UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG PATIENTS ATTENDING DIETETICS CLINIC IN HOSPITAL PENGAJAR UNIVERSITI PUTRA MALAYSIA

AKMAL SHAHIR BIN SAHRUL HASLAN

lp
FPSK6 2022 9

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG PATIENTS ATTENDING DIETETICS CLINIC IN HOSPITAL PENGAJAR UNIVERSITI PUTRA MALAYSIA

© COPYRIGHT UPM

AKMAL SHAHIR BIN SAHRUL HASLAN

DEPARTMENT OF DIETETICS

FACULTY OF MEDICINE AND HEALTH SCIENCES

UNIVERSITI PUTRA MALAYSIA

2021/2022

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG PATIENTS ATTENDING DIETETICS CLINIC IN HOSPITAL PENGAJAR UNIVERSITI PUTRA MALAYSIA

© COPYRIGHT UPM

BY

AKMAL SHAHIR BIN SAHRUL HASLAN

A project submitted as partial fulfillment of the requirement for the degree of Bachelor of Science in Dietetics with Honours at the Faculty Medicine and Health Sciences, Universiti Putra Malaysia.

SUPERVISOR'S SIGNATURE

This project titled "Factors Associated with Body Weight Status Among Patients Attending Dietetics Clinic in Hospital Pengajar Universiti Putra Malaysia" was prepared by Akmal Shahir bin Sahrul Haslan and submitted to the Faculty of Medicine and Health Sciences as a partial fulfilment of the requirement for the degree of Bachelor of Science in Dietetics with Honours from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

Received and examined by:

____

(Dr. Zuriati Ibrahim)

Date: 20 September 2022

© COPYRIGHT UPM

ACKNOWLEDGMENT

Gradually, I learned to cease looking upon challenges as difficulties and began to see tense situations as opportunities to put my growing love to use. I held these life quotes throughout my journey to complete the thesis. First, I would like to express my sincerity and a million thanks to my supervisor, Dr. Zuriati Ibrahim, for her guidance and instructions in implementation and for all the comments on completing this thesis. Also, not forget, that Dr. Syafiqah is the course coordinator for this bachelor's dissertation. With her presence, this course had been moved and conducted smoothly. Next, I would like to thank a few dietitians in the Dietetic Department that indirectly helped me as they also play an important role in my thesis journey. Frankly, collecting data from the out-patient was hard for me, however, with their guidance and letting me join the counselling session in the Dietetic room, hence I can collect the data while the counselling session has been carried out by them. My journey in collecting data at Family Medicine Clinic, HPUPM had been conducted smoothly thanks to Encik Daniel, one of the staff members in the Dietetic Department. He helped me a lot in terms of acknowledging how many patients attending the clinic on that day. Furthermore, my family members always are on my side throughout my up-and-down situation. I will not forget all the spirit and the 'doa' from them. Last but not least, to all the participants who participated in this study, thank you for helping me complete this study and I hope that this study can be a stepping stone in the study, especially on body weight status.

© COPYRIGHT UPM

TABLE OF CONTENTS

© COPYRIGHT UPM

© COPYRIGHT UPM

LIST OF TABLES

© COPYRIGHT UPM

LIST OF FIGURES

© COPYRIGHT UPM

LIST OF APPENDICES

© COPYRIGHT UPM

ABSTRACT

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG PATIENTS ATTENDING DIETETICS CLINIC IN HOSPITAL PENGAJAR UNIVERSITI PUTRA MALAYSIA.

AKMAL SHAHIR BIN SAHRUL HASLAN

Background: Overweight is defined as having a body mass index (BMI) of 25 or higher, whilst obesity is defined as having a BMI of 30 or higher. In Malaysia, a survey done by NHMS 2019 stated that about 50.1% of Malaysian adults are overweight or obese (30.4% overweight while 19.7% obese). There have been numerous studies on body weight status and its associated determinants; nevertheless, there is still a lack of research in outpatient settings in Malaysia. **Method**: This cross-sectional study aimed to determine factors associated with body weight status among patients attending Dietetics Clinic in Hospital Pengajar Universiti Putra Malaysia. Convenience sampling was used and 35 participants participated in this study. First, participants were needed to answer the sociodemographic and sleep quality questionnaires. Next, the researcher used a body composition analyser to obtain the measurement of the percentage of body fat, body fat mass, and skeletal muscle mass. Jamar handgrip was used to measure the functional status and last but not least, lipid profiles were obtained from the computerized system. Statistical analyses were conducted using IBM SPSS version 26 with a significance level of *p* values < 0.05. **Result:** Factors that were found to be significantly associated with body weight status were age (p=0.038), ethnicity (p<0.001), percentage of body fat (r=0.721, p<0.001), body fat mass (r=0.941, p<0.001), skeletal muscle mass (r=0.056, p=0.010), and functional status (r=0.503, p=0.002). There was no significant relationship between sex, marital status, lipid profiles, sleep quality, and body weight status. C**onclusion:** Factors that are associated with body weight status were obtained at the end of this study. Since this study managed to collect only 35 participants which were small, the results may be not precise and accurate, hence a larger sample size is needed and includes in-patients as well in future studies.

© COPYRIGHT UPM

ABSTRAK

FAKTOR-FAKTOR YANG BERKAITAN DENGAN STATUS BERAT BADAN DI KALANGAN PESAKIT YANG MENGHADIRI KLINIK DIETETIK DI HOSPITAL UNIVERSITI PUTRA MALAYSIA.

AKMAL SHAHIR BIN SAHRUL HASLAN

Latar belakang: Berat badan berlebihan ditakrifkan sebagai mempunyai indeks jisim badan (BMI) 25 atau lebih tinggi, manakala obesiti ditakrifkan sebagai mempunyai BMI 30 atau lebih tinggi. Di Malaysia, kaji selidik yang dilakukan oleh NHMS 2019 menyatakan bahawa kira-kira 50.1% orang dewasa Malaysia mempunyai berat badan berlebihan atau obes (30.4% berat badan berlebihan manakala 19.7% obes). Terdapat banyak kajian mengenai status berat badan dan penentu yang berkaitan; Walau bagaimanapun, masih terdapat kekurangan penyelidikan dalam persekitaran pesakit luar di Malaysia. **Kaedah:** Kajian keratan rentas ini bertujuan untuk menentukan faktor-faktor yang berkaitan dengan status berat badan di kalangan pesakit yang menghadiri Klinik Dietetik di Hospital Pengajar Universiti Putra Malaysia. Persampelan kemudahan telah digunakan dan seramai 35 peserta telah menyertai kajian ini. Pertama, peserta diperlukan untuk menjawab soal selidik sosiodemografi dan kualiti tidur. Seterusnya, penyelidik menggunakan penganalisis komposisi badan untuk mendapatkan pengukuran peratusan lemak badan, jisim lemak badan, dan jisim otot rangka. Jamar handgrip digunakan untuk mengukur status fungsional dan terakhir tetapi tidak kurangnya, profil lipid diperolehi daripada sistem berkomputer. Analisis statistik telah dijalankan menggunakan IBM SPSS versi 26 dengan tahap kepentingan nilai $p < 0.05$. **Keputusan:** Faktor-faktor yang didapati ketara dikaitkan dengan status berat badan adalah umur ($p=0.038$), etnik ($p<0.001$), peratusan lemak badan ($r=0.721$, $p<0.001$), jisim lemak badan ($r=0.941$, $p<0.001$), jisim otot rangka ($r=0.056$, $p=0.010$), dan status fungsional ($r=0.503$, $p=0.002$). Tiada hubungan yang signifikan antara jantina, status perkahwinan, profil lipid, kualiti tidur, dan status berat badan. **Kesimpulan:** Faktor-faktor yang dikaitkan dengan status berat badan diperolehi pada akhir kajian ini. Oleh kerana kajian ini berjaya mengumpul hanya 35 peserta yang kecil, hasilnya mungkin tidak tepat dan tepat, oleh itu saiz sampel yang lebih besar diperlukan dan termasuk pesakit dalam kajian masa depan.

© COPYRIGHT UPM

CHAPTER 1 INTRODUCTION

1.1 Background

Based on World Health Organisation (WHO), overweight and obese persons can be defined as those with Body Mass Index (BMI) greater than or equal to 25 and 30 kg/m^2 respectively (Mohd-Sidik et al., 2021). According to the global burden of disease, the issue has reached epidemic proportions, with over 4 million people dying each year as a result of being overweight or obese in 2017 (World Health Organization: WHO, 2020). In 2016, approximately 1.9 billion (39%) adults aged 18 years and above were overweight and over 650 million (13%) of these adults were obese (WHO,2021). Furthermore, obesity has been dubbed an epidemic in the United States of America, with an estimated 66% of the population being obese and 32.2 % overweight (Matta, 2018).

According to The National Health and Morbidity Survey (NHMS) in 2019, about 50.1% of Malaysian adults were overweight or obese (30.4% overweight while 19.7% obese). It indicates that half of the adult population in Malaysia has a problem with body weight and this issue needs to be highlighted as obesity could cause other complications. Obesity is connected with a higher risk of morbidity and mortality such as heart disease, diabetes, asthma, sleep apnea, arthritis, reproductive complications, and psychological disturbances, and is also associated with greater degrees of inflammation and oxidative stress which have been recently linked to a wide range of chronic disorders including cardiovascular disease, cancer, metabolic syndrome, non-alcoholic fatty liver disease and neurodegenerative disease such as Parkinson's disease (Davis et al., 2010; Liang et al., 2018; Chooi et al., 2019). All these conditions will

© COPYRIGHT UPM

affect the quality of life, work productivity, and healthcare costs. Medical care costs are 30% higher for obese patients than for normal-weight patients (Liang et al., 2018).

1.2 Problem Statement:

Since 1980, the global prevalence of overweight and obesity has increased, where roughly a third of the world's population is now overweight or obese. Obesity rates have increased across all age groups and sexes, regardless of geographic location, ethnic origin, or socioeconomic level (Chooi et al., 2019). By 2030, 57.8% of the world's population will be overweight or obese if no intervention is done (Kelly et al., 2008). The (BMI), which is determined by dividing the body weight in kilograms by the square of the height in metres, is a straightforward statistic for determining the overall fatness of the body (WHO,2020). However, BMI is insensitive, and there is considerable inter-individual variability in body fat percentage for any given BMI value, which is partly explained by age, sex, and ethnic origin (Chooi et al., 2019). For example, Asians have a higher body fat percentage than Caucasians with the same BMI (Chooi et al., 2019; Deurenberg et al., 2002).

The study demonstrates that bioelectrical impedance is a critical method for body composition measurement because it can accurately reflect the weight and distribution of body fat and can be used to evaluate nutritional status. Its advantages include ease of use, rapid detection, safety, non-invasiveness, economy, reliability, validity, and suitability for large-scale research groups. It also has significant value in diagnosing obesity or malnutrition ((Kushner RF, 2021; Pirlich et al., 2000). There are numerous studies on body weight status and its associated factors, but there is a limited study conducted among outpatient setting in Malaysia. Besides, there are inconsistent findings on the association between sleep quality and functional status, and body weight status. Thus, this study is needed to better understand body

© COPYRIGHT UPM

weight status and its associated factors. This study will be conducted among outpatients who attend the Dietetics Clinic in HPUPM.

1.3 Research Questions:

1. What is body weight status among patients attending Dietetics Clinic in HPUPM
2. What are sociodemographic profiles (age, sex, ethnicity, and marital status), lipid profiles (triglycerides, total cholesterol, HDL-C, and LDL-C), body composition (body fat percentage, body fat mass, skeletal muscle mass, and whole body phase angle), sleep quality, and functional status among patients attending Dietetics Clinic in HPUPM.
3. What is the association between sociodemographic profiles, lipid profiles, body composition, sleep quality, and functional status with body weight status among patients attending Dietetics Clinic in HPUPM.

1.4 Significance of Study

The proposed study will be conducted to determine the body weight status and its association with sociodemographic profiles, lipid profiles, body composition, sleep quality, and functional status among patients attending Dietetics Clinic in HPUPM. This study will fill the gap in existing studies as several studies only used body mass index and waist circumference in assessing body weight status. Also, there is limited study that assesses body weight status and its associated factors among outpatients in Malaysia. The indicators that will be used in assessing body composition are body fat percentage, body fat mass, skeletal muscle mass and body phase angle which are more accurate and reliable in measuring body weight

© COPYRIGHT UPM

status. Besides, lipid profiles, sleep quality, and functional status also will be used which can help in justifying the association with body weight status.

From the findings of this study, more detailed information regarding lipid profiles, body composition, sleep quality and functional status and its correlation with body weight status among patients attending Dietetics Clinic in HPUPM can be determined. It is beneficial to be used as baseline information for future research pertaining to body weight status and its associated factors. This study may also help in new studies which focus on lipid profiles, body composition, sleep quality, and functional status in tackling body weight issues. Furthermore, the study can provide evidence for health professionals when consulting patients with body weight problems. The study could be a tool to educate the public about managing their body weight. Overall, this study provides insight for future studies and interventions.

1.5 Objectives:

General Objective:

To determine the associations between sociodemographic profiles, lipid profiles, body composition, sleep quality, and functional status with body weight status among patients attending Dietetics Clinic in HPUPM.

Specific Objectives:

1. To determine the body weight status among patients attending Dietetics Clinic in HPUPM.
2. To determine socio-demographic profiles, lipid profiles, body composition, sleep quality, and functional status among patients attending Dietetics Clinic in HPUPM.

© COPYRIGHT UPM

3. To determine the associations between sociodemographic profiles, lipid profiles, body composition, sleep quality, and functional status with body weight status among patients attending Dietetics Clinic in HPUPM.

1.6 Hypothesis:

Alternate Hypothesis:

1. There is a significant association between sociodemographic profiles and body weight status among patients attending Dietetic Clinic in HPUPM.
2. There is a significant association between lipid profiles and body weight status among patients attending Dietetic Clinic in HPUPM.
3. There is a significant association between body composition and body weight status among patients attending Dietetic Clinic in HPUPM.
4. There is a significant association between sleep quality and body weight status among patients attending Dietetic Clinic in HPUPM.
5. There is a significant association between functional status and body weight status among patients attending Dietetic Clinic in HPUPM.

© COPYRIGHT UPM

1.7 Conceptual Framework

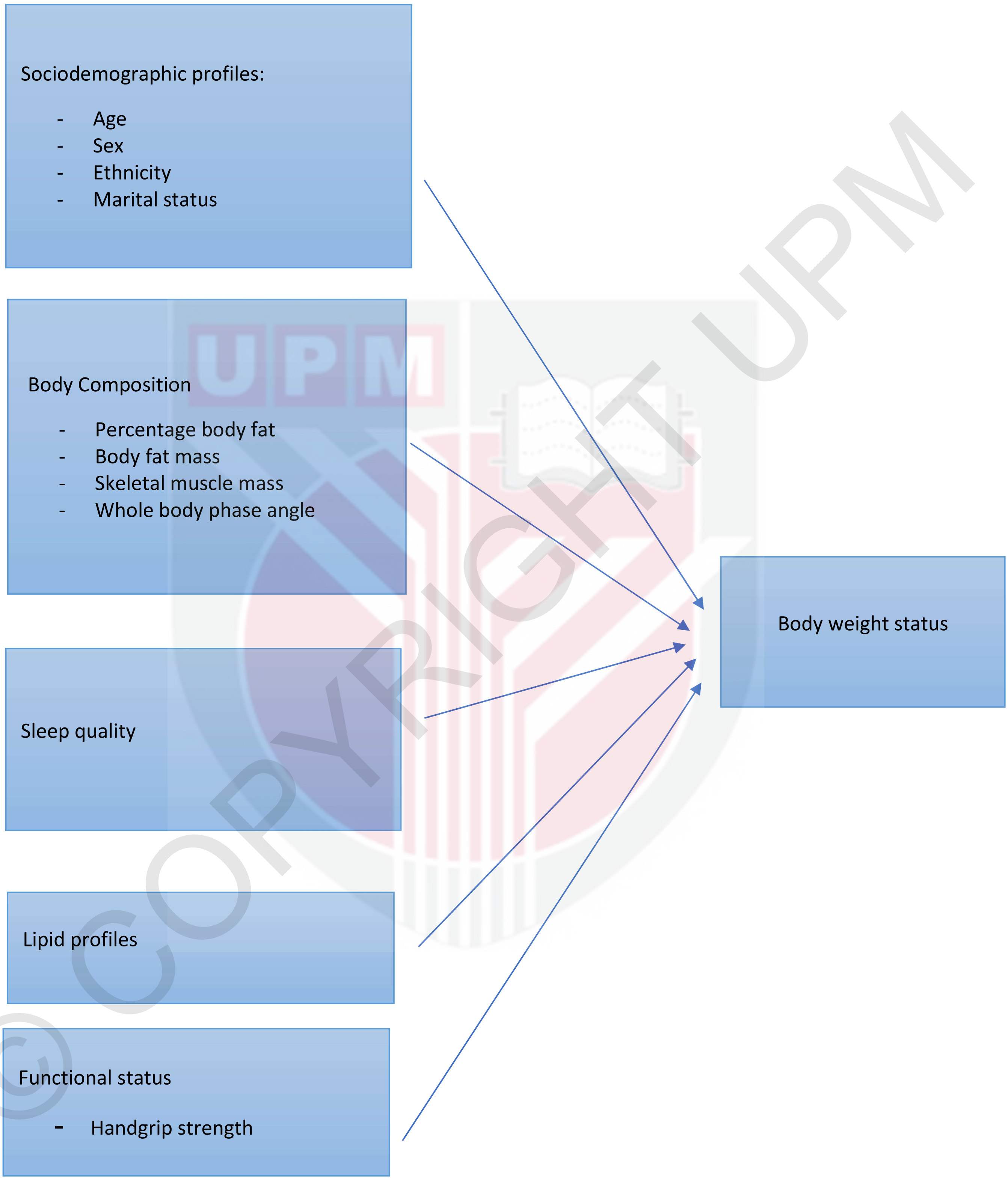


Figure 1.1: Conceptual framework of the factors associated with body weight status

CHAPTER 2 LITERATURE REVIEW

Factors associated with body weight status

2.1 Sociodemographic profile

Numerous studies have investigated the association between sociodemographic status and body weight status. First, based on a study conducted among Saudi Arabia adults, the prevalence of obesity in males was higher than in females (Azzeh et al., 2017). On the other hand, a cross-sectional study conducted in Selangor, Malaysia found that females were much more likely to be obese than males by 1.6 times (Mohd-Siddik et al., 2021). A cross-sectional study conducted in China discovered that as men and women aged, their body fat, body fat percentages, and visceral fat area increased. Meanwhile, as BMI increased, so did body fat, body fat percentages, and visceral fat area in both men and women (Liang et al., 2018). Besides, Indians have a much greater rate of obesity than other ethnic groups. Being Indian increased the chance of obesity by 55% in comparison to other ethnic groups (Mohd-Siddik et al., 2018; Zainuddin et al., 2016)). This corresponds with a study among 16127 Malaysians aged above 15 years old found that Indians, followed by Malays, had a higher rate of obesity than the indigenous groups of Sarawak, the Chinese, and Sabahan (Rampal et al., 2007).

Next, married, divorced, and widowed respondents had a 67%, 61%, and 94% greater chance of being overweight than unmarried subjects (Tzotzas et al., 2010). This corresponds with data from Bangladesh Demographic and Health Survey (BDHS) 2014 found that women who were no longer married or divorced were less likely to be overweight or obese (Tanwi et al., 2019).

© COPYRIGHT UPM

2.2 Body Composition

Human body composition is a subfield of human biology that focuses on the regulation of the number of body composition in the human body and the effect of various stimuli in vivo and in vitro on the quantitative relationship between components as well as the identification of human components in vivo (Wang et al., 1992). The quality and distribution of numerous diseases are directly linked to the health status of people of all ages, and body composition assessments can provide significant information for the diagnosis and treatment of these disorders (Chomtho et al., 2006).

In an earlier study, Liang, et. al. (2018) attempted to identify the correlation between body composition and obesity. This research was a cross-sectional study that was conducted among 5121 University students in China. The participants were assessed with an Inbody720 body composition analyzer to detect body composition. The finding stated that men had 18.33 kg for body fat, 25.74% for body fat percentage, and 91.98 cm^2. Meanwhile, women's body fat, body fat percentage and visceral fat were 19.82kg, 34.01%, and 77cm^2 respectively. Besides, body fat, body fat percentages, and visceral fat area increased with age, both in men and women. This study corresponds with another study which is a case-control study that involves participants in 52 countries. Another study found that after middle age, with increasing age, body fat starts to accumulate on certain parts of the body (Yusuf et al., 2005). However, this study was limited by the fact that Inbody720 body composition analyzer had been used, which was designed and validated specifically for the Korean population. Both Chinese and Korean have different genetics and there may be significant differences in body fat composition. As a result, the analysis may be skewed systematically. Next, the sample size was small and not enough to obtain a more accurate and reliable result. In this research also, there

© COPYRIGHT UPM

is no whole body phase angle measurement taken, hence in our purpose research will be adding phase angle to help in measuring the healthiness of our body cell's participants.

2.3 Lipid profiles

Abnormalities in lipid metabolism are frequently reported in obese people. Around 60%–70% of obese persons have dyslipidemia (Feingold et al., 2020). A cross-sectional study on 90 obese persons ranging in age from 18 to 60 years old found a significant correlation between serum triglyceride and visceral fat rating ($p<0.006$) in age more than 40 years and those with BMI more than 30kgm^{-2}. The participants were assessed and measured with a body composition analyzer (TANITA SC-330) to measure their body composition while ABX Pentra 400 chemical analyzer was used to measure lipid profiles.

Besides, this study also found a negative association between the serum HDL cholesterol with visceral fat rating in female participants with age below and over 40 years old (Sukkriang et al., 2021). It was proposed that the disparities in lipid profiles across sexes could be explained by differences in food intake, smoking and alcohol usage, and sex hormones (Arpon et al., 2019; Mohamed et al., 2018).

2.4 Functional status

Handgrip strength (HGS), a measure of the hand's maximum voluntary strength, has been described as the most simplistic way of determining muscle function. Additionally, this technique is a viable screening tool for nutritional risk assessment during hospitalization as well as a valuable indication of nutritional status in the non-hospitalized population, particularly for detecting persons with chronic malnutrition (Schlüssel et al., 2008; Shrestha et al., 2020; Lad et al., 2013). A population study among 180 adolescents found an association

© COPYRIGHT UPM

between handgrip strength with body mass index and body fat percentage. The participants were assessed and measured on anthropometric parameters, body fat percentage, handgrip strength, and endurance. The dominant hand's handgrip strength and endurance were evaluated using a handgrip dynamometer (INCO India Ltd., Ambala). Males and females who were overweight had a greater BMI and body fat percentage than those who were normal weight or underweight.

Males with normal weight had greater handgrip strength than overweight and underweight males, however, this result was not statistically significant. Underweight females showed greater handgrip strength than those who were normal weight or overweight (Lad et al., 2013). A study found a positive association between BMI and handgrip strength (Pieterse et al., 2002). However, this study was limited because there are no participants with BMI more than $30kgm^{-2}$ to correlate the association between BMI and body fat percentage with handgrip strength. Plus, the participants for this study were only healthy adolescents.

2.5 Sleep Quality

There are inconsistent studies about the association between sleep quality with obesity. In an earlier study, researchers found a positive association between sleep quality with obesity; however, a few studies show there is a negative or no correlation with obesity. (Krističević et al., 2018; Wu et al., 2015; Meyer et al., 2012; Lytle et al., 2011; Peltzer & Pengpid, 2017; Fatima et al., 2016; Hung et al., 2013; Vargas et al., 2014; Park et al., 2018). One study conducted among outpatients in an Urban Family found that out of 225 patients, 78% of them had poor sleep quality, 58% had increased Berlin apnea-risk score and 9% reported a prior diagnosis of sleep apnea and 62% of these diagnosed patients were obese (Logue et al., 2014).

© COPYRIGHT UPM

They found that there is a significant ($p<0.05$) association between sleep duration, quality or bedtime stability with obesity (Logue et al., 2014). High-quality sleep and consistent bedtimes may help to alleviate stress, normalize metabolism, and promote hunger control and increased physical activity (Logue et al., 2014). However, this study was limited with small sample size and it is unknown whether sociodemographic profiles were affecting patients of likelihood being obese.

CHAPTER 3 METHODOLOGY

3.1 Study Design

This was a cross-sectional study that aimed to assess the body weight status and its association with sociodemographic profiles, lipid profiles, body composition, sleep quality, and functional status of patients attending the Dietetics Clinic in HPUPM, Serdang.

3.2 Study Location

This study was conducted at Hospital Pengajar Universiti Putra Malaysia, Serdang which is located behind college 17, Hospital Serdang and Faculty of Medicine and Health Sciences. HPUPM also operated as a teaching hospital for the Faculty of Medicine and Health Sciences. HPUPM also has a convenient education complex and clinical research department for undergraduate and postgraduate students. HPUPM offers seven main subspecialty clinics which are stroke care centre, zoonotic disease research, hemato-oncology, geriatric care, sports surgery, prostate care centre, immunology, and dermatology.

© COPYRIGHT UPM

3.3 Study Population

The sample for this study was patients in HPUPM. Patients who met the study criteria were invited to participate in this study. All patients were screened based on the inclusion and exclusion below:

Table 3.1 Inclusion and exclusion criteria for this study

Inclusion	**Exclusion**
Patients aged 18 years old and above	Pregnant women
Male and female	Handicap or with physical disabilities
Malaysian (all ethnicity)	

3.4 Sample Size Determination

The sample size was determined using the correlation formula as is shown below (Hulley et al., 2013).

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

Where,

N= number of respondents

The standard normal deviate for $\alpha = Z\alpha = 1.96$

The standard normal deviate for $\beta = Z\beta = 0.84$ (80%)

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

r = the expected correlation coefficient

© COPYRIGHT UPM

Calculation of sample size

Table 3.2 Sample size of the calculation for correlation studies

Variables	**Correlation Coefficient, r**	**Total sample size needed, N**
Sociodemographic profiles and body weight status (Khwanchuea & Punsawad, 2021)	0.44	38
Biochemical profiles and body weight status (Sukkriang et al., 2021)	0.28	103
Body composition and body weight status (Frankenfield et al., 2001)	0.57	22
Sleep quality and body weight status (Kristicevic et al., 2018)	0.96	5
Functional status and body weight status (Lad et al., 2013)	0.33	71

The highest sample size obtained is 103 respondents

Adjusted for the expected response rate (80%):

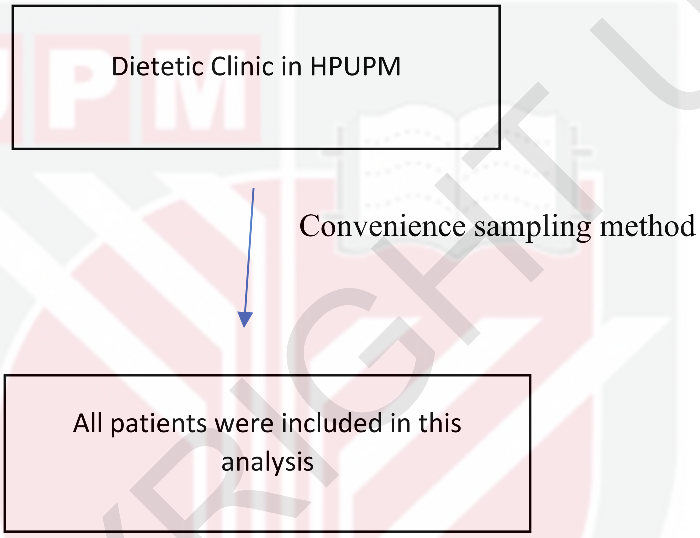
103/0.8 = 128.75

© COPYRIGHT UPM

Hence, a total of 129 respondents are required in this study after considering the response rate.

3.5 Sampling Design

All patients who attended Dietetic Clinic were included in this study for analysis



3.6 Study Instruments

Table 3.3 List of instruments used in this study

Variables	**Tools**
Sociodemographic status	Self-administered questionnaire
Body composition	Bioimpedance analyser (BIA), InBody 770
Anthropometric measurement	Weighing scale and stadiometer (SECA)
Sleep quality	Pittsburg sleep quality index (PSQI)

© COPYRIGHT UPM

Lipid profiles	Total-cholesterol, triglycerides, HDL-C and LDL-C measurement
Functional status	Jamar handgrip dynamometer

3.6.1 Sociodemographic Profiles

A self-administered questionnaire of sociodemographic factors that includes four sections: age, gender, ethnicity, and marital status.

3.6.2 Anthropometric measurement and Body Composition

Weight measured in minimum clothing to the precision of 0.1 kg on a SECA digital weighing scale (Seca 707; Seca Corporation, Hanover, Maryland; range 0.1–200 kg), and height measured to the nearest 0.1 cm while barefoot using stadiometer (Seca). (BMI) is calculated as weight (kg) divided by square of height (m^2). Body composition measured using a bioimpedance analyser (BIA) InBody 720 (BioSpace Co., Seoul, Korea). This BIA adopts a tetrapolar, eight-point tactile electrode system that separately measures the impedance of the arms, trunk, and legs at six different frequencies (1, 5, 50, 250, 500, and 1000 kHz). The following parameters were measured: body fat mass (FM), percentage body fat (BFP), skeletal muscle mass (SMM), and whole-body phase angle.

3.6.3 Sleep Quality

For this study, the researcher used Pittsburg Sleep Quality Index (PSQI) in assessing participants' sleep quality which is highly reliable and valid to measure sleep quality (Buysse et al., 1989). It is made up of 19 questions that combine to form seven primary components. Each component is rated on a scale of 0 to 3, with a lower score indicating no problems and a

© COPYRIGHT UPM

higher number indicating worsening problems. The seven components are then added together to generate a scale ranging from 0 to 21 points (Krističević et al., 2018).

3.6.4 Lipid Profiles

Triglycerides, total cholesterol, LDL-C and HDL-C measurement were taken from the computerized systems.

3.6.5 Functional Status

The participants were instructed to rest their hand on a table with their elbow at a 90-degree angle and to apply maximal force to the dynamometer's handle. Sustaining the maximal voluntary contraction for at least three seconds was used to determine the kg (kg) handgrip strength. Three readings were taken with a ten-minute interval between each, and the maximum reading was used for analysis (Lad et al., 2013).

3.6.6. Body weight status

Participants were required to fill in their weight (kg) and height (m) to calculate the BMI. The BMI was calculated through SPSS software by inserting the participant's weight and height.

3.7 Pre-Testing

Prior to the data collection, ten outpatients who attend the Dietetics clinic were chosen at random to complete this questionnaire as a pre-testing exercise before the actual data collection. The purpose of pre-testing is to validate the instruments of the survey and its measurements (Rothgab, 2008). After the pre-test, the questionnaires were improved and reviewed in order to create the most appropriate set of questionnaires for data collection. Pre-

© COPYRIGHT UPM

tested respondents' data will not be accounted for during the real data collection. The volunteers will test sleep quality questionnaire and hand grip strength to check its sensitivity and practicability.

3.8 Procedure

For this research, a questionnaire and self-assessment were used as a method for data collection. Data collection was expected from March to May 2022. Prior to data collection, it is needed to get approval from the Ethics committee JKEUPM and the management of HPUPM. Prior to the assessment, the study subjects were provided with written consent before the commencement of the study. Participants were needed to answer questionnaires about sociodemographic characteristics and sleep quality. Next, the computerized system was used to obtain body composition and lipid profile. Lastly, a dynamometer hand grip was used by the participants to measure the functional status.

3.9 Data Analysis

Statistical analyses were conducted using IBM SPSS version 26 with a significance level of p values < 0.05. The univariate analysis was used for descriptive data analyses. Categorical variables express as frequencies and percentages while continuous variables express as means and standard deviation. Pearson correlation and chi-square test were used for bivariate analysis to assess the association between the independent variable (sociodemographic profiles, biochemical profiles, body composition, sleep quality, and functional status) with the dependent variable (body weight status).

© COPYRIGHT UPM

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Results and discussion

In this section, all the variables were analyzed using IBM SPSS version 26. Based on the data collection of the respondents as a whole is a total of 35 participants which is 27% of the 129 participants targeted at the beginning of the study. There were a few emerging issues that prevented the recruitment of more participants. All participants were required to answer the questionnaire and perform some of the measurements at Dietetic Clinic in HPUPM. After taking into account of this study was conducted through convenience sampling, all the participants who attended the Dietetic Clinic from May until June and met the criteria were included in this study.

4.1 Sociodemographic profiles

Sociodemographic profiles analysed in this study were age, gender, ethnicity and marital status.

Table 4.1 Distribution for sociodemographic profiles (n=35)

Variable	n (%)	mean± SD
Age		51.46±12.47
18-59 years old	23(65.7)	
≥ 60 years old	12(34.3)	
Sex		
Male	15(42.9)	
Female	20(57.1)	
Ethnicity	29(82.9)	
Malay	5(14.3)	
Chinese	1(2.9)	
Indian		

© COPYRIGHT UPM

Marital Status		
Single	3(8.6)	
Married	31(88.6)	
Divorced/Married	1(2.9)	

As shown in Table 4.1, most of the participants were aged between 18 to 59 years old with 65.7% and the remaining was elderly with age more than 60 years old. The mean and standard deviation for age for the participants in this study was 51.46±12.47 Most of the participants was women with 57.1%. Next, most of the participants for this study were Malay with nearly 83% followed by Chinese with 14.3% and the least was Indian with only 2.9%. Last but not least, in terms of marital status, almost all of the participants were married with 88.6%, followed by a single with 8.6%, and divorced or widow with only 2.9%.

4.2 Body Composition

Body composition analyzed in this study were the percentage of body fat, body fat mass and skeletal muscle mass. Initially, whole body phase angle was included in this study, however, the researcher could not obtain the data due to technical problems. Whole body phase angle measurement can only be obtained if there is ink to print out the result from the body composition analyzer. Unfortunately, the Dietetics Clinic was lacked of ink for printing purposes. On the other hand, body fat mass, skeletal muscle mass, and percentage body fat reading obtained directly on the screen that has been displayed on the body composition analyzer.

Table 4.2 Distribution for body composition (n=33)

Variables	n (%)	Mean± SD
%Body Fat		26.08±5.43
10-20%	1(2.9)	
21-30%	4(11.4)	

© COPYRIGHT UPM

31-40%	13(37.1)	
>40%	15(42.9)	
Body Fat Mass		32.03±12.51
10-20kg	6(17.1)	
21-30kg	10(28.6)	
31-40kg	10(28.6)	
>40kg	7(20)	
Skeletal Muscle Mass		26.08±5.43
10-20kg	6(17.1)	
21-30kg	24(68.6)	
>30kg	7(20)	

As stated in table 4.2, for the percentage body fat, only 2.9% of the participants have percentage body fat ranging from 10-20%. Next, 11.4% of the participants have percentage body fat ranging from 21-30%. 37.1% of the participants from this study have percentage body fat ranging from 31-40%. About 43% of the participants have percentage body fat of more than 40%. The mean and standard deviation of the percentage body fat among the participants was 26.08±5.43. For the next category which is body fat mass, 28.6% of the participants from this study have body fat mass of 21-30kg and 31-40kg respectively. 20% of the participants have body fat mass more than 40 kg and followed with 17.1% of the remaining with the body fat mass ranging between 10-20kg. The mean and standard deviation for body fat mass among the total participants were 32.03±12.51. Last but not least, more than half of the participants (68.6%) have skeletal muscle mass ranging between 21-30kg, followed by 20% with skeletal muscle mass of more than 30 kg and the remaining (17.1%) have skeletal muscle mass ranging from 10-20kg. The mean and standard deviation for skeletal muscle mass among the total participants was 26.08±5.43.

4.3 Lipid Profile

© COPYRIGHT UPM

Lipid profile analysed in this study were triglyceride, total cholesterol, HDL-C and LDL-C level.

Table 4.3 Distribution for lipid profile (n=29)

Variables	n (%)	Mean± SD
Triglyceride		1.70±0.70.
<1.7mmol/L	14(40)	
>1.7mmol/L	16(45.7)	
Total Cholesterol		5.20±1.43
<5.2mmol/L	17(48.6)	
>5.2mmol/L	12(34.3)	
HDL-C		1.24±0.27
<1.1mmol/L	7(20)	
>1.1mmol/L	22(62.9)	
LDL-C		3.15±1.30
<2.6mmol/L	11(31.4)	
>2.6mmol/L	18(51.4)	

According to the table 4.3, for the triglyceride level, 45.7% of the participants have triglyceride level more than 1.7 mmol/L while the remaining (40%) with triglyceride level less than 1.7 mmol/L. The mean and standard deviation of the triglyceride level among all the participants was 1.70±0.70. From this result, most of the participants have normal triglyceride level with the cut-off point less than 1.7 mmol/L. Furthermore, 48.6% from the participants have total cholesterol level less than 5.2 mmol/L and the rest of the participants (34.3%) have total cholesterol more than 5.2 mmol/L. The mean and standard deviation of total cholesterol among all the participants was 5.20±1.43. It stated that most of the participants have normal total cholesterol reading with the cut-off point less than 5.2 mmol/L. Moreover, more than half of the participants (62.9%) have normal HDL-C level while the remaining (20%) with HDL-C level less than 1.1 mmol/L. The mean and standard deviation of HDL-C among all the participants was 1.24±0.27. It stated that most of the participants had high HDL-C level with

© COPYRIGHT UPM

the cut-off point less than 1.1 mmol/L. Last but not least, half of the participants (51.4%) have LDL-C level more than 2.6 mmol/L while the rest (31.4%) with LDL-C level less than 2.6 mmol/L. The mean and standard deviation of LDL-C among all the participants was 3.15±1.30. It means that most of the participants had high LDL-C level with the cut-off point less than 2.6 mmol/L.

4.4 Sleep Quality

A total score from the sleep quality questionnaire was analysed.

Table 4.4 Distribution for total score using PSQI (n=35)

Variable	n (%)	Mean± SD
Total Score		3.23±1.19
<5	28(80)	
≥5	7(20)	

Based on table 4.4, almost all of the participants (80%) have total score sleep quality score less than 5 while the remaining (20%) with total score sleep quality more than 5. The mean and standard deviation of total score sleep quality among all the participants was 3.23±1.19. This result stated that most of the participants have good sleep quality with cut-off point less than 5 (Shahid et al., 2011; Logue et al., 2014).

4.5 Functional Status

Handgrip strength was measured to determine the functional status of the participants. Only maximum reading from the three reading was included for the analysis.

Table 4.5 Distribution for functional status (n=35)

Variable	n (%)	Mean± SD
Max Reading		23.83±7.06
<20kg	10(28.6)	
≥20kg	25(71.4)	

© COPYRIGHT UPM

As stated on table 4.5, majority of the participants (71.4%) have maximum reading of hand grip strength more than 20 kg while 28.6% of the remaining have the maximum handgrip strength less than 20kg. The mean and standard deviation of the maximum reading of hand grip strength was 23.83±7.06. There is no specific cut-off point for the maximum reading of hand grip strength in this study.

4.6 Body Weight Status

Body Mass Index was measured among the participants.

Table 4.6 Distribution for body weight status (n=35)

Variable	n (%)	Mean± SD
Body Mass Index		30.59±6.48
<18.5 kgm^{-2}	1(2.9)	
18.5-24.9 kgm^{-2}	4(11.4)	
25-29.9 kgm^{-2}	13(37.1)	
>30 kgm^{-2}	17(48.6)	

Based on table 4.6, almost half of the participants (48.6%) have BMI more than 30 kgm^{-2}. Next, 37.1% of the participants have BMI ranging from 25-29.9 kgm^{-2} while the remaining of the participants (14.3%) have BMI either ranging from 18.5-24.9 kgm^{-2} or less than 18.5 kgm^{-2}. The mean and standard deviation of BMI among all the participants was 30.59±6.48. The researcher is not be able to categorize the BMI as adults and elderly have different normal values.

© COPYRIGHT UPM

4.7 Association between sociodemographic profiles and body weight status

The Chi-square test is a test that was used to see whether there are any discrepancies in the data for each population. Generally, it was used to assess the association between two categorical variables. However, this study used Fisher's Exact Test due to the frequency for this test is being less than 5 and small sample size. Fisher's Exact Test has been used to assess the association between age, sex, ethnicity, marital status and body weight status.

Table 4.7 Association between sociodemographic profiles and body weight status

Characteristics	Body weight status (Body Mass Index)		*r*-value	*p*-value
	<25 kgm^{-2} (n=5)	>25 kgm^{-2} (n=30)		
Age				0.038*
18-59 years old	1(20%)	22 (73.3%)		
60 years old and more	4 (80%)	8 (26.7%)		
Sex				0.631
Male	3 (60%)	12 (40%)		
Female	2 (40%)	18 (60%)		
Ethnicity				0.001**
Malay	1 (20%)	28 (93.3%)		
Non-Malay	4 (80%)	2 (6.7%)		
Marital Status				1.000
Single/Married	5 (100%)	29 (96.7%)		
Divorced/Widow	0 (0%)	1 (3.3%)		

Analysis of categorical data using Fisher's Exact Test

*p<0.05

**p<0.01

a. Age and body weight status

Based on the table 4.7, the p-value is 0.038 (p<0.05). Thus, the null hypothesis that stated there is no association between age and body weight status is rejected. This finding congruent with previous study from Park et al., (2019) that states age is related with the body weight status. As age increased, mean BMI significantly increased (*P* < 0.001). The prevalence of both

© COPYRIGHT UPM

underweight and normal BMI categories decreased as age increased; meanwhile, those for the overweight and obese BMI categories increased from 10.9% in women aged 20–29 years to 60% in women aged 70–79 years.

b. Ethnicity and body weight status

As shown in Table 4.7, there is a significant association between ethnicity and body weight status with p-value less than 0.01. This finding congruent with previous studies where being Indian increased the chance of obesity by 55% in comparison to other ethnic groups (Mohd Siddik et al., 2018; Zainuddin et al., 2016). Next, a study among 16127 Malaysians who aged above 15 years old found that Indians, followed by Malays, had a higher rate of obesity than the indigenous groups of Sarawak, the Chinese, and Sabahan (Rampal et al., 2007).

4.8 Association between lipid profiles and body weight status

Table 4.8 Association between lipid profiles and body weight status

Variables	*r*-value	*p*-value
Triglycerides	0.045	0.814
Total cholesterol	-0.003	0.989
LDL-C	0.442	0.772
HDL-C	-0.236	0.219

*Correlation is significant at $p<0.05$

**Correlation is significant at $p<0.01$

Based on table 4.8, r-value is the value of the pearson correlation (r) while the p-value is the significance value for each r-value given. There is low positive correlation between triglycerides and body weight status, which was not statistically significant (r=0.045, p=0.814). Second, there is negative correlation between total cholesterol and body weight status, which was not statistically significant (r=-0.003, p= 0.989). Third, there is moderate positive

© COPYRIGHT UPM

correlation between LDL-C and body weight status which was not statistically significant (r=0.442, p=0.772). Forth, there is negative correlation between HDL-C and body weight status, which was not statistically significant (r=-0.236, p=0.219). According to the data, all lipid profiles show that there is no significant correlation with body weight status (p>0.05). This finding consistent with the previous studies in the paper from Hussain et al (2019) where BMI, TC, TGs, and LDL-C showed no significant correlation where as a significant negative correlation between BMI and HDL-C was observed (r=-0.125, *p*=0.029, R^2=0.016). That study was conducted among the T2DM outpatients who attended the Dietetic Clinic at Northwest General Hospital and the mean age for the participants was 50.19 years old. The previous study was same with current study where outpatients were included and the mean age is not quite different while there are no medical conditions or diseases included in the current study. Hence, this could cause the same result for both previous and current study.

Next, the correlation between BMI and LDL-C was observed to be insignificant. However, this finding is also inconsistent with previous studies. A cross sectional study on 90 obese persons ranging in age from 18 to 60 years old found a significant correlation between serum triglyceride and visceral fat rating (p<0.006) in age more than 40 years old and those with BMI more than 30 kgm^{-2} (Sukkriang et al.,2021). Furthermore, the changes in BW were independently associated with changes in TC, LDL-C, HDL-C, and TG ($P < 0.001$) (Kiriyama et al., 2020).

4.9 Association between body composition and body weight status

Table 4.9 Association between body composition and body weight status

Variables	*r*-value	*p*-value
% Body Fat	0.721	P<0.001**
Body Fat Mass	0.941	P<0.001**
Skeletal Muscle Mass	0.056	0.010*

© COPYRIGHT UPM

*Correlation is significant at *p*<0.05
**Correlation is significant at *p*<0.01

As stated on table 4.9, there is strong positive correlation between percentage body fat and body fat mass with body weight status, which was statistically significant (r=0.721, p<0.001) and (r=0.941, p<0.001) respectively. There is moderate positive correlation between skeletal muscle mass with body weight status, which was statistically significant (r=0.056, p=0.010). This finding is consistent with the previous studies where there was a strong and significant positive correlation between BMI- BF% in males (*r* = 0.75, p < 0.01) and in females (*r* =0.82, p < 0.01) (Ranasinghe et al., 2013). Furthermore, the BMI and the body fat percentage of the overweight males and females were higher than those of the normal weight and the underweight groups (Ranasinghe et al., 2013). In a research paper of Ranasinghe et al (2013), a cross-sectional study was conducted among 1114 Sri Lanka participants with no physical disease and range aged from 18-83 years old. All the measurements were taken during the morning hours and the participants did not have any vigorous activity during the preceding 12 hours after the measurement. The similarities between the early study and the current study, both of the participants were Asian which could have same body composition and also the measurements were taken in the morning hours. Early study consists of larger number of the participants which produced more accurate results yet, both of the studies gave the same outcome where body composition has its association with body weight status. However, only body fat percentage was measure at the early study.

4.10 Association between sleep quality and body weight status

Table 4.10 Association between sleep quality and body weight status

© COPYRIGHT UPM

Variables	r-value	p-value
Total Score	0.310	0.858

*Correlation is significant at $p<0.05$

**Correlation is significant at $p<0.01$

According to table 4.10, there is moderate positive correlation between sleep quality which was not statistically significant (r=0.310, p=0.858). This stated that there is no correlation between sleep quality and body weight status (p>0.05). This result congruent with previous findings. Only sleep duration of less than 5 hours was associated with a body mass index (BMI) that was on average 2.5 kg/m^2 greater in men and 1.8 kg/m^2 greater in women (Abdallah et al., 2021). Another study found that there is an association between short sleep duration only with an increased likelihood of being overweight/obese in the adult population (Patel et al., 2008). On the other hand, current results also inconsistent with previous studies. Short sleep duration and poor sleep quality were more positively associated with obesity across BMI than with underweight (Park et al., 2018). Besides, female gender, being overweight, obesity, sleep duration, and alcohol drinking were significantly associated with global PSQI scores (Hung et al., 2013).

4.11 Association between functional status and body weight status

Table 4.11 Association between functional status and body weight status

Variables	r-value	p-value
Maximum handgrip reading	0.503	0.002**

*Correlation is significant at $p<0.05$

**Correlation is significant at $p<0.01$

© COPYRIGHT UPM

Based on the table above, there is moderate positive correlation between functional status and body weight status, which was statistically significant (r=0.503, p=0.002). This result congruent with the previous studies. There was an association between handgrip strength and BMI (Lad et al., 2013). Next, strong handgrip strength was associated with reduced risk of cognitive impairment among obese women, but not in non-obese women (Jeong et al., 2018). Last but not least, female handgrip strength was positively correlated with BMI ($p<0.001$) (Shah et al., 2022).

CHAPTER 5

CONCLUSION

Obesity is the main core of the emergence of other health conditions including diabetes, cardiovascular disease, kidney disease, and many more. Thus, determining which factors that can influence the body weight status is crucial for health care professionals especially dietitians to minimize the occurrence of these diseases. All in all, this study primarily established the association between sociodemographic profiles, lipid profiles, body composition, sleep quality, functional status, and body weight status among patients attending Dietetics Clinic in HPUPM.

LIMITATIONS AND RECOMMENDATION

However, there are several limitations that happened throughout this study. First, there is limited number of participants due to time constraints. The researcher only managed to obtain 35 participants out of 129 participants that initially planned in the beginning of the study. The researcher had seven weeks only to collect the data before the final presentation. Besides,

© COPYRIGHT UPM

convenience sampling has been used in this study, hence all the participants that attended the dietetic clinic will be included. Nevertheless, there were some of them who did not fulfil the criteria, hence they were excluded from this study. This leads to an inadequate number of participants as an average of the patients who attend the clinic was four people only. For example, there was a pregnant woman that should be excluded in this study as it will alter her initial body weight. Second, the whole body phase angle cannot be obtained for this study as the measurement can only be extracted on the printed result. Yet, there was no ink available that can be used to print the result from the body composition analyser at the dietetic clinic hence, the researcher only took the percentage body fat, skeletal muscle mass and body fat mass as a final result. This limitation had altered the initial plan which to include whole body phase angle and its association with body weight status. Third, there were two variables that were found to be less than (n=35) which were body composition (n=33) and lipid profile (n=29). For body composition, the researcher omitted two samples as one of the participants was in urgent need during that data collection day, hence the data was not available to be collected. While the other one, the participant wore a stocking while using the body composition analyser, this led to inaccurate results and the researcher decided to not include it as the final result. For lipid profile, there were six result that unavailable as some of the participants did not have any record about lipid profile including triglyceride, total cholesterol, HDL-C and LDL-C. The lipid profile that had been collected were vary in term of date availability, hence, this result may not represent the current lipid profile of the participants.

Few recommendations would be to practice after taking account of all the limitations and after completing this study. First and foremost, it is very crucial to collect more participants to have a larger sample size hence the result will be more precise and accurate. Next, include both out and inpatient participants in the study. This will be very helpful to determine which one of

© COPYRIGHT UPM

them is prone to underweight, normal, overweight and obesity. Third, to include medical conditions or diseases as the independent variable to observe what types of diseases could influence the body weight status.

© COPYRIGHT UPM

Reference

World Health Organization: WHO. (2020, February 21). *Obesity*. Who.int; World Health Organization: WHO. https://www.who.int/health-topics/obesity#tab=tab_1

Azzeh, F. S., Bukhari, H. M., Header, E. A., Ghabashi, M. A., Al-Mashi, S. S., & Noorwali, N. M. (2017). Trends in overweight or obesity and other anthropometric indices in adults aged 18-60 years in western Saudi Arabia. *Annals of Saudi Medicine*, *37*(2), 106–113. https://doi.org/10.5144/0256-4947.2017.106

Chooi, Y. C., Ding, C., & Magkos, F. (2019). The epidemiology of obesity. *Metabolism: Clinical and Experimental*, *92*, 6–10. https://doi.org/10.1016/j.metabol.2018.09.005

Deurenberg, P., Deurenberg-Yap, M., & Guricci, S. (2002). Asians are different from Caucasians and from each other in their body mass index/body fat per cent relationship. *Obesity Reviews*, *3*(3), 141–146. https://doi.org/10.1046/j.1467-789X.2002.00065.x

Frankenfield, D. C., Rowe, W. A., Cooney, R. N., Smith, J. S., & Becker, D. (2001). Limits of body mass index to detect obesity and predict body composition. *Nutrition*, *17*(1), 26–30. https://doi.org/10.1016/S0899-9007(00)00471-8

Kelly, T., Yang, W., Chen, C. S., Reynolds, K., & He, J. (2008). Global burden of obesity in 2005 and projections to 2030. *International Journal of Obesity*, *32*(9), 1431–1437. https://doi.org/10.1038/ijo.2008.102

Khwanchuea, R., & Punsawad, C. (2021). Sex differences in the relationship between body composition and biomarkers of bone and fat metabolism in obese boys and girls. *Bone Reports*, *14*, 101087. https://doi.org/10.1016/j.bonr.2021.101087

© COPYRIGHT UPM

Krističević, T., Štefan, L., & Sporiš, G. (2018). The associations between sleep duration and sleep quality with body-mass index in a large sample of young adults. *International Journal of Environmental Research and Public Health*, *15*(4). https://doi.org/10.3390/ijerph15040758

Lad, U. P., Satyanarayana, P., Shisode-Lad, S., Siri, C. C., & Ratna Kumari, N. (2013). A study on the correlation between the Body Mass Index (BMI), the body fat percentage, the handgrip strength and the handgrip endurance in underweight, normal weight and overweight adolescents. *Journal of Clinical and Diagnostic Research*, *7*(1), 51–54. https://doi.org/10.7860/JCDR/2012/5026.2668

Liang, X., Chen, X., Li, J., Yan, M., & Yang, Y. (2018). Study on body composition and its correlation with obesity A Cohort Study in 5121 Chinese Han participants. *Medicine (United States)*, *97*(21). https://doi.org/10.1097/MD.0000000000010722

Logue, E. E., Scott, E. D., Palmieri, P. A., & Dudley, P. (2014). Sleep duration, quality, or stability and obesity in an urban family medicine center. *Journal of Clinical Sleep Medicine*, *10*(2), 117–182. https://doi.org/10.5664/jcsm.3448

Mohd-Sidik, S., Lekhraj, R., & Foo, C. N. (2021). Prevalence, associated factors and psychological determinants of obesity among adults in Selangor, Malaysia. *International Journal of Environmental Research and Public Health*, *18*(3), 1–17. https://doi.org/10.3390/ijerph18030868

Schlüssel, M. M., dos Anjos, L. A., de Vasconcellos, M. T. L., & Kac, G. (2008). Reference values of handgrip dynamometry of healthy adults: A population-based study. *Clinical Nutrition*, *27*(4), 601–607. https://doi.org/10.1016/j.clnu.2008.04.004

© COPYRIGHT UPM

Sukkriang, N., Chanprasertpinyo, W., Wattanapisit, A., Punsawad, C., Thamrongrat, N., & Sangpoom, S. (2021). Correlation of body visceral fat rating with serum lipid profile and fasting blood sugar in obese adults using a noninvasive machine. *Heliyon*, *7*(2), e06264. https://doi.org/10.1016/j.heliyon.2021.e06264

Tanwi, T. S., Chakrabarty, S., Hasanuzzaman, S., Saltmarsh, S., & Winn, S. (2019). Socioeconomic correlates of overweight and obesity among ever-married urban women in Bangladesh. *BMC Public Health*, *19*(1), 3–9. https://doi.org/10.1186/s12889-019-7221-3

Tzotzas, T., Vlahavas, G., Papadopoulou, S. K., Kapantais, E., Kaklamanou, D., & Hassapidou, M. (2010). Marital status and educational level associated to obesity in Greek adults: Data from the National Epidemiological Survey. *BMC Public Health*, *10*. https://doi.org/10.1186/1471-2458-10-732

Wang, Z. M., Pierson, R. N., & Heymsfield, S. B. (1992). The five-level model: a new approach to organizing body-composition research. *The American Journal of Clinical Nutrition*, *56*(1), 19–28. https://doi.org/10.1093/ajcn/56.1.19

Chomtho, S., Fewtrell, M. S., Jaffe, A., Williams, J. E., & Wells, J. C. K. (2006). Evaluation of Arm Anthropometry for Assessing Pediatric Body Composition: Evidence from Healthy and Sick Children. *Pediatric Research*, *59*(6), 860–865. https://doi.org/10.1203/01.pdr.0000219395.83159.91

© COPYRIGHT UPM

Wu, J., Wu, H., Wang, J., Guo, L., Deng, X., & Lu, C. (2015). Associations between Sleep Duration and Overweight/Obesity: Results from 66,817 Chinese Adolescents. *Scientific Reports*, *5*(1). https://doi.org/10.1038/srep16686

Meyer, K. A., Wall, M. M., Larson, N. I., Laska, M. N., & Neumark-Sztainer, D. (2012). Sleep Duration and BMI in a Sample of Young Adults. *Obesity*, *20*(6), 1279–1287. https://doi.org/10.1038/oby.2011.381

Lytle, L. A., Pasch, K. E., & Farbakhsh, K. (2011). The Relationship Between Sleep and Weight in a Sample of Adolescents. *Obesity*, *19*(2), 324–331. https://doi.org/10.1038/oby.2010.242

Peltzer, K., & Pengpid, S. (2017). Sleep Duration, Sleep Quality, Body Mass Index, and Waist Circumference among Young Adults from 24 Low- and Middle-Income and Two High-Income Countries. *International Journal of Environmental Research and Public Health*, *14*(6), 566. https://doi.org/10.3390/ijerph14060566

Fatima, Y., Doi, S. A. R., & Mamun, A. A. (2016). Sleep quality and obesity in young subjects: a meta-analysis. *Obesity Reviews*, *17*(11), 1154–1166. https://doi.org/10.1111/obr.12444

Hung, H.-C., Yang, Y.-C., Ou, H.-Y., Wu, J.-S., Lu, F.-H., & Chang, C.-J. (2013). The association between self-reported sleep quality and overweight in a Chinese population. *Obesity*, *21*(3), 486–492. https://doi.org/10.1002/oby.20259

© COPYRIGHT UPM

Vargas, P. A., Flores, M., & Robles, E. (2014). Sleep Quality and Body Mass Index in College Students: The Role of Sleep Disturbances. *Journal of American College Health*, *62*(8), 534–541. https://doi.org/10.1080/07448481.2014.933344

Park, S. K., Jung, J. Y., Oh, C.-M., McIntyre, R. S., & Lee, J.-H. (2018). Association Between Sleep Duration, Quality and Body Mass Index in the Korean Population. *Journal of Clinical Sleep Medicine*, *14*(08), 1353–1360. https://doi.org/10.5664/jcsm.7272

Kushner RF. (2021). Bioelectrical impedance analysis: a review of principles and applications. *Journal of the American College of Nutrition*, *11*(2). https://pubmed.ncbi.nlm.nih.gov/1578098/

PIRLICH, M., SCHUTZ, T., SPACHOS, T., ERTL, S., WEIS, M., LOCHS, H., & PLAUTH, M. (2000). Bioelectrical impedance analysis is a useful bedside technique to assess malnutrition in cirrhotic patients with and without ascites. *Hepatology*, *32*(6), 1208–1215. https://doi.org/10.1053/jhep.2000.20524

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Davis, L. M., Coleman, C., Kiel, J., Rampolla, J., Hutchisen, T., Ford, L., Andersen, W. S., & Hanlon-Mitola, A. (2010). Efficacy of a meal replacement diet plan compared to a food-

© COPYRIGHT UPM

based diet plan after a period of weight loss and weight maintenance: a randomized controlled trial. *Nutrition Journal*, *9*(1). https://doi.org/10.1186/1475-2891-9-11

Yusuf, S., Hawken, S., Ôunpuu, S., Bautista, L., Franzosi, M. G., Commerford, P., Lang, C. C., Rumboldt, Z., Onen, C. L., Lisheng, L., Tanomsup, S., Wangai, P., Razak, F., Sharma, A. M., & Anand, S. S. (2005). Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. *The Lancet*, *366*(9497), 1640–1649. https://doi.org/10.1016/s0140-6736(05)67663-5

Arpón, A., Milagro, F. I., Santos, J. L., García-Granero, M., Riezu-Boj, J.-I., & Martínez, J. A. (2019). Interaction Among Sex, Aging, and Epigenetic Processes Concerning Visceral Fat, Insulin Resistance, and Dyslipidaemia. *Frontiers in Endocrinology*, *10*. https://doi.org/10.3389/fendo.2019.00496

Mohamed, S. F., Mwangi, M., Mutua, M. K., Kibachio, J., Hussein, A., Ndegwa, Z., Owondo, S., Asiki, G., & Kyobutungi, C. (2018). Prevalence and factors associated with pre-diabetes and diabetes mellitus in Kenya: results from a national survey. *BMC Public Health*, *18*(S3). https://doi.org/10.1186/s12889-018-6053-x

Feingold, K. R. (2020, November 2). *Obesity and Dyslipidemia*. Nih.gov; MDText.com, Inc. https://www.ncbi.nlm.nih.gov/books/NBK305895/

Park, B., Cho, H. N., Choi, E., Seo, D. H., Kim, S., Park, Y.-R., Choi, K. S., & Rhee, Y. (2019). Self-perceptions of body weight status according to age-groups among Korean women:

© COPYRIGHT UPM

A nationwide population-based survey. *PLOS ONE*, *14*(1), e0210486. https://doi.org/10.1371/journal.pone.0210486

Kiriyama, H., Kaneko, H., Itoh, H., Kamon, T., Mizuno, Y., Fujiu, K., Morita, H., Yamamichi, N., & Komuro, I. (2020). Association between changes in body weight and lipid profile in the general population: a community-based cohort study. *European Heart Journal - Quality of Care and Clinical Outcomes*, *7*(1), 109–110. https://doi.org/10.1093/ehjqcco/qcaa017

Hussain, A., Ali, I., Kaleem, W. A., & Yasmeen, F. (2019). Correlation between Body Mass Index and Lipid Profile in patients with Type 2 Diabetes attending a tertiary care hospital in Peshawar. *Pakistan Journal of Medical Sciences*, *35*(3). https://doi.org/10.12669/pjms.35.3.7

Ranasinghe, C., Gamage, P., Katulanda, P., Andraweera, N., Thilakarathne, S., & Tharanga, P. (2013). Relationship between Body mass index (BMI) and body fat percentage, estimated by bioelectrical impedance, in a group of Sri Lankan adults: a cross sectional study. *BMC Public Health*, *13*(1). https://doi.org/10.1186/1471-2458-13-797

Hung, H.-C., Yang, Y.-C., Ou, H.-Y., Wu, J.-S., Lu, F.-H., & Chang, C.-J. (2013). The association between self-reported sleep quality and overweight in a Chinese population. *Obesity*, *21*(3), 486–492. https://doi.org/10.1002/oby.20259

Park, S. K., Jung, J. Y., Oh, C.-M., McIntyre, R. S., & Lee, J.-H. (2018). Association Between Sleep Duration, Quality and Body Mass Index in the Korean Population. *Journal of Clinical Sleep Medicine*, *14*(08), 1353–1360. https://doi.org/10.5664/jcsm.7272

© COPYRIGHT UPM

Patel, S. R., Blackwell, T., Redline, S., Ancoli-Israel, S., Cauley, J. A., Hillier, T. A., Lewis, C. E., Orwoll, E. S., Stefanick, M. L., Taylor, B. C., Yaffe, K., & Stone, K. L. (2008). The association between sleep duration and obesity in older adults. *International Journal of Obesity*, *32*(12), 1825–1834. https://doi.org/10.1038/ijo.2008.198

Ahmed Abdallah, A., Mohamad Mahfouz, E., Sameh Mohammed, E., Anwer Emam, S., & Ahmed Abd-El Rahman, T. (2021). SLEEP QUALITY AND ITS ASSOCIATION WITH BODY WEIGHT AMONG ADULTS: AN EPIDEMIOLOGICAL STUDY. *Malaysian Journal of Public Health Medicine*, *21*(1), 327–335. https://doi.org/10.37268/mjphm/vol.20/no.3/art.912

Jeong, S., Choi, S., Kim, K., Kim, S. M., Kim, S., & Park, S. M. (2018). Association among handgrip strength, body mass index and decline in cognitive function among elderly women. *BMC Geriatrics*, *18*(1). https://doi.org/10.1186/s12877-018-0918-9

Lad, U. P. (2013). A Study on the Correlation Between the Body Mass Index (BMI), the Body Fat Percentage, the Handgrip Strength and the Handgrip Endurance in Underweight, Normal Weight and Overweight Adolescents. *JOURNAL of CLINICAL and DIAGNOSTIC RESEARCH*. https://doi.org/10.7860/jcdr/2012/5026.2668

Shah, S. A., Safian, N., Mohammad, Z., Nurumal, S. R., Wan Ibadullah, W. A. H., Mansor, J., Ahmad, S., Hassan, M. R., & Shobugawa, Y. (2022). Factors Associated with

© COPYRIGHT UPM

Handgrip Strength Among Older Adults in Malaysia. *Journal of Multidisciplinary Healthcare*, *Volume 15*, 1023–1034. https://doi.org/10.2147/jmdh.s363421

© COPYRIGHT UPM

APPENDICES

© COPYRIGHT UPM

APPENDICES A
GANTT CHART

© COPYRIGHT UPM

	2021			2022							
Activity	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Proposal Preparation												
Submission of Proposal												
Preparation of Proposal Presentation												
Correction of Proposal												
Preparation of Ethic Approval/Letters												
Data Collection and Analysis												
Final Report Preparation												
Submission of Final Report												
Final Report Presentation												
Manuscript Preparation												
Correction of Final Report												
Submission of codebook and Hard Bound Copies of Final Report												

© COPYRIGHT UPM

APPENDICES B
QUESTIONNAIRE

© COPYRIGHT UPM

FACULTY OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF DIETETICS

QUESTIONNAIRE

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG PATIENTS ATTENDING DIETETICS CLINIC IN HPUPM.

Researchers: AKMAL SHAHIR BIN SAHRUL HASLAN (200572)

Supervisor: DR. ZURIATI BINTI IBRAHIM

Date of Collection:

Instruction:

This study is conducted for academic purposes. All information will be kept private and confidential. Thank you for your cooperation in answering this questionnaire.

© COPYRIGHT UPM

PART A: SOCIO-DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS

Fill in the blank or tick the boxes for the questions below.

No	**Information**	**Options**
1	Age	…………… years old
2	Sex	( ) Male ( ) Female
3	Ethnicity	( ) Malay ( ) Chinese ( ) Indian ( ) Others Please specify: ……………………..
4	Marital status	( ) Single ( ) Married ( ) Divorced/ Widow

Part B: Anthropometric Measurement

Height (m)	**Weight (kg)**	**Body Mass Index (kgm^{-2})**

© COPYRIGHT UPM

Part C : Sleep Quality – Pittsburg Sleep Quality Index (PSQI)

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

During the past month,

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

5. During the past month, how often have you had trouble sleeping because you……	**Not during the past month**	**Less than once a week**	**Once or twice a week**	**Three or more times a week**
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dream				
i.Have pain				
j. Other reason(s), please describe:				

© COPYRIGHT UPM

8. During the past month, how often have you taken medicine to help you sleep (prescribed or “over the counter”)?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				
	Very good	**Fairly good**	**Fairly bad**	**Very bad**
9. During the past month, how would you rate your sleep quality overall?				

Part D: Body Composition

Measurement	**Result**
Percentage body fat	
Body fat mass	
Skeletal muscle mass	
Whole body phase angle	

© COPYRIGHT UPM

Part E: Biochemical Profile

Parameter	Result
Triglyceride	
Total Cholesterol	
LDL-C	
HDL-C	

Part F: Functional Status

Handgrip strength	1st Attempt	2nd Attempt	3rd Attempt

© COPYRIGHT UPM

APPENDICES C

JKEUPM AND HPUPM APPROVAL

© COPYRIGHT UPM

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

Research title	:	**Factors Associated with Body Weight Status Among Patients Attending Dietetics Clinic In HPUPM.**
Study Site	:	**Hospital Pengajar Universiti Putra Malayisa, HPUPM.**
JKEUPM Ref No.	:	**JKEUPM-2022-231**
Researcher	:	**Akmal Shahir Bin Sahrul Haslan**
Supervisor	:	**Dr. Zuriati Binti Ibrahim**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 28/03/2022
2. Respondent's Information Sheet / Consent (Malay), Version 2 dated 20/04/2022
3. Proposal (English), Version 1 dated 28/03/2022
4. Questionnaire / Interviews (English), Version 1 dated 28/03/2022
5. Curriculum Vitae of:
   a. Dr. Zuriati Binti Ibrahim

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

[x] Approved

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

[ ] Disapproved

Please note that the approval is **VALID UNTIL 22 APRIL 2023**

Researchers should comply with the following:

I. Complete a Study Final Report upon study completion (Form 3.2).

II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report occurrences of all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs) and Protocol Deviation/ Violation at all JKEUPM approved sites to JKEUPM. SAEs are to be reported within 15 calendar days from awareness of event by investigator. Initial report of SUSARs are to be reported as soon as possible but not later than 7 calendar days from awareness of event by investigator, followed by a complete report within 8 additional calendar days.

© COPYRIGHT UPM

APPENDICES D
TURNITIN RESULT

© COPYRIGHT UPM

Assignment Inbox: DTK4959 2021 2022				
Assignment Title	Info	Dates	Similarity	Actions
FYP Similarity Index	ⓘ	Start 18-Jul-2022 11:23AM Due 31-Oct-2022 11:59PM Post 25-Jul-2022 12:00AM	16%	Resubmit View

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Akmal Shahir
Assignment title:	FYP Similarity Index
Submission title:	Thesis FYP 200572
File name:	Thesis_FYP.docx
File size:	772.96K
Page count:	62
Word count:	9,880
Character count:	55,447
Submission date:	07-Aug-2022 02:56PM (UTC+0800)
Submission ID:	1879649395

Copyright 2022 Turnitin. All rights reserved.

© COPYRIGHT UPM