UNIVERSITI PUTRA MALAYSIA

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BY

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A project submitted 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

SUPERVISOR'S SIGNATURE

This project entitled "Factors Associated with Self-reported Energy Intake Among University Students in Malaysia During COVID-19 Pandemic" was prepared by Nur Mazyunah Binti Nor Azman and submitted to the Faculty of Medicine and Health Sciences as partial fulfilment of the requirement for the degree in Bachelor of Science in Dietetics with Honours from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

FACTORS ASSOCIATED WITH SELF-REPORTED ENERGY INTAKE AMONG UNIVERSITY STUDENTS IN MALAYSIA DURING COVID-19 PANDEMIC

NUR MAZYUNAH BINTI NOR AZMAN

The COVID-19 pandemic has impacted many people's lives, including the economics, social and politics of countries worldwide. Young adults, including university students, were highly affected by their dietary intake due to their inability to access physical learning fully. Realising that their dietary intake is essential and could be affected by mental health and various aspects during the pandemic, this study has been conducted to determine the factors associated with energy intake among university students in Malaysia during the COVID-19 pandemic. A cross-sectional study was conducted among 99 university students in Malaysia. The online questionnaire consisted of sociodemographic background, mental health outcome (DASS-21), and physical activity level (IPAQ). The 24-hour dietary recall was performed through online interviews. Results show that the majority of respondents were female (85%), with a mean age of 22.15 ± 0.97, Malay (86.7%), living with their family (56.7%), and had 4-6 individuals per household (68.3%). Most students represented stress 17.07 ± 9.70, and half were classified as having moderate physical activity levels. The mean energy intake of respondents is 1570.99 ± 534.4 kcal, and males have the highest energy intake (1972.17 ± 277.57) than females (1500.19 ± 61.35 kcal). There was a significant difference in mean energy intake between males and females (t=3.671, p=0.001). One of the more significant findings to emerge from this study is that low (p=0.022) and moderate physical activity levels (p=0.047) are associated with energy intake, except for highly active. The reasons remain unclear, but the possibility of being less active is due to a prolonged stay at home. Most students consumed less energy due to stress or aimed to lose weight during the pandemic before the transition to the endemic.

ABSTRAK

FAKTOR-FAKTOR YANG BERKAITAN DENGAN PENGAMBILAN TENAGA YANG DILAPORKAN SENDIRI OLEH KALANGAN PELAJAR UNIVERSITI DI MALAYSIA SEMASA PANDEMIK COVID-19

NUR MAZYUNAH BINTI NOR AZMAN

Pandemik COVID-19 telah mempengaruhi kehidupan manusia, termasuk ekonomi, sosial dan politik negara-negara di seluruh dunia. Orang dewasa, termasuk pelajar universiti, sangat terpengaruh dengan pengambilan makanan mereka kerana ketidakmampuan mereka untuk mengakses pembelajaran fizikal sepenuhnya. Menyedari bahawa pengambilan makanan mereka sangat penting dan boleh dipengaruhi oleh kesihatan mental dan pelbagai aspek semasa wabak, kajian ini telah dijalankan dengan objektif untuk menentukan faktor-faktor yang berkaitan dengan pengambilan tenaga di kalangan pelajar universiti di Malaysia semasa wabak COVID-19. Dalam kajian ini, kajian keratan rentas dilakukan di kalangan 99 pelajar universiti di Malaysia. Soal selidik dalam talian terdiri daripada latar belakang sosiodemografi, status kesihatan mental (DASS-21), dan tahap aktiviti fizikal (IPAQ). Ingatan diet 24 jam dilaksanakan melalui temu ramah atas talian. Hasil kajian menunjukkan bahawa majoriti responden adalah wanita (85%), usia rata-rata 22.15 ± 0.97, Melayu (86.7%), tinggal bersama keluarga mereka (56.7%), dan mempunyai 4-6 individu setiap isi rumah (68.3%). Sebilangan besar pelajar mengalami tekanan (17.07 ± 9.70) dan separuh daripadanya dikategorikan sebagai tahap aktiviti fizikal yang sederhana. Pengambilan tenaga responden rata-rata adalah 1570.99 ± 534.4 kcal, dan lelaki mempunyai pengambilan tenaga tertinggi (1972.17 ± 277.57) daripada wanita (1500.19 ± 61.35 kcal). Terdapat perbezaan yang signifikan dalam pengambilan tenaga min antara lelaki dan wanita ($t = 3.671$, $p = 0.001$). Salah satu penemuan yang lebih penting dalam kajian ini ialah tahap aktiviti fizikal ($p = 0.022$) dan tahap aktiviti fizikal sederhana ($p = 0.047$) dikaitkan dengan pengambilan tenaga. Puncanya masih kurang jelas, tetapi pelajar kurang aktif mungkin disebabkan oleh berada di rumah dalam tempoh yang lama semasa pandemik. Sebilangan besar pelajar juga mengambil jumlah tenaga yang rendah disebabkan oleh tekanan atau bertujuan untuk menurunkan berat badan semasa wabak sebelum peralihan ke endemik.

CHAPTER 1

INTRODUCTION

1.1 Background

A varied, adequate, balanced and moderate combination of energy and nutrients defines a healthy diet (Malaysian Dietary Guidelines, 2020). A healthy dietary intake is essential, especially among young adults, to provide enough nutrients and ensure good health (Nik Hairi Omar et al., 2015). Dietary intake may impact biological systems and mechanisms, including oxidative processes, immune system functioning and brain function (Adan et al., 2019; Khanna, 2016). Numerous studies have shown that diets or nutrition are associated with mental health. Many claims make it rather difficult to determine the specific dietary pattern contributing to mental health outcomes (Adan et al., 2019). An Australian study shows that male students were stressed and related to unhealthy food consumption among college students (Papier et al., 2015). Another study conducted in International Islamic University Malaysia (IIUM) in Kuantan reported that most students have moderate diet quality and only a few have severe mental health status, including depression, anxiety, and stress (Nor Hidayatul, Nor Azwani, & Wan Azdie, 2020).

The COVID-19 pandemic has impacted many people's lives, including the economics, social and politics of countries worldwide. According to a study in the U.S (Dietze et al., 2020), adults reported elevated mental health conditions associated with COVID-19, with young adults with a few other factors having the worst mental outcomes. In Malaysian studies, the prevalence of anxiety is 67%, stress is 70%, and

depression of 42.3% are among adults during the COVID-19 pandemic movement control order (MCO) (Perveen et al., 2020). The MCO is when there is a restriction of movement and staying at home is necessary. The surge of vaccination programs results in the government not reimposing MCO but implementing stricter control measures. Recently, The Ministry of Higher Education (MoHE) announced that universities and colleges are allowed to reopen in October 2021, considering that the learning approaches can be either hybrid on-campus or online learning (MoHE, 2021). Students may respond differently due to lifestyle changes and may be impacted by MCO, which makes them stay at home for longer. Both diet and mental health outcomes are important components to ensure prolonged well-being, especially during these hard times. Young adults, including university students, were highly affected, especially on dietary intake, due to the inability to fully access physical learning (Evenson et al., 2021). Hence, this study aims to determine the factors associated with dietary intake among university students in Malaysia during the Covid-19 pandemic.

1.2 Problem statement

According to Abdul Aziz et al. (2020), eating balance can provide positive emotions and psychology; inversely, overeating can cause bad emotional and psychological problems. Emerson et al. (2019) have found an association between a healthy diet and mental health; for example, higher consumption of fruits and vegetables is associated with a high level of happiness and mental health. Young adults are at an important age to practice healthy eating and lifestyle behaviour (Rodrigues et al., 2019). They were staying at home longer since the COVID-19 period potentially allows them to cook home food and a healthier eating plan (Dinan et al., 2018). A

present study reported a relationship between worse diet quality (high consumption of sweets, soft drinks, sweetened beverages and lower fruits and vegetable intake) and risk of depression.

With the ongoing COVID-19 pandemic, people are tested with physical distancing as preventive measures to minimise the contact and the spread of viruses. People worldwide, including Malaysia, have to practice the new norm despite it being rather challenging, especially for those who enjoy gatherings and socialising. More than half of the local university students who consumed macronutrients have achieved the Malaysian Food Pyramid Guidelines (Nik Hairi Omar et al., 2015). However, the study was conducted before the Covid-19 pandemic, and the data is based on the previous guidelines. As adults keep losing a jobs daily, these tests can bring about various mental health outcomes such as anxiety and depression (Shanmugam et al., 2020). University students, on the other hand, upon juggling to finish their studies, their mental health is impacted as they face a stressful environment by having travel restrictions, feeling anxious about going out and being infected with Covid-19, financial burden, and anxiety thinking about an unpredictable future (Matthys et al., 2021).

There is a scarcity of studies on the association between dietary intake and mental health among young people in foreign countries. However, the outcome of the association from these research studies might be different in the population among university students of this country due to changes in diet and lifestyle since COVID-19 pandemic. Both mental health outcomes and diet are important components to ensure prolonged well-being, and care should be taken starting from the young adult years.

1.3 Significance of study

1.3.1 University students

The findings from the study provided useful information to university or college students regarding the importance of achieving an adequate energy intake and how it relates to sociodemographic, mental health and physical activity during the COVID-19 pandemic. Besides, a review of studies shows a strong relationship between diet and mental health outcomes among emerging adults (Collins et al., 2020). Another study found that stress was associated with selecting unhealthy diets among first-year undergraduate students (Papier et al., 2015). Thus, diet intake may be affected by mental health, and young adults are among productive years who should be aware of their health and contribute to the community and country.

1.3.2 Community and country

This study will greatly help future researchers, the community, and the country. Recently, there have been shocking news in university students were dead due to pressure and stress while facing difficulties in online learning and teaching during the pandemic (Ruwaida & Noorazura, 2021). Also, students tend to be sedentary and consume high energy-dense food, resulting in excessive energy intake during the pandemic. Hence, the study's outcome will reveal the association between mental health outcomes and physical activity with energy intake. This knowledge can increase awareness among people in the community and country.

1.4 Research questions

1. What is the energy intake of university students during the COVID-19 pandemic?
2. What are the university students' mental health status and physical activity levels during the COVID-19 pandemic?
3. Is mental health, physical activity level, and sociodemographic factors associated with energy intake among university students in Malaysia during the COVID-19 pandemic?

1.5 Research Objectives

1.5.1 General objective

To determine the association between sociodemographic, mental health outcomes and physical activity levels with energy intake among university students in Malaysia during the COVID-19 pandemic.

1.5.2 Specific objectives

1. To determine sociodemographic factors (age, gender, ethnicity, living situation and household income) among university students in Malaysia during the COVID-19 pandemic.
2. To determine the energy intake, mental health outcomes and physical activity levels among university students in Malaysia during the COVID-19 pandemic.

3. To determine the association between sociodemographic factors, mental health outcomes and physical activity levels with energy intake among university students in Malaysia during the COVID-19 pandemic.

1.6 Research Hypothesis (Alternative)

There is a significant association between sociodemographic factors, mental health outcomes and physical activity with energy intake among university students in Malaysia during the COVID-19 pandemic.

CHAPTER 2

LITERATURE REVIEW

2.1 Energy intake

Getting enough energy from nutrition is essential for every human being to ensure the ability to perform daily activities. Both macro and micronutrients are consumed to support growth and development (Chen et al., 2018). According to Recommended Nutrient Intake (2017), the human body requires adequate energy through nutritional intake or food ingested to meet energy demands. The modern lifestyle has caused people to consume more energy-dense food, such as refined carbohydrates and high fat, and practise a sedentary lifestyle which would increase the risks of getting metabolic diseases (obesity, diabetes, hypertension) (Fudla et al., 2021). Excessive energy intake of highly palatable energy-dense food may fall to chronic diseases (RNI, 2017). High added sugar consumption could also increase energy intake (Patel et al., 2018). An energy intake of 1530kcal/day was found among female college students, which is higher than the previous study, which was 1126kcal/day (Khairil-Shazmin et al., 2021). However, the study did not assess the achievement of energy requirements based on RNI.

During the pandemic, an individual's dietary intake may be affected mainly due to social and environmental changes, and people begin to adapt to a new norm. A study conducted among young adults in Germany shows that the pandemic has significantly impacted eating habits among young adults (Huber et al., 2021). Previous studies also have highlighted young adults have poor eating habits and are at risk of

being obese as they become independent in their daily eating and lifestyle during their university life (Stamp et al., 2019; Yun et al., 2018). As the pandemic rises, the situation might worsen for university students as the new norm makes them face the laptop screen all day for online classes, leading to an unhealthy lifestyle and increased energy intake.

2.2 Associated factors

2.2.1 Sociodemographic factors

2.2.1.1 Gender

Energy and nutrient intake are indeed differences between male and female university students. Male students show higher energy intake than female students; however, the energy intake for both genders does not meet the recommended nutrient intake (RNI) (Gan et al., 2011). Similar studies also show that there is a lower calcium intake and high sodium intake among university students. At the same time, female college students have higher vegetable consumption (Rodrigues et al.,2019). Few studies reported the relationship between energy intake and gender in which males consumed higher energy than females (Mohammadi et al., 2019).

2.2.1.2 Age

Few studies examined the dietary changes during Covid-19 among college aged-students. A prolonged unhealthy lifestyle and dietary habits may influence their future and physical health throughout their adult life (Sidebottom et al., 2021).

Emerging adulthood at age 18-29 seems to be a critical period for diet and mental health, and there is an association between diet quality and depression, anxiety, and psychological health (Collins et al., 2020). A recent multinational study examining adults' physical and mental health impact in seven middle countries across Asia shows that Thailand has the highest DASS-21 scores and one of the risk factors identified was age less than 30 years old (Wang et al., 2021).

2.2.1.3 Ethnicity

In Malaysia, most of the population consists of Malay, followed by Chinese and Indian. The food preferences of Malaysian students vary depending on their ethnicities, such as traditional and western foods (Nik Hairi Omar et al., 2015). The result of the study supported by Abdullah et al. (2016) was that Malay adolescents consumed higher western and local foods. Western-based food patterns are usually high in fat, sugar, and salt, contributing to high-calorie intake. There is also an association between snacking on local food among Malays and Chinese ages 12-19 (Abdullah et al., 2016).

2.2.1.4 Living Situation

Young adults tend to have an unhealthy dietary pattern while staying at college and living away from their parents as they may experience the adoption of unhealthy dietary habits, especially in developed countries. However, recent studies might have contradicted findings whereby students experience changes in dietary behaviour while at home during the Covid-19 pandemic. The changes in their diet include an increased

average number of meals cooked and prepared at home and lower consumption of fruits and vegetables (Sidebottom et al., 2021). Students who live on campus prefer brisk walking and jogging as it is more convenient; thus, they may contribute to their physical activity levels (Nik Hairi Omar et al., 2015). In contrast, there is no difference in mental health outcomes among students living on and off campus (Zaiton, 2020).

2.2.1.5 Household income

Financial difficulties are one factor that people keep worrying about when it comes to isolation periods during the Covid-19 Pandemic. Although university students may receive financial support through scholarships or loans in respective universities, they would need more to support their families, especially those with low-income backgrounds. Dietary intake could be influenced by income among university students because poor income may result in poor dietary outcomes. A Brazilian study examined students from low-income families consuming high fibre and low cholesterol in their diet as they lived on campus (Hartmann et al., 2021). On the other hand, Salameh et al. (2014) found that males from private universities have higher income levels than females, and students with higher income levels are more likely to adopt a high plant-based diet than low-income. The income level of the students was assessed through monthly household income and the number of people in the household (Salameh et al., 2014).

2.3 Mental Health outcome

Mental health is fundamental in every single stage of life, from childhood to adulthood. It is an essential component of health and a basis of cognitive, communication, resilience and self-confidence (WHO, 2018; Health Direct, 2018). There is vast evidence showing diet is important for mental health, and better dietary intake is associated with a reduced risk of depression (Loughman et al., 2021). During the pandemic, high anxiety, depression, and stress rates were reported in general countries such as China, Spain, Italy, Iran, US, Turkey, Nepal and Denmark (Xiong et al., 2020). Malaysia is one of the top countries with the highest Depression Anxiety Stress Score (DASS-21) (Wang et al., 2021). According to a study, the outbreak of Covid-19 is associated with psychological pressure. This situation leads people to eat larger amounts of food at a higher frequency and change of usual diet (Abbas & Kamel, 2020).

More than half of university students in Australia were found to be suffering from stress, with females having higher stress than males. There was a relationship between stress and consumption of meat and processed food (Papier et al., 2015). Tajik et al. (2017) found that higher unhealthy dietary behavior leads to higher depression and stress symptoms among Malaysian adolescents. Unhealthy eating includes more sweetened beverages and cookies than milk and water (Tajik et al., 2017). Another study conducted among Chinese postmenopausal women has shown an association between a dietary pattern of low consumption of processed food and high consumption of plant-based food with a reduced risk of depression and stress (Liu et al., 2016). However, the study was conducted among women before the COVID-19 pandemic.

2.4 Physical activity

Physical activity is any bodily movement involving skeletal muscle resulting in energy expenditure (World Health Organisation, 2020). A prolonged sedentary lifestyle is usually at risk of disease exposure, and doing physical activity would be helpful to boost our health. Energy balance is when energy intake is the same as energy expenditure; thus, an individual should achieve energy balance to maintain weight. During a long period of covid-19, students tend to practice sedentary behaviour due to online learning. There is a decline in moderate-to-vigorous physical activity per week, and this reduction has caused a barrier to achieving optimal and good health (Sidebottom et al., 2021). Besides changes in dietary habits, and stress conditions, physical inactivity would contribute to weight gain (Yun et al., 2018*).*

2.5 Conceptual Framework

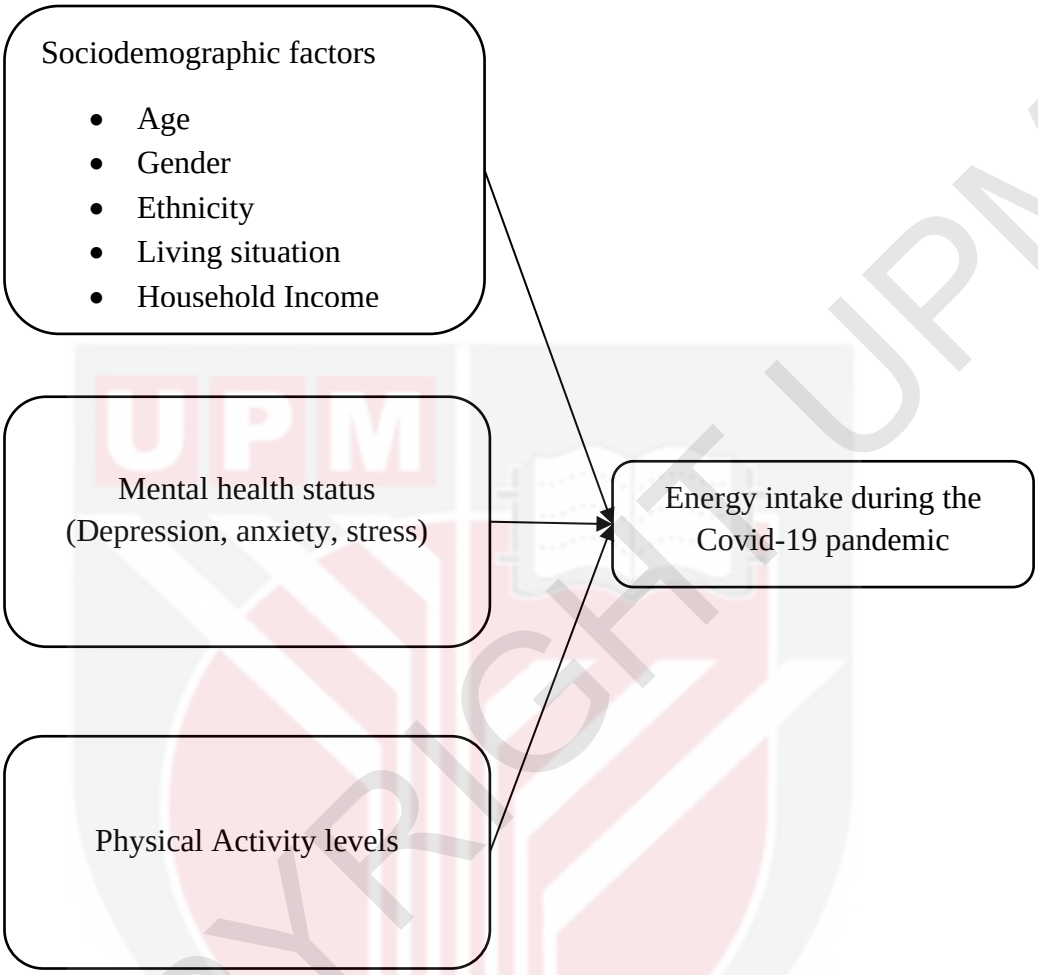

Figure 2.1 Conceptual Framework

CHAPTER 3

METHODOLOGY

3.1 Study Location

This study was conducted using online surveys to collect data among university students in Malaysia, including public and private universities.

3.2 Study Design

The study design chosen was cross-sectional because the research study was conducted in a shorter time, including the data collection period. Hence, a cross-sectional study was the most suitable and convenient for this research.

3.3 Study Participants

The study participants include more than 18 years old university students in Malaysia. Participants with eating disorders were excluded since they may influence the study's outcome on diet and mental health (Chan et al., 2020).

Table 3.1 Study Participants

Inclusion criteria	Exclusion criteria
Age 18 years and above	Pregnant and lactating women
Malaysian	Having eating disorders such as anorexia nervosa and bulimia nervosa.

3.4 Sampling

In this era of Covid-19, physical learning was not yet fully implemented for all students. Thus, recruiting participants, especially university students, was rather difficult because some students were at home doing online classes. Hence, a snowball sampling method was used to determine the factors associated with dietary intake among university students during the COVID-19 pandemic. Snowball sampling is a recruitment method in which study participants are asked to help researchers look for other eligible participants (Oregon States University, 2010). This method was suitable because it was much easier to approach the participants. The recruitment of participants was stopped once the desired number of participants was reached within the required time.

3.5 Sample Size Determination

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

$$N = \left[\frac{(Z\alpha + Z\beta)}{C}\right]^2 + 3 \quad (3.1)$$

Where,

N= number of respondents

α = Zα = 1.96

β = Zβ = 0.84

C = 0.5 x In [(1+r)/(1-r)]

r = the expected correlation coefficient

Table 3.2 Calculation of sample size

Correlation studies	Correlation coefficient, r	Sample size, N
Assessment of dietary intake patterns and their correlates among university students in Lebanon (Salameh et al., 2014)	0.352	C = 0.5 x In [(1+r)/(1-r)] C = 0.3677 $N = [(Z\alpha+Z\beta)/C]^2 + 3$ N = ***61**
Impact of the COVID-19 pandemic on the lifestyle, mental health, and quality of life of adults in South Korea (Park et al., 2021)	0.97	C = 0.5 x In [(1+r)/(1-r)] C = $N = [(Z\alpha+Z\beta)/C]^2 + 3$ N = ***5**
Vegetarian diet and mental health: Cross-sectional and longitudinal analyses in culturally diverse samples (Lavallee et al., 2019)	0.73	C = 0.5 x In [(1+r)/(1-r)] C = 0.2448 $N = [(Z\alpha+Z\beta)/C]^2 + 3$ N = ***12**
Dietary pattern and energy intake (Sprake et al., 2018)	0.6	C = 0.5 x In [(1+r)/(1-r)] C = $N = [(Z\alpha+Z\beta)/C]^2 + 3$ N = ***19**

Based on the table above, the highest calculated sample size was 61 respondents. A minimum sample size of 8 respondents was taken as the total number of respondents required for a 24-hour diet recall. The sample size was counted to adjust the expected response rate at 80%.

Table 3.3 Adjustment of sample sizeCriteria

	Adjustment	Sample Size
Estimated sample design effect	1.3	79.3
Expected response rate	0.8	100

Hence, a total of 100 respondents were required in this study after considering the design effect and response rate.

3.6 Study Instrument

The survey was designed in the English language. The questionnaire was divided into five sections; section A was sociodemographic background, section B was for mental health outcome (DASS-21), section C was for physical activity level (IPAQ), and section D was for 24-hour dietary recall.

3.7 Data collection technique

3.7.1 Sociodemographic background

The participants were assessed on their sociodemographic background, including gender, age, ethnicity, living situation, household income and the number of individuals per household. The method to identify the sociodemographic status was by using a self-administered questionnaire. In the survey, the birth date was asked to identify the age of the participants. On the other hand, household income refers to the

sum of income from family members who live on the same roof and is linked to the number of individuals per household.

3.7.2 Energy intake

A 24-hour dietary recall is an instrument used in the study to estimate the total energy intake of the participants. The participants who agreed to be interviewed for a 24-hour dietary recall were given the options to conduct an online meeting instead of phone calls. The recalls were conducted using standardised probing questions and measuring tools to estimate the portion size. The participants were assigned the dietary recall on three random days, including weekends. During the interview, dietary assessment aids (household measures, food album) were shown to the participants to identify foods and quantify portion sizes consumed. Then, the mean daily energy was obtained by taking the average of the three 24-hour dietary recalls. The dietary intake data was analysed based on the food composition table and relevant sources, including the Singapore Food Composition and Food Atlas. The energy adequacy was based on Recommended Nutrient Intakes for Malaysia (NCCFN, 2017) for ages 19-29, with 2440kcal for males and 1840kcal for females.

3.7.3 Mental health outcome (DASS-21)

The participants' stress, anxiety and depression level were assessed using the Depression Anxiety Stress Scale version 21 (DASS-21). The components are 21-items, with every seven items consisting of stress, anxiety and depression. A 4-point Likert scale was used to determine the frequency and severity of stress and depression

experienced by the participants in the previous 1-week. It ranges from 0 (did not apply at all) to 4 (applied very much/most of the time). The scores by each participant were calculated by summing up the scores of stress, anxiety and depression respectively and comparing the normal, moderate, and severe cut-off level by referring to the DASS manual. Cronbach's alpha values for the subscales of depression, anxiety and stress were 0.94, 0.86 and 0.87, respectively. Thus, it is a reliable and convenient research tool to screen depression, anxiety and stress levels among university students (Ezekwe, 2018).

3.7.4 Physical activity

The International Physical Activity Questionnaire (IPAQ) was used to determine the physical activity levels of university students in Malaysia. The self-administered IPAQ questionnaire was in a short form as it would be convenient for the participants to fill in the form. IPAQ-BM, a Malay version of the questionnaire, has proven to be a reliable and valid instrument for assessing levels of physical activity among the Malaysian population (α=0.8). The questions required participants to consider the physical activity done in the last seven days. The scoring system was based on total MET-min/week. Then, the physical activity levels were classified into low, moderate and high.

3.8 Pre-test

The pre-testing was conducted before the actual data collection. Thus, ten university students in Malaysia were chosen randomly to answer the questionnaires. It

was necessary to have pre-tested respondents with similar research criteria to determine their understanding of the questions and to receive feedback to improvise the questionnaire. The time taken to complete the questionnaire was also noted. Further reassessment and improvement were done after the pre-test to achieve a better set of questionnaires.

3.9 Study Ethics

The ethical approval from the Ethic Committee for Research Involving Human Subject (JKEUPM) was obtained before the conduction of this study with reference number UPM/TNCPI/RMC/1.4.18.2 (JKEUPM) on 7th February 2022. Each respondent was brief about the purpose of the study and their right to withdraw from the study. All information gained from the respondent will be kept confidential. Their consent was obtained before answering the questionnaire.

3.10 Procedure

The questionnaire provided is self-administered by the eligible participants in this study. All data were received through an online Google Form. An invitation link for participation in this study is blasted through various social media platforms, including Facebook, Instagram, WhatsApp, and email. Participants were required to complete the Google form. Since the sampling used for this study is snowball sampling, the participants are required to search for other university students to answer the questionnaire by blasting an official Google form link. The link was distributed in

several phases, and the data were collected until the desired number of respondents was achieved.

3.11 Data Analysis

Statistical analyses were conducted using IBM SPSS version 21. Firstly, the normality distributions of the data were assessed to identify parametric or non-parametric tests. The normality of data has been proven by using Kolmogorov-Smirnov and Shapiro-Wilk statistical tests, with a significance level of $p>0.05$. Then, the univariate analysis was used for descriptive data analysis. Through descriptive data analyses, the categorical variables were expressed in absolute frequencies (n) and relative frequencies (%), whilst the continuous variables were expressed in the mean and standard deviation. The statistical tests were chosen for inferential analysis based on the normality test result. The Chi-square test was used to assess the association between the independent variable (sociodemographic, physical activity and mental health) with the dependent variable (dietary/energy intake). For the mean differences of gender, an independent T-test was used. Also, Pearson correlation was used to assess the association between the independent variable (sociodemographic: age, monthly income) with the dependent variable (dietary/energy intake). One-way ANOVAs were used to determine the relationship between the participants' mental health status and energy intake.

CHAPTER 4

RESULTS

Data were collected between 11th March 2022 and 30th May 2022 among local university students. A total of 99 subjects were involved in the study. Of the study population, sixty subjects completed the questionnaire and agreed to be interviewed for diet recall. Thirty-nine subjects were excluded because they refused to be interviewed for dietary recall, although they completed the questionnaire. Therefore, the response rate for this study was 60%.

4.1 Sociodemographic factors

The first objective was to determine sociodemographic factors among the local university students. Table 4.1 shows the sociodemographic profile of the respondents. The sample comprises 51 (85%) females and 9 (15%) males. The mean age of the students is 22.15 years (SD 0.97). The majority of the respondents are Malay (n=52; 86.7%), living with their family (n=34; 56.7%), and 4-6 of individuals per household (n=41; 68.3%). About half of the students reported that their household income is < RM4,851 per month, considered B40 (*Pengkelasan Baru Golongan B40, M40 Dan T20.*, n.d.).

Table 4.1 Sociodemographic factors (n=60)

Characteristics	Mean ± S.D.	n (%)
Age	22.15 ± 0.97	
Gender		
Male		9 (15)
Female		51 (85)
Ethnicity		
Malay		52 (86.7)
Chinese		4 (6.7)
Indian		4 (6.7)
Residency Status		
Family House		34 (56.7)
Rental House		8 (13.3)
College		18 (30.0)
No. of Individuals per household		
1-3		12 (20.0)
4-6		41 (68.3)
>6		7 (11.7)
Household income		
B40		31 (51.7)
M40		25 (41.7)
T20		4 (6.7)

4.2 Energy Intake

Respondents were interviewed for a 24-hour diet recall to determine the total calories consumed in the last 24 hours. The number of calories consumed per day was compared with RNI for Malaysian (National Coordinating Nutrition, 2017) recommendation for energy based on age group and gender. The requirements for energy intake of males and females were 2240kcal and 1840kcal at 19 - 29 years old. The analyses were based on the mean energy intake. Table 4.2 shows the mean energy

intake of respondents is 1570.99 ± 534.4 kcal. Male has the highest energy intake (1972.17 ± 277.57) than female (1500.19 ± 61.35 kcal) respondents. The percentage of students who did not meet the RNI is 86.9% and 81.2% for females and males. Thus, the result of the study reveals that both male and female subjects do not achieve adequate average energy intake, which is lower than the RNI requirement.

Table 4.2 Mean, SD and classification of Energy intake of the participants (n=60)

Variables	Mean ± S.D.
Energy intake, kcal	1570.99 ± 534.4
Male	1972.17 ± 277.57
Female	1500.19 ± 61.35

An independent sample t-test was conducted to evaluate the mean difference. The comparison between the mean energy intake of male and female students is shown in table 4.3. There was a significant difference in mean energy intake between males and females (t=3.671, p=0.001).

Table 4.3 Mean, SD and classification of Energy intake of the participants by using an independent sample t-test

Gender	Mean	SD	t-value	p-value
Male	2.11	0.93	3.671	0.001*
Female	1.27	0.59		

*Significant at $p<0.05$

4.3 Mental Health Status

There were 4 points on the Likert scale to measure depression, anxiety and stress levels based on the DASS-21 score. The mean score of depression, anxiety, and stress was analysed to measure the severity of mental health status, including normal, mild to moderate and severe. Table 4.4 shows the percentage of depression, anxiety and stress among the students. Half the students represent mild to moderate anxiety (50%) and mild to moderate stress (51.7%). Most students represent stress which was 17.07 ± 9.70, compared to depression and anxiety. Depression has the lowest mean score, which was 14.6 ± 12.09. About one-third of participants represent normal anxiety and stress, and two-thirds represent a normal level of depression.

Table 4.4 Mean, SD and classification of Depression, Anxiety, Stress Scale (DASS-21) score

Variables	Mean ± S.D.	n (%)
Depression	14.6 ± 12.09	
Normal		24 (40)
Mild to moderate		20 (33.3)
Severe		16 (26.7)
Anxiety	14.77 ± 10.33	
Normal		18 (30)
Mild to moderate		30 (50)
Severe		12 (20)
Stress	17.07 ± 9.70	
Normal		12 (20)
Mild to moderate		31 (51.7)
Severe		17 (28.3)

4.4 Physical Activity Levels

Physical Activity levels were classified based on:

- Low active, which is considered as no activity or <1500 MET-mins per week
- Moderate active with at least 1500 MET per week
- High active with at least 3000 MET-minutes/week

A formula calculates MET-min per week to determine the levels of physical activity. The data were analysed using category scorers which are low, moderate and high levels. Results in Table 4.5 show that most students were classified as moderate physical activity, which was 30 (50%). In contrast, 17 (28.3%) and 13 (21.7%) respondents represent low and active physical activity levels.

Table 4.5 Mean, SD and classification of IPAQ score

Variables	Mean ± S.D.	n (%)
Physical activity level		
Low Active		17 (28.3)
Moderate active		30 (50)
Active		13 (21.7)

4.5 Association between sociodemographic factors, mental health outcomes and physical activity levels with energy intake

Table 4.6 shows the association between sociodemographic factors and energy intake by respondents. Majority of respondents with age 20-22 (n=45; 84.9%), female (n=43; 42.5%), Malay (n=42; 80%), living with family (n=29; 85.3%), and B40 (n=29; 93.5%), do not meet the RNI. The analyses show no significant association between

age, gender, ethnicity, residency status, household income and no. of individuals per household with energy intake ($p>0.05$).

Table 4.6 Association between sociodemographic factors with energy intake

Variables	Met RNI recommendation (n=10)	Not Met RNI recommendation (n=50)	$\chi 2$	r-value	ρ-value
Age			0.809	0.063	0.369
20-22	8 (15.1)	45 (84.9)			
23-25	2 (28.6)	5 (71.4)			
Gender			0.235		0.628
Male	2 (22.2)	7 (77.8)			
Female	8 (15.7)	43 (42.5)			
Ethnicity			1.846		0.174
Malay	10 (19.2)	42 (80)			
Non-Malay	0 (0)	8 (6.7)			
Residency Status			0.14		0.907
Family House	5 (14.7)	29 (85.3)			
Rent/College	5 (19.2)	21 (80.8)			
Household income			3.417		0.065
B40	2 (6.5)	29 (93.5)			
M40/T20	8 (27.6)	21 (72.4)			
No of individuals per household				-0.02	0.988
≤6					
>6					

One-way ANOVA test was used to determine the mean difference between mental health outcome and energy intake. In the study, most students with stress levels met RNI (17.4 ± 11.74). The results did not show any significant difference between depression, anxiety and stress with energy intake (Table 4.7).

Table 4.7 Association between depression, anxiety and stress with energy intake

Variables	Met RNI	Not met RNI	ρ-value
Depression	15 ± 11.4	14.52 ± 12.33	0.910
Anxiety	14.4 ± 11.96	14.84 ± 10.11	0.903
Stress	17.4 ± 11.74	17 ± 9.38	0.906

The Pearson correlation was run to determine the relationship between physical activity levels and energy intake. As can be seen from Table 4.8, there was a strong negative correlation between low activity with energy intake (r = -0.296; p-value: 0.022) and moderate activity with energy intake (r = -0.258; p-value=0.047), which was statistically significant (ρ<0.05).

Table 4.8 Association between physical activity with energy intake

Variable	Energy intake	
	r	**ρ-value**
Low active	-0.296	**0.022***
Moderate active	-0.258	**0.047***
High active	0.01	0.995

CHAPTER 5

DISCUSSION

5.1 Sociodemographic factors (age, gender, ethnicity, living situation and household income) among university students in Malaysia during the Covid-19 pandemic.

Sociodemographic characteristics were evaluated via a self-administered questionnaire, including gender, age, race, living situation, household income and the number of households. The result of this study will now be compared to the finding of previous work. Meng et al. (2021) found that more female than male college students participated in their research. A study in Bangladesh reveals that more females experienced mental health issues during the pandemic. Besides, in this study, most students lived with family instead of alone during the pandemic, which is consistent with the previous research (Hosen et al., 2021 & Meng et al., 2021).

As previously mentioned, the mean age of the university students in the study was about 22 years old. The result was not far from the previous study in which the mean age of students was 20 years old because the age rate for undergraduate university students in Malaysia is between 18-25 years old (Hakim et al., 2012). There were multiracial students involved in the study, and Malay students were the highest major group in Malaysia. Most students came from middle-income families. Economy experts predicted that families from B40 income levels would impact the most during a pandemic. However, this study found that most students are from wealthy families and may have fewer issues spending their money on food. Besides, the number of individuals per household is at an average of 4-6 for most students. Thus, having

middle-income families and an increase in household sizes, they may rather save than spend the money to reduce the cost of living.

5.2 Energy intake among university students in Malaysia during the COVID-19 pandemic.

The second question in this study sought to determine the energy intake among local university students during the pandemic. The university students classified energy intake with RNI based on gender and age. The result from the study revealed that both male and female students have energy intake lower than the RNI requirement. This means that both genders do not achieve adequate energy intake. However, the previous study conducted among university students with those of Hakim et al. (2012) and Gan et al. (2011) found that more male students achieved the RNI. These contradictory results are due to the difference in the time frame since the previous studies were conducted before the pandemic.

Furthermore, this study found that energy intake did not meet the RNI for Malaysians, with male and female students achieving 86.9% and 81.2% of RNI. The result was contrary to previous research that 79.8% of RNI was met by male students (Hakim et al., 2012). Additionally, there was a significant difference between the energy intake of males and females in this study. The finding was supported by a study from Zhao et al. (2020)

The current study's findings seem to be consistent with a previous study in Canada in which the energy intake of university students decreased during the Covid-19 pandemic (Tulchin-Francis et al., 2021). A previous study revealed that when their

physical activity decreased, their calorie intake also decreased (Tulchin-Francis et al., 2021). Most students in this study may have lower energy intake due to energy balance during the pandemic.

5.3 Mental health outcomes among university students in Malaysia during the COVID-19 pandemic.

Most students represented mild to moderate anxiety (50%) and mild to moderate stress (51.7%) in this study. The mean stress was 17.07 ± 9.70, higher than depression and anxiety. These results agree with the findings of other studies, in which 80% of undergraduate students have moderate to high-stress levels (Ling & Zahry, 2021). Besides, a survey conducted among adolescents reported that fast food and snacking patterns were related to stress (Tajik et al., 2016). Based on a 1-day self-reported diet recall, most students reported consuming unhealthy snacks such as cookies, cakes and *kuih muih*. It might be because the students experienced higher stress during the pandemic. However, the types of food consumed by the students were not further assessed in this study.

The findings regarding low anxiety and depression do not support the previous research. Research on college students in China by Meng et al. (2021) reported that most college students had experienced anxiety and fear of depression during the COVID-19 pandemic since 2020. Thus, they faced mental health problems due to the pandemic (Meng et al., 2021). The discrepancy may be due to differences in population in both countries. Besides, Yee et al. (2021) reported that one-third of Malaysians were found to have mild-to-severe depression during the pandemic. It also contradicts the previous study where most have normal stress (Nor Hidayatul et al., n.d.). A possible

explanation for this might be that high levels of anxiety and depression chose not to participate in this study (Meng et al., 2021).

In addition, the research found that mental health issues happened due to not performing physical exercise (Hosen et al., 2021). Hosen et al. (2021) reported that a higher level of Bangladeshi students experienced psychological issues during the COVID-19 pandemic, including depression (43.3%) and anxiety (32.6%). When stressed, students eat less, affecting their health (Cheng & Kamil, 2020). It might be the possible explanation for why the students consumed energy intake less than RNI.

5.4 Physical activity levels among university students in Malaysia during the Covid-19 pandemic.

In this study, it was found that half of the university students have a moderate level of physical activity (50%), followed by low active (28.3%) and active (21.7%). The results agree with the findings of other studies in which the local university students were moderately active during the COVID-19 pandemic (Mohd Hakim et al., 2021). The previous research assessed during the lockdown has not changed the results of being moderately active throughout the pandemic. It could be explained by the lack of time for the students to have both online and face-to-face classes (Tulchin-Francis et al., 2021). Their schedule seems to be more hectic as they need to attend classes and experience online classes, which limits their time for being physically active.

In contrast to earlier findings, it was reported that students among University Kebangsaan Malaysia (UKM) students have an active lifestyle (Nik Hairi Omar et al., 2015). The contradictory results are due to different living situations, in which the

previous study evaluated students living on campus rather than living with their families at home. Hence, the students enjoyed being active in doing outdoor activities on their campus. Moreover, most previous studies before the pandemic showed high physical activity levels among university students aged 19-25 (Rajappan et al., 2015; Nik Hairi Omar et al., 2015). This result may be explained by the fact that physical activity levels have decreased among university students since the pandemic.

5.5 The association between sociodemographic factors, mental health outcomes and physical activity levels with energy intake among university students in Malaysia during the Covid-19 pandemic.

5.5.1 Sociodemographic factors with energy intake

This study found no significant association between energy intake and age among university students, as the p-value is 0.369 ($p>0.05$). The ages of 20-22 have the highest mean energy intake score (84.9%) that does not meet the RNI. During the pandemic, at this stage, most students tend to eat more due to stress which results in high energy intake. Also, young adults are among the age group who have increased energy requirements to meet the energy demand. Anyhow, the result from this study reveals that the majority have low energy intake as they do not meet the requirement. They might be due to stress, resulting in reduced appetite and low-calorie consumption.

This study did not show any significant association between gender and energy intake ($p=0.628$). The findings are consistent with a previous study by Gan et al. (2011), who reported no significant difference between male and female university students and energy intake. Based on the result, females have the highest mean (n=43)

that did not meet the RNI recommendation compared to male students (n=7). The differences might be due to the majority of participants being female. Another possible explanation might be that females are less active than males; thus, they consume energy lower than the recommendation.

The current study also found no association between ethnicity and energy intake (p=0.174). Based on the results from the table shows that most Malay university students did not meet RNI for energy (80%). This finding confirms a previous study in which there was no significant association between ethnicity and energy based on RNI (Gan et al., 2011). On top of that, there was also no association between residency status and energy intake (p=0.907). From the study, it was found that the majority of participants did not meet the recommendation. It may be that these students had barriers to eating adequately, such as time constraints and stress which have led them to search for more convenient food or not to eat enough.

Very little was found in the literature regarding the association between household income and individuals per household with energy intake. However, this study found no association in which the p-value for household income and individuals per household was 0.065 and 0.988. The results from the study reveal that the majority did not meet the RNI. A previous study reported that low household income was associated with poor diet quality (French et al., 2019). The low-income group in this study is B40, which is more likely to spend less on food, especially during the pandemic. Thus, the situation has led them to inadequate energy intake.

5.5.2 Mental health status with energy intake

The current study determined the relationship between mental health status and energy intake among university students based on RNI. Contrary to expectations, this study did not find a significant relationship between depression, anxiety and stress with energy intake. Supporting our findings, a survey of the relationship between dietary energy density and mental health among women aged 18-56 years by Maddahi et al. (2020) observed no significant difference between diet and depression, stress and stress anxiety. Previous research also reported that they did not find a significant relationship between anxiety and calorie intake among college students (Biasi, 2019). A healthy diet plays a role in improving mental health (Muhammad Asim Shabbir et al., 2022). However, this study found no significant difference between the students' energy intake and mental health status.

The results contradict a study by Yee et al. (2021) in which mild to severe depression was found significant among younger people. However, the study was conducted during a movement control order for one month. Another study conducted among undergraduate students in private universities found that stressed students consume significantly fewer calories than non-stressed students (Cheng & Kamil, 2020). The inconsistent results may be due to various tools used in previous studies to estimate dietary intake and mental health, such as food frequency and perceived stress scale.

5.5.3 Physical activity levels with energy intake

This study found an association between low and moderate physical activity and energy intake. Thus, it may have contributed to high energy intake. Some authors have speculated that people spend more time inside and have limited physical activity (Matthys et al., 2021). These results are consistent with other research that during the COVID-19 pandemic, most of the population had increased food consumption with decreased physical activity (Bakhsh et al., 2021). Abbas emphasises the problem of widespread obesity during the Covid-19 pandemic, which results in lower physical activity during restrictions and consumption of more energy-dense foods that are rich in fat and sugar. (Czenczek-Lewandowska et al., n.d.). During the pandemic, people spend more time inside and have limited physical activity. However, more time at home may have resulted in positive habits, including increased cooking (Matthys et al., 2021).

CHAPTER 6

CONCLUSION AND RECOMMENDATION FOR FUTURE RESEARCH

6.1 Strengths, limitations and recommendations

The study revealed strengths and limitations. The findings from this study provide new information on energy intake based on RNI among university students during the pandemic. Moreover, the outcome brought up mental health status and physical activity levels among university students during the pandemic to explore in future studies. Besides, the result can fill the gaps in previous research. However, more research on this topic must be undertaken before the association between sociodemographic background, mental health and physical activity levels with energy intake are more clearly understood.

The current study only determined factors associated with energy intake but does not allow to state clearly that these factors have an impact or influence on energy intake. This study also failed to achieve a sample size of 60. With a small sample size, interpretation with caution must be applied, as the findings may not represent generalizability. The use of 24-hour dietary recall may not be adequate as a single measurement; thus, having a combination with other tools such as a food frequency questionnaire and food diary is necessary to ensure data accuracy. Also, the data collection period was conducted during the transition from pandemic to endemic, which may produce results opposite to the hypothesis.

6.2 Conclusion

One of the more significant findings to emerge from this study is that physical activity levels (low and moderately active) are associated with energy intake, except for highly active. The reasons remain unclear, but the possibility of being less active is due to a prolonged stay at home. Most students consumed fewer calories due to stress and aimed to lose weight during the pandemic before the transition to the endemic. Therefore, there was an association between low to moderate physical activity and energy intake among university students during the COVID-19 pandemic.

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APPENDICES

Appendix A Work Plan (Gantt Chart)

	2021			2022							
Month / **Activity**	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Preparing proposal											
Submission of Proposal											
Preparing presentation proposal											
Submission for ethical approval											
Presentation proposal											
Correction of proposal											
Conduct pre-test questionnaire											
Data collection											
Data analysis											
Write-up											
Submission of draft copy thesis											
Submission of thesis											
Final report and presentation											

Appendix C Questionnaire (English Version)

Reference Number ☐☐☐

FACULTY OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF DIETETICS

RESEARCH QUESTIONNAIRE

FACTORS ASSOCIATED WITH SELF-REPORTED ENERGY INTAKE AMONG UNIVERSITY STUDENTS IN MALAYSIA DURING COVID-19 PANDEMIC

RESEARCHER'S NAME	:	NUR MAZYUNAH BINTI NOR AZMAN
MATRIC NO.	:	203386
PROGRAMME	:	BACHELOR OF SCIENCE (DIETETICS)
SUPERVISOR'S NAME	:	DR. ZALINA ABU ZAID

Your personal information given in this questionnaire is for research purpose only. It will be kept strictly confidential. I would be very grateful if you could help me by completing this questionnaire.

SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS

Fill in the blank or tick (/) the boxes for the questions below.

1. Birth of date	:	__/__/__ (dd/mm/yy)
2. Gender	:	☐ Male ☐ Female
3. Ethnicity	:	☐ Malay ☐ Indian ☐ Chinese Others (Please state): _____
4. Living Situation	:	☐ College dormitory ☐ Own house ☐ Rented room Others (Please state): _____
5. No. of Individuals per household	:	☐ 1 – 3 Others (Please state): _____ ☐ 4 – 6
6. Household Income	:	☐ Less than RM4,851 per month ☐ RM4,851 – RM10,970 per month ☐ More than RM10,970 per month

SECTION B: DEPRESSION ANXIETY STRESS SCALE

Please read each statement and choose (/) only ONE statement applied to you over the past week.

No.	Statement	Not at all	Sometimes	Good part of time	Most of the time
1	I found it hard to wind down				
2	I was aware of dryness of my mouth				
3	I couldn't seem to experience any positive feeling at all				
4	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion).				
5	I found it difficult to work up the initiative to do things.				
6	I tended to over-react to situations				
7	I experienced trembling (e.g. in the hands)				
8	I felt that I was using a lot of nervous energy				
9	I was worried about situations in which I might panic and make a fool of myself				
10	I felt that I had nothing to look forward to				
11	I found myself getting agitated				
12	I found it difficult to relax.				
13	I felt down-hearted and blue.				
14	I was intolerant of anything that kept me from getting on with what I was doing.				
15	I felt I was close to panic.				
16	I was unable to become enthusiastic about anything.				
17	I felt I wasn't worth much as a person.				
18	I felt that I was rather touchy.				

19	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat).				
20	I felt scared without any good reason.				
21	I felt that life was meaningless.				

SECTION C: PHYSICAL ACTIVITY

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ days per week

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ hours per day

   _____ minutes per day

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ days per week

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ hours per day

_____ minutes per day

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ days per week

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ hours per day

_____ minutes per day

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ hours per day

_____ minutes per day

☐ Don't know/Not sure

SECTION D: 24-HOUR DIETARY RECALL

In this section, you may need to provide a phone number to the researcher to set up an interview to conduct a 24-hour diet recall. You will be asked to recall the items consumed during the last 24 hours. Throughout the session, you can refer to the household measuring tools provided by the researcher to identify the portion size. At the end of the session, you will know your **total calorie, amount of carbohydrate, protein and fat** consumed in a day. The estimated interview time is within 15-30 minutes.

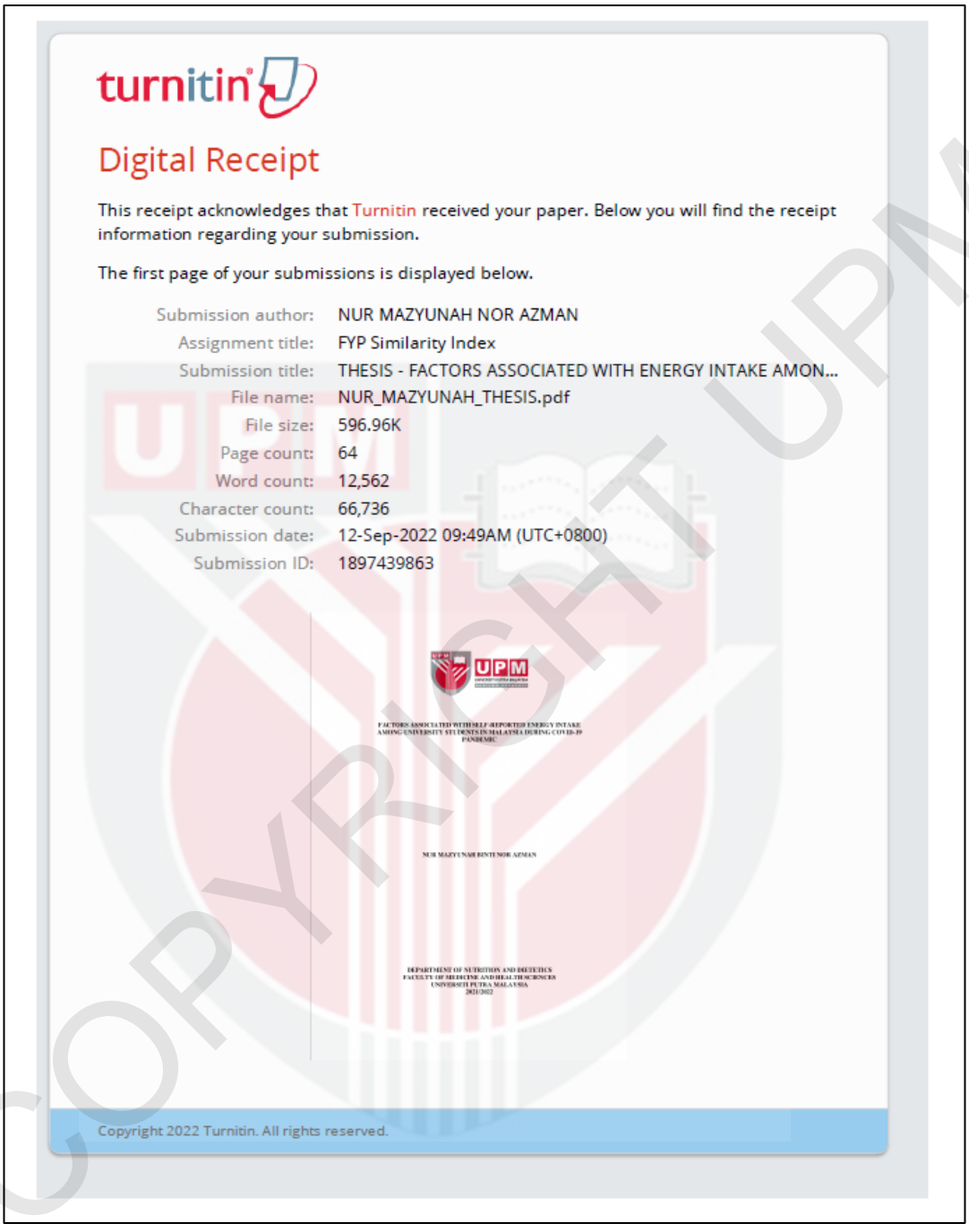
Do you agree to perform a 24-hour diet recall?	:	☐ Yes. Please provide your phone number: _____ ☐ No

Teaspoon **Tablespoon** **Cup**

**To estimate serving size*

- END OF THE QUESTION –

Appendix D Turnitin Report



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FACTORS ASSOCIATED WITH SELF-REPORTED ENERGY INTAKE AMONG UNIVERSITY STUDENTS IN MALAYSIA DURING COVID-19 PANDEMIC

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FACULTY OF MEDICINE AND HEALTH SCIENCES
UNIVERSITI PUTRA MALAYSIA
2021/2022

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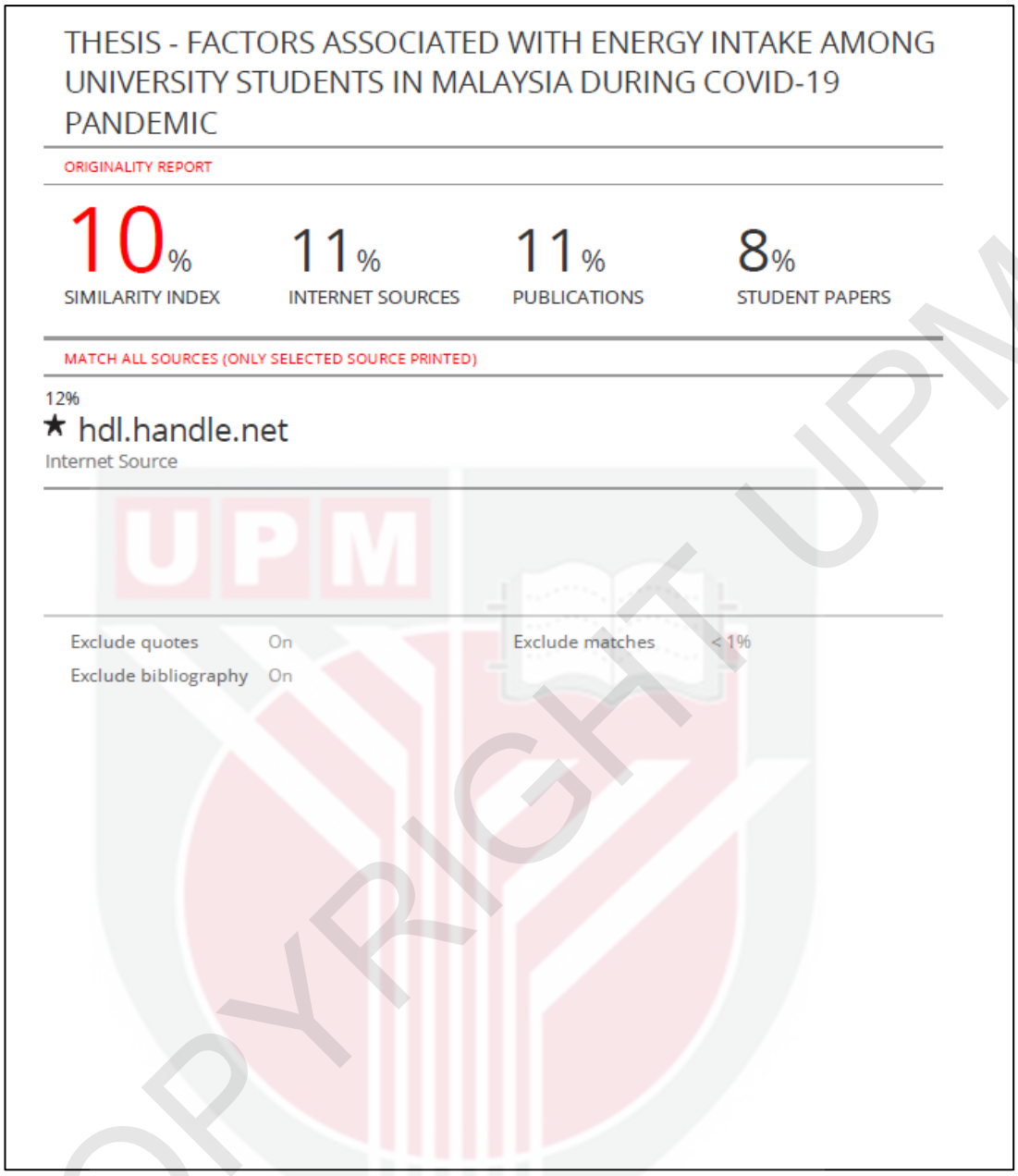

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