ASSOCIATION BETWEEN BMI AND WAIST CIRCUMFERENCES WITH EATING BEHAVIOR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

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ASSOCIATION BETWEEN BMI AND WAIST CIRCUMFERENCES WITH EATING BEHAVIORAMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

By

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CERTIFICATE

This is to certify that the dissertation entitled “ASSOCIATION BETWEEN BMI AND WAIST CIRCUMFERENCES WITH EATING BEHAVIOR AMONG UNDERGRADUATE STUDENTS IN UNIVERSITI SAINS MALAYSIA, HEALTH CAMPUS, KUBANG KERIAN, KELANTAN” is the bona fide record of research work done by Ms NURUL NAJWA BINTI ABDUL ROZAK during the period from February 2024 to July 2024 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and in quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Health Science (Honours) (Dietetics).

DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except were otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotional purposes.

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LIST OF ABBREVIATION

AEBQ	Adult Eating Behaviour Questionnaire
BMI	Body Mass Index
CDC	Centers of Disease Control and Prevention
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
T2DM	Type 2 Diabetes Mellitus
US	United States of America
USM	Universiti Sains Malaysia
WHO	World Health Organization

HUBUNGKAIT ANTARA INDEKS JISIM TUBUH (IJT) DAN UKUR LILIT PINGGANG SERTA TINGKAH LAKU MAKAN DALAM KALANGAN PELAJAR SARJANA MUDA DI UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

ABSTRAK

Obesiti dan isu-isu kesihatan yang berkaitan adalah membimbangkan dan semakin meningkat dalam kalangan orang muda, terutamanya pelajar sarjana muda. Indeks Jisim Tubuh (IJT) dan ukur lilit pinggang adalah penunjuk kritikal obesiti, dan tingkah laku makan secara signifikan memberi kesan kepada metrik ini. Kajian ini bertujuan untuk mengkaji hubungkait antara IJT, ukur lilit pinggang, dan tingkah laku makan dalam kalangan pelajar sarjana muda. Satu kajian keratan rentas telah dijalankan yang melibatkan 179 pelajar sarjana muda berusia 19 tahun ke atas daripada Universiti Sains Malaysia Kubang Kerian, Kelantan. Peserta kajian ini adalah terdiri daripada 146 peserta perempuan (81.6%) and 33 peserta lelaki (18.4%). Pengukuran antropometrik, termasuk IJT dan ukur lilit pinggang, direkod. Tingkah laku makan dinilai menggunakan *"Adult Eating Behavior Questionnaire (AEBQ)",* yang menilai habit pemakanan berdasarkan corak emosi, luaran, dan kekangan. Analisis statistik, termasuk korelasi Spearman dan dijalankan untuk menentukan hubungkait antara IJT, ukut lilit pinggang, dan tingkah laku makan. Kajian mendapati terdapat hubungan positif lemah yang signifikan antara BMI dengan pendekatan makanan, *Emotional Over-Eating (EOE),* (r = 0.18, p = 0.02). Sementara itu, *Slowness in Eating (SE)* menunjukkan terdapat hubungan negatif lemah yang signifikan antara BMI dan subskala penghindaran makanan (r = -0.17, p = 0.02). Seterusnya, terdapat korelasi negatif yang lemah antara lilitan pinggang dengan *Satiety Responsiveness (SR)* (r = -0.17, p = 0.03*). Emotional Under-Eating (EUE)* juga menunjukkan terdapat hubungan negatif yang sangat lemah antara lilitan pinggang dan subskala penghindaran makanan.

ASSOCIATION BETWEEN BMI AND WAIST CIRCUMFERENCES WITH EATING BEHAVIOR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

ABSTRACT

Obesity and related health issues are rising concerns among young adults, particularly undergraduate students. Body Mass Index (BMI) and waist circumference are critical indicators of obesity, and eating behavior significantly influences these metrics. Understanding the association between BMI, waist circumference, and eating behavior can inform targeted interventions to promote healthier lifestyles. This study aims to explore the association between BMI, waist circumference, and eating behavior among undergraduate students. A cross-sectional study was conducted involving 179 undergraduate students aged 19 above from Universiti Sains Malaysia Kubang Kerian, Kelantan. Participants in this study were 146 female respondents (81.6%) and 33 male respondents (18.4%). Anthropometric measurements, including BMI and waist circumference, were recorded. Eating behavior was assessed using the Adult Eating Behavior Questionnaire (AEBQ), which evaluates emotional, external, and restrained eating patterns. Statistical analyses, including Spearman's correlation and multiple regression, were performed to determine the associations between BMI, waist circumference, and eating behaviors. The study found there is a significant positive weak association between BMI with food approach, Emotional Over-Eating (EOE), ($r = 0.18$, $p = 0.02$). Meanwhile, Slowness in Eating (SE) showed there is a significant negative weak association between BMI and food avoidance subscales ($r = -0.17$, $p = 0.02$). Next, there is a significantly weak negative correlation waist circumference with Satiety Responsiveness (SR) ($r = -0.17$, $p = 0.03$). Emotional Under-Eating (EUE) also showed there is significantly weak negative association between waist circumferences and food avoidance subscale.

CHAPTER 1 INTRODUCTION

1.1. Background of Study

Eating is a complex behavior that is necessary for development and survival. In essence, learning occurs, particularly during the formative years. Eating habits are shaped early in infancy by experiences, and they are likely to persist through all stages of life until the start of adulthood. Internal metabolic demands, which are indicated by varying levels of nutrients like glucose and hormones and peptides linked to metabolism (such as leptin, insulin, ghrelin, and orexin), are the primary cause of eating behavior, which includes food seeking and the beginning and end of food consumption also the regulation of food consumption is influenced by hedonic and sensory signals, such as smell (Lacroix et al., 2016). Nutritious or healthy eating behavior assists in preventing noncommunicable diseases (NCDs) like diabetes, heart disease, stroke, and cancer, as well as malnutrition in all its manifestations (WHO, 2020).

Numerous factors, according to experts, can affect how we feel about food and how we eat. Cultural, evolutionary, social, familial, individual, economic, and psychological factors are among them. A common coping strategy for emotions like stress, boredom, anxiety, or even to extend happy feelings is eating. While eating to calm and ease your feelings can be helpful in the short term, it frequently results in regret and guilt and can even exacerbate negative emotions. Gaining weight can also harm self-esteem, and it can have other negative health effects like high blood pressure, cholesterol, or sugar levels (*Eating & Psychology*, 2020). Anthropometric measurements are quantitative, non-invasive assessments of the human anatomy (Casadei K, 2022). Anthropometry is the most affordable, non-invasive, widely applicable, and portable method available for determining the dimensions, makeup, and size of the human body. It forecasts survival, performance, and health while also reflecting

nutritional status and overall health. As such, it is a useful yet underutilized instrument for informing clinical judgements and public health policy. The fundamental components of anthropometry include skinfold thickness, height, weight, head circumference, body mass index (BMI), and measurements of the limbs, waist, and hips to determine adiposity (Casadei, 2022). In this study, anthropometric measurements of body mass index (BMI) and waist circumferences are used to assess body composition. Body mass index (BMI) It is calculated as the individual's weight in kilograms divided by their height in meters squared (kg/m2) (CPG Obesity, 2023).

Body Mass Index (BMI) calculation
BMI = $kkkk \div mm^2$

Every individual's body weight status can be measured using the BMI (WHO, 2010). Based on World Health Organization, BMI is less than 18.5 will fall within the underweight range, 18.5 to 24.9 is within the healthy weight range, 25.0 to 29.9, falls within the overweight range and 30.0 or higher, is within the obese range (WHO, 2010). Meanwhile, according to CPG obesity2023, there are six BMI-based weight classification for adults for over 18 years old, which are <18.5 is classified as underweight, 18.5-22.9 kg/m^2 is normal, 23.0-27.4 is pre-obese or overweight, 27.5-32.4 obese I, 32.5-37.4 obese II and ≥ 37.5 obese III. However, BMI has certain limits, despite research showing its value in estimating population-based mortality and disease-specific morbidity. BMI was unable to differentiate between fat and muscle weight (CPG Obesity, 2023)

Waist circumferences is one of the anthropometric measurements which is used to estimate the potential disease in an individual. Excessive abdominal fat status can be a very serious because it determines an individual to be at greater risk for developing obesity-related conditions. For example, Type 2 Diabetes (T2DM), high blood pressure, and coronary artery

disease. According to the World Health Organization, 2011, waistline measuring is used to determine whether a person have the higher risk of getting a developing obesity-related disease or not. There are different ranges divided by ethnicity or country. However, in this study, range of Asian normal waist circumferences is used.

Country or ethnic group	**Sex**	**Waist Circumferences (cm)**
Europid	Men	>94
	Women	>80
South Asian	Men	>90
	Women	>80
Chinese	Men	>90
	Women	>80

Source: WHO, 2011

1.2. Problem Statement

A cross-sectional study has been conducted by a local university in Malaysia found that BMI is significantly associated with eating behavior (Abdalla et al., 2020).The eating behavior among students may lead to body mass index (BMI) status. A cross-sectional study at a local university in Malaysia found 6% prevalence of abnormal eating behavior among students. The majority of the students (79.3%) of study sample were from medical professional courses such as health sciences, medicine, biomedical sciences, dentistry, pharmacy, and nursing. The study showed a significantly positive association between eating behavior and BMI.

Another study is conducted to measure one of core anthropometric status which is waist circumferences among students which also significantly associated with eating behavior. The study found that obese students have 18.5% prevalence of having very high waist circumferences. Women students presented majority of very high level of waist circumferences compared to men. High value of waist circumferences is a good indication of high abdominal fat and associated with increased intraperitoneal fat. This has been justified by the study that university students generally have unhealthy eating habits and inadequate nutrient intake which led to the increase weight than waist circumferences.

1.3 Research Questions

1. What is the eating behavior status among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan?
2. What is the body mass index (BMI) status of undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.?
3. What is the waist circumferences measurements of undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan?
4. What is the association between body mass index (BMI) status and eating behavior of undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan?
5. What is the association between waist circumferences and eating behavior of undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.?

1.4. Research Objectives

1.4.1. General Objectives

To determine the association between BMI and waist circumferences with eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan

1.4.2. Specific Objectives

1) To determine eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

2) To determine body mass index (BMI) status among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

3) To determine the waist circumferences status of undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

4) To determine the association between body mass index (BMI) and eating behavior undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

5) To determine the association between waist circumferences status and eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

1.5. Research Hypothesis

1.5.1 Hypothesis I

Null Hypothesis (H0)

There is no significant association between body mass index (BMI) and eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

Alternative Hypothesis (HA)

There is a significant association between body mass index (BMI) and eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

1.5.2 Hypothesis II

Null Hypothesis (H0)

There is no significant association between waist circumferences and eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

Alternative Hypothesis (HA)

There is a significant association between waist circumferences and eating behavior among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

1.6. Significance of Study

The study on the connection between BMI, waist circumferences and eating behavior holds immense significance as it delves into critical aspects of overall health and well-being. Investigating how these anthropometric influences eating behavior is pivotal in addressing the global challenges of obesity and weight management. These can help to decrease the risk of getting chronic diseases.

The finding of this study will help to understand better about the eating behavior of university students in Malaysia. The findings of the study therefore can help to give awareness about how eating behavior is affected to different factors in order to improve nutritional status and improve the anthropometric status among students. Some consultation programs can be organized to prevent and help the students from worsening their habits of eating then impacting their young body. Moreover, this study will help to determine the body mass index (BMI) status and waist circumferences among university students in Malaysia. Based on the data collected, we would be able to find the prevalence of overweight and obesity among the university students which then would help us in planning some proper intervention strategies. For example, healthy lifestyle and healthy eating behavior in the future.

Apart from that, the findings of this study will help to confirm and determine the association between body mass index and waist circumference with eating behavior of university students which can further affect their nutritional status, and quality of eating behavior. Furthermore, we would also have a more in-depth understanding of the practice of eating behavior and its effect on body weight status of university students. This would help us to determine the relevancy and practicality of eating behavior in a university setting. This cross-sectional study is expected to provide a stronger rationale for the practicing of good quality eating behavior as one of the solutions to overcome overweight and obesity problems among university students.

CHAPTER 2 LITERATURE REVIEW

2.1. Literature Review

2.1.1. Population of Study (Undergraduate Students)

Students' dietary pattern and lifestyle choices face additional difficulties as they are undergoing transition to independent living. Even though the influence of dietary pattern of student primarily come from family, choosing improper lifestyle patterns during college also can give long-term effects on the emergence of chronic diseases later in life due to unhealthy eating pattern. This is based on a study conducted by Sloan et al., 2008, students have to decide their own meals without parental guidance during study period, which frequently leads to unhealthy eating habits (Sloan et al., 2008). This group of the population also tends to decline certain food and choose food based on their preferences (Mooney and Walbourn, 2001). This is a crucial time in life when these habits are formed. Research found that university students are found to have associations with overweight and obese body status especially first year student which ongoing in increasing weight (Jiang et al., 2019). This is due to unhealthy lifestyle that have been practiced such as preferring food that has high percentage of fat and sugar, low of physical activity and short period of sleeping (Balgoon et al., 2019).

For instance, students often miss meals, dislike dining at home, snacks, choose inexpensive fast food, and eat fast food. When this is unhealthy, health issues are raised. The maintenance of bad habits from this early age into later adulthood presents health issues. Studies have linked stress, heavy workloads, and hectic schedules to the bad eating habits that university students develop. Research indicates that students' eating habits are significantly harmed by psychological variables, such as poor coping mechanisms under stressful circumstances, such as exams (Majabadi et al., 2016).

Research carried out in US colleges revealed that students were consuming food based

on pleasure and taste and did not take health as consideration. The students stated that they were busy since they started to enter tertiary education, and this became a reason for not maintaining a healthy lifestyle. The students also mentioned that they are discouraged from staying active and doing exercise as time is a constraint due to the limited period of time to spend. The availability and accessibility of healthy food options, self-control, social support, product costs, limited budgets, lack of discipline and time, and self- control were all mentioned as significant influencing factors of students' eating behaviors (Sogari et al., 2018).

Studies have indicated that a few factors affect the foods that students choose to eat. According to Marquis et al. (2017), one of the factors influencing students' meal preferences is cost. Out of all the respondents, the majority, 42% of respondents preferred dishes that were simple to prepare, indicating that they were worried about time constraints. According to Sprake et al. (2018), students who are not proficient in the kitchen are more inclined to eat fast food. Research showed the students who are struggling, especially those who are pressed for time because of their academic obligations, often resort to consuming fast food, which might result in poor eating habits (Hilger-Kolb et al., 2019).

Furthermore, during the university phase, students encounter numerous unhealthy food choices, such as those rich in saturated fat and refined sugar, potentially harming cognitive functions. The primary factors influencing individuals' adoption of healthy or unhealthy dietary patterns encompass their self-perceptions, genetic makeup, lifestyle decisions, environmental influences, and various habits that all of which exhibit interconnected effects. Within the realm of dietary habits, a crucial element is eating behavior, a series of actions shaping the human- food relationship. This encompasses drinking habits, food selection, culinary preparations, and the amount of food consumed. Food availability, personal preferences, portion sizes, cultural values, familial beliefs, and dietary styles impact eating behavior, with these factors strongly influenced by acquired experiences. Eating

behavior is categorized into dimensions, each delineating a specific aspect related to food (Valladares et al., 2016).

2.1.2 Definition and Prevalence of Body Mass Index (BMI)

Body Mass Index (BMI) is a measure of body fat based on an individual's weight and height. It is commonly used as a screening tool to categorize individuals into different weight status categories and to assess the potential health risks associated with their body weight. The formula for calculating BMI is:

Body Mass Index calculation
BMI = $kkkk \div mm^2$

According to CPG obesity 2023, BMI-based weight classification for adults for over 18years old, which are <18.5 is classified as underweight, 18.5-22.9 kg/m^2 is normal, 23.0-27.4 is pre-obese or overweight, 27.5-32.4 obese I, 32.5-37.4 obese II and ≥ 37.5 obese III (CPG Obesity, 2023). Prevalence of BMI categories can vary across populations and regions. High BMI, especially in the overweight and obesity categories, is associated with an increased risk of various health conditions, including cardiovascular disease, type 2 diabetes, certain cancers, and musculoskeletal disorders (WHO, 2011).

Other than that, a sample of bachelor's degree candidates was categorized as follows by 6.1% as underweight, 53.4% as normal weight, 23.0% as overweight, and 17.6% as obese among 920 students from 5 universities in Malaysia. Overall, the research findings show that among Malaysian university students, the combined prevalence of overweight and obesity is 21.2% and 16.3%, respectively, across all participants. In terms of student demographics, this results to 21.9% overweight and 14.3% obese for master's students, 17.8% overweight and 18.4% obese

for doctoral students, and 23% overweight and 17.6% obese for bachelor's candidates (Radzi *et al.*, 2019).

It is important to acknowledge that even though BMI is a useful screening tool, it has limitations. It does not directly measure body fat percentage or distribution, and it does not account for variations in muscle mass, bone density, and other factors that can influence body weight. Therefore, BMI should be interpreted cautiously, and additional assessments may be needed for a comprehensive evaluation of an individual's health and risk factors.

2.1.3 Definition and Prevalence of Waist Circumference

Waist circumference is a measurement of the waist's circumference, taken at a specific point, typically just above the hip bone. It is a simple and commonly used anthropometric measure that provides an indication of abdominal or central obesity. Abdominal obesity is associated with an increased risk of various health conditions, including cardiovascular disease, type 2 diabetes, and metabolic syndrome (WHO, 2011).

Waist circumference is a valuable complement to BMI because it provides additional information about fat distribution. Central obesity, where fat is concentrated around the abdomen, is considered particularly detrimental to health. This is because visceral fat (fat around the internal organs) is metabolically active and has been linked to an increased risk of various health problems (WHO, 2011).

A combination of measures is commonly used, including BMI, waist circumference, and other health assessments, to get a more comprehensive view of an individual's health and risk factors. Waist circumference is categorized by gender. For example, men who are below 94 cm are determined as low risk of getting obesity-related disease, and men higher than 94 cm are determined to have a high-risk of obesity-related diseases such as diabetes (WHO, 2011).