UNIVERSITI PUTRA MALAYSIA

DISORDERED EATING BEHAVIOUR AND ITS ASSOCIATION WITH SOCIO-DEMOGRAPHIC FACTORS, NUTRITION KNOWLEDGE, WEIGHT STATUS, AND DIETARY INTAKE AMONG MALAYSIAN UNIVERSITY STUDENTS

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FACULTY OF MEDICINE AND HEALTH SCIENCES

UNIVERSITI PUTRA MALAYSIA

2020/2021

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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

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ACKNOWLEDGEMENT

First and foremost, I would like to express my deepest gratitude to Dr Zuriati Binti Ibrahim, my bachelor dissertation's supervisor, who has been guiding me throughout the whole process of doing this research. She spent her time and energy teaching me how to conduct research and thesis writing. I am truly indebted to her for all that she has contributed during this whole period. Besides that, I would also like to thank Dr Syafiqah Binti Rahmat, our course coordinator for DTK4959A and DTK4959B, for her effort in coordinating and guiding us throughout the period of this project.

Furthermore, I would like to express my gratitude to all the participants who have taken some time from their day to participate in my study by answering my questionnaires, and some of them who had also partaken in an online interview. Without them, my project would not have been possible.

Finally, I would like to thank all my friends and families who have given me an infinite amount of encouragement and patience throughout the whole period I was completing my bachelor dissertation.

TABLE OF CONTENTS

Title Page i
Supervisor's Signature ii
Acknowledgement iii
Table of contents iv
List of Tables vi
List of Figures vii
List of Appendices viii
Abstract ix
Abstrak x

CHAPTER ONE INTRODUCTION
1.1 Study Background 1
1.2 Problem Statements 3
1.3 Significance of Study 4
1.4 Research Questions 4
1.5 Objectives 4
1.6 Alternative Hypothesis 5
1.7 Conceptual Framework 6

CHAPTER TWO LITERATURE REVIEW
2.1 Disordered Eating Behaviour 7
2.2 Socio-demographic Factors
2.2.1 Age 8
2.2.2 Gender 9
2.2.3 Ethnicity 9
2.2.4 University Type 10
2.2.5 Field of Study 11
2.2.6 Residential Area 11
2.2.7 Household Income 12
2.3 Nutrition Knowledge 13
2.4 Weight Status 14
2.5 Dietary Intake
2.5.1 Total Calorie Intake 15

CHAPTER THREE METHODOLOGY
3.1 Study Design 17
3.2 Study Location 17
3.3 Sample Size 17
3.4 Sampling Method 19
3.5 Inclusion and Exclusion Criteria 20
3.6 Study Instrument
3.6.1 Socio-demographic Factors 20
3.6.2 Self-reported Weight and Height 20
3.6.3 Nutrition Knowledge 21

3.6.4 Dietary Intake 22
3.6.5 Disordered Eating Behaviour 22
3.7 Ethics Approval 22
3.8 Pre-testing 23
3.9 Data Collection 23
3.10 Data Analysis 23
CHAPTER FOUR RESULT AND DISCUSSION
4.1 Socio-demographic Characteristics 25
4.2 Nutrition Knowledge 27
4.3 Anthropometry Data 27
4.4 Total Calorie Intake 28
4.5 Disordered Eating Behaviour 28
4.6 Associations between Socio-demographic Factors and Disordered Eating Behaviour 29
4.7 Associations between Nutrition Knowledge and Disordered Eating Behaviour 31
4.8 Association between Weight Status and Disordered Eating Behaviour 32
4.9 Associations between Total Calorie Intake and Disordered Eating Behaviour 33
CHAPTER FIVE CONCLUSION
5.1 Conclusion 35
5.2 Strengths 36
5.3 Limitations 36
5.4 Recommendations 37
REFERENCES 38
APPENDICES
Appendix A JKEUPM Letter of Approval 44
Appendix B Information Sheets 46
Appendix C Consent Form 49
Appendix D Questionnaire 51
Appendix E Turnitin Result 62

LIST OF TABLES

Table 3.1	Sample Size Calculation of Prevalence Study	38
Table 3.2	Sample Size Calculation of Correlation Study	40
Table 4.1	Distribution of Patients According to Socio-demographic Characteristics	48
Table 4.2	Distribution of Participants According to Nutrition Knowledge	49
Table 4.3	Distribution of Participants According to Anthropometry Data	51
Table 4.4	Participants' Total Calorie Intake	52
Table 4.5	Distribution of Participants According to Disordered Eating Behaviour	55
Table 4.6	Associations between Socio-demographic Factors and Disordered Eating Behaviour	59
Table 4.7	Association between Nutrition Knowledge and Disordered Eating Behaviour	61
Table 4.8	Association between Weight Status and Disordered Eating Behaviour	63
Table 4.9	Association between Total Calorie Intake and Disordered Eating Behaviour	65

LIST OF FIGURES

Figure 1.1 Conceptual Framework 6

LIST OF APPENDICES

Appendix A	JKEUPM Letter of Approval	44
Appendix B	Information Sheets	46
Appendix C	Consent Form	49
Appendix D	Questionnaire	51
Appendix E	Turnitin Result	62

ABSTRACT

DISORDERED EATING BEHAVIOUR AND ITS ASSOCIATION WITH SOCIO-DEMOGRAPHIC FACTORS, NUTRITION KNOWLEDGE, WEIGHT STATUS, AND DIETARY INTAKE AMONG MALAYSIAN UNIVERSITY STUDENTS

MUHAMMAD MUHAIMIN BIN MOHD AZLAN

Disordered eating behaviour (DEB) is prevalent among Malaysian university students. DEB is also known to have long-term effects on the health of young adults, who are at an increased risk of developing eating disorders at this age. However, despite having multiple studies done on the topic of DEB, some of the factors associated with it were contradicting. Thus, this cross-sectional study aimed to determine the prevalence of DEB and its association with socio-demographic factors, nutrition knowledge, weight status, and dietary intake among Malaysian university students. Participants were recruited using non-probability snowball sampling method. A self-administered questionnaire and self-reported anthropometry data were collected from participants using an online platform and a self-administered questionnaire. The Nutrition Knowledge Questionnaire based on the Malaysian Dietary Guideline 2010 was used to assess nutrition knowledge, and the online diet history interview was used to assess dietary intake. DEB was assessed using EAT-26 questionnaire. One hundred respondents (60% female and 40% male) participated in the study, while a sub-sample (n=33) were interviewed for their dietary intake. The mean age of participants was 22.32 ± 1.18 years. Most of the participants were Malays (87%), from public universities (87%), enrolling in non-nutrition related bachelor's degrees (87%). Many of them live in urban areas (47%) and are considered in middle household income (44%). The majority of participants (94%) had good nutrition knowledge and a normal BMI (71%). Participants' average daily calorie intake was 1530 ±448 kcal. DEB was prevalent in a high percentage of participants (34%). No significant relationship was found between any of the socio-demographic factors, nutrition knowledge, weight status, or dietary intake and DEB. More research with a larger sample size is needed to properly determine the factors associated with DEB. As there was a high percentage of DEB among Malaysian university students, it is important for related healthcare professionals and researchers to look into the issue to prevent the population from developing eating disorders.

ABSTRAK

TABIAT PEMAKANAN BERCELARU DAN PERKAITANNYA DENGAN FAKTOR SOSIO-DEMOGRAFIK, PENGETAHUAN NUTRISI, STATUS BERAT, DAN PENGAMBILAN MAKANAN ANTARA PELAJAR UNIVERSITI DI MALAYSIA

MUHAMMAD MUHAIMIN BIN MOHD AZLAN

Tabiat pemakanan bercelaru (TPB) adalah kerap dalam kalangan pelajar universiti di Malaysia. TPB juga diketahui untuk menyebabkan kesan pada jangka masa yang lama terhadap kesihatan golongan belia, iaitu golongan yang mempunyai risiko tinggi untuk mempunyai gangguan pemakanan. Walaupun terdapat banyak kajian berkenaan topik TPB beberapa faktor yang berkait didapati bercanggah. Oleh kerana itu, kajian keratan rentas ini dijalankan dengan tujuan untuk mengenal pasti kelaziman TPB dan perkaitannya dengan faktor sosio-demografik, pengetahuan nutrisi, status berat, dan pengambilan makanan dalam kalangan pelajar universiti di Malaysia. Peserta dilantik menggunakan kaedah bukan kebarangkalian persampelan bola salji. Borang soal selidik telah digunakan melalui platform atas talian untuk memperoleh faktor sosio-demografik dan data antropometri. Pengetahuan nutrisi diperoleh menggunakan *Nutrition Knowledge Questionnaire* berdasarkan Panduan Diet Malaysia 2010 dan pengambilan makanan pula diperoleh melalui temu bual sejarah pemakanan atas talian. TPB diperoleh melalui soal selidik EAT-26. Sebanyak 100 responden (60% perempuan dan 40% lelaki) telah menyertai kajian ini, manakala sub-sampel (n=33) telah ditemu bual untuk mendapatkan pengambilan makanan mereka. Min umur peserta ialah 22.32 ± 1.18 tahun. Hampir kesemua peserta adalah berbangsa Melayu (87%), daripada universiti awam (87%), dan mengambil ijazah sarjana muda yang tidak berkaitan dengan nutrisi (87%). Kebanyakan daripada mereka bertinggal di kawasan bandar (47%), dan dikategorikan dalam kumpulan pendapatan isi rumah sederhana (44%). Majoriti peserta mempunyai pengetahuan nutrisi yang bagus (94%) dan BMI yang normal (71%). Min jumlah pengambilan tenaga seharian peserta adalah 1530.73 ± 448.99 kcal. Peratusan yang tinggi daripada peserta mempunyai risiko TPB (34%). Tiada sebarang perkaitan yang signifikan didapati antara faktor sosio-demografik, pengetahuan nutrisi, status berat, dan pengambilan makanan terhadap TPB. Kajian lanjut dengan bilangan sampel yang lebih besar diperlukan untuk mengenal pasti faktor yang berkaitan dengan TPB dengan lebih baik. Oleh kerana peratusan TPB dalam kalangan pelajar university di Malaysia tinggi, amatlah penting untuk pekerja penjagaan kesihatan dan penyelidik untuk mendalami isu ini untuk mengelakkan daripada populasi tersebut daripada mempunyai gangguan pemakanan.

CHAPTER 1

INTRODUCTION

1.1 Study Background

Disordered eating behaviour (DEB) is defined as a spectrum of unusual eating behaviours that on their own, may not be enough to diagnose someone as having an eating disorder (Anderson, 2018). Pengpid and Peltzer (2018) reported that the prevalence of DEB among university students across 5 ASEAN countries was at an average of 11.5%, which Malaysia was included and had 13.8% prevalence. In another study done in Malaysia, DEB is common among university students, especially female students where 22.9% of the female students had DEB. In comparison, only 13.3% were present with DEB (Chin et al., 2020).

Kärkkäinen et al. (2019) stated that with DEB, it was found that there are long-term consequences for the health of young adults. In young adults, DEB was shown to correlate with worse physical and psychological health. In addition, DEB is proven to be associated with detrimental mental health problems in both male and female adolescents (Herpertz-Dahlmann et al., 2008). They reported that those with DEB had a significantly worse state of depression

and anxiety, although they were able to control their weight status. They also found that the children and adolescents with DEB admitted to having their quality of life disrupted due to their mental health issues related to DEB compared to the group without DEB.

The consequences of DEB are more detrimental among the obese group as compared to non-obese groups. In young obese women, it was found that this population has a high prevalence of DEB and is significantly correlated with an increasing rate of psychological distress (Darby et al., 2007). These obese women were engaged in dietary restraint, weight concern, eating concern, and shape concern, which were identified as specific eating disorder (ED) predictors of psychological distress. Furthermore, when comparing this group of obese women with non-obese young women, it was found that the former group has a significantly higher prevalence of depression and anxiety.

Body mass index (BMI) is a common screening tool used to calculate the ratio between weight and height and categorise a person's weight status based on the calculated ratio. It was reported that 1 in 2 of Malaysian adults was overweight or obese (National Institute of Health Malaysia, 2019). While for Malaysian university students, more than 20% of them were overweight and 17% were obese (Radzi et al., 2019). In previous studies, BMI has been found to be significantly associated with DEB. One study done in Malaysia found that people with higher BMI have a higher prevalence of having DEB than the lower BMI counterpart (Chin et al., 2020).

Nutrition knowledge is defined by Axelson and Brinberg (1992) as a scientific structure thanutrition instructors form to represent the image of a person’s process of thinking concerning food and nutrition information. It is commonly known that nutrition education is

important as having a good foundation in food and nutrition knowledge will lead to healthier food and lifestyle choices.

1.2 Problem Statements

National Institute of Health Malaysia (2019) reported in the National Health and Morbidity Survey 2019 that half of the Malaysian adults were overweight or obese. In Malaysia, a study was able to find that DEB is positively associated with BMI (Chin et al., 2020). As the trend of overweight and obesity prevalence seems to be increasing year by year, the consequential effect of that may cause an increase in DEB prevalence among Malaysians and lead to the development of eating disorders.

A study was conducted to understand the knowledge, attitude and practice of healthy eating and factors associated with healthy eating among university students in Selangor, Malaysia (Hassan et al., 2015). This study found that 26% of the participants had poor healthy eating knowledge, while 78% of the participants had unhealthy eating practices.

To the best of the researcher's knowledge, no study has been conducted that identifies the association between DEB and nutrition knowledge in Malaysia. Although some studies touched on the factors associated with DEB in Malaysia, none of these studies mentioned nutrition knowledge as one of the factors (Cheah et al., 2015; Chin et al., 2020; Chong et al., 2017; Leng, 2008). As for existing studies on the association between DEB and nutrition knowledge, the population of these studies more accurately represent athletes, as well as young adults living in the United States of America, United Kingdom, and Israel (Lubic, 2019;

Neumark-Sztainer et al., 1996; Wyon et al., 2014). Therefore, it is important to understand the prevalence of DEB and its association with socio-demographic profiles, nutrition knowledge, weight status and dietary intakes among Malaysian university students.

1.3 Significance of Study

This study was done in hopes of contributing to the body of knowledge in nutrition and dietetics related issues about DEB and university students. Besides that, this research will hopefully provide the expected findings that will be the baseline data for future studies, and the outcomes may inform other health professionals for planning and implementing any nutrition intervention program.

1.4 Research Questions

1. What is the prevalence of DEB among Malaysian university students?
2. Are there any associations between socio-demographic factors, nutrition knowledge, weight status, and dietary intake on DEB?

1.5 Objectives

General Objectives:

To determine the prevalence of DEB and its association with socio-demographic factors, nutrition knowledge, weight status and dietary intake among Malaysian university students.

Specific Objectives:

1.1 To determine the socio-demographic factors, nutrition knowledge, weight status and dietary intake among Malaysian university students.

2.1 To determine the prevalence of DEB among Malaysian university students.

3.1 To determine the associations between socio-demographic factors, nutrition knowledge, weight status, and dietary intake with DEB.

1.6 Alternative Hypothesis

There are significant associations between socio-demographic factors, nutrition knowledge, weight status, and dietary intake on DEB.

1.7 Conceptual Framework

This study hypothesised that there are associations between socio-demographic factors, nutrition knowledge, weight status, and dietary intake on DEB. Figure 1.1 is listed with the specific variables for socio-demographic factors and dietary intake. While previous studies found correlations between field of study (Korinth et al., 2009), household income (Hassan et al., 2015) and nutrition knowledge (Hassan et al., 2015) with DEB, other studies had different outcomes (Beumont et al., 1981; Castillo et al., 2015; Chin et al., 2020; Chong et al., 2017; Scagliusi et al., 2009; Z. Yu & Tan, 2016).

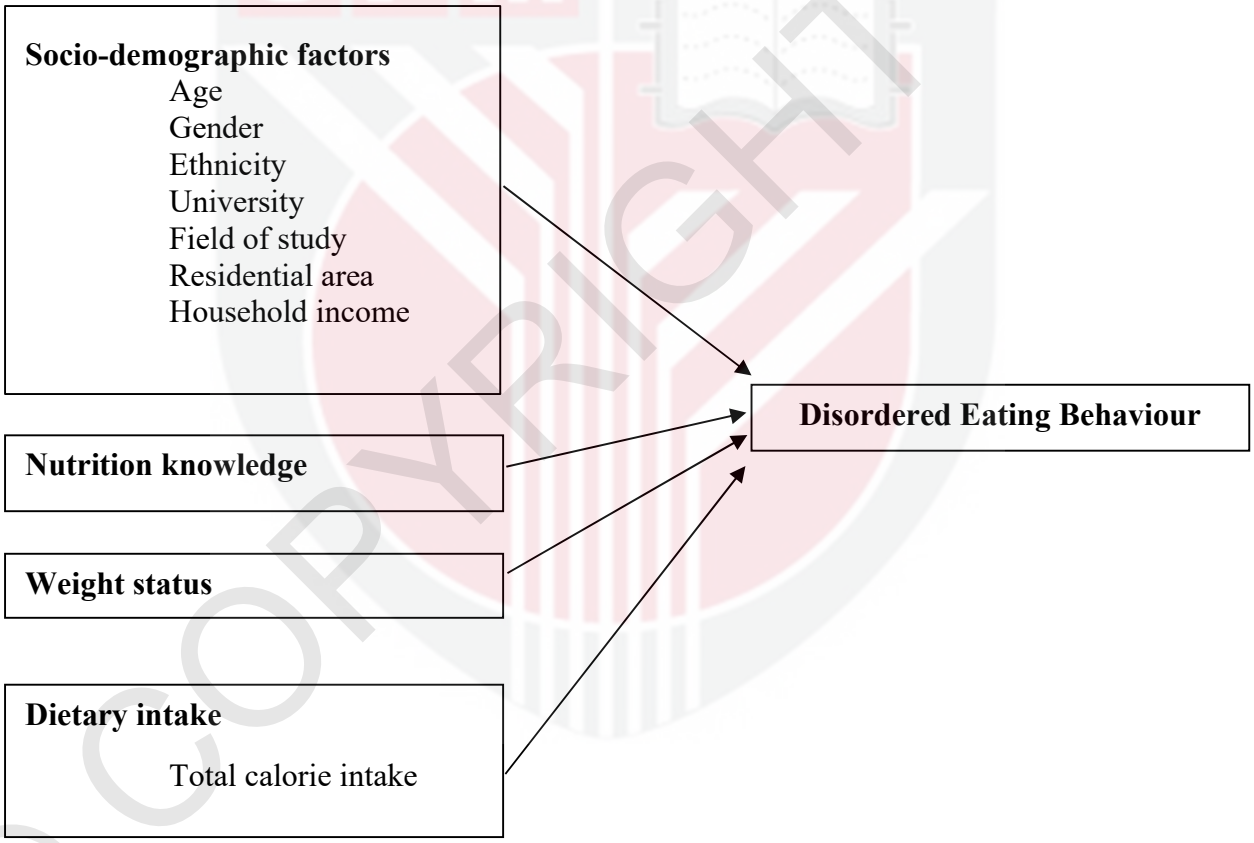

Figure 1.1 Conceptual Framework

CHAPTER 2

LITERATURE REVIEW

2.1 Disordered Eating Behaviour

The definition of DEB is a range of eating behaviours that are not normal; however, having these eating behaviours might not be sufficient to be diagnosed with an eating disorder (Anderson, 2018). As mentioned, the prevalence of DEB has been increasing in ASEAN countries (Pengpid & Peltzer, 2018). The study explained that within the 5 ASEAN countries studied, Yangon, Myanmar had the highest prevalence of DEB, though the reasons as to why were not determined and were predicted to be due to the quick changes of socio-culture in Myanmar. Overall, the study found that the increasing trend of DEB may be more prevalent in lower- and upper- middle-income countries in ASEAN.

Some examples of DEB may include but are not limited to binge eating, dietary restraint, emotional eating, disinhibition (lack of restraint), strict dieting, and controlling body weight and shape by engaging in dangerous compensatory behaviours. These examples of DEB have known risk factors for developing eating disorders (Kinzl et al., 1999; Quick & Byrd-

Bredbenner, 2013). The definition for eating disorders (ED) is constant DEB that can cause a change in the intake or absorption of food and physical or psychological dysfunction in a person (American Psychiatric Association, 2017). Signs of ED seem to start developing during adolescence and young adulthood, which can be explained by a period full of distress for instance, having to go to college or university and leaving the comfort of their home (Hoek, 2006; Hudson et al., 2007). The estimated prevalence of ED was found to range from 8% to 20.5% among students in their college years (Eisenberg et al., 2011; Hoerr et al., 2002; Tavolacci et al., 2015). It is critical for college students to undergo screening in order to detect early signs of ED or DEB. Late detection can result in prolonged engagement in undesirable eating practices such as dieting, fasting, vomiting, and laxative abuse, which can lead to the development of DEB (Striegel-Moore, 1997).

2.2 Socio-demographic Factors

2.2.1 Age

In terms of age, multiple studies suggest that the onset of eating disorders was found to be the highest during the period of late adolescence or early adulthood (Micali et al., 2013; Smink et al., 2012; Stice et al., 2013). In a study done by (Hudson et al., 2007) they found that the average age of people developing eating disorders was 18.9 years old, 19.7 years old and 25.4 years old for anorexia nervosa, bulimia nervosa and binge eating disorder, respectively. The finding of this study regarding the peak onset of eating disorders around the age of 18 to 25 years old may be relevant for university students in Malaysia as most undergraduate students are in that age range. In a study done by Chin et al. (2020), they found that age had an insignificant, negative correlation with DEB ($p = -0.05$).

2.2.2 Gender

Many studies suggest that factors associated with DEB are different between males and females. In university students, DEB is more prevalent among female students than male students (Araia et al., 2017; Chan et al., 2020; Chin et al., 2020). Chin et al. (2020) found that more than 20% of university students in Malaysia had DEB. To be more specific, female students had a higher prevalence of DEB (22.9%) as compared to male students (13.3%, $p < 0.05$). One of the possible reasons why females are more likely to have DEB than males is because the former tend to have a desire to be thinner or smaller sized, whereas males would prefer to be lean and bigger sized with more muscle (Beumont et al., 1981; Khor et al., 2009). Similar results were found in a study done among university students in the United Arab Emirates, where more females were not satisfied with the size of their body, and they wished to have weight loss compared to males who wished to have weight gain (Radwan et al., 2019). Another study done in Malaysia was able to find that female Malaysian undergraduate medical students had high acceptance of their body image (Manaf et al., 2016). However, this was associated with a higher risk of having eating disorders among these female students.

2.2.3 Ethnicity

Chin et al. (2020) had done a study in which ethnicity was one of the socio-demographic characteristics that act as one of the independent variables to DEB. In this study, they compared DEB among the three major ethnicities in Malaysia: Malay, Chinese, and Indian. The respondents were 55% Chinese, 34.9% Malay, 7.4% Indian and 2.7% other ethnicities (Indigenous people, Sabah Aborigines, and Sarawak Aborigines). It was found that there was a significant association between ethnicity and DEB ($r_s = -0.104$, $p < 0.05$). This finding was similar to other local studies (Chong et al., 2017; Gan et al., 2018; Rahim et al., 2019). However, the study mentioned that ethnicity cannot be used to significantly predict male and

female students having DEB. This meant that all Malaysian ethnicities are at risk of having DEB among university students.

Another study was done in Malaysia that assessed ethnicity as one of the socio-demographic characteristics found association between ethnicity and DEB among girls (Mellor et al., 2009). When comparing the three major ethnicities in Malaysia, Indian girls were more than five times more likely to have DEB, whereas Malay girls were almost four times more likely to have DEB, with Chinese girls as the standard. The prevalence of DEB in this study was 38.5% for the Indian girls, 34.1% for Malay girls, and 10.3% for Chinese girls. Malay and Indian adolescents were found to have a higher tendency to engage with weight loss behaviour than Chinese adolescents. The study also found that these Malay and Indian adolescents were given more pressure to lose weight from adults, older siblings, or cousins than Chinese adolescents. Hence, these reasons may explain why Chinese adolescents have a much lower prevalence of having DEB than Malay and Indian adolescents.

2.2.4 University type

Not many studies were found to determine the differences in DEB between public universities and private universities. A study done to compare factors associated with DEB between male and female Malaysian university students included type of university as one of their independent variables in the socio-demographic characteristics (Chin et al., 2020). However, the researchers did not go into detail on studying the differences between the two types of universities when it comes to DEB. This is because they only used the results from private universities as a reference to be compared to results from public universities to determine the variables predicting the individual type of disordered eating. Therefore, the only

information available was a negative correlation between the type of university and DEB for male students (r_s = -0.028), while the female students had a positive correlation between the type of university and DEB. However, both these correlations were found to be insignificant.

2.2.5 Field of study

There are inconsistent findings on whether nutrition students are free from the risk of developing DEB. Therefore, study was conducted to assess DEB among nutrition and non-nutrition major college students (Z. Yu & Tan, 2016). In this study, they analysed data from 961 respondents, of which 147 respondents were of nutrition and dietetics program, 136 respondents were of non-nutrition majors from Brooks College of Health, and 678 respondents were of other majors in the university. It was found that there was no significant difference between their study course and DEB across these three study groups.

In another study, it was found that the nutrition students reported having a higher prevalence of dietary restraint than the non-nutrition students (Korinth et al., 2009). However, there was a significant decrease in the prevalence of dietary restrains among nutrition students and non-nutrition students at their 7th and higher semester. They also found significant improvement in food selection within the nutrition students at the end of their study programme, while for the control group, the food selection worsened.

2.2.6 Residential area

A study was done in South Africa to examine the relationship between body image, eating attitudes, BMI, and physical activity in young adult females living in rural and urban areas (Prioreschi et al., 2017). They recruited 509 participants living in rural areas and 510

participants living in urban areas, in which the participants are females between the age of 18 and 23 years. They found that the participants living in urban areas had a higher prevalence of being overweight and obese than those living in rural areas ($p = 0.02$) and stronger desire to be thin ($p = 0.02$). Besides that, both urban and rural groups that are either overweight or obese had a positive association with wanting to be skinny ($p < 0.01$) and had a negative association of wanting to be fat ($p < 0.01$). There was an association between dissatisfaction with their body image and a disordered eating attitude within the urban group ($p < 0.01$).

2.2.7 Household income

In a study done among Malaysian university students to determine the knowledge, attitude, and practice of healthy eating and its associated factors, they studied household income(Hassan et al., 2015). In the study, they divided household income into three different categories: high (>RM10000), middle (RM3000-RM10000), and low (<RM3000). They found that the only factor that had a significant association with healthy eating practice was household income ($p = 0.33$). Specifically, families with low household income were found to have good healthy eating practices compared to high and middle household income families. The explanation for this finding is that these students from high and middle household incomes tend to buy food luxuriously from restaurants and stalls as they can afford to do so. This habit may influence their daily dietary habit. Therefore, the authors concluded that more research is needed to find the best strategy to improve the healthy eating practices of Malaysian university students from high and middle household income families.

However, the finding from Hassan et al. (2015) was not consistent with another study done in Malaysia. In a study done to determine the associations between socio-demographic characteristics and pubertal status with disordered eating among primary school children in

Selangor, Malaysia, it was found that in both gender groups, there were no significant differences in parental monthly income and socio-economic status between those with and without disordered eating (Chong et al., 2017).

2.3 Nutrition Knowledge

A study was conducted to understand the knowledge, attitude and practice of healthy eating and factors associated with healthy eating among university students in Selangor, Malaysia (Hassan et al., 2015). This study found that 26% of the participants had poor healthy eating knowledge, while 78% of the participants had unhealthy eating practices. This study also found that the female students showed significantly higher knowledge related to healthy eating than the male students. Hence, although most Malaysian university students here showed good healthy eating knowledge, this does not reflect their eating practices.

In another study that did a comparison between nutritional knowledge, eating attitudes and chronic dietary restraint scores among patients with eating disorders (bulimia nervosa and anorexia nervosa), they mentioned that in a clinical setting, patients with eating disorders tend to consider themselves to be an expert when it comes to nutrition (Scagliusi et al., 2009). This is because they have read multiple books and magazines regarding diets. Even so, these patients were also found to be following misguided beliefs and myths on this topic. Other studies also found similar results in which patients with eating disorders had higher nutritional knowledge as compared to healthy people without eating disorders (Beumont et al., 1981)

Nutritional awareness was found to be significantly associated with disordered eating attitudes and behaviours, according to some studies. In a study done to compare basic nutrition

knowledge between adolescents with eating disorders and their parents, and adolescents without eating disorders and their parents, it was found that the former study group had a significantly higher correct responses as compared to the latter study group (Castillo et al., 2015). However, both study groups were unable to answer more than half of the questions correctly. This shows that there is insufficient basic nutrition knowledge among adolescents with and without eating disorders and their parents. These adolescents with ED and their parents were able to score higher than the control group when answering energy expenditure questions, although they did have a low score on the appropriate food composition of daily caloric intake. Consequently, this can increase the risk of prolonged negative energy balance due to misinformation.

2.4 Weight Status

A study done to compare the factors associated with DEB between male and female Malaysian university students by Chin et al. (2020) found significant differences in terms of BMI when comparing between the two genders. The results showed that the female students had lower BMI than the male students, where only 13.3% of the female students were either overweight or obese compared to 21.9% of the male students. For the extreme opposite end of the weight status, more female students (16.7%) were present to be underweight compared to male students (8.2%). Considering the BMI of the two gender groups, the female students were also found to achieve a higher mean score than the male students in the EAT-26 questionnaire. This meant that the female students were more likely to engage in DEB than their male counterparts. However, this does not necessarily mean that female students with lower BMI have a higher risk of having DEB than male students with higher BMI. The study discovered the opposite where BMI had a significant, positive correlation with DEB ($r = 0.094$, $p < 0.05$), meaning that this study suggested that people with higher BMI are at risk of having DEB

compared to people with lower BMI. Other studies seem to have the same finding where BMI is positively correlated with DEB (Liao et al., 2010; Madanat et al., 2006; Makino et al., 2006; Pengpid & Peltzer, 2018; Rouzitalab et al., 2015; Suhail & Zaib-U-Nisa, 2002).

2.5 Dietary Intake

2.5.1 Total calorie intake

A study had an objective to study the relationship between eating disorders and calorie intake (Zambrowicz et al., 2017). The researchers collected data of 183 participants that had participated from six previously published studies or that are currently participating in two eating behaviour studies which are still ongoing. In those other studies, the participants had answered the Three Factor Eating Questionnaire (TFEQ) and Eating Disorders Examination Questionnaire (EDE-Q). The participants were people suffering from either anorexia nervosa or bulimia nervosa, as well as healthy people used as the control group. From there, they had analysed the association between TFEQ scores, EDE-Q scores, and calorie intake. Both of the questionnaires were used to study the symptoms of eating disorder. The TFEQ focused on the cognitive restraint of eating, disinhibition, and hunger as the symptoms of eating disorders, while the EDE-Q focused on restraint, eating concern, shape concerns, and weight concerns. The finding of the study claimed that there was a significant negative correlation between the total calorie intake of the participants and their scores on restraining symptoms from the TFEQ ($r = -0.60$, $p < 0.001$) and the EDE-Q ($r = -0.54$, $p < 0.001$). In other words, the lower the total calorie intake of the participants, the higher the prevalence of DEB among these participants.

CHAPTER 3

METHODOLOGY

3.1 Study Design

The design of this study is cross-sectional. A cross-sectional study is designed to be performed at a single point in time where it is commonly used to determine the prevalence of the favourable outcome (Levin, 2006). One of the advantages of using a cross-sectional design for this study is that it is suitable to compare multiple variables simultaneously. other advantage of using a cross-sectional study is that it requires not much time to perform and is considerably cheap. It is also beneficial when used correctly to determine the aetiology of a disease, produce research hypotheses, and plan for a public health program.

3.2 Study Location

The study was done through online platforms among public and private university students in Malaysia.

3.3 Sample Size

To determine the minimum sample size in this cross-sectional study, two formulae were needed; one formula was for the prevalence part of the study, while the other formula was for the correlation part of the study.

To study the prevalence, the sample size was determined using the following formula (Daniel, 1999):

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where n = sample size,

Z = Z statistic for level of confidence = 1.96

P = expected prevalence or proportion

d = precision = 0.05

On the other hand, to study the correlation, the sample size was determined using the following formula (Hulley et al., 2013):

$$N = \left[\frac{Z_\alpha + Z_\beta}{C}\right]^2 + 3$$

Where Z_α = the standard normal deviate for α = 1.96

Z_β = the standard normal deviate for β = 0.84

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

r = the expected correlation coefficient

Table 3.1 and Table 3.2 show the calculation for the minimal sample size for this study. When comparing the calculations for each variable, it was found that the highest number of

participants needed to provide significant findings was 160 participants. However, assuming that there were going to be unacceptable responses to be excluded out from the study due to missing data or data coming from participants who were from the exclusion criteria, an additional of 10% participants should suffice to replace the unacceptable responses. Therefore, the final minimum sample size was 176 participants.

Table 3.1 Sample Size Calculation of Prevalence Study

Prevalence study	**Expected prevalence, *P***	**Sample size, *n***
Prevalence of disordered eating (J. Yu et al., 2015)	Male, $P = 0.053$ Female, $P = 0.04$	$n = 77.12 \sim 77$ $n = 59$

Table 3.2 Sample Size Calculation of Correlation Study

Correlation study	**Correlation coefficient, r**	**Sample size, *n***
BMI and DEB (Verzijl et al., 2018)	r = 0.22	$n = 159.7 \sim 160$
Total daily calorie intake and DEB (Zambrowicz et al., 2017)	r = -0.538	$n = 24.68 \sim 25$
Nutrition knowledge (Wyon et al., 2014)	Male, r = -0.624 Female, r = -0.492	Male, $n = 17.65 \sim 18$ Female, $n = 30.01 \sim 30$

3.4 Sampling Method

Non-probability snowball sampling method was for this study. To reach the minimal sampling size, the researcher used his social networks to recruit participants and get the

following participants to share the survey with their friends and families currently enrolled in public or private Malaysian universities. However, note that not all universities were represented in the collection of data.

3.5 Inclusion and Exclusion Criteria

The inclusion criteria of the participants in this study were: 1) current undergraduate university students (public or private), 2) understands English or Malay, 3) Malaysian, 4) aged 18 years old and above, and 5) male or female. While for exclusion criteria, students who were present with any chronic diseases (excluding obesity) was excluded from the study.

3.6 Study Instruments

3.6.1 Socio-demographic factors

To collect the socio-demographic information of participants, a self-developed questionnaire was used through an online survey. The questions that were included in the socio-demographic characteristics were age, gender, ethnicity, university, study course name, residential area, and household income.

3.6.2 Self-reported weight and height

Participants were required to provide their self-reported weight and height. Using the information provided by the participants, the weight status of participants was collected by calculating the BMI which was by the researcher. The most common way to measure weight status is by using the Body Mass Index (BMI). To determine a person's BMI, the person's weight (in kilograms) is divided by the square of height (in meters). In general, the

classification of weight status for adults was divided into 4 categories: 1) underweight (BMI < 18.5 kg/m^2), 2) normal weight (BMI between 18.5 and 24.9 kg/m^2), 3) overweight (BMI between 25 and 29.9 kg/m^2

3.6.3 Nutrition knowledge

To assess the nutrition knowledge of participants, a self-administered questionnaire used by Hassan et al. (2015) to study the knowledge, attitude, and practice of healthy eating and its associated factors among Malaysian university students in Selangor was adopted in this study survey. From the study, the questionnaire that they used was adopted from the Ministry of Health in their Malaysia's Healthy Lifestyle Campaign 1997. The authors also adapted some of the questionnaire items from the Malaysian Dietary Guideline 2010 published by Malaysia's Ministry of Health. Upon assessment, the questionnaire that they used consisted of four parts. The only part of the questionnaire that was adapted into this study was the knowledge on healthy eating. The participants had to give their response to the 13 statements in the questionnaire with "true", "false, or "do not know". One example from the statements was "based on the food pyramid, rice, noodle, bread, cereals, and tubers are recommended to be taken between 8 to 11 servings per day". The authors scored the questionnaire by categorising the participants who were able to score 50% and above as having good knowledge on healthy eating, while those who scored below 50% were considered to have poor knowledge of healthy eating. Participants were given 1 mark for answering questions correctly for each question, while 0 mark were given for answering the questions incorrectly or with "do not know". The author pretested the questionnaire, and it had a low Cronbach's alpha score of 0.4. However, the Cronbach's alpha score referred to all four parts of the questionnaire, not just for the knowledge on the healthy eating part. Therefore, reliability and internal consistency were tested during data analysis.

3.6.4 Dietary intake

This study used the diet history method, specifically usual food intake, to assess participants' dietary intake. The researcher scheduled an online interview through Google Meet for participants to have their dietary intake assessed. The use of video or voice call was determined by the need for demonstration and illustration of common household measurements in order to obtain more accurate data.

3.6.5 Disordered eating behaviour

To assess DEB, the Eating Attitudes Test-26 (EAT-26) was used (Garner et al., 1982). The EAT-26 questionnaire consists of 3 components; the first component requires the participants to answer regarding their personal information (birth date, gender, height, and weight), the second component consists of the actual EAT-26 questions, and the last component requires the participants to answer behavioural symptoms that reflect eating disorder. However, only the second component of the questionnaire was used to assess DEB among the participants as the first and last components were irrelevant. For the second component of the questionnaire, the EAT-26 items assess 3 subscales that reflect on eating disorder symptoms: 1) dieting, 2) bulimia and food preoccupation, and 3) oral control. A score of 20 and above shows high concern levels of participants towards dieting, body weight and harmful eating behaviours. The EAT-26 questionnaire was validated and checked for reliability, with the overall Cronbach's alpha was at 0.83.

3.7 Ethics Approval

Before conducting the study, the application for ethical approval was acquired from the Ethics Committee Research Involving Human Subjects, Universiti Putra Malaysia (JKEUPM).

Furthermore, the consent of participants was acquired through written informed consent from the participants, ensuring that their confidential information should be protected, and their identity remained anonymous.

3.8 Pretesting

Prior to conducting the study, pretesting was done to determine the reliability and validity of the study instruments. Pretesting was done on 18 participants, which was roughly 10% of the sample size and the data from the pretesting was not included in the study.

3.9 Data Collection

Data collection was conducted from June to July of 2021. Participants answered the survey online and were recruited through the researcher's social network (friends and families). The researcher encouraged the first group of participants to promote the study survey to their friends and families to achieve the minimal sampling size. That procedure continued until the researcher was able to gather enough data to find significant findings.

3.10 Data Analysis

IBM SPSS Statistics version 26 was used for the data analysis, with significance level set at $p<0.05$. The data were presented by means and standard deviations (SD) for continuous variables and frequencies and percentages for categorical variables. For bivariate analysis, the associations between the categorical independent variables (gender, ethnicity, university type, field of study, residential area, household income, nutrition knowledge and weight status) and the categorical dependent variable, DEB, were tested using the Chi-square test of independence and Fisher's exact test. Besides that, Mann-Whitney U test was used to determine differences

between those with DEB risk and those without DEB risk on their total calorie intake. Lastly, Kendall's tau-b test was used to determine the associations between continuous independent variable, age, and categorical dependent variable, DEB.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Socio-demographic Characteristics

Table 4.1 shows the distribution of socio-demographic characteristics among the participants. There was a total of 100 participants whose data was accepted as they passed the inclusion and exclusion criteria, which meant that 62.5% of calculated sample size was achieved. Sixty percent of participants were females while forty percent were males. The differences between the number of participants between both genders can be explained by the gender gap in terms of enrolment of male students in Malaysia (Tienxhi, 2017). The mean age of the participants was 22.32 ± 1.18 years old, with the participants ranging from 20 to 25 years old. A majority of the participants (87%) were Malay, followed by Chinese (9%) and Indian (4%). Most of the participants (87%) were students from public universities, and only a few (13%) were from private universities. This may not justifiably represent students from the public and private universities as out of 1.3 million Malaysian university students, 500,000 were enrolled in 20 of the public universities in Malaysia and more than 600,000 were enrolled in private universities (Tapsir, 2019). Most of the participants (87%) were taking non-nutrition

related degree programs, while only a few (13%) were taking nutrition related degree programs. There were more participants (47%) living in urban areas as compared to those (42%) living in suburban areas, while the participants (11%) living in rural areas were the least. Forty-four percent of participants were from middle household income category (RM 3,000 – RM 10,000), while thirty-seven percent were from low household income category (<RM 3,000), and nineteen percent were from high household income category (>RM 10,000). The finding was relatively congruent with a local study with a similar method of household income categorisation (Hassan et al., 2015).

Table 4.1 Distribution of Participants According to Socio-demographic Characteristics (*n*=100)

Variable	n (%)	Mean ± SD	Range
Age (years)		22.32±1.18	20-25
20	6 (6)		
21	15 (15)		
22	41 (41)		
23	21 (21)		
24	13 (13)		
25	4 (4)		
Gender			
Female	60 (60)		
Male	40 (40)		
Ethnicity			
Malay	87 (87)		
Chinese	9 (9)		
Indian	4 (4)		
Others	0 (0)		
University type			
Public	87 (87)		
Private	13 (13)		
Field of study			
Nutrition-related	13 (13)		
Non-nutrition related	87 (87)		

Table 4.1 (Cont.) Distribution of Participants According to Socio-demographic Characteristics (*n*=100)

Variable	n (%)	Mean ± SD	Range
Residential area			
Urban	47 (47)		
Suburb	42 (42)		
Rural	11 (11)		
Household income			
Low (<RM 3,000)	37 (37)		
Middle (RM 3,000 – RM 10,000)	44 (44)		
High (>RM 10,000)	19 (19)		

4.2 Nutrition Knowledge

Table 4.2 depicts the distribution of nutrition knowledge among the participants. Most of the participants (94%) were found to have good nutrition knowledge, while only (6%) had poor nutrition knowledge. This finding was comparatively higher than what Hassan et al. (2015) found. The mean score of the participants on the nutrition knowledge questionnaire was 9.44 ± 1.95, ranging from 4 to 13. This difference in finding could be due to the recruitment of participants where this study had a large sum of participants coming from medical or health sciences university degrees. Hence, this may result in a higher percentage of participants with good nutrition knowledge as these participants may have basics in nutrition knowledge.

Table 4.2 Distribution of Participants According to Nutrition Knowledge (*n* =100)

Variable	n (%)	Mean ± SD	Range
Nutrition Knowledge		9.44±1.95	4-13
Poor	6 (6)		
Good	94 (94)		

4.3 Anthropometry Data

Table 4.3 shows the distribution of participants according to their anthropometric data. The mean height of the participants was 162.60 ± 9.22 cm. The mean weight of the participants was 59.27 ± 12.69 kg. A majority of the participants (71%) were found to have normal BMI, followed by overweight (12%), underweight (11%) and obese (6%). This finding was almost similar to a local study (Chin et al., 2020).

Table 4.3 Distribution of Participants According to Anthropometry Data (*n* =100)

Variable	n (%)	Mean ± SD	Range
Height (cm)		162.60±9.22	145-189
Weight (kg)		59.27±12.69	35-107
BMI (kg/m^2)		22.32±3.83	16.22-35.15
Underweight	11 (11)		
Normal	71 (71)		
Overweight	12 (12)		
Obese	6 (6)		

4.4 Total Calorie Intake

Table 4.4 depicts the total calorie intake of the participants. The mean total calorie intake of the participants was 1530.73 ± 448.99 kcal, ranging from 808 to 2568 kcal. This finding is relatively similar to a local study where they reported their participants' mean total calorie intake is 1662 ± 518 kcal (Cheng & Kamil, 2020).

Table 4.4 Participants' Total Calorie Intake (*n* =33)

Variable	Mean ± SD	Range
Total calorie intake (kcal)	1530.73±448.99	808-2568

4.5 Disordered Eating Behaviour

Table 4.5 shows the distribution of participants according to DEB. Thirty-four percent of participants were found to be at risk of having DEB, while sixty-six percent were not at risk of having DEB. The mean EAT-26 score of participants was 17.03 ± 10.17, ranging from 1 to 56. This finding of having 34% of participants having risk of DEB is considered high compared to a local study where they reported 20.3% of their participants had DEB (Chin et al., 2020). A possible reason why the finding was different could be due to psychological distress caused by the COVID-19 lockdown which was found to be significantly associated with DEB (Ramalho et al., 2021).

Table 4.5 Distribution of Participants According to Disordered Eating Behaviour (*n* =100)

Variable	n (%)	Mean ± SD	Range
Disordered Eating Behaviour, EAT-26		17.03±10.17	1-56
At risk	34 (34%)		
Not at risk	66 (66%)		

4.6 Associations between Socio-demographic Factors and Disordered Eating Behaviour

Table 4.6 shows the associations between socio-demographic factors and DEB. There was an insignificant negative correlation found between age and DEB. This finding was found to be consistent with several other studies (Chin et al., 2020; Z. Yu & Tan, 2016). As the range of age of participants is only five years, this may be a reason why no significant correlation was found. Besides that, no significant association was found between gender and DEB. However, this finding contradicts multiple studies where they found females are much more likely to have DEB than males (Araia et al., 2017; Chan et al., 2020; Chin et al., 2020). Several studies found that females have a higher tendency to develop DEB as they tend to have a higher desire to be thinner or smaller sized (Beumont et al., 1981; Khor et al., 2009). There was also

no significant association found between ethnicity and DEB. This finding is different from other studies where they found that different ethnicities have different risks of having DEB (Chin et al., 2020; Mellor et al., 2009). Mellor et al. (2009) found that within the participants of their study, the Indian girls were five times more likely to have DEB, while the Malay girls were four times more like to have DEB, with the Chinese girls set as the standard. It was mentioned that the possible reason for that is that the Indian and Malay girls felt more pressured to lose weight from adults or relatives than the Chinese counterpart. Therefore, the difference in finding could be because of a small number of participants representing the non-Malay ethnicities. Furthermore, no significant association between the type of universities that the participants attend to and DEB, which was consistent with previous local study (Chin et al., 2020). Apart from that, the field of study was also found to not have any significant association with DEB which was consistent with a previous study (Z. Yu & Tan, 2016). However, this finding contradicts with another study where they found that the students enrolling in a nutrition university degree had significantly higher prevalence of DEB as compared to those enrolling in other degrees (Korinth et al., 2009). Next, no significant association was found between residential area or participants and DEB, which contradicts a study where they found that the participants living in urban areas had a significantly higher prevalence of having DEB (Prioreschi et al., 2017). They mentioned that the females living in rural areas have a higher risk of developing DEB as it was associated with the desire to be fatter; however, this study was done in South Africa where the people living in rural areas might reflect having lower income and food insecurity. Hence, this reasoning might not reflect Malaysian women in rural areas. For household income, no significant association was also found between household income and DEB. This finding was consistent with a study where there was no significant difference in household income between those with and without DEB (Chong et al., 2017).

Hence, this finding suggests that the prevalence of DEB occurs equally among different income levels.

Table 4.6 Associations between Socio-demographic Factors and Disordered Eating Behaviour (*n*=100)

Variable	Disordered Eating Behaviour risk		χ^2	*r*-value	*p*-value
	No (n = 66)	At risk (n = 34)			
Age				-0.023[c]	0.805
Gender			2.406[a]		0.121
Male	30 (75%)	10 (25%)			
Female	36 (60%)	24 (40%)			
Ethnicity					0.621[b]
Malay	57 (65.5%)	30 (34.5%)			
Chinese	7 (77.8%)	2 (22.2)			
Indian	2 (50%)	2 (50%)			
University type					0.209[b]
Public	55 (63.2%)	32 (36.8%)			
Private	11 (84.6%)	2 (15.4%)			
Field of study					0.209[b]
Nutrition-related	11 (84.6%)	2 (15.4%)			
Non-nutrition related	55 (63.2)	32 (36.8%)			
Residential area					0.754[b]
Urban	29 (61.7%)	18 (38.3%)			
Suburb	29 (69%)	13 (31%)			
Rural	8 (72.7%)	3 (27.3%)			
Household income			5.674[a]		0.059
Low (<RM 3,000)	23 (62.2%)	14 (37.8%)			
Middle (RM 3,000 – RM 10, 000)	34 (77.3%)	10 (22.7%)			
High (>RM 10,000)	9 (47.4%)	10 (52.6%)			

[a] Chi-square test
[b] Fisher's Exact test
[c] Kendall's Tau B

4.7 Associations between Nutrition Knowledge and Disordered Eating Behaviour

Table 4.7 illustrates the association between nutrition knowledge and DEB. There was no significant association found between nutrition knowledge and DEB. This finding contradicts with multiple studies, where they found that patients with DEB risk had significantly higher nutrition knowledge compared to those without DEB risk (Beumont et al., 1981; Castillo et al., 2015; Scagliusi et al., 2009). Scagliusi et al. (2009) also found that the patients with eating disorders had lower nutrition knowledge scores than nutrition students. Hence, they speculated that although these patients with ED have good knowledge in terms of number of calories in food, as well as different types of diets, they may not have much knowledge on nutrition which could be a factor to their predisposition to DEB. Adolescents with ED often do not study enough on the diet that they are planning to adopt, hence causing them to be unaware of not consuming enough calories, vitamins, and minerals (Patton et al., 1997).

Table 4.7 Association between Nutrition Knowledge and Disordered Eating Behaviour (*n*=100)

Variable	Disordered Eating Behaviour risk		χ^2	*r*-value	*p*-value
	No (n = 66)	At risk (n = 34)			
Nutrition Knowledge					1.000[b]
Poor	4 (66.7%)	2 (33.3)			
Good	62 (66%)	32 (32%)			

[b] Fisher's Exact test

4.8 Associations between Weight Status and Disordered Eating Behaviour

Table 4.8 displays the association between weight status and DEB. This study found no significant association between weight status and DEB. However, this finding was inconsistent

with multiple studies, where they found significant positive correlation between weight status and DEB (Chin et al., 2020; Liao et al., 2010; Madanat et al., 2006; Makino et al., 2006; Pengpid & Peltzer, 2018; Rouzitalab et al., 2015; Suhail & Zaib-U-Nisa, 2002). Having higher BMI may increase the risk of having DEB as those being overweight or obese, as well as having poor body weight perception could lead to unhealthy mental status, which is associated with DEB (Pengpid & Peltzer, 2018).

Table 4.8 Association between Weight Status and Disordered Eating Behaviour (*n*=100)

Variable	Disordered Eating Behaviour risk		χ^2	*r*-value	*p*-value
	No (n = 66)	At risk (n = 34)			
Weight Status					0.98[b]
Underweight	10 (90.9%)	1 (9.1%)			
Normal	47 (66.2%)	24 (33.8%)			
Overweight	5 (41.7%)	7 (58.3%)			
Obese	4 (66.7%)	2 (33.3%)			

[b] Fisher's Exact test

4.9 Associations between Total Calorie Intake and Disordered Eating Behaviour

Table 4.9 depicts the association between total calorie intake and DEB. This study found no significant difference in total calorie intake between participants at risk and not at risk of DEB. This finding contradicts a study that found a significant negative correlation between total calorie intake and DEB, which meant that the lower the total calorie intake a person has, the higher the risk of developing DEB (Zambrowicz et al., 2017). The difference in finding may be explained by the small and insufficient sample data of participants' total calorie intake that was obtained for this study.

Table 4.9 Association between Total Calorie Intake and Disordered Eating Behaviour (*n*=33)

Variable	Disordered Eating Behaviour risk		χ^2	*r*-value	*p*-value
	No (n = 22)	At risk (n = 11)			
Total calorie intake (kcal)	1625 ± 471	1339 ± 341			0.076[d]

[d] Mann-Whitney U test

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, there was a high prevalence of DEB among Malaysian university students. Besides that, most of the participants had good nutrition knowledge based on the questionnaire used. Although a significant association between nutrition knowledge and DEB was not found, further research may be needed as multiple studies have found that those with DEB had significantly higher nutrition knowledge. Hence, it may be necessary to study the type of nutrition knowledge that this group has, such as estimating the number of calories a food has or the number of calories, macronutrients, and micronutrients a person needs. This may provide a deeper insight into why people still develop DEB despite having good nutrition knowledge. Furthermore, a high percentage of participants did not have normal weight status, it may be significant to study the possible factors causing their weight status not to be optimal. All in all, the study found no significant association between any of the socio-demographic factors, nutrition knowledge, weight status, and dietary intake on DEB.

5.2 Strengths

One of the strengths of this study is that this study prepared the survey questionnaire in English and Malay to help the participants understand the content of the questionnaire and help the participants provide more accurate responses. This gave the participants options to choose from and reduced the participants' burden in answering the survey.

Besides that, the sample population was designed to involve students from all public and private universities in Malaysia. Therefore, this would have provided more accurate data to represent the whole country of Malaysia as the participants would be coming from different universities in different states.

Another advantage to this study is that it used diet history interviews to collect the participants' information on their dietary intake. This is an advantage as it reduces the burden of the participants of having to record their dietary intake if the method of acquiring their dietary intake is through food records or food diaries. Besides that, it may have also avoided more inaccurate reporting of the participants as they may not understand the proper way of recording their food intake using other methods such as food diary and food frequency questionnaire. Although diet history may have been more burdensome, underreporting could be reduced as the researcher could ask for the specifics of the participants' dietary intake to avoid missing any details.

5.3 Limitations

Several limitations were identified when conducting this study. One of the limitations was due to the restriction of COVID-19 pandemic, the chosen sampling and data collection method was not optimal in achieving the appropriate sample size, as well as obtaining optimal representatives from different socio-demographic groups. Hence, this could be the reason why none of the factors studied were found to be significantly associated with DEB. This also meant that this study might not be suitable to be used to generalise to the population of the country. Besides that, the use of self-administered questionnaire may have increased the risk of bias in the self-reported responses of the participants. Furthermore, the use of the Nutrition Knowledge Questionnaire developed by Hassan et al. (2015) which had low reliability with Cronbach's alpha of 0.4 may have subjugated to the overestimation of participants' nutrition knowledge. Apart from that, there might be risk of inaccurate total calorie calculation due to the chances of inconsistency in the diet history method done by the researcher. Finally, there is also a risk of underreporting or overreporting of participants during the diet history interview.

5.4 Recommendations

It is recommended that future studies use a questionnaire with higher reliability and internal consistency to provide more reliable data for the study. Future studies should also include the distribution of carbohydrates, protein, and fat in the dietary intake as independent variables to study the factors associated with DEB. The dietary intake should also be compared with the recommendations to RNI to determine if the participants are achieving the necessary daily recommended nutrients. Lastly, a better sampling and data collection method should be used to achieve enough sample size to provide a more accurate finding.

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APPENDICES

APPENDIX A
JKEUPM LETTER OF APPROVAL

Ref. no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM)
Date: 17 June 2021

Dear Prof./Dr./Mr./Ms.,

APPLICATION FOR JKEUPM ETHICAL CLEARANCE: APPROVED

With reference to the above, I am pleased to inform you that your application for ethical clearance for the research project entitled **'Prevalence of Disordered Eating Behaviour and its Association with Sociodemographic Factors, Nutrition Knowledge, Weight Status and Dietary Intake among Malaysian University Students'** has been approved.

Please note that the official letter of approval will be issued as soon as possible. However, the ethical clearance is considered effective from the date of this email, and you may now proceed with your research.

Kindly remind the ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Researchers should also complete a Study Final Report upon study completion. The form can be obtained from the Ethics Committee for Research Involving Human Subjects (JKEUPM) website (http://www.tncpi.upm.edu.my/faildokumen).

If you have any enquiries, please contact Ms. Nurulhasanah Ishak (03-97691605) or Ms. Nor Ellia Abd Ajis (03-97691244).

Note: Please use this reference number for any transaction.

- JKEUPM-2021-274

Thank you.

Yours faithfully,

Prof. Dr. Zamberi Sekawi
Chair
Ethics Committee for Research Involving Human Subjects
Universiti Putra Malaysia

APPENDIX B
INFORMATION SHEETS

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

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

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

1. STUDY TITLE:

Prevalence of disordered eating behaviour and its association with socio-demographic factors, nutrition knowledge, weight status, and dietary intake among Malaysian university students.

2. INTRODUCTION:

The purpose of this study is to examine the prevalence of disordered eating behaviour and its association with socio-demographic factors, nutrition knowledge, weight status and dietary intake among Malaysian university students. The main reason to perform this study is because a majority of Malaysian university students practice unhealthy eating habits despite having good healthy eating knowledge. Therefore, it may be beneficial to conduct this study to help understand what are the other factors that may be related to disordered eating behaviour. This research will help in contributing to the body of knowledge in nutrition and dietetics related issues regarding disordered eating behaviour among university students. The result of this research will also serve as a baseline for future related studies, as well as inform other health professionals in planning and implementing an intervention program.

3. WHAT WILL YOU HAVE TO DO?

After reading this information sheet, please sign at the end of this form as an indication that you agree to participate in this study voluntarily. There are no invasive measurements involved as only questionnaires and a video or a voice call interview will be used in this study. ***The questionnaire consists of five (5) sections: section A (socio-demographic), B (anthropometry), C (nutrition knowledge), D (disordered eating behaviour), and E (dietary intake interview).*** The questionnaires will be administed online through Google Forms, while the video or voice calls will be on Google Meet. You may contact this number through the Whatsapp application or phone call for any clarification: 018-3700630.

Answering the questionnaire will take about 10 minutes and the video or voice call interview will take about 15 minutes.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

You **SHOULD NOT** be taking part in this study if you are:

(1) Non-Malaysian

(2) Present with any chronic diseases (excluding obesity)

5. WHAT WILL BE THE BENEFITS OF THE STUDY?

(a) TO YOU AS THE SUBJECT?

You will get to know your total daily calorie intake, as well as the composition of your daily intake.

(b) TO THE INVESTIGATOR?

The findings of this study will be useful to determine the prevalence of disordered eating behaviour among Malaysian university students. Furthermore, this study will allow the investigator to determine the associations between demographic factors, nutrition knowledge, weight status, and dietary intake with disordered eating behaviour. The data will be used to fill the gap in knowledge of the scientific world, help relevant authorities to improve on existing guideline

6. WHAT ARE THE POSSIBLE RISKS?

There are no foreseeable risks to you with your participation in this study as data collection is done through online means and all the assessments are non-invasive.

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

Yes, all the information and your identity will remain strictly confidential and will only be used for academic purposes.

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

If you have any questions regarding this study and require more in-depth explanation, please feel free to contact the researcher of this study, Muhammad Muhaimin Bin Mohd Azlan using the following number: 018-3700630 or email at muhaiminazlan@gmail.com. You may also contact the supervisor, Dr Zuriati Binti Ibrahim through the email zuriatiib@upm.edu.my.

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

APPENDIX C
CONSENT FORM

9. CONSENT

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

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

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

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

*delete where necessary

Signature ……..……. Signature ……..…….
(Respondent) (Witness)

Date :…….. Name :……..…..

I/C No. :……..…..

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

Date ……..…… Signature ……..……..
(Researcher)

APPENDIX D
QUESTIONNAIRE

FACULTY OF MEDICINE AND HEALTH SCIENCES

DEPARMENT OF DIETETICS

Questionnaire

Research Title:

Prevalence of disordered eating behaviour and its association with socio-demographic factors, nutrition knowledge, weight status and dietary intake among Malaysian university students.

Kelaziman tabiat makanan bercelaru dan perkaitannya dengan faktor sosiodemografik, pengetahuan nutrisi, status berat, dan pengambilan makanan antara pelajar universiti di Malaysia.

Researcher's Name: Muhammad Muhaimin Bin Mohd Azlan

Matric Number: 198971

Supervisor: Dr. Zuriati Binti Ibrahim

Introduction:
This study is conducted for academic purposes and under no circumstances will your personal information be divulged. Thank you for your cooperation in answering this questionnaire.

Pengenalan:
Kajian ini dijalankan untuk tujuan akademik dan informasi anda tidak akan dibocorkan untuk apa-apa tujuan. Terima kasih atas kerjasama anda dalam menjawab soal selidik ini.

Section A: Sociodemographic
Bahagian A: Sosiodemografik

Please fill in your answer or tick [/] in the appropriate box.

Sila isi jawapan anda atau tandakan [/] dalam kotak yang bersesuaian.

1	**Age/** *Umur*	☐☐ **years old/** *tahun*
2	**Sex/** *Jantina*	☐ **Male/** *Lelaki* ☐ **Female/** *Perempuan*
3	**Ethnicity/** *Bangsa*	☐ **Malay/** *Melayu* ☐ **Chinese/** *Cina* ☐ **Indian/** *India* ☐ **Others/** *Lain-lain* **(specify/** *nyatakan***: _____)**
4	**University/** *Universiti*	**Type of university:** ☐ **Public/** *Awam* ☐ **Private/** *Swasta* **Name of university/** *Nama universiti***:** _____
5	**Field of study/** *Bidang pengajian*	**Name of degree course/** *Nama kursus ijazah***:** _____

6	**Residential area/** *Kawasan perumahan*	☐ **Urban/** *Bandar* ☐ **Suburbs/** *Pinggir bandar* ☐ **Rural/** *Luar bandar*
7	**Household income/** *Pendapatan isi rumah*	☐ **< RM 3,000** ☐ **RM 3,000 – RM 10,000** ☐ **> RM 10,000**

Section B: Anthropometric measurement
Bahagian B: Ukuran antropometri

Please fill in your answer in the space provided.
Sila isi jawapan anda dalam ruangan yang disediakan.

1	**Weight/** *Berat* **(kg)**	_____ **kg**
2	**Height/** *Tinggi* **(cm)**	_____ **cm**

Section C: Nutrition knowledge based on Malaysian Dietary Guidelines
Bahagian C: Pengetahuan nutrisi berdasarkan Panduan Diet Malaysia

Please tick [/] in the box provided if you think the statement is true, false or if you do not know the answer.

Sila tanda [/] dalam kotak yang disediakan jika anda rasa kenyataan tersebut adalah betul, salah, atau jika anda tidak tahu jawapannya.

	Item/ *Item*	**True/** *Betul*	**False/** *Salah*	**Do not know/** *Tidak tahu*
1	**Based on the food pyramid, rice, noodles, bread, cereals, and tubers are recommended to be taken between 8-11 servings per day**			

	Mengikut piramid makanan, nasi, mi dan kumpulannya, roti, bijirin dan ubi disyorkan untuk diambil di antara 8-11 hidangan sehari			
2	**Rice and bread contain more carbohydrate compared to fruits and vegetables** *Nasi dan roti mengandungi kandungan karbohidrat yang lebih tinggi berbanding buah-buahan dan sayur-sayuran*			
3	**Based on the food pyramid, vegetables and fruits are recommended to be taken in plenty amount which is at least five servings per day** *Mengikut piramid makanan, sayur-sayuran dan buah-buahan disyorkan untuk diambil dalam jumlah yang banyak iaitu paling kurang 5 hidangan setiap hari*			
4	**Green leafy vegetables like spinach and lettuce (salad group) are sources of folate or vitamin B9** *Sayur berdaun hijau seperti seperti bayam dan daun salad (kumpulan salad) adalah sumber folat atau vitamin B9*			
5	**Based on the food pyramid, fish, meat, poultries, eggs, nuts and legumes are recommended to be taken between 3-4 servings per day** *Mengikut piramid makanan, ikan, daging, ayam, itik, telur, kekacang dan bijian disyorkan untuk diambil di antara 3-4 hidangan sehari*			
6	**Fish, meat, poultries, eggs, nuts and legumes are sources of protein** *Ikan, daging, ayam, itik, telur, kekacang dan bijian merupakan sumber protein*			
7	**Based on the food pyramid, milk and milk products are recommended to be taken 1-3 servings per day**			

	Mengikut piramid makanan, susu dan produk tenusu dinasihatkan untuk diambil sebanyak 1-3 hidangan sehari			
8	**Sweetened condensed milk or filled milk are scategorised as milk or dairy product** *Susu pekat manis atau susu isian dikategorikan di dalam produk susu atau tenusu*			
9	**Based on the Malaysian food pyramid, sugar, salt, fat and oil are located on the highest level** *Mengikut piramid makanan Malaysia, gula, garam, lemak dan minyak terletak di bahagian paling atas*			
10	**Trans fat is fat that has undergone hydrogenation process and usually found in margarine, cake, biscuits and junk foods** *Lemak trans merupakan lemak tidak tepu yang melalui prosess hidrogenasi dan biasanya terdapat di dalam marjerin, kek, biskut dan makanan ringan*			
11	**Unsaturated fat is found in vegetable oils such as olive oil and sunflower oil** *Lemak tidak tepu terdapat dalam minyak sayuran seperti minyak zaitun dan minyak matahari*			
12	**Monosodium Glutamate (MSG) in foods act as food flavouring and can increase the risk of hypertension** *Monosodium Glutamat (MSG) dalam makanan ringan bertindak sebagai bahan penambah perasa dan boleh meningkatkan risiko penyakit darah tinggi*			
13	**Nutrition information panel help us to compare nutrient contents in two same food but different brands**			

	Panel maklumat pemakanan membantu kita membuat perbandingan kandungan nutrisi dua makanan yang sama tetapi berbeza jenama			

Section D: Eating Attitude Test-26
*Bahagian D: 'Eating Attitude Test-26***'**

Please tick [/] **in the box provided depending on how often the statements relate to you.**

Sila tanda [/] *dalam kotak yang disediakan berdasarkan kekerapan kenyataan-kenyataan tersebut berkait dengan anda.*

	Item/ *Item*	**Always/** *Sepanjang masa*	**Usually/** *Selalunya*	**Often/** *Kerap*	**Some Times/** *Kadang-kadang*	**Rarely/** *Jarang*	**Never/** *Tidak pernah*
1	**Am terrified about being overweight.** *Saya takut menjadi berat badan berlebihan*						
2	**Avoid eating when I am hungry.** *Saya elak daripada makan bila saya lapar*						
3	**Find myself preoccupied with food.** *Saya mendapati diri saya sibuk dengan makanan*						
4	**Have gone on eating binges where I feel that I may not be able to stop.** *Saya pernah melalui makan gelojoh sehingga tidak boleh berhenti*						
5	**Cut my food into small pieces.**						

	Saya potong makanan saya kecil-kecil						
6	**Aware of the calorie content of foods that I eat.** *Saya perasan kandungan kalori makanan yang saya makan*						
7	**Particularly avoid food with a high carbohydrate content (i.e., bread, rice, potatoes, etc.)** *Saya mengelakkan diri saya daripada makanan tinggi karbohidrat (seperti roti, nasi, kentang, dan lain-lain)*						
8	**Feel that others would prefer if I ate more.** *Saya rasa seperti orang lain lebih rela saya makan lebih banyak*						
9	**Vomit after I have eaten.** *Saya muntah selepas saya telah makan*						
10	**Feel extremely guilty after eating.** *Saya rasa sangat bersalah selepas makan*						
11	**Am preoccupied with a desire to be thinner.** *Saya mendapati diri saya sibuk dengan perasaan ingin menjadi lebih kurus*						
12	**Think about burning up calories when I exercise.**						

	Saya fikirkan tentang membakar kalori semasa saya bersenam						
13	**Other people think that I am too thin.** *Orang lain fikirkan saya terlalu kurus*						
14	**Am preoccupied with the thought of having fat on my body.** *Saya mendapati diri saya sibuk dengan pemikiran badan saya berlemak*						
15	**Take longer than others to eat my meals.** *Saya mengambil masa lebih lama daripada orang lain untuk makan makanan saya*						
16	**Avoid foods with sugar in them.** *Saya mengelak daripada makanan yang mengandungi gula*						
17	**Eat diet foods.** *Saya makan makanan berdiet*						
18	**Feel that food controls my life.** *Saya merasakan makanan mengawal kehidupan saya*						
19	**Display self-control around food.** *Saya menunjukkan kawalan diri terhadap makanan*						
20	**Feel that others pressure me to eat.**						

	Saya rasa orang lain memberikan tekanan untuk saya makan						
21	**Give too much time and thought to food.** *Saya terlebih berfikir dan mengambil masa terlalu lama terhadap makanan*						
22	**Feel uncomfortable after eating sweets.** *Saya rasa tidak selesa selepas makan makanan bermanisan*						
23	**Engage in dieting behaviour.** *Saya terikut dengan tingkah laku berdiet*						
24	**Like my stomach to be empty.** *Saya suka perut saya berkosongan*						
25	**Have the impulse to vomit after meals.** *Saya terdorong untuk muntahkan makanan selepas makan*						
26	**Enjoy trying new rich foods.** *Saya suka mencuba makanan baharu*						

Section E: Dietary intake interview
Bahagian E: Temu bual pengambilan makanan

This section requires the researcher to interview the respondents to collect their daily dietary intake through Google Meet.
Bahagian ini memerlukan penyelidik untuk menemu bual responden untuk mendapatkan maklumat pengambilan makanan seharian anda melalui panggilan Google Meet.

Please provide your phone number so that the researcher can set a schedule for the interview:_____

Sila letakkan nombor telefon anda supaya penyelidik boleh menetapkan jadual untuk temu bual tersebut:_____

APPENDIX E
TURNITIN RESULT

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