Tests

### 3.6.5.1 Hand-grip Strength

In the hand-grip strength test, subjects being tested on muscle strength. Muscle strength defined as the maximum amount of force that a muscle can exert against some form of resistance in a single effort. The instrument used in this test is Jamar Plus Dynamometer and subjects need grip as much as they can on the device and the data obtained recorded by taking the average of the scores. The references of the procedure for this test were based on the study American College of Sports Medicine 2010 (ACSM, 2010). Below is the scoring for the hand-grip strength for the subjects:

**Table 3.8. Scoring for handgrip strength test proposed by Carranza et al. (2014)**

| Score         | Men (kg) | Women (kg) |
|---------------|----------|------------|
| Excellent     | > 64     | > 38       |
| Very good     | 56 – 64  | 34 – 38    |
| Above average | 52 – 56  | 30 – 34    |
| Average       | 48 – 52  | 26 – 30    |
| Below average | 44 – 48  | 22 – 26    |
| Poor          | 40 – 44  | 20 – 22    |
| Very poor     | < 40     | < 20       |

The scoring of the subjects indicated and reflected the muscle strength level in which one of the components in health-related fitness status.

### 3.6 .5.2 Sit And Reach Test

In the sit and reach test, the flexibility component from health-related fitness was one of the components that need to assess in this study. Flexibility defined as a range of movement in a joint or series of joints, and length in muscles that cross the joints to induce a bending movement or motion. A study from the American College of Sports Medicine 2010 (ACSM, 2010) used as a reference to determine the proper procedure

for the test. In this test, subjects needed to perform sit and reach by using Sit and Reach Box. Subjects are needed to sit and stretch their body maximum to measure the flexibility level. Below is the scoring for the sit-and-reach test in which used to measure flexibility:

**Table 3.9. Scoring for sit and reach test proposed by Graves, Pollock & Bryant (2001)**

| Percentile | Score         | Men | Women |
|------------|---------------|-----|-------|
| 90         | Excellent     | 22  | 24    |
| 80         |               | 20  | 22    |
| 70         | Above average | 19  | 21    |
| 60         |               | 18  | 20    |
| 50         | Average       | 17  | 19    |
| 40         |               | 15  | 18    |
| 30         | Below average | 14  | 17    |
| 20         |               | 13  | 16    |
| 10         | Poor          | 11  | 14    |

The scoring of the subjects indicated and reflected their flexibility level in which one of the components in health-related fitness status.

### **3.7 Procedure**

#### **3.7.1 Pre-Testing**

For the pre-testing, 5 undergraduate students from Faculty Engineering, Universiti Putra Malaysia which in different courses participated for the pre-test. These students screened first to make sure whether they meet the criteria or not to decide for any inclusion or exclusion criteria. The pre-test aimed to make sure that the questionnaires provided for the study applied to the subjects. Time also being taken for the estimation

time during the assessments for time-saving performing all of the assessments and average time of respondents to complete the assessments was 15 minutes.

### **3.7.2 Data Collection**

Data collection conducted from early March to the end of March 2020. Due to COVID 19 outbreak, the data collection had to be stopped in the mid of March 2020. The data collection procedure started as subjects need to answer self-administered questionnaires about sociodemographic background and physical activity sections completely. After that, they being assessed on 24-hour dietary recall and supplement intake and this session being done as interview session. Components such as anthropometry, body composition (fat percentage and visceral fat), BMI and fitness status were measured after they answered the questionnaires and complete the interview session.

### **3.7.3 Ethical Approval**

Before the study was conducted, approval for the study was obtained from UPM's Ethics Committee for Research Involving Human Subjects, JKEUPM. Information form was distributed among the respondents to inform them regarding the aim of this study and consent form was given when the administration of the questionnaire.

### **3.7.4 Data Analysis**

All the data of statistical analysis was conducted by IBM SPSS Statistics 22 software with statistical significance level was set at value  $p < 0.05$ . Descriptive data were

analyzed by univariate analysis. As for the results for continuous variables, it presented as means and standard deviation. For inferential statistics, the association for categorical variables was tested by the chi-square test while the correlation between continuous variables will be tested by Pearson's product-moment correlation.



## CHAPTER 4

### RESULTS AND DISCUSSION

#### 4.1 Introduction

This chapter presented the results and discussion of this study that aimed to determine the relationship between sociodemographic background, nutritional status, supplement intake, and physical activity with fitness status among undergraduate students from Faculty Engineering, Universiti Putra Malaysia.

#### 4.2 Sociodemographic background of subjects

According to the findings from Table 4.1, out of 81 subjects, 58 (71.6%) represented female subjects while 23 (28.4%) represented male subjects. In our study location, there were about 3000 students in total which enrolled in 8 different courses, and the gender allocation studies enrolment in the faculty was slightly higher for females compared to males (Universiti Putra Malaysia, 2019). The majority of the subjects were Malay which consisted of 14 (60.9%) males and 34 (58.6%) females that represented 59.3% of the subjects. It followed by Chinese which consisted of 6 (26.1%) males and 18 (31.0%) females that represented 29.6% of the subjects. Besides, others ethnicities such as Iban and Kadazan which consisted 1 (4.3%) male and 6 (10.3%) female that represented 8.6% of the total subjects while the minority ethnicity came from Indian which consisted only 2 (8.7%) male which represented 2.5% of the total subjects. For the subjects' residence, the majority of the subjects stayed at hostel or college which contributed 87.6% from the total subjects while the

minority came from rented or family houses which contributed 12.4% from the total subjects.

**Table 4.1: Sociodemographic Background of Undergraduate Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Sociodemographic Background</b> | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Ethnicity</b>                   |                                 |                                   |                                  |
| Malay                              | 14 (60.9)                       | 34 (58.6)                         | 48 (59.3)                        |
| Indian                             | 2 (8.7)                         | 0 (0.0)                           | 2 (2.5)                          |
| Chinese                            | 6 (26.1)                        | 18 (31.0)                         | 24 (29.6)                        |
| Others                             | 1 (4.3)                         | 6 (10.3)                          | 7 (8.6)                          |
| <b>Religion</b>                    |                                 |                                   |                                  |
| Islam                              | 15 (65.2)                       | 36 (62.1)                         | 51 (63.0)                        |
| Hindu                              | 2 (8.7)                         | 0 (0.0)                           | 2 (2.5)                          |
| Buddha                             | 5 (21.8)                        | 16 (27.6)                         | 21 (25.9)                        |
| Others                             | 1 (4.3)                         | 6 (10.3)                          | 7 (8.6)                          |
| <b>Residence</b>                   |                                 |                                   |                                  |
| Hostel/College                     | 20 (87.0)                       | 51 (87.9)                         | 71 (87.6)                        |
| Rented House                       | 1 (4.3)                         | 4 (6.9)                           | 5 (6.2)                          |
| Family House                       | 2 (8.7)                         | 3 (5.2)                           | 5 (6.2)                          |
| <b>Mother Education Level</b>      |                                 |                                   |                                  |
| Primary School                     | 4 (17.4)                        | 6 (10.3)                          | 10 (12.3)                        |
| Secondary School                   | 6 (26.1)                        | 31 (53.4)                         | 37 (45.7)                        |
| Diploma                            | 4 (17.4)                        | 9 (15.5)                          | 13 (16.1)                        |
| Degree                             | 9 (39.1)                        | 10 (17.2)                         | 19 (23.5)                        |
| Master – PhD                       | 0 (0.0)                         | 2 (3.5)                           | 2 (2.4)                          |
| <b>Father Educational Level</b>    |                                 |                                   |                                  |
| Primary School                     | 5 (21.7)                        | 6 (10.3)                          | 11 (13.6)                        |
| Secondary School                   | 3 (13.0)                        | 24 (41.4)                         | 27 (33.3)                        |
| Diploma                            | 5 (21.7)                        | 13 (22.4)                         | 18 (22.3)                        |
| Degree                             | 8 (34.8)                        | 12 (20.7)                         | 20 (24.7)                        |
| Master – PhD                       | 2 (8.7)                         | 3 (5.2)                           | 5 (6.1)                          |
| <b>Parent Income</b>               |                                 |                                   |                                  |
| B40 (< RM4360)                     | 8 (34.8)                        | 22 (37.9)                         | 30 (37.0)                        |
| M40 (> RM4360-RM9619)              | 11 (47.8)                       | 28 (48.3)                         | 39 (48.1)                        |
| T20 (> RM9619)                     | 4 (17.4)                        | 8 (13.8)                          | 12 (14.9)                        |

Findings showed that there were 58.0% of the subjects' mother educational level was primary and secondary school followed by 42.0% which was higher education level including Diploma, Degree, Master, and Ph.D. Meanwhile, for the subjects' father

educational level, the majority was higher education level (Diploma, Degree, Master, and Ph.D.) which contributed 53.1% of total subjects while the minority was primary and secondary school education level that represented 46.9% of the total subjects. As we can see, student enrolment in a university depends on their parent's educational level. However, based from the study about parent education and student success, there is no relationship between parental educational level and student achievement because it depends on the personal factors such as grades, parent's academic expectations, and self-efficacy that had a strong direct impact on educational aspirations (Nelson, 2009). It opposed the finding from a local study in which stated that parent education and students' academic performance very well related (Bakar et al., 2017).

Another finding showed that most of the subjects came from the Middle-Class family (M40) which represented 48.1% of total subjects, followed by Lower Class family (B40) which represented 37.0% of total subjects, and Upper-Class family (T20) which represented 14.9% of total subjects. A study stated that parent income levels related to the academic achievements of the students. It is because parents play a crucial role to enhance their children's academic achievements by providing social, financial, and material support (Machebe et al., 2017). Meanwhile, a study in Malaysia among university students proposed a different view in which academic performance from B40 family students was substantially different from the M40 family. The result also opposed most of the study as the academic performance of students from the B40 family was better than students from the M40 family (Hassan et al., 2020).

#### **4.3 Nutritional status of subjects**

Based on the findings from Table 4.2, the mean and standard deviation for BMI among respondents was  $22.10 \pm 3.80 \text{ kg/m}^2$ . The majority of the subjects had normal BMI which consisted of 16 (69.6%) male and 42 (72.4%) female which represented 71.6% of total subjects. It followed by subjects who were underweight and obese which consisted of 6 (26.1%) male and 7 (12.1%) female which represented 16.0% of total subjects. Subjects who were underweight were the minority which consisted of 1 (4.3%) male and 9 (15.5%) female which contributed only 12.3% from total subjects. The finding differed the survey from National Health and Morbidity Survey Malaysia (NHMS) in 2006, 2011, and 2015 showed that the prevalence of overweight and obesity among Malaysian adults aged 18 years old and above increased in trend. A local study conducted in Malaysia which involved undergraduate students in University Malaysia Sarawak showed that 52.8% of students with normal BMI. The finding also showed that the sex differences in BMI were related to the mean BMI was  $21.1 \text{ kg/m}^2$  for females and  $22.0 \text{ kg/m}^2$  for males in which 25.3% of females were underweight while 33.7% of males were overweight (Kuan et al., 2011). Aside from the findings, age was clearly shown to be the key factors of overweight and obesity among Malaysian adults as a study in Malaysia found that obesity and overweight at ages 31–35 years old and above (Pell et al., 2016).

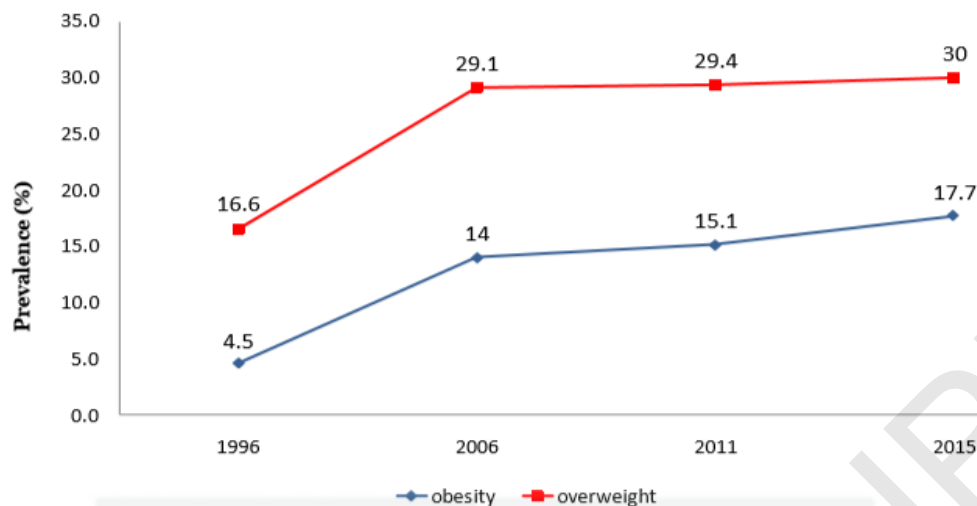


**Figure 3. Trends of overweight and obesity among Malaysian adults aged 18 years old and above based NHMS**

From this study, most of the subjects have normal fat percentage which represented 70.4% of total subjects that consisted of 15 (65.2%) male and 42 (72.4%) female. It was followed by high and very high-fat percentage subjects which represented 23.5% of total subjects that consisted of 5 (21.7%) males and 14 (24.1%) females. The least number came from subjects that have a low-fat percentage which represented 6.2% of total subjects which consisted of 3 (13.0%) male and 2 (3.5%) female. The mean and standard deviation for fat percentage among respondents was  $24.30 \pm 6.62$  %. Besides, findings also showed that the majority of the subjects had normal visceral fat which represented 92.6% of total subjects while the remaining 7.4% of subjects had high and very high visceral fat. The mean and standard deviation for visceral fat among respondents was  $4.12 \pm 3.51$  kg. Based on a study which proposed the relationship between body composition and gender, a group with normal body fat percentage and increased BMI was significantly more in male than female. On the other hand, a group with increased BMI and body fat percentage it was found that there were more females

than males. Results also found that the high levels of BMI-for-age are strongly linked with increases in fat mass (Bhatt, 2016).

Moreover, from table 4.2, the finding also showed that the majority of the subjects which represented 60.5% from total subjects that consisted of 16 (69.6%) male and 33 (56.9%) female did not meet the calories requirement per day. The mean calories intake per day based on RNI for both male and female were 1748 kcal/day and 1460 kcal/day respectively. A study conducted in Malaysia showed that the overall mean and median energy intakes of Malaysian adults were 1,550 kcal/day for males and 1,480 kcal/day for females approximately. The mean intake of energy was lower than the average energy intake recommended by RNI with male participants having a significantly higher energy intake than female participants. The finding also showed that the mean intakes of protein, carbohydrates, and fat between males were also significantly higher (Lee & Muda, 2019).

**Table 4.2: Nutritional Status of Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Nutritional Status</b>                          | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|----------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>BMI (kg/m<sup>2</sup>)</b>                      |                                 |                                   |                                  |
| Underweight (< 18.5)                               | 1 (4.3)                         | 9 (15.5)                          | 10 (12.3)                        |
| Normal (18.5 – 24.9)                               | 16 (69.6)                       | 42 (72.4)                         | 58 (71.7)                        |
| Overweight (25.0- 29.9)                            | 6 (26.1)                        | 4 (6.9)                           | 10 (12.3)                        |
| Obese (> 30)                                       | 0 (0.0)                         | 3 (5.2)                           | 3 (3.7)                          |
| <b>Fat Percentage (%)</b>                          |                                 |                                   |                                  |
| Low (< 10)                                         | 3 (13.0)                        | 2 (3.5)                           | 5 (6.2)                          |
| Normal (< 20)                                      | 15 (65.2)                       | 42 (72.4)                         | 57 (70.4)                        |
| High (< 25)                                        | 4 (17.4)                        | 10 (17.2)                         | 14 (17.2)                        |
| Very High (> 25)                                   | 1 (4.3)                         | 4 (6.9)                           | 5 (6.2)                          |
| <b>Visceral Fat (kg)</b>                           |                                 |                                   |                                  |
| Normal (0.5 – 9.5)                                 | 20 (87.0)                       | 55 (94.8)                         | 75 (92.6)                        |
| High (10.0 -14.5)                                  | 3 (13.0)                        | 1 (1.7)                           | 4 (4.9)                          |
| Very High (15.0 – 30.0)                            | 0 (0.0)                         | 2 (3.5)                           | 2 (2.5)                          |
|                                                    |                                 | Mean ± SD                         |                                  |
| <b>Calories Requirement per Day<br/>(kcal/day)</b> | 1748 ± 643.33                   | 1460 ± 363.46                     | 1541 ± 463.46                    |

#### **4.4 Supplement intake of subjects**

Based on table 4.3, the finding showed that the majority of the subjects which represented 64.2% of total subjects did not consume medication, vitamin and mineral supplement consumption compared to those who consumed which was 35.8% which consisted of 4 (17.4%) male and 25 (43.1%) female. For the consumption of food supplements, most of the subjects did not consume food supplements which contributed 87.7% from a total subject while the remaining 12.3% did consume food supplements consisted of 1 (4.4%) male and 9 (15.5%) female. It is proven as a study reported that females have higher reported use of supplements compared to males with 48% males and 56% females reported regular use. This study also showed that supplement use increase with age, education, physical activity, fruit intake, and dietary fiber intake. Thus, dietary supplement intake may be related to a healthy lifestyle (Jennifer Fishovitz, Juan A. Hermoso, Mayland Chang, 2008). A local study which investigated about the prevalence of supplement intake among Malaysian adult also supported the finding as to the prevalence of the consumption of vitamins, medications, and food supplements intake was higher in female compared to male. It also showed that the prevalence of supplement intake among Malaysian adults increased in trend (Mohd Zaki et al., 2018).

For the subjects who did consume the medication, vitamin and mineral supplement consumption, the majority of them consumed those supplements for their health benefit, followed by doctor prescription, energy and only 1 of them consumed for beauty reason. For the frequency of consumption, most of them consumed supplements almost every day, followed by once a week and a minority of them consumed more than once a week and 1-3 times a month. Besides, for the subjects who did consume food supplement consumption, 7 subjects consumed those supplements

for their health benefit and only 1 of them because of a doctor's prescription. For the frequency of consumption, 5 of them consumed supplements almost every day, followed by 1 subject once a week and the other 4 of the subjects consumed more than once a month and once a while.

A study from the United States of America showed that there was a statistically significant for supplement use as increases of age and the number is higher in females compared in males. Most of the reasons that being pointed out for supplement use were overall health and wellness benefits and fill nutrient gaps in their dietary intake. Besides, the comparison between supplement users compared to non-users was found significantly as they tried to eat a balanced and healthy diet, regular medical check-up, get proper and sleep duration, exercise regularly, and maintain a healthy weight (Lieberman et al., 2015).

**Table 4.3 Supplement Intake Among Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Supplement Intake</b>                                      | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|---------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Medication, Vitamin and Mineral Supplement Consumption</b> |                                 |                                   |                                  |
| Yes                                                           | 4 (17.4)                        | 25 (43.1)                         | 29 (35.8)                        |
| No                                                            | 19 (82.6)                       | 33 (56.9)                         | 52 (64.2)                        |
| <b>Food Supplement Consumption</b>                            |                                 |                                   |                                  |
| Yes                                                           | 1 (4.4)                         | 9 (15.5)                          | 10 (12.3)                        |
| No                                                            | 22 (95.6)                       | 49 (84.5)                         | 71 (87.7)                        |

**Table 4.4 Reason and Frequency of Supplement Intake and Frequency of Supplement Intake Among Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| Reason and Frequency   | Medication,<br>Vitamin and<br>Mineral Supplement<br>n = 29<br>n(%) | Food<br>Supplement<br>n = 10<br>n(%) | Total<br>n=(39)<br>n(%) |
|------------------------|--------------------------------------------------------------------|--------------------------------------|-------------------------|
| <b>Reason</b>          |                                                                    |                                      |                         |
| Doctor Prescription    | 5 (17.2)                                                           | 1 (10.0)                             | 6 (15.4)                |
| Own Health Benefit     | 18 (62.1)                                                          | 7 (70.0)                             | 25 (64.1)               |
| Energy                 | 4 (13.8)                                                           | 2 (20.0)                             | 6 (15.4)                |
| Beauty                 | 2 (6.9)                                                            | 0 (0.0)                              | 2 (5.1)                 |
| <b>Frequency</b>       |                                                                    |                                      |                         |
| Everyday               | 15 (51.7)                                                          | 5 (50.0)                             | 20 (51.3)               |
| > Once A Week          | 10 (34.5)                                                          | 1 (10.0)                             | 11 (28.2)               |
| Once A Week            | 2 (6.9)                                                            | 3 (30.0)                             | 5 (12.8)                |
| 1 – 3 Times A<br>Month | 2 (6.9)                                                            | 1 (10.0)                             | 3 (7.7)                 |

#### 4.5 Physical activity level of subjects

Based from Table 4.4, the finding showed that the majority of the subject had high physical activity level which represented 64.2% of total subjects consisted of 15 (65.2%) male and 37 (63.8%) female followed by moderate physical activity level (22.2%) of total subjects and low physical activity level (13.6%). A cross-sectional study conducted in Malaysia to assess physical activity correlations among adults, it was found that there was a significant difference between gender and physical activity level as more males engaged in physical activity compared to females (Lian et al., 2016). This can be explained as most women especially Malaysian women were found less physically active than men due to traditional and cultural beliefs especially from Muslim views where physical activity is seen as unfeminine and associated with lower social status. The consistent finding also being showed in a study from Libya in which was males were consistently associated with achieving the guidelines recommendations for physical activity. The finding also explained that higher health awareness among students can help them to achieve the recommended levels for

vigorous physical activity and muscle strengthening in physical activity (El Ansari et al., 2014).

Another finding showed that Malay (40.7%) had higher physical activity levels, followed by Chinese (13.6%), another ethnicity (8.6%), and Indians (1.2%). There was a significant relationship between ethnicity and physical activity level. The result shows that there was a significant positive relationship between Malay and total physical activity. Malays tend to engage more in overall physical activity compared to other ethnicities. However, there were no significant relationships were not found for Indians concerning total physical activity (Lian et al., 2016).

**Table 4.5 Physical Activity Level Among Undergraduate Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Physical Activity Level</b> | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|--------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Low</b>                     | 1 (4.4)                         | 10 (17.2)                         | 11 (13.6)                        |
| <b>Moderate</b>                | 7 (30.4)                        | 11 (19.0)                         | 18 (22.2)                        |
| <b>High</b>                    | 15 (65.2)                       | 37 (63.8)                         | 52 (64.2)                        |

**Table 4.6 Physical Activity Level Among Undergraduate Student in Faculty Engineering, Universiti Putra Malaysia (n=81) Based on Ethnicity**

| <b>Physical Activity Level</b> | <b>Malay<br/>n = (48)<br/>n(%)</b> | <b>Indian<br/>n = (2)<br/>n(%)</b> | <b>Chinese<br/>n = (24)<br/>n(%)</b> | <b>Others<br/>n = (7)<br/>n (%)</b> | <b>Total<br/>n = (81)<br/>n(%)</b> |
|--------------------------------|------------------------------------|------------------------------------|--------------------------------------|-------------------------------------|------------------------------------|
| <b>Low</b>                     | 8 (16.7)                           | 0 (0.0)                            | 3 12.5                               | 0 (0.0)                             | 11 (13.6)                          |
| <b>Moderate</b>                | 7 (14.6)                           | 1 (50.0)                           | 10 (41.7)                            | 0 (0.0)                             | 18 (22.2)                          |
| <b>High</b>                    | 33 (68.8)                          | 1 (50.0)                           | 11 (45.8)                            | 7 (100.0)                           | 52 (64.2)                          |

#### 4.6 Health-related fitness (Flexibility and Handgrip Strength) of subjects

**Table 4.7 Flexibility Score Among Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Flexibility Score</b> | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|--------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Weak</b>              | 4 (17.4)                        | 11 (19.0)                         | 15 (18.5)                        |
| <b>Average</b>           | 2 (8.7)                         | 11 (19.0)                         | 13 (16.1)                        |
| <b>Excellent</b>         | 17 (73.9)                       | 36 (62.0)                         | 53 (65.4)                        |

Based on the findings from Table 4.5, the majority of the subjects had an excellent score in the flexibility test which represented (65.4%) from total subjects consisted of 17 (73.9%) male and 36 (62.0%) female. It followed by a weak score which was 18.5% of total subjects while the minority is average score subjects which were 16.1% of total subjects.

**Table 4.8 Handgrip Strength Score Among Student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| <b>Handgrip Strength Score</b> | <b>Male<br/>n=(23)<br/>n(%)</b> | <b>Female<br/>n=(58)<br/>n(%)</b> | <b>Total<br/>n=(81)<br/>n(%)</b> |
|--------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Weak</b>                    | 16 (69.6)                       | 31 (53.4)                         | 47 (58.1)                        |
| <b>Average</b>                 | 6 (26.1)                        | 24 (41.4)                         | 30 (37.0)                        |
| <b>Excellent</b>               | 1 (4.3)                         | 3 (5.2)                           | 4 (4.9)                          |

Another finding from Table 4.5, the majority of the subjects had weak scores in the handgrip strength test which represented (58.1%) of total subjects consisted of 16 (69.6%) male and 31 (53.4%) female. It followed by an average score which was 37.0% of total subjects while the minority is excellent score subjects which were only 4.9% of total subjects.

A study in the USA found that there was a significant difference between males and females with the level of fitness status in this study. Findings also revealed that different physical fitness measures due to gender differences, which are more likely related to physiological characteristics and are found across all age groups (Busing & West, 2016). The consistent finding was also discovered in a study from Seattle, the USA which stated that females showed lower aerobic capacity compared to males. The gender disparities can be explained clearly in the aerobic capacity concept as it was attributed due to higher body fat composition, lower hemoglobin content and smaller heart size especially occur in females (Woo et al., 2006). Meanwhile, a local study in public universities in Selangor claimed that the majority of the students had poor aerobic capacity. The finding also showed that male students generally had a higher VO<sub>2</sub>max than female students (Emad et al., 2017).

The fitness status varies among the population. A study in Malaysia conducted among firefighters showed that physical fitness among firefighters was at a low level. Findings also found as age increased, physical fitness also declined (Atikah et al., 2015). Another study involved athletes showed that their overall fitness levels were at a good level as their fitness status can affect the performance (Chong et al., 2011). Besides, another study at Universiti Sabah Malaysia stated that the fitness level of students was generally low (Razak et al., 2013). Overall, the supporting evidence showed that fitness level among Malaysian adults is generally low especially among the normal population.

#### **4.7 Hypothesis Testing**

**a) There is no relationship between sociodemographic background and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

Based on finding in table 4.9, there was a negative correlation between parent income and handgrip strength test ( $r = -0.381$ ,  $p < 0.001$ ). Therefore, fitness status among adolescents was closely related to parental income. This study is consistent with the findings from a study targeting university students in Poland. It specifically indicated that subjects with lower socioeconomic status were less likely to have skeletal muscle unfitness compared to those from middle-class families. Besides, gender also can be one of the variables which can affect the fitness status and in this study, the finding showed that male subjects were more likely to have poor aerobic fitness than females. It also indicated the important fact that males have an almost four times greater chance of poor fitness than females (Hardman, 2011).

Another study in Malaysia targeted Malaysian adolescents aged 13-17 years old which showed consistent findings proposed that approximately less than 10% of Malaysian adolescents were considered fit with a ratio of fitness 1:10 with more number girls compared to boys. The poor level of fitness in the study clearly showed that it is crucial to identify and promote healthy lifestyle choices and eventually intervention started from a young age. However, the result was based on the physical activity questionnaire as the assessment reported only in the behaviours of the participants. Thus, better assessment needs to perform to identify the physical activity level among the study group. Moreover, gender differences toward the fitness level can be affected due to variances in hematologic (Hanifah et al., 2014). Thus, the hypothesis was rejected.

**Table 4.9 Relationship between sociodemographic background and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| Variables                       | Flexibility Test              |           | $\chi^2$          | P     |
|---------------------------------|-------------------------------|-----------|-------------------|-------|
|                                 | Poor                          | Good      |                   |       |
| <b>Gender</b>                   |                               |           | €                 | 0.747 |
| Male                            | 6 (21.4)                      | 17 (32.1) |                   |       |
| Female                          | 22 (78.6)                     | 36 (67.9) |                   |       |
| <b>Ethnicity</b>                |                               |           | 0.102             | 0.750 |
| Malay                           | 17 (60.7)                     | 31 (58.5) |                   |       |
| Non Malay                       | 11 (39.3)                     | 22 (41.5) |                   |       |
| <b>Religion</b>                 |                               |           | 0.246             | 0.620 |
| Muslim                          | 18 (64.3)                     | 33 (62.3) |                   |       |
| Non-Muslim                      | 10 (35.7)                     | 20 (37.7) |                   |       |
| <b>Residence</b>                |                               |           | €                 | 0.681 |
| College/hostel                  | 25 (89.3)                     | 46 (88.5) |                   |       |
| Outside college/hostel          | 3 (10.7)                      | 7 (13.5)  |                   |       |
| <b>Mother Educational Level</b> |                               |           | €                 | 0.478 |
| Primary/secondary school        | 14 (50.0)                     | 33 (62.3) |                   |       |
| Higher education                | 14 (50.0)                     | 20 (37.7) |                   |       |
| <b>Father Educational Level</b> |                               |           | €                 | 0.525 |
| Primary/secondary school        | 12 (42.9)                     | 26 (49.1) |                   |       |
| Higher education                | 16 (57.1)                     | 27 (50.9) |                   |       |
| <b>Parent Income (RM)</b>       | <b>r</b><br>- 0.093           |           | <b>P</b><br>0.409 |       |
|                                 | <b>Handgrip Strength Test</b> |           |                   |       |
| <b>Gender</b>                   |                               |           | €                 | 0.498 |
| Male                            | 22 (28.6)                     | 1 (25.0)  |                   |       |
| Female                          | 55 (71.4)                     | 3 (75.0)  |                   |       |
| <b>Ethnicity</b>                |                               |           | €                 | 0.745 |
| Malay                           | 47 (61.0)                     | 1 (25.0)  |                   |       |
| Non Malay                       | 30 (39.0)                     | 3 (75.0)  |                   |       |
| <b>Religion</b>                 |                               |           | €                 | 0.620 |
| Muslim                          | 49 (63.6)                     | 2 (50.0)  |                   |       |
| Non-Muslim                      | 28 (36.4)                     | 2 (50.0)  |                   |       |
| <b>Residence</b>                |                               |           | €                 | 0.343 |
| College/hostel                  | 67 (87.0)                     | 4 (100.0) |                   |       |
| Outside college/hostel          | 10 (13.0)                     | 0 (0.0)   |                   |       |
| <b>Mother Educational Level</b> |                               |           | €                 | 0.583 |
| Primary/secondary school        | 44 (57.1)                     | 3 (75.0)  |                   |       |
| Higher education                | 33 (42.9)                     | 1 (25.0)  |                   |       |
| <b>Father Educational Level</b> |                               |           | €                 | 0.620 |
| Primary/secondary school        | 36 (46.8)                     | 2 (50.0)  |                   |       |
| Higher education                | 41 (53.2)                     | 2 (50.0)  |                   |       |
| <b>Parent Income (RM)</b>       | €                             |           | <b>0.001*</b>     |       |

\*a: Data analyzed using Chi-square test

\*b: Data analyzed using Fisher's exact test

€: Chi-square test assumption not fulfilled and Fisher's exact test not available

\*: Correlation was significant at  $p < 0.001$

**b) There is no relationship between nutritional status and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

Based on finding in table 4.8, there was a negative correlation between BMI and handgrip strength test ( $r = -0.229$ ,  $p = < 0.040$ ). Therefore, fitness status among university students was closely related to their BMI. This finding was consistent as a previous study in China which indicates that there was a significant relationship between BMI and fitness status. Normal weight students were generally found to have better physical fitness than underweight, overweight, and obese students which number is higher in males compared to females. Besides, the study also proved that a significant increasing trend of overweight and obesity among college students was due to a significant decline in physical activity levels among them. (Chen et al., 2020). This finding also supported by the study in Selangor, Malaysia which targeted police officers aged 20-39 years old. It reported that body fat, BMI, body weight, and waist circumference showed a major association with all components of physical fitness which cause by the overall working environments of police officers that were sedentary. The finding also claimed that poor levels of physical activity can give an impact on body weight and increase body fat which leads to a declining in individual fitness status (Nasruddin et al., 2018).

However, it was found that there is no significant relationship between nutritional intake and fitness status. The finding was similar to the study from Indonesia which reported that there was no significant relationship between nutritional nutrient intake with fitness status based fitness test scores (Ahmad et al., 2016). A similar study

assessed nutrient intake and its relation with fitness status also stated about carbohydrate intake and fitness status. It was found that there were no independent fitness tests found significantly associated with any of the classifications of carbohydrate intake. From this situation, it can be well explained that a high carbohydrate diet was not the primary and key factor that contributed to an increase in performance. However, individuals who maintain a carbohydrate-rich diet have higher fitness levels as they actively participated in a more frequent exercise routine (Serd, 2012). Therefore, the hypothesis was rejected.

**Table 4.10 Relationship between nutritional status and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| Variables                    | Flexibility Test |               | Handgrip Strength Test |       |
|------------------------------|------------------|---------------|------------------------|-------|
|                              | r                | P             | r                      | P     |
| BMI (kg/m <sup>2</sup> )     | - 0.229          | <b>0.040*</b> | 0.070                  | 0.535 |
| Fat Percentage (%)           | - 0.016          | 0.888         | - 0.030                | 0.792 |
| Visceral Fat                 | - 0.171          | 0.128         | - 0.058                | 0.605 |
| Calories Requirement per Day | - 0.077          | 0.497         | 0.025                  | 0.825 |

**c) There is no relationship between supplement intake and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

Based on finding in table 4.9, there was no significant correlation between supplement intake and fitness status. This finding opposed the study to assess the patterns of dietary supplement use among college students which found that the relationship between supplement intake and fitness status was strongly associated. This can be explained as the subjects believed with the supplement intake, it can help to assist with usual daily activities without becoming tired too easily. This clearly showed us that

supplement intake is just a matter of concept which is more related to mental compared with any physical energy or caloric intake (Lieberman et al., 2015).

Another study in Lebanon that targeted people who exercising in the gym reported that strength training, treadmill, and fights, and martial arts had significant associations with the use of nutritional supplements. It also clearly explained that most of the industrial and marketing of supplements most focused and targeted on exercisers in gyms. However, most studies investigating supplement use worldwide focused on athletes instead of exercisers in the gym (El Khoury & Antoine-Jonville, 2012). Hence, the null hypothesis was failed to be rejected.

**Table 4.11 Relationship between supplement intake and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| Variables                                                     | Flexibility Test |           | $\chi^2$ | P     |
|---------------------------------------------------------------|------------------|-----------|----------|-------|
|                                                               | Poor             | Good      |          |       |
| <b>Medication, Vitamin and Mineral Supplement Consumption</b> |                  |           | 3.458    | 0.484 |
| Yes                                                           | 13 (46.4)        | 16 (30.2) |          |       |
| No                                                            | 15 (53.6)        | 37 (69.8) |          |       |
| <b>Food Supplement Consumption</b>                            |                  |           | 1.833    | 1.833 |
| Yes                                                           | 5 (17.9)         | 5 (9.4)   |          |       |
| No                                                            | 23 (82.1)        | 48 (90.6) |          |       |
| <b>Medication, Vitamin and Mineral Supplement Consumption</b> |                  |           | 2.047    | 0.727 |
| Yes                                                           | 27 (35.1)        | 2 (50.0)  |          |       |
| No                                                            | 50 (64.9)        | 2 (50.0)  |          |       |
| <b>Food Supplement Consumption</b>                            |                  |           | 2.126    | 0.713 |
| Yes                                                           | 10 (13.0)        | 0 (0.0)   |          |       |
| No                                                            | 67 (87.0)        | 4 (100.0) |          |       |

**d) There is no relationship between physical activity and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

Based on the findings in table 4.10, there is no significant correlation between physical activity and fitness status. the finding opposed to some studies found that showed there was a significant relationship between physical activity and fitness status. A study by Emeljanovas et al. (2017) found that there was a significant value between the level of physical activity and fitness status score. It indicated when physical activity level higher it closely related to the excellent score for handgrip strength. However, it was found that there were no statistically significant relationships were found among the total volume of physical activity and other health-related physical fitness components such as flexibility, trunk strength, speed, and agility (Emeljanovas et al., 2017).

Another study from Slovenia involved university students. It reported that males had a better score than females in fitness tests except in a flexibility test (Lipošek et al., 2019). Thus, the null hypothesis was failed to be rejected.

**Table 4.12 Relationship between physical activity and fitness status among student in Faculty Engineering, Universiti Putra Malaysia (n=81)**

| Variables               | Flexibility Test |       | Handgrip Strength Test |       |
|-------------------------|------------------|-------|------------------------|-------|
|                         | r                | P     | r                      | P     |
| Physical Activity Level | 0.087            | 0.443 | 0.171                  | 0.126 |

## CHAPTER 5

### CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

Based on the findings from this study, for sociodemographic background, gender allocation in this study was 71.6% for females and 28.4% for males. For ethnicity, the majority of the respondents were Malay (59.3%) while the minority were Indian (2.5%). For residence, most of the respondents stayed at a hostel or college (87.6%) while the remaining 12.4% of subjects stay at rented house and family house. For the mother educational level, 58.1% of respondents answered primary and secondary school followed by 41.9% of respondents answered higher education level (Diploma, Degree, Master, and Ph.D.). Meanwhile, for the father educational level, 53.1% of them answered a higher education level (Diploma, Degree, Master, and Ph.D.) while 46.9% of them answered primary and secondary school educational level. About 48.1% of total respondents came from the Middle-Class family (M40), followed by Lower Class family (B40) (37.0%) and Upper-Class family (T20) (14.9%).

For nutritional status, 71.6% of respondents had normal BMI in which (51.9% female and 19.8% male), 70.4% respondents had normal fat percentage (51.9% female and 18.5% male) and 92.6% respondents had normal visceral fat (67.9% female and 24.7% male). The majority of the respondents did not meet the calories requirement per day of RNI with males (1747.73 kcal/day) and female (1459.36 kcal /day) respectively. Next, for supplement consumption, 35.8% of respondents consumed medication, vitamin, and mineral supplements while only 12.3% of respondents consumed food supplements. For the physical activity level, 64.2% of respondents achieved a high

physical activity level (45.7% female and 18.5% male). The prevalence for the students who reach an excellent score for flexibility test was 65.4% consists of 17 males and 36 females respectively. Meanwhile, for the students who reach an excellent score for handgrip strength, only 4.9% of students obtained an excellent score while almost 58.1% of students had a weak score.

Based on hypothesis testing, it was found that sociodemographic background was associated with the fitness status as there was a negative correlation between parent income and handgrip strength test ( $r = -0.381$ ,  $p < 0.001$ ). It was also found that nutritional status was associated with fitness status as there was a negative correlation between BMI and handgrip strength test ( $r = -0.229$ ,  $p < 0.040$ ). Meanwhile, there was no association found between supplement intake and physical activity with fitness status in this study.

## **5.2 Limitations**

There were several limitations found in this study. Firstly, the causality relationships of the factors cannot be determined due to the cross-sectional study was conducted. Next, convenience sampling and small sample size cannot be determined to generalize the whole population of adults especially university students. Besides, due to the Covid-19 outbreak, the early targeted subjects were 85 subjects but managed to obtain 81 subjects only and about 5% more subjects required to achieve the target. Furthermore, 24-hour diet recall used as a nutritional intake instrument might not show the actual and frequent intake of the subjects in which data biased can happen. Last but not least, there were some difficulties occurred during data collection as too many assessors involved in the study in which different way of assessment might happen.

### 5.3 Recommendations

A longitudinal study is the best recommendation to observe and determine the causality relationship of the factors. Besides, simple random sampling and large sample size which involved several universities in Malaysia are needed to generalize the population of adults especially university students. Next, the number of assessors involved in the study need to be reduced to reduce the different measurement and increase the quality of the measurement assessed.

Moreover, the nutritional intake instrument which used 24-hour diet recall needs to be improved by using the Food Frequency Questionnaire record to prevent under-report on behalf of the subjects. The frequency, pattern, and type of meal consumed by the subjects can be assessed accurately and precisely. Other nutrients including macronutrients and micronutrients also can be assessed by using the Food Frequency Questionnaire (FFQ). However, it will take more time for the assessor to assess the dietary intake of the subjects but to obtain precise and accurate data, the method should be improved.

Last but not least, the assessment for health-related fitness status needs to be covered all the components which include flexibility, muscle strength, cardiovascular endurance, muscle endurance, and body composition. The findings in the study did not reflect the whole status of health-related fitness status components as it only covered two components which were flexibility and muscle strength (handgrip strength).

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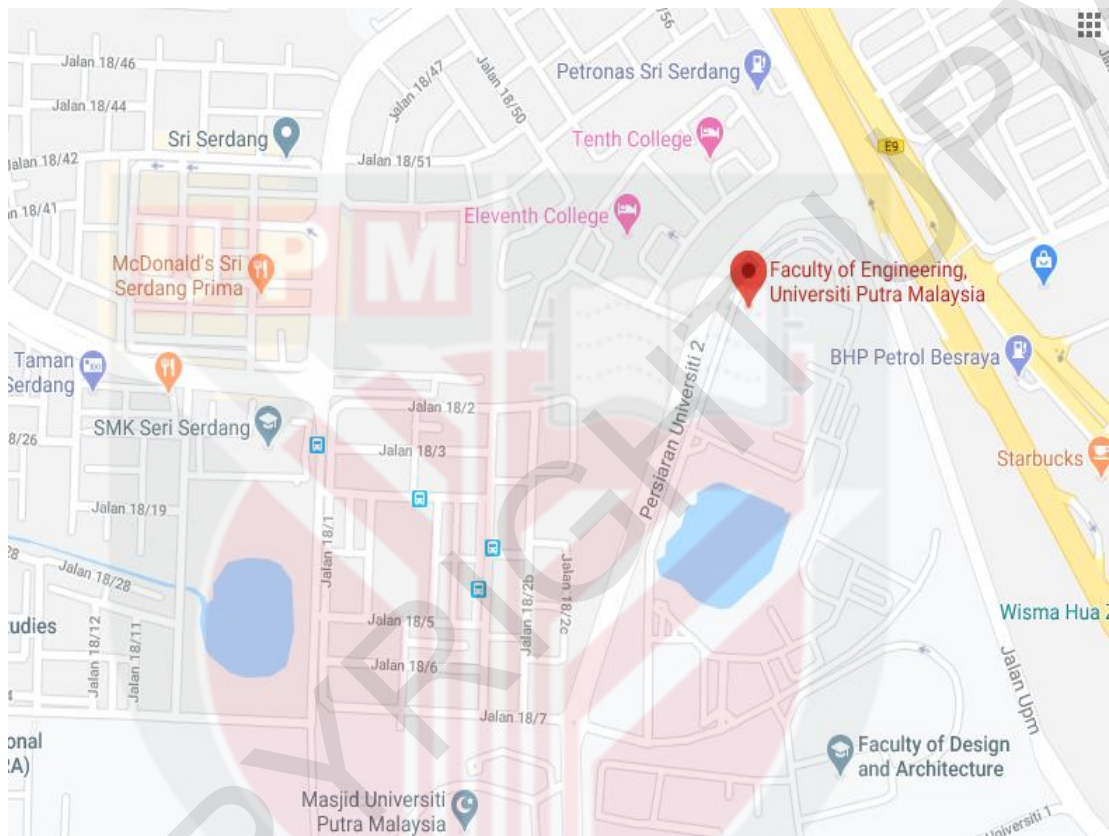
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## APPENDIX

### APPENDIX I: MAP OF FACULTY ENGINEERING, UNIVERSITI PUTRA MALAYSIA



## APPENDIX III: CONSENT FORM

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



### **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**

Hubungan Antara Latar Belakang Sosiodemografik, Status Pemakanan, Pengambilan Suplemen Dan Aktiviti Fizikal Dengan Status Kecergasan Dalam Kalangan Pelajar Sarjana Muda Dari Fakulti Kejuruteraan Universiti Putra Malaysia

#### **2. PENGENALAN**

Status kecergasan adalah keadaan di mana seseorang individu itu sihat dan sihat secara fizikal yang membolehkan mereka mempunyai kualiti hidup yang baik untuk menjalani tugas dan aktiviti setiap hari. Secara khusus, status kecergasan dapat mencerminkan keadaan semasa individu khususnya ketika mereka melakukan kegiatan fizikal. Terdapat beberapa komponen asas yang memenuhi status kecergasan iaitu bersemangat dan berjaga-jaga, tiada keletihan dan tenaga yang mencukupi apabila melakukan aktiviti dan bertindak balas terhadap kecemasan.

Dalam kajian ini, status kecergasan subjek adalah pemboleh ubah yang utama dengan hubungan empat pemboleh ubah bergantung yang terdiri daripada latar belakang sosiodemografi, status pemakanan, pengambilan suplemen dan aktiviti fizikal. Subjek terdiri pelajar Fakulti Kejuruteraan, Universiti Putra Malaysia yang berusia antara 19 tahun hingga 25 tahun.

Oleh itu, tujuan kajian ini adalah untuk mengkaji hubungan antara latar belakang sosiodemografi, status pemakanan, pengambilan makanan tambahan dan aktiviti fizikal dengan status kecergasan di kalangan pelajar sarjana muda dari Fakulti Kejuruteraan, Universiti Putra Malaysia. Walaupun subjek dianggap sebagai aktif dan sesuai secara fizikal, empat komponen yang disebutkan di atas juga perlu menilai supaya kita dapat mengenal pasti dengan jelas faktor-faktor yang boleh mempengaruhi status kecergasan di kalangan orang dewasa.

#### **3. APAKAH YANG PERLU ANDA LAKUKAN?**

Jika anda bersetuju untuk menyertai kajian ini, anda perlu menjawab soal selidik dengan 5 bahagian dengan bantuan penyelia bertugas kerana mereka akan melakukan temubual bersemuka dengan anda. 5 bahagian soal selidik termasuk:

- Bahagian A: Soal Selidik Ciri Sosiodemografi
- Bahagian B: Data Antropometri
- Bahagian C: Rekod Pengambilan Makanan 24 Jam
- Bahagian D: Soal Selidik Pengambilan Suplemen
- Bahagian E: Soal Selidik Aktiviti Fizikal Global
- Bahagian F: Ujian Aktiviti Fizikal Berkaitan Kesihatan

Semasa sesi temubual, anda diperlukan untuk menjawab soal selidik dan memberikan

maklumat mengenai diri anda dengan maklumat yang sah dan benar. Sekiranya terdapat sebarang masalah semasa sesi atau kajian ini berlangsung, anda boleh bertanya penyelidik yang bertugas.

**4. SIAPA YANG TIDAK BOLEH MENYERTA KAJIAN INI?**

Subjek yang telah didiagnosis dengan penyakit mental, kecederaan dan pelajar tahun akhir yang mengikuti latihan industri

**5. APAKAH FAEDAH MENYERTA KAJIAN INI?**

**a) KEPADA ANDA SEBAGAI PESERTA?**

Anda akan membantu penyiasat untuk mengkaji semula dan menganalisis data hubungan antara latar belakang sosiodemografi, status pemakanan, pengambilan suplemen dan aktiviti fizikal dengan status kecergasan di kalangan pelajar dan ia akan mencerminkan data penduduk umum terutama di Malaysia kerana kajian berkaitan tajuk ini masih dalam proses dan tidak dilakukan secara holistik. Selain itu, kajian ini juga membantu anda untuk mendapatkan pengetahuan dan maklumat tambahan tentang bidang pemakanan sukan dan faktor-faktor yang mempengaruhi status kecergasan yang juga boleh memberi kesan kepada persembahan individu anda dalam sukan.

**b) KEPADA PENYELIDIK?**

Data dan hasil kajian boleh menjadi penunjuk yang baik dan mencerminkan kumpulan penduduk yang disasarkan iaitu orang dewasa dari umur 19 hingga 25 tahun. Ia juga berfungsi sebagai kajian asas untuk penyelidikan masa depan, mengisi jurang penyelidikan, menambah ilmu pengetahuan dan memberikan pandangan untuk pencegahan pada masa hadapan dan program promosi kesihatan di peringkat komuniti.

**6. ADAKAH IA BERISIKO?**

Dalam kajian ini, proses pengumpulan data tidak melibatkan pergerakan yang bahaya dan terlalu banyak kerana kaedah pengumpulan data dijalankan secara temubual dan kajian soal selidik sahaja. Kajian ini juga tidak dibiayai oleh mana-mana pihak atau organisasi. Justeru itu, bayaran balik untuk kos perjalanan atau pembiayaan lain tidak akan ditanggung.

**7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?**

Maklumat dan hasil dari kajian ini akan digunakan dalam kajian ini sahaja. Semua maklumat atau data mengenai subjek akan kekal sulit. Maklumat yang relevan hanya akan diberikan kepada pihak tertentu yang terlibat dalam kajian ini sahaja. Dengan menandatangani borang persetujuan ini, anda bersetuju untuk memberikan maklumat atau data kepada penyiasat.

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

Sekiranya anda mempunyai sebarang soalan tambahan semasa menjalankan penyelidikan, anda boleh menghubungi Muhammad Amirul bin Muliady dengan keterangan yang tertera:

No. Telefon: 018-2498159

Alamat: D-4-8-4, Blok D, Kolej 17, Universiti Putra Malaysia, 43400 Serdang, Selangor

Nama penyelia: Prof. Madya Dr. Hazizi bin Abu Saad

No. Telefon: 03-97692434

E-mel: hazizi@upm.edu.my

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 .....  
(Responden)

Tandatangan .....  
(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)

## APPENDIX IV: QUESTIONNAIRE



**FAKULTI PERUBATAN DAN SAINS KESIHATAN**

**JABATAN PEMAKANAN DAN DIETETIK**

**BORANG SOAL SELIDIK**

**Tajuk Kajian:**

Hubungan Antara Latar Belakang Sosiodemografik, Status Pemakanan, Pengambilan Suplemen Dan Aktiviti Fizikal Dengan Status Kecergasan Dalam Kalangan Pelajar Sarjana Muda Fakulti Kejuruteraan Universiti Putra Malaysia

**Penyelidik: Prof. Madya Dr. Hazizi bin Abu Saad dan Muhammad Amirul bin Muliady**

**BAHAGIAN A: SOAL SELIDIK CIRI SOSIODEMOGRAFI**

|     |  |
|-----|--|
| ID: |  |
|-----|--|

|                             |                                                                                                                   |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------|
| Umur                        |                                                                                                                   |
| Jantina                     | <input type="checkbox"/> Lelaki <input type="checkbox"/> Perempuan                                                |
| Etnik                       | <input type="checkbox"/> Melayu <input type="checkbox"/> India <input type="checkbox"/> Cina    Lain-lain: _____  |
| Agama                       | <input type="checkbox"/> Islam <input type="checkbox"/> Hindu <input type="checkbox"/> Buddha    Lain-lain: _____ |
| Tempat Tinggal              | <input type="checkbox"/> Asrama/Kolej <input type="checkbox"/> Rumah Sewa <input type="checkbox"/> Rumah Sendiri  |
| Pekerjaan Ibu               |                                                                                                                   |
| Pekerjaan Bapa              |                                                                                                                   |
| Pendapatan Bulanan Ibu Bapa | Ibu : _____<br>Bapa : _____                                                                                       |
| Taraf Pendidikan Tertinggi  | Ibu : _____<br>Bapa : _____                                                                                       |
| Jumlah Isirumah             |                                                                                                                   |
| Bidang Pengajian            |                                                                                                                   |
| Tahun Pengajian             |                                                                                                                   |

## BAHAGIAN B: DATA ANTROPOMETRI

| Komponen                               | Bacaan 1 | Bacaan 2 | Purata |
|----------------------------------------|----------|----------|--------|
| Berat (kg)                             |          |          |        |
| Tinggi (cm)                            |          |          |        |
| Indek Jisim Badan (kg/m <sup>2</sup> ) |          |          |        |
| Peratusan Lemak (%)                    |          |          |        |
| Lemak Viseral (kg)                     |          |          |        |

### BAHAGIAN C: REKOD PENGAMBILAN MAKANAN 24 JAM

Hari: \_\_\_\_\_

Tarikh: \_\_\_\_\_

[illegible]

## BAHAGIAN D: SOAL SELIDIK PENGAMBILAN SUPLEMEN

Q1 Dalam tempoh satu tahun yang lepas, adakah Cik makan apa-apa ubat/vitamin/mineral. (Tandakan /)

a) ☐ Ya (sila ke soalan Q2)

b) ☐ Tidak (sila ke soalan Q3)

Q2 Apakah jenis vitamin/mineral yang diambil?

**(Tidak perlu bacakan senarai)** Minta bekas/botol daripada peserta untuk mengesahkan jenis vitamin/mineral, boleh terima jawapan lebih dari satu.

Q3 Apakah sebab Cik mengambilnya?

Q4 Berapa kerapkah Cik mengambilnya?

| Q2: Jenis<br>(Bulatkan pada abjad jenis<br>vitamin/mineral yang diambil) | Q3: Sebab pengambilan<br>(rujuk kod di bawah, bulatkan<br>angka bagi sebab<br>pengambilan, jawapan boleh<br>lebih daripada satu,<br>maksimum empat sebab) |   |   |   |   |   |   |   | Q4: Kekerapan<br>(rujuk kod di bawah) |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---------------------------------------|
| a. multivitamin dan multimineral                                         | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| b. multivitamin dan zat besi                                             | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| c. vitamin A/karatenoid                                                  | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| d. vitamin B kompleks                                                    | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| e. vitamin B12                                                           | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| f. vitamin C                                                             | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| g. asid folik/B6                                                         | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| h. vitamin B kompleks + vitamin C                                        | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| i. vitamin D dan kalsium                                                 | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| j. zat besi                                                              | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| k. kalsium                                                               | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| l. vitamin E                                                             | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| m. zink                                                                  | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| n. zink + B kompleks                                                     | 1                                                                                                                                                         | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |

Jangka masa pendek (berapa lama, nyatakan?) .....

Kod sebab pengambilan

Kod kekerapan

1 – atas arahan doctor

1 – setiap hari

2 – kesihatan (bukan arahan doktor secara am)

2 – lebih dari sekali seminggu

3 – tambah tenaga

3 – seminggu sekali

4 – kecantikan

4 – 1 hingga 3 kali sebulan

5 – penurunan berat badan

5 – sekali sekala (jangka masa pendek)

6 – tambah ingatan

7 - penurunan kolesterol

8 – tidak pasif/tiada jawapan

Q5 Dalam tempoh satu tahun yang lepas, adakah Cik mengambil apa-apa suplemen makanan (Seperti minyak ikan, lesitin, evening primrose, jus buah noni dan lain-lain)

a) ☐ Ya (sila ke soalan Q6)

b) ☐ Tidak (sila berhenti sini, temubual tamat)

Q6 Apakah Cik mengambil bahan berikut?

(Bacakan senarai suplemen di bawah) Minta bekas/botol daripada peserta untuk mengesahkan jenis suplemen.

Q7 Apakah sebab Cik mengambilnya?

Q8 Berapa kerapkah Cik mengambilnya?

| Q2: Jenis<br>(Bulatkan pada abjad jenis<br>suplemen yang diambil) | Q3: Sebab pengambilan<br>(rujuk kod di bawah, bulatkan angka<br>bagi sebab pengambilan, jawapan<br>boleh lebih daripada satu, maksimum<br>empat sebab) |   |   |   |   |   |   |   | Q4: Kekerapan<br>(rujuk kod di bawah) |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---------------------------------------|
| a. minyak ikan                                                    | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| b. pati ayam                                                      | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| c. pati ikan haruan                                               | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| d. pati bawang putih                                              | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| e. jus buah noni                                                  | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| f. hasil madu lebah/royal jelly                                   | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| g. evening primrose oil                                           | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| h. lesitin                                                        | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| i. spirulina                                                      | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| j. Ginkgo Biloba                                                  | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| k. Lain-lain, nyatakan                                            |                                                                                                                                                        |   |   |   |   |   |   |   |                                       |
| - .....                                                           | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| - .....                                                           | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| - .....                                                           | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |
| - .....                                                           | 1                                                                                                                                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                                       |

Jangka masa pendek (berapa lama, nyatakan?) .....

Kod sebab pengambilan

1 – atas arahan doctor

2 – kesihatan (bukan arahan doktor secara am)

3 – tambah tenaga

4 – kecantikan

5 – penurunan berat badan

6 – tambah ingatan

7 – penurunan kolesterol

8 – tidak pasif/tiada jawapan

Kod kekerapan

1 – setiap hari

2 – lebih dari sekali seminggu

3 – seminggu sekali

4 – 1 hingga 3 kali sebulan

5 – sekali sekala (jangka masa pendek)

## BAHAGIAN E: SOAL SELIDIK AKTIVITI FIZIKAL GLOBAL

| Soalan-soalan                               |                                                                                                                                                                                                                                                                                                                                            | Maklumbalas                                         | Kod         |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------|
| <b>Aktiviti Fizikal Berkaitan Pekerjaan</b> |                                                                                                                                                                                                                                                                                                                                            |                                                     |             |
| 1                                           | Adakah pekerjaan anda melibatkan aktiviti kerja berat yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung seperti berlari, membawa atau mengangkat barang yang berat, menggali, mencangkul, menuai, berkebun, memburu atau melakukan kerja pembinaan sekurang-kurangnya 10 minit secara berterusan? | Ya 1<br><br>Tidak 2<br><br>Jika 'Tidak', sila ke P4 | P1          |
| 2                                           | Biasanya dalam seminggu, berapa hariakah anda melakukan kerja-kerja berat dalam pekerjaan anda?                                                                                                                                                                                                                                            | Jumlah hari; _____                                  | P2          |
| 3                                           | Pada hari biasa yang anda lakukan kerja berat, berapa lamakah anda melakukannya?                                                                                                                                                                                                                                                           | Jam : Minit<br>( ____ : ____ )                      | P3<br>(a-b) |
| 4                                           | Adakah pekerjaan anda melibatkan aktiviti kerja sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung seperti berjalan pantas, membawa barang yang ringan, memancing, membuat kerja rumah, mencuci kereta atau mengecat rumah sekurang-kurangnya 10 minit secara berterusan?               | Ya 1<br><br>Tidak 2<br><br>Jika 'Tidak', sila ke P7 | P4          |
| 5                                           | Biasanya dalam seminggu, berapa hariakah anda melakukan kerja-kerja sederhana dalam pekerjaan anda?                                                                                                                                                                                                                                        | Jumlah hari; _____                                  | P5          |

|                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                      |                                                      |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------|
| 6                                                                                                                                                                                                                                                                                                                        | Pada hari biasa yang anda lakukan kerja sederhana, berapa lamakah anda melakukannya?                                                                                                 | Jam : Minit<br>( ____ : ____ )                       | P6<br>(a-b) |
| <b>Aktiviti Fizikal Berkaitan Perjalanan</b>                                                                                                                                                                                                                                                                             |                                                                                                                                                                                      |                                                      |             |
| <p>Soalan-soalan seterusnya <b>TIDAK</b> termasuk aktiviti fizikal semasa bekerja yang telah anda nyatakan:</p> <p>Sekarang, saya ingin bertanya mengenai kaedah yang biasa anda gunakan untuk bergerak dari satu tempat ke tempat yang lain (seperti ke tempat kerja, pasar, membeli-belah, masjid dan sebagainya).</p> |                                                                                                                                                                                      |                                                      |             |
| 7                                                                                                                                                                                                                                                                                                                        | Adakah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke dan dari sesuatu tempat?                                                          | Ya 1<br><br>Tidak 2<br><br>Jika 'Tidak', sila ke P10 | P7          |
| 8                                                                                                                                                                                                                                                                                                                        | Dalam satu minggu yang biasa, berapa harikah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke dan dari sesuatu tempat?                    | Jumlah hari; _____                                   | P8          |
| 9                                                                                                                                                                                                                                                                                                                        | Dalam satu hari yang biasa, berapa lamakah anda berjalan atau berbasikal untuk bergerak dari satu tempat ke tempat yang lain?                                                        | Jam : Minit<br>( ____ : ____ )                       | P9<br>(a-b) |
| <b>Aktiviti Fizikal Pada Waktu Lapang</b>                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |                                                      |             |
| <p>Soalan-soalan seterusnya <b>TIDAK</b> termasuk aktiviti fizikal semasa bekerja dan semasa perjalanan yang telah anda nyatakan:</p> <p>Sekarang, saya ingin bertanya tentang aktiviti yang anda lakukan untuk rekreasi, kecergasan dan sukan.</p>                                                                      |                                                                                                                                                                                      |                                                      |             |
| 10                                                                                                                                                                                                                                                                                                                       | Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang lasak yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung | Ya 1<br><br>Tidak 2<br><br>Jika 'Tidak', sila ke P13 | P10         |

|    |                                                                                                                                                                                                                                                                                                                                      |                                                      |              |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------|
|    | seperti berlari, jogging, aerobik atau bermain bola sepak sekurang-kurangnya 10 minit secara berterusan?                                                                                                                                                                                                                             |                                                      |              |
| 11 | Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?                                                                                                                                                                                                 | Jumlah hari; _____                                   | P11          |
| 12 | Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?                                                                                                                                                                                                                | Jam : Minit<br>( ____ : ____ )                       | P12<br>(a-b) |
| 13 | Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung seperti berjalan pantas, berbasikal, berenang, menanam pokok bunga atau bermain bola tampar sekurang-kurangnya 10 minit secara berterusan? | Ya 1<br><br>Tidak 2<br><br>Jika 'Tidak', sila ke P16 | P13          |
| 14 | Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?                                                                                                                                                                                             | Jumlah hari; _____                                   | P14          |
| 15 | Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?                                                                                                                                                                                                            | Jam : Minit<br>( ____ : ____ )                       | P15<br>(a-b) |

#### **Aktiviti Sedentari Atau Tidak Aktif**

Soalan berikut adalah berkaitan dengan aktiviti duduk atau baring/sandar di tempat kerja, di rumah, semasa dalam perjalanan atau semasa bersama rakan-rakan. Contohnya, duduk menulis, mengguna computer, duduk bersama rakan-rakan, perjalanan dalam kereta, bas, keretapi, duduk membaca, bermain kad atau menonton televisyen, **TETAPI TIDAK TERMASUK** waktu tidur.

|    |                                                                                                     |                                |              |
|----|-----------------------------------------------------------------------------------------------------|--------------------------------|--------------|
| 16 | Dalam satu hari yang biasa, berapakah jumlah masa yang anda gunakan untuk duduk atau baring/sandar? | Jam : Minit<br>( ____ : ____ ) | P16<br>(a-b) |
|----|-----------------------------------------------------------------------------------------------------|--------------------------------|--------------|



## BAHAGIAN F: UJIAN AKTIVITI FIZIKAL BERKAITAN KESIHATAN

### UJIAN 1: DUDUK DAN LUNJUR

#### Peralatan:

- Pita pengukur

#### Arahan:

1. Pastikan peserta menanggalkan kasut dan duduk di lantai dengan lutut dirapatkan dan pita ukur di antara kedua-dua belah kaki.
2. Pastikan kedua belah tapak kaki diletakkan dalam jarak 10 ke 12 inci dan tumit setara dengan pita pengukur pada tanda 15 inci.
3. Dengan memastikan kedua belah tangan diletakkan bersama, melunjur ke hadapan secara perlahan dengan kedua belah lengan dilunjurkan sepenuhnya. Lunjur sejauh mungkin dan tahan selama 2 saat.
4. Jalankan ujian sebanyak 3 kali dan rekodkan kiraan tersebut.

| Persentil | Skor             | Lelaki | Perempuan |
|-----------|------------------|--------|-----------|
| 90        | Sangat baik      | 22     | 24        |
| 80        |                  | 20     | 22        |
| 70        | Baik             | 19     | 21        |
| 60        |                  | 18     | 20        |
| 50        | Sederhana        | 17     | 19        |
| 40        |                  | 15     | 18        |
| 30        | Sangat sederhana | 14     | 17        |
| 20        |                  | 13     | 16        |
| 10        | Lemah            | 11     | 14        |

Percubaan pertama: \_\_\_\_\_

Percubaan kedua: \_\_\_\_\_

Percubaan ketiga: \_\_\_\_\_

Purata: \_\_\_\_\_



## UJIAN 2: KEKUATAN CENGKAMAN TANGAN

### Peralatan:

- Peranti cengkaman tangan

### Arahan:

1. Pastikan peserta selesa menggenggam peralatan di tangan yang dikehendaki peserta. Laraskan genggam pada peralatan sekiranya peserta tidak selesa bagi memudahkan menggenggam kemas peralatan.
2. Jika peserta bersedia melakukan ujian, pastikan peserta menggenggam secara kuat peralatan dan bacaan akan dikeluarkan dari peralatan.
3. Peserta diberi dua kali percubaan setiap seorang dan rekod keputusan yang tertinggi yang diperoleh berdasarkan ujian yang dilakukan.

| Skor             | Lelaki  | Perempuan |
|------------------|---------|-----------|
| Cemerlang        | > 64    | > 38      |
| Sangat baik      | 56 – 64 | 34 – 38   |
| Baik             | 52 – 56 | 30 – 34   |
| Sederhana        | 48 – 52 | 26 – 30   |
| Sangat sederhana | 44 – 48 | 22 – 26   |
| Lemah            | 40 – 44 | 20 – 22   |
| Sangat lemah     | < 40    | < 20      |

Percubaan pertama : \_\_\_\_\_ (kg)

Percubaan kedua : \_\_\_\_\_ (kg)

Purata : \_\_\_\_\_ (kg)