

**PREVALENCE AND PAIN INTENSITY OF DYSMENORRHEA AND THEIR
ASSOCIATION WITH DIETARY QUALITY AMONG FEMALE
UNDERGRADUATE STUDENTS AT UNIVERSITI SAINS MALAYSIA**

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**SCHOOL OF HEALTH SCIENCES
UNIVERSITI SAINS MALAYSIA**

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By

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**Dissertation submitted in partial fulfilment of the Requirements for the degree of
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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
S-MHEI	Standardized Malaysian Healthy Eating Index
USM	Universiti Sains Malaysia
VAS	Visual Analog Scale
PD	Primary Dysmenorrhea
BMI	Body Mass Index
MOH	Ministry of Health
MFP	Malaysian Food Pyramid
MDG	Malaysian Dietary Guidelines
NRS	Numeric Rating Scale
RDA	Recommended Dietary Allowance
SPSS	Statistical Package for the Social Sciences
MDGCA	Malaysian Dietary Guidelines for Children and Adolescent
CVI	Content Validity Index
SD	Standard Deviations
IQR	Interquartile Ranges
USM-HREC	Human Research Ethic Committee USM
n	Total number of respondents
CHO	Carbohydrate

**PREVALENS DAN INTENSITI KESAKITAN DISMENOREA SERTA
HUBUNGANNYA DENGAN KUALITI DIET DALAM KALANGAN PELAJAR
WANITA PRASISWAZAH DI UNIVERSITI SAINS MALAYSIA**

ABSTRAK

Dismenorea merupakan masalah ginekologi yang lazim dalam kalangan pelajar universiti wanita dan boleh menjejaskan prestasi akademik, aktiviti harian, serta kualiti hidup. Kajian ini bertujuan untuk mengkaji hubungan antara kualiti diet, prevalens dismenorea, dan intensiti kesakitan dismenorea dalam kalangan pelajar wanita prasiswazah di Universiti Sains Malaysia (USM). Kajian keratan rentas ini melibatkan 132 orang pelajar wanita prasiswazah yang dipilih menggunakan kaedah pensampelan mudah. Data dikumpulkan menggunakan soal selidik yang merangkumi maklumat sosiodemografi, kaedah rekod diet 24 jam selama tiga hari, dan soal selidik dismenorea. Kualiti diet dinilai menggunakan Standardized Malaysian Healthy Eating Index (S-MHEI). Data dianalisis menggunakan IBM SPSS versi 31.0. Statistik deskriptif digunakan untuk meringkaskan data, manakala Ujian Tepat Fisher digunakan untuk menentukan hubungan antara pemboleh ubah. Skor min kualiti diet responden ialah 46.55 (SD = 8.57), dengan majoriti responden (78.0%) diklasifikasikan sebagai mempunyai kualiti diet yang rendah. Prevalens dismenorea adalah sebanyak 86.4%. Kebanyakan responden mengalami intensiti kesakitan sederhana (55.3%), diikuti oleh intensiti kesakitan ringan (34.2%), intensiti kesakitan teruk (8.8%) dan dua daripada responden (1.8%) tidak mengalami sebarang kesakitan. Terdapat hubungan yang signifikan antara prevalens dismenorea dan intensiti kesakitan ($p < 0.001$). Walau bagaimanapun, tiada hubungan yang signifikan ditemui antara kualiti diet dengan prevalens dismenorea ($p = 0.323$) mahupun intensiti kesakitan dismenorea ($p = 0.083$). Kesimpulannya, dismenorea

didapati mempunyai prevalens yang tinggi dalam kalangan pelajar wanita prasiswazah dan kebanyakannya dikaitkan dengan intensiti kesakitan sederhana. Walaupun kualiti diet responden secara umumnya adalah rendah, tiada hubungan yang signifikan ditemui antara kualiti diet dan hasil berkaitan dismenorea. Kajian pada masa hadapan yang melibatkan saiz sampel yang lebih besar dan populasi yang lebih pelbagai adalah disyorkan bagi meneroka dengan lebih lanjut hubungan antara faktor pemakanan dan dismenorea.

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ABSTRACT

Dysmenorrhea is a common gynecological condition among female university students and may adversely affect academic performance, daily activities, and quality of life. This study aimed to investigate the association between dietary quality, prevalence of dysmenorrhea, and pain intensity of dysmenorrhea among female undergraduate students at Universiti Sains Malaysia (USM). A cross-sectional study was conducted among 132 female undergraduate students selected using convenience sampling. Data were collected using a questionnaire consisting of sociodemographic information, a 3-day 24-hour dietary recall, and a dysmenorrhea questionnaire. Dietary quality was assessed using the Standardized Malaysian Healthy Eating Index (S-MHEI). Data were analyzed using IBM SPSS version 31.0. Descriptive statistics were used to summarize the data, while Fisher's Exact tests were used to determine associations between variables. The mean dietary quality score was 46.55 (SD = 8.57), with the majority of respondents (78.0%) classified as having poor dietary quality. The prevalence of dysmenorrhea was 86.4%. Most respondents experienced moderate pain intensity (55.3%), followed by mild (34.2%), severe pain intensity (8.8%) and 2 of the respondent (1.8%) reported no pain intensity. A significant association was found between dysmenorrhea prevalence and pain intensity ($p < 0.001$). However, no significant association was observed between dietary quality and dysmenorrhea prevalence ($p = 0.323$) or pain intensity of dysmenorrhea ($p = 0.083$). In conclusion, dysmenorrhea was highly prevalent among female undergraduate students and was commonly associated with moderate pain intensity. Although dietary quality was generally poor among

respondents, no significant association was found between dietary quality and dysmenorrhea outcomes. Future studies involving larger and more diverse populations are recommended to further investigate the relationship between dietary factors and dysmenorrhea.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF STUDY

Dysmenorrhea is defined as pain experienced during menstruation (Iacovides et al., 2015). The pain is usually located in the lower abdomen and may radiate to the inner thighs and lower back. It is one of the most common gynecological conditions and can negatively affect a woman's quality of life (Maleki & Tartaglia, 2023). In addition to menstrual pain, dysmenorrhea may be accompanied by nausea, vomiting, diarrhea, headaches, muscle cramps, low back pain, fatigue, and, in more severe cases, sleep disturbances (McKenna & Fogleman, 2021). This menstruation-associated pain occurs as a result of excessive production of prostaglandins in the endometrium during the ovulatory cycle, leading to increased myometrial contractions, vasoconstriction, and sensitization of nerve endings (Ameade et al., 2018).

Dysmenorrhea is highly prevalent worldwide, with more than 50% of menstruating women reported to experience menstrual pain, while approximately 10–20% describe the pain as severe and distressing (Gabeyehu et al., 2017). Among female university students, dysmenorrhea has become a significant health concern because of its high prevalence and its adverse effects on daily functioning and academic performance (Armour et al., 2019). Previous studies have reported that the prevalence of dysmenorrhea among university students ranges from 41.7% to 78%, with a substantial proportion experiencing moderate to severe pain (Hu et al., 2020; Jaiprakash et al., 2016). Furthermore, a large meta-analysis involving 78,068 students reported an overall prevalence of primary dysmenorrhea of 66.1%, with prevalence increasing over recent years (Wang et al., 2022). In Malaysia, the reported prevalence of dysmenorrhea varies considerably across studies, largely due to differences in study populations, diagnostic

criteria, and assessment methods (Mohamad Bakro et al., 2023). More recent evidence showed that 71.8% of young women aged 18–22 years experienced dysmenorrhea, of whom 53.2% reported moderate pain severity (Mohamad Bakro et al., 2023).

Pain intensity is an important characteristic of dysmenorrhea, as it reflects the severity of symptoms experienced and the extent to which menstrual pain interferes with daily activities and overall well-being. Higher pain intensity has been associated with greater disruption to academic performance, daily functioning, and quality of life among female university students (Durand et al., 2021). Mammo et al. (2022) reported that many students experienced dysmenorrhea predominantly in the lower abdomen and lower back, with varying levels of pain severity.

Among the various factors associated with dysmenorrhea, dietary quality has received increasing attention because of its potential role in influencing menstrual health. Diet quality is a multidimensional concept that reflects the overall adequacy, diversity, balance, and healthfulness of an individual's dietary intake. A healthy diet provides sufficient energy and essential nutrients required for growth, health, and an active lifestyle, while dietary diversity contributes to adequate nutrient intake (Food and Agriculture Organization [FAO], 2021). Compared with evaluating individual nutrients or food groups, assessing overall dietary quality provides a more comprehensive reflection of habitual eating behaviours by capturing the diversity, balance, and overall adequacy of the diet (Gil et al. (2015).

Dietary quality among female university students with dysmenorrhea has become an important area of interest, as unhealthy eating patterns may contribute to the

occurrence and severity of menstrual pain. University students are often exposed to irregular meal patterns and frequent consumption of fast foods, sugary foods, processed foods, and beverages high in fat and sugar due to academic stress, limited time, and lifestyle factors (Suárez-Reyes et al., 2019). In addition, poor dietary habits, skipping breakfast, low physical activity, poor sleep quality, obesity or underweight status, and a family history of dysmenorrhea have been identified as factors associated with dysmenorrhea among university students (Hu et al., 2020; Wang et al., 2022). Previous studies have reported that female students with dysmenorrhea commonly have inadequate intake of essential nutrients such as iron, folate, vitamin B12, and calcium, while frequently consuming foods high in saturated fat and sugar (Kartal & Akyuz, 2018; Syamsudi et al., 2024).

Evidence suggests that dietary quality may influence dysmenorrhea through its effects on prostaglandin production and uterine muscle activity. Poor dietary quality may increase prostaglandin production, thereby contributing to greater menstrual pain intensity (Ramadhan et al., 2023). Conversely, healthier dietary patterns characterised by higher consumption of fruits, vegetables, dairy products, fish, and fibre-rich foods have been associated with lower pain severity among women with dysmenorrhea (Szymańska et al., 2020). Likewise, students with higher consumption of saturated fats, processed foods, and sweets tend to report more severe menstrual pain, whereas healthier dietary patterns rich in vegetables, fruits, and dairy products are associated with lower pain intensity (Szymańska et al., 2020; Ramadhan et al., 2023). Collectively, these findings suggest that overall dietary quality may play an important role in influencing both the occurrence and severity of dysmenorrhea.

Although numerous studies have investigated dysmenorrhea and its associated factors among university students, many have focused on individual dietary components or specific eating habits rather than overall dietary quality. Furthermore, limited evidence is available regarding the association between dietary quality and pain intensity among Malaysian female university students. Therefore, this study was conducted to determine the prevalence and pain intensity of dysmenorrhea and to examine their association with dietary quality among female undergraduate students at Universiti Sains Malaysia.

1.2 PROBLEM STATEMENT

Previous studies have examined the influence of diet on dysmenorrhea. Certain foods such as red and processed meats, refined sugar, and processed foods are reported to affect estrogen and prostaglandin levels in the blood, where elevated prostaglandin concentrations have been linked to dysmenorrhea (Itani et al., 2022). Among female university students, the high prevalence of dysmenorrhea has become an important concern, as it may negatively affect quality of life, emotional wellbeing, concentration, and academic performance. However, the condition often receives little attention from both students and the community, as many perceive it as a normal part of menstruation (Itani et al., 2022). In reality, dysmenorrhea can cause weakness, pallor, reduced concentration, and disruption of daily activities, and it is also a contributing factor to absenteeism from school and work (Putri et al., 2021).

University students are often exposed to unhealthy dietary habits and lifestyle practices, which may contribute to the occurrence and severity of dysmenorrhea. Despite this, most Malaysian studies have mainly focused on the prevalence of dysmenorrhea,

with limited research investigating the prevalence and pain intensity of dysmenorrhea and their association with dietary quality among female university students.

Therefore, this study aimed to determine the prevalence and pain intensity of dysmenorrhea and their association with dietary quality among female undergraduate students at Universiti Sains Malaysia. The findings are expected to provide a clearer understanding of how dietary habits may relate to both the occurrence and severity of dysmenorrhea among university students, who are often exposed to suboptimal eating patterns. In addition, this study will provide valuable insights into the burden of dysmenorrhea in this population, which may support future health promotion and nutrition-related interventions.

1.3 RATIONALE OF THE STUDY

The study aimed to address common health issues in female university students. Although dysmenorrhea is not a dangerous condition that threatens life, it can still affect women's quality of life. When the pain is severe, it may cause difficulties in daily activities and reduce productivity (Osman & El-Houfey, 2016). The condition can also contribute to psychological distress, including feelings of isolation, mood disturbances, and reduced participation in academic and social activities (Itani et al., 2022) while also decreasing academic performance and overall well-being (Armour et al., 2019). In addition, this study is also significant in providing locally relevant evidence, as most existing research on dietary factors and dysmenorrhea has been conducted in Western or other Asian populations where the cultural dietary pattern, genetic and lifestyle may differ across populations. Therefore, the findings of this study will contribute valuable data specific to the Malaysian female university student population, helping to fill the gap in local research.

1.4 RESEARCH QUESTIONS

1. What is the prevalence of dysmenorrhea among female undergraduate students in USM?
2. What is the pain intensity of dysmenorrhea among female undergraduate students in USM?
3. What is dietary quality among female undergraduate students in Universiti Sains Malaysia (USM)?
4. Is prevalence of dysmenorrhea associated with the pain intensity of dysmenorrhea among female undergraduate students in USM?
5. Is dietary quality associated with the prevalence of dysmenorrhea among female undergraduate students in USM?
6. Is dietary quality associated with the pain intensity of dysmenorrhea among female undergraduate students in USM?

1.5 RESEARCH OBJECTIVES

General Objective

To investigate the prevalence and pain intensity of dysmenorrhea and their association with dietary quality among female undergraduate students at Universiti Sains Malaysia

Specific Objectives

1. To determine the prevalence of dysmenorrhea among female undergraduate students in USM.

2. To assess the pain intensity of dysmenorrhea among female undergraduate students in USM.
- 3.. To assess the dietary quality among female students in USM.
4. To examine the association between prevalence of dysmenorrhea and pain intensity of dysmenorrhea among female undergraduate students in USM.
5. To examine the association between dietary quality and prevalence of dysmenorrhea among female undergraduate students in USM.
6. To examine the association between dietary quality and pain intensity of dysmenorrhea among female undergraduate students in USM.

1.6 RESEARCH HYPOTHESIS

Hypothesis 1:

H_0 : There is no association between prevalence of dysmenorrhea and pain intensity of dysmenorrhea among female undergraduate students in USM

H_A : There is an association between prevalence of dysmenorrhea and pain intensity of dysmenorrhea among female undergraduate students in USM

Hypothesis 2:

H_0 : There is no association between dietary quality and prevalence of dysmenorrhea among female undergraduate students in USM

H_A : There is an association between dietary quality and prevalence of dysmenorrhea among female undergraduate students in USM

Hypothesis 3:

H_0 : There is no association between dietary quality and pain intensity of dysmenorrhea among female undergraduate students in USM

H_A : There is an association between dietary quality and pain intensity of dysmenorrhea among female undergraduate students in USM

1.7 OPERATIONAL DEFINITION**1. Dysmenorrhea:**

Dysmenorrhea refers to the occurrence of painful menstrual cramps experienced during menstruation (Iacovides et al., 2015). According to Shamsunarnie et al. (2009), participants were considered to have primary dysmenorrhea if they met all of the following criteria: experienced cramping pain in the lower abdomen not associated with any diagnosed gynecological condition; pain onset occurred just before or within one day of menstruation and lasted between 24 to 72 hours; pain was present in at least 50% of menstrual cycles over the past six months; and reported one or more episodes of menstruation in the past 6 to 10 months.

2. Pain Intensity:

Pain intensity refers to the severity of menstrual pain experienced by respondents during menstruation. In this study, pain intensity was measured using the Visual Analog Scale (VAS), with scores ranging from 0 to 10. Pain intensity was categorized as no pain (0), mild pain (1–3), moderate pain (4–7), and severe pain (8–10) according to the classification described by Senturk et al. (2025).

3. Dietary Quality:

Dietary quality refers to the extent to which an individual's overall dietary pattern meets established dietary recommendations and promotes optimal health (Gil et al., 2015). In this study, dietary quality was operationally defined using the Standardized Malaysian Healthy Eating Index (S-MHEI), which evaluates overall diet quality based on adherence to the recommendations of the Malaysian Dietary Guidelines (MDG) and Malaysian Dietary Guidelines for Children and Adolescents (MDGCA). The S-MHEI consists of 11 components with a maximum total score of 100. Respondents with an S-MHEI score of less than 51 were classified as having poor dietary quality, scores between 51 and 80 were classified as dietary quality needing improvement, and scores of more than 80 were classified as having good dietary quality (Jailani et al., 2021).

1.8 CONCEPTUAL FRAMEWORK

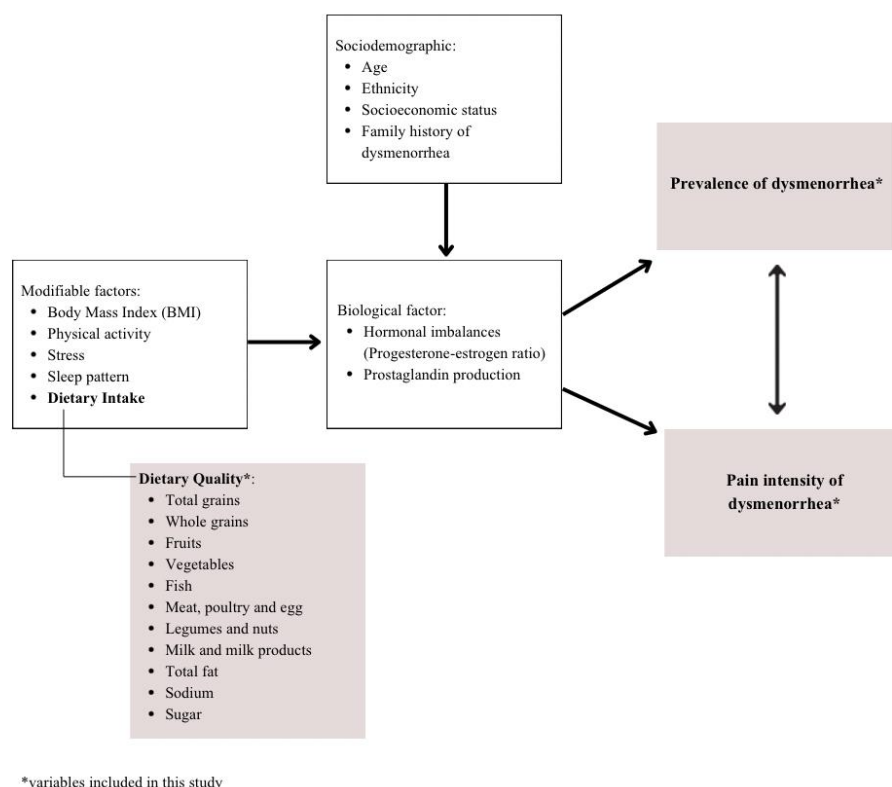


Figure 1: Conceptual framework illustrating the association between dietary quality, prevalence of dysmenorrhea, and pain intensity of dysmenorrhea among female undergraduate students

Figure 1 presents the conceptual framework of the study. Dysmenorrhea is very common among young women, with certain lifestyle and dietary factors that may influence both how often it occurs and how severe the pain is (Ciołek et al., 2024). Poor eating patterns such as skipping breakfast, high consumption of sugary foods and frequent intake of caffeinated beverages are linked to higher risk of experiencing menstrual pain and may worsen its intensity (Ramadhan et al., 2023). In contrast, healthier dietary habits, including eating more fruits, vegetables, and nutrient-rich foods, may help reduce discomfort (Szymańska et al., 2020). Overall, while diet is not the only factor, a good dietary quality appears to play a role in lowering the prevalence and severity of dysmenorrhea.

CHAPTER 2: LITERATURE REVIEW

2.1 Definition of dysmenorrhea

Dysmenorrhea is defined as the presence of painful cramps of uterine origin that occur during menstruation and represent one of the most common causes of pelvic pain and menstrual disorder (Bernardi et al., 2017). Dysmenorrhea originated from the Greek word in which “dys” means difficult, unusual, or painful, “meno” means month and “rrhea” means flow. So, the word dysmenorrhea means painful monthly flow (Thakur & Pathania, 2022). Dysmenorrhea pains are felt in the lower abdomen and may radiate into the inner parts of thighs. In a high percentage of cases, youth may experience systemic symptoms such as backache, nausea, vomiting, diarrhea, fatigue and headache (Osman & El-Houfey, 2016). Dysmenorrhea can be considered a multifactorial disorder with influential factors such as age, maternal history of dysmenorrhea, body mass index (BMI), exercise, nutritional status, and low-socioeconomic status (Mohapatra et al., 2020).

In relation to its pathophysiology, two main types of dysmenorrhea are identified in the literature: primary and secondary dysmenorrhea. Primary dysmenorrhea (PD) is not associated with any known organic gynaecological cause and has been traditionally associated with psychogenic causes, although it is currently more associated with biochemical causes, mainly an excess of the secretion of prostaglandins and vasopressin (Fajrin et al., 2020). Vasopressin is a hormone that is released by the hypophysis or pituitary gland and causes muscular contraction. Secondary dysmenorrhea is menstrual discomfort caused by pelvic disease such as endometriosis (Thakur & Pathania, 2022). The diagnosis of dysmenorrhea is clinical. Some investigations identify cases using numerical scales of pain, which at the same time serve to classify intensity while others

include characteristics such as intensity of pain, limitation to perform daily activities, or the requirement of analgesic management (local or systemic) (Teherán et al., 2018).

2.2 Prevalence of dysmenorrhea among female students

A large meta-analysis of 96 cross-sectional studies involving 78,068 students with a mean age of 19 years reported an overall prevalence of primary dysmenorrhea of 66.1% (Wang et al., 2022). The distribution of severity showed that 31.1% of cases were mild, 25.7% moderate, and 8.3% severe, indicating that a substantial proportion of students experience clinically significant pain. In addition, the prevalence of primary dysmenorrhea has increased over time, rising from 58.8% before 2010 to 68.5% after 2010 and reaching 70.8% between 2015 and 2021.

The prevalence of dysmenorrhea is difficult to determine because of the different definitions of the condition. The estimates vary from 45% to 95% (Kural et al., 2015). In Malaysia, a study conducted by Mohamad Bakro et al. (2023) showed that the majority of respondents 73.2% have Primary Dysmenorrhea and about 26% of them have Secondary Dysmenorrhea. This difference in the prevalence of severe dysmenorrhea in Malaysia can be understood due to the multicultural population and medication practice diversity. The study demonstrated that about 45.3% of the respondents reported that they have a family history of dysmenorrhea where this rate is close to the findings of the study conducted by Abubakar et al. (2020). Furthermore, it was more common in younger individuals aged 18-24 years in Malaysia and the prevalence varied among ethnic groups, with the studies indicating higher rates in the Malay population compared to the Chinese and Indian populations.

Jaiprakash et al. (2016) explained that 78% of 215 female medical students of MAHSA University in Malaysia complained of dysmenorrhea among which 52% was of moderate severity. Among the students who had dysmenorrhea, 92.2% frequently consumed fast food and 61.7% students exercised on an average of 2 times a week. It was observed that among the students with dysmenorrhea 58.1% had normal BMI and obesity was seen in 9% of the students.

2.3 Pain intensity of dysmenorrhea among female students

Senturk et al. (2025) investigated the impact of mild, moderate and severe PD on chronotype, social jetlag, and eating disorder, as well as mood changes like depression and anxiety. The cross-sectional study included 92 participants reporting painful menstruation and were diagnosed with PD. The pain intensity was assessed using Visual Analog Scale (VAS) pain score. Patients with a VAS pain score of 8-10 were considered to have severe primary dysmenorrhea, those with a VAS pain score of 4-7 were considered to have moderate dysmenorrhea, and those with a VAS pain score of 1-3 were considered to have mild dysmenorrhea. The findings showed that the patients in the mild, moderate, and severe PD groups were similar in terms of age, BMI, age at menarche, duration of menstruation, and number of pads used. The results were consistent with the previous studies which showed that the severity of dysmenorrhea increases with increasing VAS pain score (Ortiz et al., 2022). In relation to dietary intake, the author also suggests that low intakes of fish, eggs, fruits, and dairy products may trigger dysmenorrhea.

Mammo et al. (2022) conducted an institution-based cross-sectional study to assess the prevalence of primary dysmenorrhea and its associated factors among female

students. The findings of the study showed that 495 out of 733 (70.0%) with CI (66.6–73.4%) of the students reported that they were suffering from PD. According to the numeric rating scale (NRS) experienced mild pain 203 (41.0%), moderate pain 181 (36.6%) and severe pain 111 (22.4%). More than two-thirds of students 338 (68.3%) had pain that started a few days before menstrual flow and in almost half of the students 245 (49.5%) pain lasted within one day of menstrual flow. The location of this pain varies among students and was mostly reported in the lower abdomen 341 (68.9%), followed by the lower back 103 (20.8%), and abdominal pain that extended to thighs (10.1%).

2.4 Dietary quality among female students

Diet quality refers to a diversified, balanced and healthy diet, which provides energy and all essential nutrients for growth and a healthy and active life. The World Health Organization (2015) stated that a healthy diet intake is very important for human life as it prevents people from developing malnutrition and other chronic non-communicable diseases such as diabetes, hypertension, and heart diseases. Therefore, the Ministry of Health (MOH) Malaysia has published the Malaysian Food Pyramid (MFP) to guide people to take a variety of food according to food serving recommendations. Accordingly, increasing diet quality could be independently associated with a reduced risk of death (by all causes) of up to 28% (Neelakantan et al., 2018).

Neelakantan et al., (2020) suggest that students, in particular, are an important target audience for public health actions, seeing that entering university constitutes a drastic change in lifestyle that can bring about new challenges and meaningfully affect the students' habits and health. Rivalry between classmates, the pressure to succeed academically, changes in workload and support networks, new types of relationships, and

in some instances, moving away from home are all factors that can trigger new, risky behaviors and reinforcing many habits that impact health. Furthermore, a study from Ramón-Arbués et al. (2021) reported that being a woman is associated with a better diet quality. The relationship between gender and diet are conditioned by a suite of physiological, psychological, and sociocultural factors. Thus, women generally believe in the importance of a healthy diet and are more likely to monitor their body weight.

The adequacy of food intake and healthy food choices ensure that the students meet the dietary requirement for growth and health maintenance. The findings of the current study indicated that the students did not meet the daily requirement for fruits and vegetables as proposed in the Malaysian Dietary Guidelines (MDG) (Ayob et al., 2020). Similarly, Ramón-Arbués et al., (2021) suggest that university students' diet quality is generally poor where the participants in the study consumed insufficient amounts of “fruit” and “vegetable” and excessive amounts of “cold meats and cuts” and “sweets”. Factors that predicted a diet of worse quality were being male, living alone, maintaining low levels of physical activity, smoking, consuming alcohol, leading a sedentary lifestyle, experiencing psychological distress, and insomnia. Internationally, researchers have found a remarkable range in the percentage of university students who have a healthy diet, ranging between 1.8% and 57% (Suliga et al., 2020; Calderon et al., 2019). Those differences, for the most part, can be explained in terms of the different socioeconomic realities and living arrangements of the various countries studied.

2.5 Potential association between prevalence of dysmenorrhea and pain intensity of dysmenorrhea among university students

Several studies have suggested a close relationship between the prevalence of dysmenorrhea and the intensity of menstrual pain experienced among university students. Dysmenorrhea is highly prevalent among young women of reproductive age, particularly university students, with reported prevalence rates ranging from approximately 80% to 90% in different populations. Among those experiencing dysmenorrhea, a substantial proportion reported moderate to severe pain intensity, indicating that the condition is not only common but may also impose a considerable burden on daily functioning. For instance, Abu Helwa et al. (2018) reported that 85.1% of Palestinian university students experienced dysmenorrhea, with a mean pain intensity score of 6.79 out of 10, suggesting a relatively high level of pain among affected individuals.

Similarly, Ullah et al. (2021) found a prevalence of 91.5% among university students in Pakistan, with 65.8% of respondents reporting moderate to severe menstrual pain. These findings indicate that a higher prevalence of dysmenorrhea within a population is often accompanied by greater pain severity among affected individuals. Furthermore, severe menstrual pain has been associated with adverse outcomes such as reduced academic performance, impaired concentration, absenteeism, and limitations in social and physical activities. Therefore, assessing both the prevalence and pain intensity of dysmenorrhea provides a more comprehensive understanding of the burden of dysmenorrhea among university students and its potential impact on their quality of life.

2.6 Potential association between dietary quality and prevalence of dysmenorrhea among university students

Diet refers to the total amount of food consumed by individuals while nutrition is an essential aspect of human life and plays a vital role in maintaining good health and wellbeing (Zohoori, 2020). The nutritional status of university students in recent years has become an issue of concern (Suárez-Reyes et al., 2019). University life is a critical period for establishing healthy eating habits and attitudes. However, university students are at risk of developing poor eating habits due to various factors, including economic conditions, academic stress and lack of information about nutritional concepts. Poor diet quality leads to malnutrition, increasing the risk of preventable diseases. Food environments on university campuses also play a significant role in shaping the dietary habits of students, with the availability of and accessibility to healthy food options being important factors influencing food choices and overall diet quality (Almoraie et al., 2025).

Dysmenorrhea has been reported that more than 50% of menstruating women complain of dysmenorrhea (Kartal & Akyuz, 2018). Kartal & Akyuz (2018) conducted a randomized controlled study on 67 female students who were suffering from PD to evaluate the effect of diet therapy on PD in female university students. The food consumed frequently by students was assessed and a diet compatible with PD was prepared by the expert dietician for the students. The intervention group followed a diet rich in complex carbohydrates, fiber, protein, fish, calcium, nuts, and limited caffeine, spicy, fatty, and sugary foods for three months. The results showed a significant reduction in pain intensity among the diet group compared to the control group, suggesting that diet modification can be an effective complementary approach in managing dysmenorrhea. In the study, it was determined that students frequently consumed foods that predispose in

PD including coffee, fat, sugar-rich foods and low consumption of healthy foods including protein sources (egg, fish, and meat). The author suggests the necessity of developing a nutrition protocol for students with complaints of PD.

2.7 Potential association of dietary quality and pain intensity of dysmenorrhea

Szymańska et al. (2020) conducted an observational cohort study among 949 women with dysmenorrhea that aimed to characterize the eating patterns of Polish women with severe and moderate dysmenorrhea. Two measurement tools were used in the study: the Visual Analog Scale (VAS) and an original questionnaire to assess the consumption frequency of selected food groups. The VAS consisted of a straight line with endpoints defining extreme limits such as “no pain at all” and “pain as bad as it could be,” while the questionnaire consisted of nine questions. Each question concerned a different food product (vegetables, fruits, dairy, meat, fish, fast food products/salty products, sweets) or stimulants (coffee, alcohol).

The findings showed that the average consumption of vegetables, fruits, dairy products, and coffee was significantly lower in women with severe pain than in those with moderate pain. On the other hand, the average consumption of meat, fish, and fast food products was significantly higher in women with severe pain than in women with moderate pain. Additionally, the study showed a positive correlation between menstrual pain and the consumption of sweets and processed foods containing saturated fatty acids. The authors suggested that introducing three servings of dairy per day significantly decreased the incidence of dysmenorrhea compared to the group excluding dairy. Furthermore, meat consumption was identified as another differentiating factor, with high meat intake potentially harming the menstrual cycle. In contrast, the associations of fish

and caffeine consumption remain controversial and reflect inconsistent findings in the literature.

Ramadhan et al. (2023) reported that female university students with PD had a high frequency of saturated fat intake (75%). Saturated fat may disrupt progesterone metabolism during the luteal phase of the menstrual cycle, leading to increased prostaglandin production and contributing to dysmenorrhea. Prostaglandins are synthesized from fatty acids. When progesterone levels fall before menstruation, stored fatty acids such as arachidonic acid are released from cell membrane phospholipids and converted into prostaglandins. Elevated prostaglandins cause stronger uterine contractions, reduce uterine blood flow, and heighten peripheral nerve sensitivity, all of which contribute to menstrual pain.

The study also found that PD was more common among students who rarely consumed dairy products. Dairy intake may help reduce dysmenorrhea because calcium plays an essential role in regulating uterine neuromuscular activity. Inadequate calcium intake can lead to increased muscle spasms and stronger uterine contractions, resulting in more severe menstrual discomfort.

2.8 Potential association of dietary quality, prevalence and pain intensity of dysmenorrhea

Mammo et al. (2022) conducted a cross-sectional study among 495 female students in Wolaita Zone, Southern Ethiopia, to assess the prevalence, intensity, and associated factors of PD. Data were collected using a self-administered questionnaire that included socio-demographic, lifestyle, dietary variables and menstrual characteristics where severity of dysmenorrhea was measured using a 10-point VAS. The study found a

prevalence of 70%, with 41.0% reporting mild pain, 36.6% moderate, and 22.4% severe dysmenorrhea. Younger age (<18 years), longer menstrual flow, irregular cycles, family history of dysmenorrhea, and skipping breakfast were significantly associated with the condition.

These results highlight the burden of dysmenorrhea among young women and the importance of lifestyle factors such as diet. Specifically, skipping breakfast was associated with increased odds of dysmenorrhea, consistent with evidence that poor dietary habits can aggravate menstrual pain. Although the cross-sectional design limits causal inference, the findings suggest that promoting healthy dietary practices could play a role in reducing the prevalence and severity of dysmenorrhea in this population.

Monday et al. (2019) examined the prevalence of dysmenorrhea and its association with dietary habits among high school and college students in Saint Vincent and the Grenadines. The study found that 77% of respondents experienced menstrual pain, with the majority reporting pain on the first day of menstruation. Pain intensity was more common among younger women aged 16–25 years and was associated with longer menstrual duration, highlighting the significant burden of dysmenorrhea on this population.

In relation to diet, the study explored the consumption of cereals, dairy, proteins, vegetables, sugars, and caffeinated beverages. Although no strong overall correlation was established, frequent sugar intake and caffeine consumption were significantly associated with greater pain severity. These findings are consistent with previous research suggesting that sugar and caffeine may exacerbate dysmenorrhea, whereas healthier dietary patterns such as higher intake of fruits, vegetables, and omega-3 fatty acids may have protective effects (Bajalan et al., 2019). The study underscores the potential role of

diet in influencing menstrual pain, though further research is needed to establish clearer causal relationships.

CHAPTER 3: METHODOLOGY

3.1 STUDY DESIGN

The study's research design was a cross-sectional study aimed to investigate the prevalence and pain intensity of dysmenorrhea and their association with dietary quality among female undergraduate students at Universiti Sains Malaysia. This study design was chosen because it allows the assessment of outcomes and variables of interest within a population at a single point in time in a cost-effective and time-efficient manner.

3.2 STUDY LOCATION

The study was conducted at Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan, focusing on undergraduate students currently enrolled in any courses at USM Kubang Kerian. Specifically, several locations were selected for data collection, namely Desasiswa Murni 3, Desasiswa Murni 4, Dewan Utama, and Grey Square PPSP. These locations were chosen because a large number of students are usually present at these places during certain periods of time. By targeting a specific group of students and conducting the data collection at selected locations, the process became easier, faster, and more effective.

3.3 STUDY POPULATION

The study population consisted of undergraduate students from the School of Health Sciences, School of Medical Sciences, and School of Dental Sciences enrolled at Universiti Sains Malaysia (USM) during the study period. This study population was suitable for investigating the prevalence and pain intensity of dysmenorrhea and their association with dietary quality, as university students are often exposed to irregular

eating patterns, academic stress, and lifestyle practices that may influence both dietary habits and menstrual health.

3.4 SELECTION CRITERIA

3.4.1 Inclusion Criteria:

- Female undergraduate USM students aged 18-25 years
- Currently enrolled in any academic program at USM
- Willing to provide informed consent
- Able to understand English and complete the questionnaire

3.4.2 Exclusion Criteria:

- Current pregnancy or <6 months postpartum
- Current lactation
- Use of systemic hormonal therapy in the past 3 months (e.g., combined oral contraceptives/progestin-only pills/injectables/implants)
- Acute gynecologic surgery in the past 6 months
- Chronic medical conditions (e.g., inflammatory bowel disease, celiac disease, chronic kidney disease, autoimmune disorders)
- Clinically diagnosed with eating disorders
- Non-menstruators (amenorrhea) in the last 3 months for any reason
- Irregular menstrual cycles, with cycle length <21 days or >35 days

3.5 SAMPLE SIZE CALCULATION

3.5.1 Sample size for dietary quality among university students

The expected prevalence from the previous study, which reported 6.9% of university students were categorized as having poor diet quality, is used in the calculation of the sample size for this research (Ramón-Arbués et al., 2021). The number of sample size calculated by using formula as follow (Daniel, 1999):

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

n = sample size

z = standard value at confidence interval 95% = 1.96

Δ = precision set at 5% = 0.05

p = prevalence from previous study is 6.9%

$$n = \left[\frac{1.96}{0.05} \right]^2 0.069(1-0.069)$$

$$n = 98.7 \sim 99$$

In case of non-response rate, a 10% increase of sample size was applied. Therefore, the final sample size required:

$$99 + 99 (10/100) = 108.9$$

=109 participants