ASSOCIATION BETWEEN SLEEP QUALITY WITH EATING BEHAVIOUR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

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ASSOCIATION BETWEEN SLEEP QUALITY, WITH EATING BEHAVIOUR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

By

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Dissertation submitted in partial fulfilment

of the requirements for the degree

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JULY

CERTIFICATE

This is to certify that the dissertation entitled "ASSOCIATION BETWEEN- SLEEP QUALITYWITH EATING BEHAVIOUR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITISAINS MALAYSIA KUBANG KERIAN, KELANTAN" is the bona fide record of research work done by Ms. AHLAMI FARHA BINTI AYOB during the period from October 2023 to May 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 investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted as a whole 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

BMI	Body Mass Index
IQR	Interquartile Range
PQSI	Pittsburgh Quality Sleep Index
AEBQ	Adult Eating Behaviour Questionnaire
USMKK	Universiti Sains Malaysia Kubang Kerian
SPSS	Statistical Package for Social Sciences
FDA	Food and Drug Administration
PTPTN	The National Higher Education Fund Corporation
H	Hunger
FR	Food Responsiveness
EOE	Emotional Over-Eating
EF	Enjoyment of Food
SR	Satiety Responsiveness
FF	Food Fussiness
SE	Slowness in Eating

HUBUNGKAIT ANTARA KUALITI TIDUR DAN TINGKAH LAKU MAKAN DALAM KALANGAN PELAJAR SARJANA MUDA DI UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

ABSTRAK

Penyelidikan mengenai hubungan antara tabiat makan dan kualiti tidur adalah penting, terutamanya bagi pelajar universiti yang sering mengalami jadual makan dan tidur yang tidak teratur. Tujuan kajian ini adalah untuk menentukan hubungan antara tingkah laku makan dan kualiti tidur dalam kalangan pelajar sarjana muda di Universiti Sains Malaysia Kubang Kerian (USMKK), Kelantan. Kajian keratan rentas telah dijalankan melibatkan (n=179) pelajar sarjana muda di USMKK, Kelantan. serta Indeks Kualiti Tidur Pittsburgh (PSQI) untuk menilai kualiti tidur mereka. Kajian ini mempunyai korelasi antara tingkah laku makan dan kualiti tidur. Keputusan menunjukkan bahawa kualiti tidur yang baik dikaitkan dengan *"Food Responsiveness"* ($r = 0.403$, $p < 0.001$), menunjukkan corak pemakanan yang lebih sihat. *"Sleep Latency"* yang lebih lama mempunyai korelasi dengan peningkatan *"Emotional-Under-Eating"* ($r = 0.554$, $p < 0.001$), yang menunjukkan cabaran dalam pengawalan pemakanan emosional. *"Habitual Sleep Efficiency"* juga menunjukkan korelasi positif dengan pengawalan selera makan. Selain itu, gangguan tidur dikaitkan dengan *"Food Responsiveness"* yang lebih tinggi ($r = 0.273$, $p < 0.001$) dan *"Emotional Eating"* ($r = 0.194$, $p = 0.009$). Memahami hubungan ini adalah penting dalam merumuskan intervensi yang berfokus untuk meningkatkan kualiti tidur dan tingkah laku pemakanan, seterusnya berpotensi memberikan kesan kesihatan yang lebih baik bagi populasi yang terjejas oleh masalah atau ketidakaturan tidur.

ASSOCIATION BETWEEN SLEEP QUALITY WITH EATING BEHAVIOUR AMONG UNDERGRADUATE STUDENTS OF UNIVERSITI SAINS MALAYSIA KUBANG KERIAN, KELANTAN.

ABSTRACT

Research on the association between eating behaviour and sleep quality is crucial, particularly for university students who frequently have irregular eating and sleeping schedules. The purpose of this study is to investigate the relationship between eating behaviour and sleep quality among (n=179) undergraduate students of Universiti Sains Malaysia Kubang Kerian (USMKK), Kelantan. A cross-sectional study was conducted involving undergraduate students at USMKK. Participants completed the Adult Eating Behaviour Questionnaire (AEBQ) to rate their eating behaviour and the Pittsburgh Sleep Quality Index (PSQI) to rate their quality of sleep. The study emphasises how intricate the relationship is between eating behaviour and sleep quality. Aspects of sleep quality are significantly correlated with tendencies toward eating behaviour. Results indicated that better sleep quality is linked to higher Food Responsiveness ($r = 0.403$, $p < 0.001$), suggesting healthier eating patterns. Longer sleep latency correlated with increased Emotional Under-Eating ($r = 0.554$, $p < 0.001$), indicating challenges with emotional eating. Habitual Sleep Efficiency is also positively correlated with appetite regulation. Additionally, sleep disturbances were associated with higher Food Responsiveness ($r = 0.273$, $p < 0.001$) and Emotional Under-Eating ($r = 0.194$, $p = 0.009$)., Comprehending these associations is important in formulating focused interventions that aim to enhance the quality of sleep and dietary practices, so potentially providing improved health consequences for populations impacted by sleep problems or irregularities.

CHAPTER 1 INTRODUCTION

1.1. Background of Study

Eating is a complicated behaviour that is essential to growth and life. Fundamentally, itis learned, especially in the early years. Eating behaviours are formed early during childhood,under the influence of experience, and are likely to follow through every phase of childhood until the beginning of adulthood. As a result, early flavour exposure has a significant impact on the development of "what" to eat, or in other words, food preferences and choices, includingfood neophobia (Nicklaus, 2016). The term "eating behaviour" refers to a wide range of activities, including feeding habits, dieting, and food-related issues like obesity, eating disorders, and feeding disorders. Eating behaviour research in the context of behavioural medicine is concerned with the causes, treatments, and prevention of eating disorders and obesity as well as the promotion of healthy eating habits that aid in the management and prevention of illnesses like diabetes, hypertension, and some types of cancer (Lara LaCaille, 2013).

The term "sleep quality" is occasionally employed to encompass various measures of sleep, including total sleep time (TST), sleep onset latency (SOL), extent of sleep fragmentation, total wake time, sleep efficiency, and occasionally disturbances during sleep (Krystal & Edinger, 2008). Sleep quality is defined as an individual's subjective contentment with all facets of the sleep experience. It encompasses four key attributes: sleep efficiency, sleep latency, sleep duration, and wake after sleep onset (Nelson et al., 2022). Various antecedents influence sleep quality, including physiological factors such as age, circadian rhythm, body mass index, NREM, REM, psychological factors such as stress, anxiety, depression, and

environmental factors such as room temperature, television/device use, as well as family and social commitments.

Positive outcomes of good sleep quality include feelings ofrestfulness, normal reflexes, and positive interpersonal relationships. Conversely, the consequences of poor sleep quality encompass fatigue, irritability, daytime dysfunction, delayed responses, and increased consumption of caffeine or alcohol (Nelson et al., 2022). University students are a population of people who are undergoing a phase of life from adolescence to adulthood. This time is contemplated with critical and crucial events that determine the journey of the next phase. They will face different and a lot of challenges especiallyacademic and social changes. This will contribute to a major factor in their eating behaviour (Hassel & Ridout, 2018).

1.2. Problem Statement

University is determined to be one of the places that are surrounded by high pressure and stressful environments. Thus, students' eating behaviours can change negatively during their time in college or university (Deliens et al., 2014). University students often experience significant changes in their lifestyle, including sleep patterns and dietary habits, which can impact their overall well-being. Insufficient sleep and unhealthy eating behaviours are prevalent among this demographic, yet the relationship between sleep quality and eating behaviour remains inadequately understood. The stressful academic environment, irregular schedules, and newfound independence may contribute to disruptions in sleep and eating routines. Understanding the intricate link between sleep quality and eating behaviour is critical for promoting the health and well-being of university students (Schmickler et al., 2023).

This study also seeks to investigate the association between sleep quality and eating behaviour among university students, exploring factors such as sleep duration, sleep disturbances, and specific eating behaviours. The findings will contribute valuable insights intothe complex interplay between sleep quality and dietary choices in the university setting, informing targeted interventions to enhance both sleep health and nutritional habits among thispopulation. Additionally, our goal was to gather suggestions and ideas to help create efficient and customized intervention programs meant to enhance university students' healthy eating habits.

1.3 Research Questions

1. What is the eating behaviour status among undergraduate students of Universiti Sains MalaysiaKubang Kerian, Kelantan?
2. What is the level of sleep quality among undergraduate students of Universiti SainsMalaysia Kubang Kerian, Kelantan.?
3. Is there any association between sleep quality and eating behaviour among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan?

1.4. Research Objectives

1.4.1. General Objectives

To determine the association between sleep quality with eating behaviour among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan

1.4.2. Specific Objectives

1) To determine eating behaviour status among undergraduate students of Universiti SainsMalaysia Kubang Kerian, Kelantan.

2) To determine the sleep quality among undergraduate students of Universiti SainsMalaysia Kubang Kerian, Kelantan.

3) To determine the association between sleep quality and eating behaviour among undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

1.5. Research Hypothesis

1.5.1 Hypothesis III

Null hypothesis (HO):

There is no significant association between sleep quality and eating behaviour amongundergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

Alternative hypothesis (HA):

There is a significant association between sleep quality and eating behaviour amongundergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan.

1.6. Significance of Study

The study on the connection between sleep quality and eating behaviour holds immensesignificance as it delves into critical aspects of overall health and well-being. Investigating howsleep quality influences eating behaviour is pivotal in addressing the global challenges of obesityand weight management. The intricate links between sleep patterns and metabolic health, including factors such as insulin resistance and type 2 diabetes, underscore the importance of this research in preventing chronic diseases.

Furthermore, understanding the psychological influences of sleep quality on eating habits contributes to insights into emotional overeating and stress-related dietary patterns. This research informs the development of targeted public health interventions, allowing for the customization of strategies that may positively impact both sleep quality and eating behaviour. By recognizing the interconnectedness of these fundamental aspects of daily life, researchers and healthcare professionals can contribute to holistic health approaches, empowering individuals to make informed decisions that enhance their overall quality of life. Ultimately, this study offers a comprehensive understanding of the factors influencing dietary choices, fostering a proactive approach to health and well-being.

The investigation into sleep quality and eating behaviour holds significant importance for several compelling reasons. Firstly, studying the behavioural patterns associated with sleep and eating helps to uncover correlations and understand how one may influence the other. For instance, specific sleep patterns may have direct implications on the type and quantity of food consumed, highlighting important behavioural connections. Secondly, the study has implications for both prevention and treatment strategies. A comprehensive understanding of the interplay between sleep and eating behaviours enables the development of personalized approaches for

individuals struggling with weight management or sleep disorders. In essence, the investigation into sleep quality and eating behaviour is essential for a holistic understandingof their intricate relationship and for the development of strategies that contribute to overall health and well-being.

CHAPTER 2 LITERATURE REVIEW

2.1. Literature Review

2.1.1. In-Depth Review of Population of Study (Undergraduate Students)

Students' food and lifestyle choices face additional difficulties as they move from school to university. Choosing improper lifestyle patterns during college can have long-term effects on the emergence of chronic diseases later in life. This is a crucial time in life when these habits are formed. In addition, a lot of students put on weight when they go to college, and young adults are more likely to be obese. Young students are a nutritionally susceptible group that fails to achieve dietary needs due to several changes in their physical and psychological development. Unhealthy eating patterns can be caused by environmental and social variables (Alolabi et al., 2022).

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 thatuniversity 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 (Alolabi et al., 2022).

Research carried out in US colleges revealed that students were consuming more high-fat foods and less of the recommended amount of fruit and vegetables (Sogari et al., 2018). Few qualitative studies that have used focus group discussions to examine eating behaviour determinants in university students have been conducted (Diehl & Hilger-Kolb, 2019; Kapoor et al., 2022; Sogari et al., 2018). 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 behaviours (Supramaniam et al., 2023).

According to a study, most university students had regular meals every day, although over half did not have breakfast. Snacking frequently, consuming fried food at least three timesa week, and consuming little fruit and vegetables each day were all prevalent. Those who wereoverweight or obese visited fast food outlets far more frequently (Tok, Ahmad & Koh, 2018). 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 all of which exhibit interconnected effects.

Within the realmof dietary habits, a crucial element is eating behaviour, a series of actions shaping the human-food relationship. This encompasses drinking habits, food selection, culinary preparations, andthe amount of food consumed. Food availability, personal preferences, portion sizes, cultural values, familial beliefs, and dietary styles impact eating behaviour, with these factors strongly influenced by acquired experiences. Eating behaviour is categorized into dimensions, each delineating a specific aspect related to food (Valladares et al., 2016).

2.1.2 Definition and Prevalence of Sleep Quality

The intricate, reversible neurobiological state of sleep is typified by closed eyes, behavioural inactivity, and a disengagement from the outside world in terms of perception. Sleep Quality refers to a person's satisfaction with their sleep experience, which includes elements of sleep initiation, maintenance, quantity, and wakefulness-up refreshment (Lara LaCaille, 2013). The National Sleep Foundation and the American Academy of Sleep Medicineadvise adults to aim for 7–9 hours of sleep each night, while school-aged children and teenagersare recommended to get up to 11 hours (Hirshkowitz et al., 2015). Despite these guidelines, various studies indicate that sleep issues are more prevalent than commonly recognized. For instance, more than half of the participants (n=11,356) said they had trouble getting enough sleep from 117 organisations in Malaysia (Chan et al., 2021). Similarly, in a study among university students in South Italy, a significant portion of students (n=473) have trouble sleeping and have higher overall PSQI scores due to stress (84.4%) and depression (71.9%) (Angelillo et al., 2024).

2.1.3 Effect of Sleep Quality among Undergraduate Students

There is a growing body of evidence indicating that sleep plays a significant role in influencing eating behaviours and common among students when they enter universities and has been connected to a number of detrimental health outcomes, including lower academic performance (Schmickler et al., 2023). According to student reports, sleep is one of the first health habits they give up while attending university, with between 20% and 40% of them sleeping less than the recommended amount of 7 to 9 hours (Schmickler et al., 2023). More recently, it has been suggested that limitations brought on by the pandemic played a major role in students' sleep patterns,

including their bedtime routines, sleep latency, and length of sleep, all of which significantly worsened the quality of their sleep (Valenzuela et al., 2022).

Factors such as insufficient sleep duration, poor sleep quality, and later bedtimes have been consistently linked to increased food intake, poor dietary choices, and excess body weight. In the contemporary environment where food is readily available, insufficient sleep appears to contribute to higher calorie consumption (Chaput, 2014). Lack of sleep has been associated with elevated snacking, an increased frequency of meals, and a preference for energy-rich foods (Chaput, 2014). Proposed mechanisms explaining how inadequate sleep may lead to higher caloric intake include increased time and opportunities for eating, psychological distress, heightened sensitivity to food rewards, disinhibited eating, the additional energy needed to sustain wakefulness, and alterations in appetite hormones (Chaput, 2014).

Notably, the global association between insufficient sleep and excess energy intake seems to be driven more by pleasure-seeking factors than by homeostatic (physiological) factors. Furthermore, the consumption of specific foods that affect tryptophan availability, as well as the synthesis of serotonin and melatonin, may contribute to promoting better sleep. In conclusion, there are intricate connections between sleep patterns, eating behaviour, and energy balance. It is crucial to recognize the role of sleep in obesity research and to incorporate it into the comprehensive lifestyle approach that traditionally focuses on diet and physical activity (Chaput, 2014).

2.1.4 Pittsburg Sleep Quality Index (PSQI)

The PSQI (Pittsburgh Sleep Quality Index) was created to assess the overall sleep quality in clinical populations. The PSQI has been used in numerous studies of adult populations internationally to assess sleep quality and its relation to a variety of outcomes (Coxet al., 2022). The findings of this research suggest that the individual component scores of thePSQI can offer valuable insights into the sleep patterns of college students. However, it is important to approach the interpretation of the PSQI global score cautiously, as it may not accurately capture the complexity and diverse aspects of sleep disturbance due to the wide range of components contributing to this score (Dietch et al., 2016). The questionnairecomprises 19 self-reported items, each falling into one of seven subcategories: subjective sleepquality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Additionally, there are five extra questions intended for clinical assessment, rated by the respondent's roommate or bed partner, but thesequestions are not included in the scoring process (Shahid et al., 2011).

Each component is assigned a value ranging from 0 to 3, with "0" signifying the absence of sleep difficulties and "3" indicating more severe sleep issues. For example, the daytime dysfunction score is determined by the sum of two items (frequency of taking sleep aids and how often having trouble staying awake during daily activities like eating). These arecoded on a 0–3 scale (0 = 0, 1–2 = 1, 3–4 = 2, and 5–6 = 3). The subjective sleep quality component involves a person's self-assessment of overall sleep quality on a scale of 0 (very good) to 3 (very bad). Sleep latency measures how long it takes for an individual to fall asleep,while sleep duration indicates the actual hours of sleep obtained at night. Habitual sleep efficiency is calculated as the ratio of hours slept to hours spent in bed, multiplied by 100,

expressed as a percentage (>85% indicates no sleep problems, scored as “0”; <65% indicates more severe sleep problems, scored as “3”). The sleep disturbances component is derived fromthe sum of eight item scores indicating the frequency of sleep-related issues (e.g., waking up during the night, experiencing pain, or feeling too cold/hot). The global PSQI score is the sumof these seven components, ranging from 0 to 21, with a total score exceeding 5 indicating a "poor" sleeper. The PSQI also includes an open-ended question about "other reasons" for experiencing sleep difficulties (Cox et al., 2022).

2.1.5. Assessing Eating Behaviour

Eating behaviour refers to the actions, patterns, and habits related to the consumption of food and drink. It encompasses a wide range of behaviours, including food choices, portionsizes, meal timing, and the frequency of eating. Eating behaviour is influenced by various factors, including physiological, psychological, social, and environmental factors (Scaglioni etal., 2018). Prevalence of eating behaviours can vary widely across individuals and populations.Some common eating behaviours include skipping breakfast, eating fast food, and others (Lillico et al., 2014)

The prevalence of specific eating behaviours can be influenced by cultural, societal, and individual factors. For example, cultural attitudes toward food, body image ideals, and societal pressures can impact how individuals approach eating. Additionally, individual factors such as genetics, mental health, and personal experiences can play a role in shaping eating behaviours (Kabir, Miah & Islam, 2018). Eating behaviours are closely linked to overall health and well-being. Unhealthy eating behaviours can contribute to various health issues, includingobesity, nutritional deficiencies, and eating disorders (Kapoor et al., 2022). Understanding and addressing

these behaviours is important for promoting healthier lifestyles and preventing or managing associated health conditions.

2.1.6. Adult Eating Behaviour Questionnaire (AEBQ)

AEBQ is a tool designed to assess various aspects of eating behaviour in adults. It is used in research settings to investigate different dimensions of eating behaviour, particularly in the context of weight management, obesity, and eating disorders. It can be used to a large scale of population including university students (Warkentin, Costa & Oliveira, 2022). As evidence, there was a study that used AEBQ on a group of students from the Technical University of Moldova (n=602) (Siminiuc et al., 2022).

The AEBQ comprises 35 items measured on a 5-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree"). These items are organized into eight subscales, categorized into Food Approach and Food Avoidance scales based on their positive or negative associationswith weight. The four Food Approach scales include Hunger (H), Food Responsiveness (FR), Emotional Overeating (EOE), and Enjoyment of Food (EF). The four Food Avoidance scales consist of Satiety Responsiveness (SR), Emotional Under-Eating (EUE), Food Fussiness (FF), and Slowness in Eating (SE) (Hunot- Alexander et al., 2019).

2.1.5 Association Between Sleep Quality and Eating Behaviour

Research on the interplay between sleep quantity and dietary patterns suggests that insufficient sleep may correlate with increased consumption of energy-dense foods. Lack of sleep has been linked to an increase in caloric intake through several possible mechanisms, including increased eating time and opportunities,

psychological distress, increased sensitivity to food reward, disinhibited eating, increased energy required to sustain prolonged wakefulness, and changes in appetite hormones (Chaput, 2014). Studies also link later bedtimes to higher intake of fast foods and caffeinated beverages, while a studyassociates delayed sleep times with altered macronutrient intake (Sejbuk et al., 2022). Furthermore, healthy behaviours, including dietary choices, demonstrate a positive association with sleep quality (Al-Hosseini & Jafarirad, 2015).

However, scant literature explores the relationship between eating behaviours and sleepquality, especially in healthy students. Students who have trouble sleeping eat less healthy and balanced foods. Poor sleep quality is significantly associated with emotional, constrained, and external eating behaviours (Al- Hosseini & Jafarirad, 2015). This research contributes to the understanding of how sleep quality influences dietary habits and lifestyle choices among this specific demographic.

2.2. Conceptual Framework

As shown in the F~~f~~igure 1~~1~~, the quality and specific nutrient intake in one's diet play a crucial role in influencing hormonal pathways that, in turn, impact both the quantity and quality of sleep. Conversely, sleep patterns affect the overall energy intake, including specific foods and nutrients, through biological and behavioural mechanisms. While early research primarily focused on the effects of insufficient sleep duration on nutritional quality, recent studies have delved into the intricate relationship between prolonged sleep duration and dietary patterns. Current findings suggest that both extremes of sleep duration disrupt sleep patterns, hormonal levels, and circadian rhythms, contributing to weight-related issues, obesity, and increased

risk factors for chronic diseases like type 2 diabetes and cardiovascular disease (Sejbuk et al., 2022).

Various factors shape the eating behaviour and dietary intake of students. Key influencesinclude individual aspects such as cooking skills, food preferences, taboos, and knowledge, as well as societal factors like peer influence and social norms. University-related factors,including campus culture and examination frequency, also play a role, along with environmental considerations such as the availability of cooking resources, facilities, and food prices. These diverse elements collectively contribute to determining the dietary choices and eating habits of students (Kabir et al., 2018).

Conversely, the excessive consumption of noodles, sweets, and sugary beverages, alongwith skipping breakfast and irregular eating patterns, is linked to subpar sleep. On the other hand, a diet abundant in fish, seafood, and vegetables is correlated with improved sleep. Insufficient macronutrient intake, excessive calories, and delayed meals can diminish sleep quality and potentially contribute to the onset of insomnia (Sejbuk et al., 2022).

These patterns may manifest from childhood and persist throughout life, making it imperative to comprehendthe interplay between sleep and nutrition for effective public health and clinical strategies, particularly given the global impact of non-communicable diseases as leading causes of mortality (Frank et al., 2017). Among the studies studying eating behaviour, it was generally discovered that skipping a meal, especially breakfast, was associated with less ideal sleep duration. The studies indicated that the prevalence of sleep problems, such as insomnia, was higher among meal skippers (Doan et al., 2022).

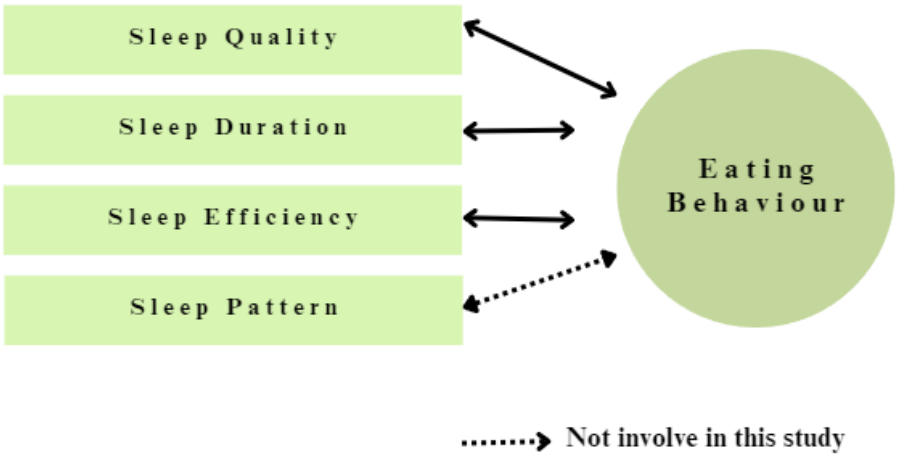

Figure 1 Flow Chart

CHAPTER 3 METHODOLOGY

3.1 Research Design

This study is designed as a cross-sectional study that involves the use of questionnaires which used to determine sleep quality, sociodemographic factors, and eating behaviour among undergraduate students of Universiti Sains Malaysia, Kubang Kerian, Kelantan. Cross-sectional studies are less expensive and time-consuming than other forms of research because they only gather data once. With cross-sectional studies, you can compare group differences and gather data from a sizable subject pool. It also records a particular point in time.Furthermore, it is relatively inexpensive and allows researchers to collect information ina relatively short time due to not require follow-up of study subjects.

3.2 Study Area

The study is conducted at School of Medical, School of Dentistry and School of Health Science of Universiti Sains Malaysia, Kubang Kerian, Kelantan. This location was chosen because good place for conducting research as well as convenient and timesaving for data collection.

3.3 Study Population

The subjects involved in this study are undergraduate students of Universiti Sains Malaysia Kubang Kerian, Kelantan. Undergraduate students are chosen as research participantsbecause they are easily accessible and suitable for this research topic. Additionally, they are also often more willing to participate in research studies than other populations.

3.4 Selection Criteria

3.4.1. Inclusion Criteria

The selection of subjects is based on:

- Participants must be aged 19 and above.
- Currently enrolled as undergraduate students in the School of Medical, School of Dentistry, and School of Health Science of Universiti Sains Malaysia Kubang Kerian, Kelantan.
- Hold nationality as Malaysian.

3.4.2 Exclusion Criteria

Subjects are excluded when:

- Currently having underlying health concerns and chronic health diseases (Diabetes, Hyperlipidemia, Hypertension, and any Psychological Disorder).

3.5. Sample Size Estimation

In this research, the formula that is used in the sample size calculation is

$$n = \left[\frac{Z}{\Delta}\right]^2 p(1-p)$$

n = sample size

Z = value representing the desired confidence level (95% confidence)Δ = precision (true value)

p = anticipated population proportion

3.5.1 Sample Size Estimation for Eating Behaviour

The sample size was estimated using data from a previous study published by (Quick et al., 2015). For this research, the confidence interval is set to be 95%. The Z score value for the 95% confidence interval is 1.96. The precision of 5% has been decided. The expected prevalence of the previous study, which is 12.1% was used in the calculation of the sample sizeof this research is based on the classification of not eating- competent behaviour (Quick et al., 2015). So, the anticipated population proportion is 0.12. Based on this calculation, the calculated sample size for eating behaviour was 179 participants.

$$n = [\frac{z^2}{\Delta}]p(1-p)$$

$$n = [\frac{1.96^2}{0.05}](0.12)(1.0.12)$$

n =162.27 + 10% dropout added to the sample

n = 178.5 ~ 179 samples

3.5.1 Sample Size Estimation for Sleep Quality

The sample size was estimated using data from a previous study published by (Grandner, 2019). For this research, the confidence interval is set to be 95%. The Z score valuefor the 95% confidence interval is 1.96. The precision of 5% has been decided. The expected prevalence of the previous study, which is 7.75% was used in the calculation of the sample size of this research is based on the insufficient sleep duration of 5 hours in the US Population (Grandner,2019). So, the anticipated population proportion is 0.08. Based on this calculation, the calculated sample size for sleep

quality was 124 participants.

$$n = [\frac{z^2}{\Delta}]p(1-p)$$

$$n = [\frac{1.96^2}{0.05}](0.08)(1-0.08)$$

n = 113.1 ~ 113 Samples + 10% dropout added to the sample

n = 124.3 ~ 124 Samples

3.5.2 Sample Size Estimation for Association between Sleep Quality and Eating Behaviour

$$n = \frac{p1\ (1-p1) + p2(1-p2)}{(p1-p2)^2} + (z\alpha + z\beta)^2$$

n = sample size

p = anticipated population proportion α = level of statistical significance

zα = 1.96 (α = 0.05)

zβ = 0.84 (80% power)

The level of confidence for this study is set at 95%. The 95% confidence level Z-score is 1.96 (α = 0.05), and the power of this study has been set at 80%

- Based on a study conducted among 18-24 years old college students, it is reported that39% of respondents were poor sleepers (Shoff et al., 2009). Therefore, the anticipated population proportion is 0.39. On the other hand, a study conducted among adults aged 20-59 years, in the city of Pelotas, southern Brazil showed that 65% of the adults have characteristics frequency less than twice weekly of binge eating episodes. So, the anticipated population proportion is 0.65 (De França et

al., 2014).

- For $p1$ = prevalence of poor sleepers among 18-24 years old college students (from the study, $p_1 = 0.39$)
- For $p2$ = prevalence of frequency less than twice weekly of binge eating episodes among adults aged 20-59 years, city of Pelotas, southern Brazil (from previous study, $p_2 = 0.65$)

$$n = \frac{0.39\ (1 - 0.39) + 0.65(1 - 0.65)}{(0.39 - 0.65)^2} + (1.96 + 0.84)^2$$

n = 54 + 10% dropout added to the sample

n = 59.4 ~ 59 samples per group

n = 59 x 2

n =118 samples

Thus, the range from the calculation sample size is between 118 to 179 participants. So, the total sample for this study is 179 participants.

3.6 Sampling Method and Subject Recruitment

Samples are gathered through the convenience sampling approach, a non-probability method. All participants are recruited on a voluntary basis. Undergraduate students of Universiti Sains Malaysia, Kubang Kerian who satisfy the inclusion criteria and willingly express interest in participating are chosen to engage in the study. They are invited to review the research information, consent to participation by approving the consent form, and fill out the questionnaire.

3.7 Research Tools and Materials

There are three (3) sections for each set of questionnaires. Each section contains various types ofquestions, and the subjects are expected to answer them accordingly. The three (3) sections are:

3.7.1 Section A: Sociodemographic data

The focus revolves around individuals' details, encompassing factors like age,gender, ethnicity, duration of education, household income, and financial support received during the academic period.

3.7.2 Section B: Pittsburgh Sleep Quality Index (PSQI)

Section B will assess sleep quality with the use of the Pittsburgh Sleep Quality Questionnaire (PSQI) (Buysse et al., 1989). Permission was obtained from the original author of the PSQI for use in this study. The questionnaire comprises 19 self-reported items, each falling into one of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Additionally, there are five extra questions intended forclinical assessment, rated by the respondent's roommate or bed partner, but these questions arenot included in the scoring process (Shahid et al., 2011).

The 19 questions, self-assessed by individuals, cover diverse aspects of sleep quality. They encompass sleep duration, latency, frequency, and severity of specific sleep-related issues. These 19 items are categorized into seven component scores, which are subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Each carries equal weight on a scale from 0 to 3. The summation of these seven component scores results

in a global PSQI score, ranging from 0 to 21, where scores higher than 5 indicate poor sleep quality (Buysse et al., 1989)

3.7.3 Section C: Adult Eating Behaviour Questionnaire (AEBQ)

Section C will assess eating behaviour with the use of the Adult Eating Behaviour Questionnaire (AEBQ) (Hunot et al., 2016). Permission was obtained from the original author of the PSQI for use in this study. The AEBQ comprises 35 items measured on a 5-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree").

These items are organized into eight subscales, categorized into Food Approach and Food Avoidance scales based on their positive or negative associations with weight. The four Food Approach scales include Hunger (“If my meals are delayed I get light-headed”, 5 items),Food Responsiveness (“When I see or smell food that I like, it makes me want to eat”, 4 items),Emotional Overeating (“I eat more when I'm upset”, 5 items), and Enjoyment of Food (“I lovefood”, 3 items). The four Food Avoidance scales consist of Satiety Responsiveness (“I often get full before my meal is finished”, 4 items), Emotional Under-Eating (“I eat less when I'm upset”, 5 items), Food Fussiness (“I often decide that I don't like a new food, before tasting it”,5 items), and Slowness in Eating (“I am often last at finishing a meal”, 4 items) (Hunot-Alexander et al., 2019).

The AEBQ is a robust measure of four ‘food approach’ and four ‘food avoidant’ traits,which are internally and externally reliable. This instrument will enable us to track associationsbetween eating behaviour and weight into adulthood and could potentially identify individuals at risk of weight gain (Hunot et al., 2016). Means values were calculated by characteristics of the food approach (receptivity to food,

emotional overeating, and the pleasure of eating food) revealing a positive correlation with overconsumption patterns, indicating more frequent food consumption. Conversely, receptivity to satiety, emotional sublimation, food fussiness, and slowness in eating were found to have a negative correlation with malnutrition patterns (Siminiuc et al., 2022). Currently, there is no validation conducted in Malaysia, However, based on previous study conducted at the Cronbach's Alpha ranged from 0.8 to 0.9 (Choy, 2022).

3.8 Operational Definition

3.8.1 Sleep Quality

Sleep quality is defined as an individual's self-satisfaction with all aspects of the sleepexperience. Sleep quality has four attributes: sleep efficiency, sleep latency, sleep duration, andwake after sleep onset (Nelson et al., 2021).

3.8.2 Eating Behaviour

A complex interplay of physiologic, psychological, social, and genetic factors that influence meal timing, quantity of food intake, food preference, and food selection (Grimm & Steinle, 2011). An approach to food that focuses on an individual's awareness and experiences of food will be measured using Adult Eating Behaviour Questionnaires (AEBQ) and the scoreswill be analyzed (Warkentin, Costa & Oliveira, 2022).