Prevalence of Dysmenorrhea and Its Association with Body Mass Index among Female College Students in Sulaymaniyah : A Cross Sectional Survey Study

Abstract:

Background:

Dysmenorrhea is a periodic, cramping pain sensation, typically experienced in the lower abdomen before or during menstruation. It is among the most common gynecologic issues affecting female students. It is a frequent cause of college absence in this age group and can negatively affect academic performance. In addition, overweight and obesity are common health concerns among females.

Objectives:

The purpose of this study is to investigate the relationship between body mass index (BMI) and dysmenorrhea. Although previous studies suggest a possible association, the evidence remains inconclusive due to existing gaps in knowledge. Therefore, this study aims to determine the prevalence and severity of dysmenorrhea among female college students in Sulaymaniyah across different BMI categories and to evaluate the association between BMI, dysmenorrhea intensity, and related risk factors.

Methodology:

A cross-sectional study was conducted from January 2024 to March 2024 among female college students aged 18–25 years (n=362) from eight universities in Sulaymaniyah. Participants were

assessed using a self-administered questionnaire to determine BMI, dysmenorrhea prevalence and intensity, and associated risk factors, with pain severity evaluated using the Visual Analog Scale (VAS). BMI levels and associated risk factors were compared according to the dysmenorrhea presence and severity.

Results:

The overall prevalence of dysmenorrhea among participants was 91.2%. Regarding pain severity, 14.7% reported mild pain, 41.4% moderate pain, and 35.1% severe pain, while 8.8% reported no dysmenorrhea.

The mean BMI values showed a decreasing trend with increasing pain severity. Participants with severe dysmenorrhea had the lowest mean BMI (n = 150; 22.57 ± 4.05 kg/m²), followed by those with moderate pain (n = 177; 22.95 ± 3.78 kg/m²) and mild pain (n = 24; 23.21 ± 3.76 kg/m²). In contrast, students without dysmenorrhea had the highest mean BMI (n = 11; 24.08 ± 3.89 kg/m²).

Statistical analysis demonstrated no significant association between BMI and the presence or severity of dysmenorrhea. However, significant associations were observed between dysmenorrhea and its severity with menstrual irregularity, heaviness of menstrual blood loss, and positive family history ($p < 0.05$).

Females with severe dysmenorrhea had the lowest normal mean BMI level, followed by those with moderate dysmenorrhea, mild dysmenorrhea, and then those with no dysmenorrhea. Those with no dysmenorrhea had the highest normal BMI level. The mean BMI level in females with severe dysmenorrhea was (n = 150; 22.57 ± 4.05 (standard deviation) kg/m2), with moderate dysmenorrhea (n = 177; 22.95 ± 3.78 kg/m2) , in those mild dysmenorrhea (n = 24; 23.21± 3.76 kg/m2) dysmenorrhea, and in those with no pain (n=11; 24.08± 3.89).

Conclusion:
Dysmenorrhea is highly prevalent among female college students in Sulaimaniyah, with greater severity observed in individuals with menstrual irregularities, heavy bleeding, or a positive family history. Body mass index (BMI) was not significantly associated with dysmenorrhea, suggesting that it may not be a major contributing factor. These findings highlight the importance of routine screening and targeted reproductive health education, and further research is needed to investigate other biological, genetic, and lifestyle contributors to menstrual pain.

Keywords:

Dysmenorrhea, Overweight, College Students.

Introduction

Dysmenorrhea refers to the pain experienced before or during menstruation, which is a common gynecological problem. Although the pain is usually mild, it can be severe pain in some women and may hinder their normal activities for several days. Dysmenorrhea affects over 50% of women during menstrual cycles, typically for 1-2 days each month [1]. A systematic review and meta-analysis of research including more than 20,000 young women from 38 countries reported dysmenorrhea prevalence was 71.1% [6]. In severe cases of dysmenorrhea, additional symptoms may include diarrhea, nausea, vomiting, headaches, and dizziness [1]. The repercussions of dysmenorrhea span, physical, social, emotional, educational, and economic domains. According to a survey targeting women aged 18 and above with primary dysmenorrhea, over half reported symptoms that hindered their daily activities, while 17%

missed school or work [2]. Dysmenorrhea is the leading cause of short-term school absences among adolescent girls, with statistics indicating that 1 in 8 girls aged 14-20 miss school or work due to this condition [3]. In the US, approximately 600 million working hours, or $2 billion are lost annually due to debilitating dysmenorrhea in the absence of adequate relief. Studies indicate that women who continue working or attending classes during dysmenorrhea often demonstrate reduced productivity or performance [4]. Furthermore, a systematic analysis of 33 studies examine the relationship between primary dysmenorrhea and mental health, finding that stress-related illnesses, anxiety, and depression were the most commonly studied conditions in affected individuals [5]. Women with dysmenorrhea report detrimental effects on social functioning, including reduced participation in social and athletic activities and strained relationships with family and friends [6]. Moreover, untreated or improperly managed dysmenorrhea may lead to nociceptive priming, increasing the risk of chronic pelvic pain [5]. Overweight and obesity, characterized by excessive fat accumulation, are associated with negative health outcomes.

Height and weight measurements are used to calculate body mass index (BMI) to identify overweight and obese individuals. Excessive weight results from an imbalance between calorie intake and expenditure, increasing the risk of diabetes, heart disease, and cancer [7]. In a study conducted in Iraq, 76% of women were overweight or obese, indicating that only one-quarter had normal weight, highlighting the urgent need for further attention to this issue [8].

Increased weight in young females has been associated with dysmenorrhea. Primary dysmenorrhea involves elevated prostaglandin production by the endometrium, which induces uterine contractions. It has been suggested that dysmenorrhea may occur due to increased prostaglandin production in overweight and obese individuals [9]. However, other studies do not list obesity as an associated factor [10].

Given the high prevalence of dysmenorrhea and the inconsistent findings regarding its relationship with BMI, this study aims to investigate the association between BMI and dysmenorrhea, determine the prevalence of dysmenorrhea, and identify associated risk factors among female college students in Sulaimani city.

Materials & Methods

An analytical, observational, cross-sectional study was conducted from January to March 2024 in Sulaimani city. The study included 362 female college students aged 18–25 years from the departments of Medicine, Veterinary, Engineering, Nursing, Pharmacy, Sciences, Dentistry, Medical Laboratory Sciences, Humanities, and Law across all eight universities in Sulaymaniah: University of Sulaimani, Komar University, Cihan University, Tishk International University, Sulaimani Polytechnic University, University of Human Development, Qaiwan International University, and American University of Iraq – Sulaymaniyah.

Convenience and snowball sampling techniques were employed to select participants. Data were collected using a semi-structured, self-administered questionnaire, pre-tested for clarity and provided in both English and Kurdish. Data collection was conducted via an online questionnaire using Google Forms (n=150) and a paper-based questionnaire (n=212) distributed on campus.

The questionnaire consisted of two sections. The first section collected socio-demographic information, and the second section gathered detailed menstrual information, including age at menarche, menstrual flow quantity, menstrual regularity, cycle duration, dysmenorrhea severity and associated symptoms, family history of dysmenorrhea, physical activity, dietary habits, and pain relief methods. Menstrual pain was assessed using the Visual Analogue Scale (VAS), a standard 10-point numerical rating tool, with higher scores indicating greater pain intensity. Scores of 1–3, 4–7, and 8–10 were classified as mild, moderate, and severe dysmenorrhea, respectively.

Body mass index (BMI) was calculated using the formula weight (kg)/height² (m²). For on-site participants (n=212),

height and weight were measured with a tape measure and a digital scale (1.0 g accuracy), while online participants self-reported their measurements. Based on WHO guidelines, participants were categorized as underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (≥30 kg/m²).

Ethical approval was obtained from the Clinical Sciences Department, College of Medicine, University of Sulaimani. Participation was voluntary, and informed consent was obtained from all participants prior to enrollment. Confidentiality of personal information was ensured.

Data were entered into Microsoft Excel and transferred to SPSS version 27 for analysis. Eligibility criteria included female university students aged 18–24 years proficient in Kurdish or English. Exclusion criteria were females under 18, non-students, students enrolled in universities outside Sulaimani, and those who refused or failed to complete the questionnaire. Descriptive statistics (frequencies, percentages, means, standard deviations) were calculated, and the Chi-Square test was used. A p-value <0.05 was considered statistically significant.

Results

A total of 362 female participants aged 18 years and above were included to evaluate the relationship between dysmenorrhea and BMI. Sociodemographic data are presented in Table 1. Menstrual characteristics of the participants are presented in Table 2.

The most common sites of pain were the lower abdomen and back, with 96.3% of participants reporting cramping pain. Additionally, 78.7% had a positive family history of dysmenorrhea.

Figure 1 shows that 91.2% (n = 330) of participants experienced dysmenorrhea. Percentages of dysmenorrhea severity and BMI categories are presented in pie charts (Figures 2 and 3, respectively).

Chi-square analysis indicated that family history was the primary factor associated with dysmenorrhea. No statistically significant association was found between BMI and the prevalence or severity of dysmenorrhea (Tables 4 and 5, $p > 0.05$).

Other factors, including age at menarche, marital status, exercise, smoking, and alcohol consumption, were not significantly associated with dysmenorrhea.

Figure 1: In this study, 91.2% of participants experienced dysmenorrhea, whereas 8.8% did not.

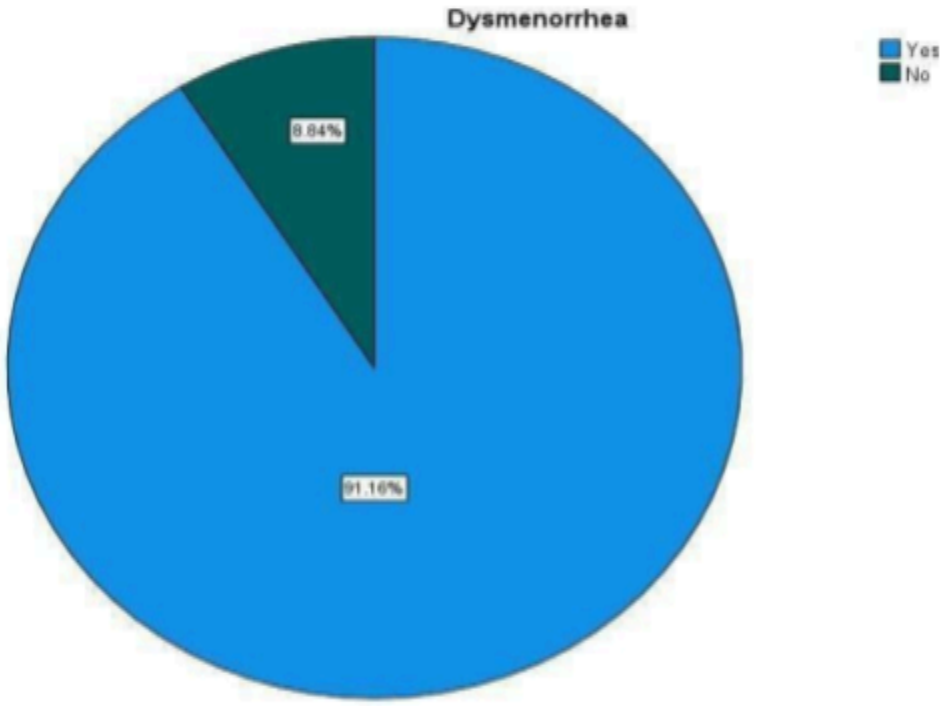


Figure 2 shows that, among participants who experienced pain, 7%, 49%, and 41% had mild, moderate, and severe dysmenorrhea, respectively.

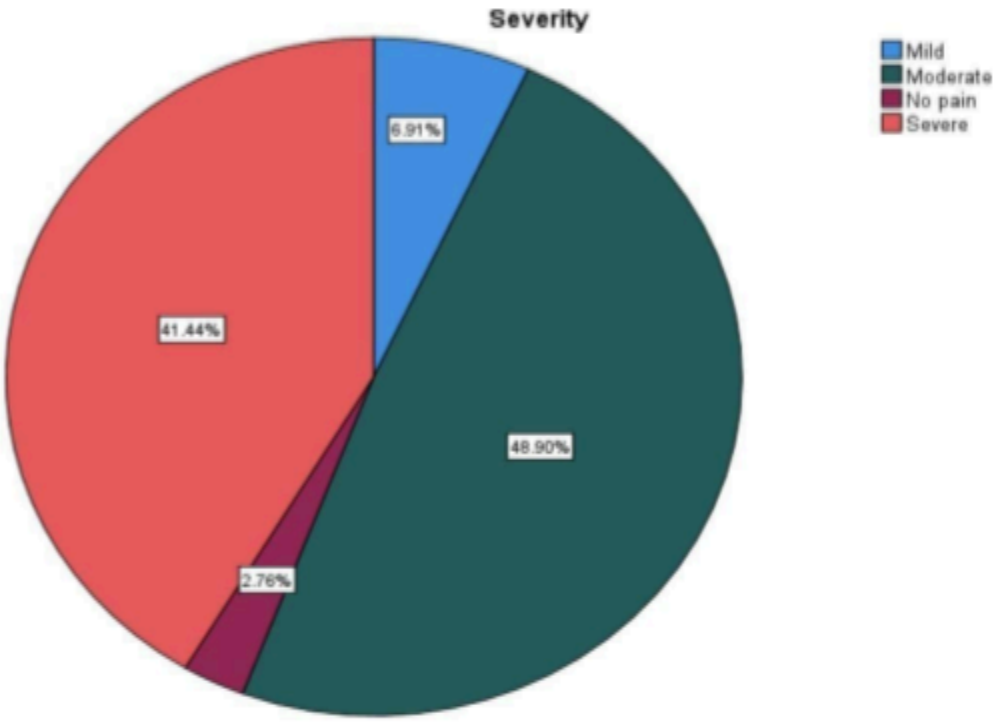
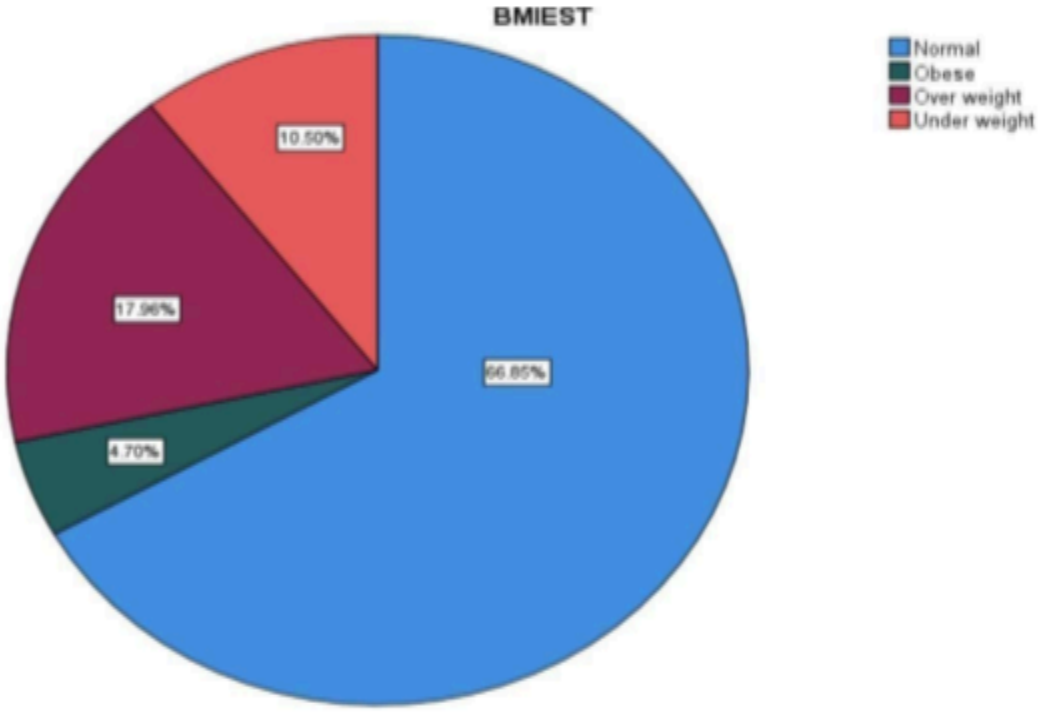


Figure 3 shows the distribution of BMI categories among students, with 10%, 66%, 17%, and 4% classified as underweight, normal weight, overweight, and obese, respectively.



Most participants (236/362) were from the College of Medicine at the University of Sulaimani. The majority were single and reported a moderate economic status (Table 1).

Variable	Frequency	Percentage
University		
Sulaimani	236	65.2%
Komar	47	13%
Qaiwan	4	1.1%
AUIS	18	5%
Polytechnic	23	6.4%
Human Development	16	4.4%
Tishk	13	3.6%
Cihan	5	1.4%
Department		
Medicine	133	36.7%
Dentistry	29	8%
Pharmacy	18	5%
Nursing	17	4.7%
Veterinary	7	1.9%
Medical laboratory scientist	19	5.2%
Engineering	34	9.4%
Sciences	14	3.9%
Law	9	2.5%
Humanities	7	1.9%
Other	68	18.8%
Academic year		
Stage 1	41	11.3%
Stage 2	62	17.1%
Stage 3	41	11.3%
Stage 4	160	44.2%
Stage 5	40	11%
Stage 6	18	5%
Marital Status		
Single	342	94.5%
Married	19	5.2%
Divorced	1	0.3%
Residency		
Inside city	269	74.3%
Outside city	93	25.7%
Economic Status		
Low	9	2.5%
Moderate	293	80.9%
High	60	16.6%

Table 1. Sociodemographic Characteristics of the Participants.

Among the management strategies, the most commonly used methods were rest and sleep (72.6%), heat therapy (69.2%), and medication (52.5%) (Table 2).

Variable	Frequency	Percentage
Age of menarche		
9_11		
12_14		
15_17		
18_20		
Menstruate every month		
Yes		
No		
Menstrual duration		
2_3		
3_5		
5_7		
More than 7		
Heaviness of blood loss		
Light		
Moderate		
Heavy		
Dysmenorrhea		
Yes		
No		
Onset of menstrual pain		
Before period		
At the beginning of the p		
At the end of the peri		
After period		
Pain duration		
Few hours		
1_2 days		
More than 2 days		
Site of pain		
Lower abdomen		
Back		
Thighs		
Other places		
Type of pain		
Cramp pain		
Throbbing pain		
Other		
Management Strategies		
Rest and Sleep		
Heat		
Medication		
Herbal Medicine		
Exercise		
Other		
Family history of dysmeno		
Yes		
No		
Lifestyle factors		
Variable	Frequency	Percentage
Type of diet		
Healthy diet	35	9.7%
Mixed	308	85.1%
Unhealthy diet	19	5.2%
Exercise		
Yes, frequently	24	6.6%
Yes, occasionally	166	45.9%
No	172	47.5%
Smoking		
Yes, frequently	14	3.9%
Yes, occasionally	20	5.5%
No	328	90.6%
Alcohol consumption		
Yes, frequently	2	0.6%
Yes, occasionally	12	3.3%
Never	348	96.1%
Stress		
Yes, highly stressed	171	47.2%
Yes, moderately stressed	163	45%
No	28	7.7%
Mental-related Depression		
Yes	337	93.9%
No	22	6.1%

Table 2. Menstrual Characteristics of the Participants.

Table 2 shows that most participants reported a mixed diet (85.1%) and were non-smokers (90.6%). The majority were non-alcohol consumers (96.1%). However, many reported experiencing stress (47.2%) and premenstrual mood swings and depression (47.4%) (Table 3).

Table 3. Lifestyle Characteristics of the Participants.

Table 3 shows that the p-value for the association between dysmenorrhea prevalence and menstrual regularity was 0.01, indicating statistical significance. A strong association was also observed between dysmenorrhea prevalence and positive family history (p = 0.001).

Dysmenorrhea	
Variable	P value
Marital Status	0.92
BMI_ESTIMATION	0.468
Menstruation	0.01
Age of menarche	0.121
Mood swing and Depression	0.522
Stress	0.206
Family history of dysmenorrhea	0.001
Menstrual duration	0.06
Heaviness of blood loss	0.106
Type of diet	0.811
Exercise	0.885
Smoking	0.106
Alcohol consumption	0.905

Table 4. Factors Associated with Dysmenorrhea.

Table 4 shows statistically significant associations between dysmenorrhea severity and the heaviness of menstrual blood loss (p = 0.002), as well as family history of dysmenorrhea (p = 0.006).

Severity	
Variable	P value
Marital Status	0.462
BMI_ESTIMATION	0.793
Menstruation Irregularity	0.57
Age of menarche	0.227
Mood swing and Depression	0.727
Stress	0.055
Family history of dysmenorrhea	0.006
Menstrual duration	0.583
Heaviness of blood loss	0.002
Type of diet	0.696
Exercise	0.281
Smoking	0.179
Alcohol consumption	0.637

Table 5. Factors Associated with the Severity of Dysmenorrhea.

The primary objective of this study was to determine the relationship between BMI and dysmenorrhea severity. As shown in Table 6, the mean BMI across all severity categories was within the normal range; however, the lowest mean BMI was observed among participants with severe dysmenorrhea.

Severity of dysmenorrhea	BMI	
	Mean	St.deviation
Mild	23.21	3.76
Moderate	22.95	3.78
Severe	22.57	4.05
No pain	24.08	3.89

Table 6. Association Between Dysmenorrhea Severity and Mean BMI

DISCUSSION

Before or during menstruation, dysmenorrhea is a severe cramping feeling in the lower abdomen that is frequently accompanied by headaches, nausea, vomiting, diarrhea, and sweating [30]. It is a common gynecological issue that has a detrimental impact on women's everyday activities and quality of life [11]. According to the results of our study, 91.2% of female college students in Sulaimani had dysmenorrhea. In line with our findings, a research conducted in Jordan found that 90.1% of women had dysmenorrhea [12]. A prospective study conducted on female college students in China found that 56.4% of them had dysmenorrhea; the reason for this discrepancy in the reported prevalence might be attributed to genetics, dietary differences, and cultural attitudes in the various regions [21]. But it also needs to be taken into consideration that this finding depends on the females' perception of pain. The most prevalent type of pain reported by participants was cramping (96.3%). Additionally, the most frequent site of pain for the majority of the female participants (92.7%) was lower abdomen; in a research done in Northern Ethiopia amongst university students most participants also reported the most frequent site of pain to be lower abdomen [13]. The most frequently reported sites of pain beyond the lower abdomen were the back (73.7%) and thighs (43.8%). While the lower abdomen is the primary location of cramping during dysmenorrhea, radiating pain to the back and thighs is a recognized symptom. These

findings of our research align with the established symptoms of dysmenorrhea described in medical literature. Furthermore, 58.5% of participants reported experiencing the onset of menstrual pain premenstrually, which is consistent with the typical pattern of dysmenorrhea pain starting before menstruation [34]. Positive family history of dysmenorrhea ($p = 0.001$) was significantly associated with prevalence and intensity of dysmenorrhea in our analysis and a similar result was obtained from India, and Iran [14, 28]. Positive family history that is shown to be a risk factor for dysmenorrhea could be due to genetic predisposition. It can also be due to visual learning behavior between mother and daughter [22]. Our analysis concluded that there was no significant association between BMI and dysmenorrhea according to results obtained from the chi-square test we conducted and in two researches from Turkey and Iran they also found no association between dysmenorrhea with BMI [19, 28]. On the contrary, in a study in India they found them to be significant and related [18]. Also according to our results the prevalence of dysmenorrhea was higher in those with normal BMI, this goes along with a study done in Iran where they found that the frequency of dysmenorrhea was higher in the normal weight group [16]. However this finding is not consistent with a Japanese study where frequency of dysmenorrhea was greatest amongst the underweight group [15]. And also not consistent with a study done at a university in Turkey where they found the prevalence of primary dysmenorrhea to be higher among young women who were overweight or obese [17]. These discrepancies could be explained by the hypothesis that quality of diet and not just the total calories leading to a certain BMI might be a more relevant factor in dysmenorrhea. The link between BMI and dysmenorrhea might be influenced by diet composition within each BMI category. For example, people with normal BMI who consume a healthy diet might experience less dysmenorrhea compared to those with normal BMI who have a diet high in processed foods and unhealthy fats. In fact, a cross-sectional study amongst Iranian women concluded that high fruit and vegetable intake reduces the risk of dysmenorrhea [28]. We also inquired about the dietary type of the participants, only 35 participants reported adherence to a healthy eating pattern.

This limited sample size for participants following a healthy diet restricted our ability to further study any possible association between a healthy diet and the risk of

dysmenorrhea. In China, increased menstrual blood flow during menstruation has been shown to be associated to severity of dysmenorrhea and this goes in accordance with our highly significant association (p-value =0.002) that we found between heaviness of blood loss and severity of dysmenorrhea amongst our research participants [21]. This association might be due to the fact that the synthesis of prostaglandins in endometrial tissue and prostaglandin release in menstrual fluid are both elevated in many of these dysmenorrhea patients. The uterine muscle becomes uncontrollably hyperactive due to an increase in prostaglandins, which causes uterine ischaemia and pain [33]. Therefore heavier bleeding might be associated with a thicker endometrium potentially leading to more prostaglandin and stronger contractions resulting in worse cramp and pain. Our study also identified a significant association between irregularity of menstrual cycles and dysmenorrhea prevalence (p-value=0.01). The participants with irregular menstrual cycles experienced dysmenorrhea more. Previous research has also found irregular menstrual cycles to be a significant risk factor for dysmenorrhea and this supports our findings [36, 37]. Regular menstrual cycles depend on hormonal balance including estrogen and progesterone; irregular cycles often indicate hormonal imbalance and this imbalance can lead to overproduction of prostaglandins and enhance uterine contractions and contribute to dysmenorrhea. In addition, both irregular cycles and dysmenorrhea can happen due to an underlying gynecological disease like polycystic ovarian syndrome, endometriosis,..etc. and this can also explain the association between menstrual irregularity and dysmenorrhea. Our study also aligns with results obtained from a study amongst female college students in Northern Ethiopia in finding no significant association between age at first menarche and prevalence of dysmenorrhea [13]. However, this contradicts findings from an Egyptian study amongst adolescents [20]. The difference in age groups between our study and the Egyptian research could be the reason for the conflicting results. The hormonal fluctuations that occur in that period of life that could impact menstrual experiences potentially lead to association between early menarche and dysmenorrhea in adolescents compared to college students. Alcohol drinking has previously been associated with prevalence of dysmenorrhea [13]. However, in this study no association was found between drinking alcohol and prevalence or severity of dysmenorrhea, but the cause of no association

finding may be due to only 14 subjects submitting that they were alcohol consumers. Exercise also showed no relation to prevalence and intensity of dysmenorrhea in our study. A number of studies have also failed to find any relation between intensity of dysmenorrhea and participation in exercise [13, 23, 25, 28]. A number of other studies found that physically active groups reported lower prevalence of dysmenorrhea and positive influence on dysmenorrhea; this could be due to exercise being a moderator of stress and stress is known to increase sympathetic activity and to dysmenorrhea through increasing severity of uterine contraction. Physical activity also causes release of endorphins by the brain and this may increase pain threshold [24, 26]. Smoking also showed no significant association with dysmenorrhea or its severity in our study although it has been shown to be associated in two studies and a meta-analysis of observational studies [25, 29, 31]. Yet, only 34 of our participants reported being smokers and this may be the reason for the outcome of our analysis. A significant portion of our subjects (premenstrually 47.4% and during menstruation 32.6%) reported mood swings and depression. This aligns with this study showing pooled prevalence of PMS worldwide was 47.8% [32].

These mental health symptoms can contribute to repetitive absenteeism reported in previous research on school and work absences in this age group [2, 3, 4, 5, 29]. Among the management strategies employed by our subjects rest and sleep were mostly used reported by 72.6% of the female participants. Heat therapy followed closely with a prevalence of 69.2%. Medication use was reported by 52.5% of participants while herbal remedies and exercise were used by 10.2% and 4.5% of participants, respectively. Our findings suggest a preference for non-pharmaceutical management strategies for dysmenorrhea amongst the participating female college students. In addition, a high proportion of the females (41% severe, 49% moderate) reported experiencing moderate to severe dysmenorrhea. This preference of non-pharmaceutical approaches could have a potential association with this finding because medication drugs like NSAIDs are highly effective in treating dysmenorrhea [35].

Strengths and Limitations:

Our research design employed several strategies to ensure the validity and reliability of the findings. The most important point of our survey is that this is the first study to explore the relationship between dysmenorrhea and BMI in this region, thus it will serve as a reference for future research and programs. In addition, this study sheds light on an important health issue that affects the quality of female students' lives, and if it becomes severe it might lead to inefficiency. The Visual Analogue Scale (VAS), a standard pain assessment tool for assessing the severity of dysmenorrhea, was one of the comprehensive data collection methods used in our study. We also measured participant height and weight using a scale to obtain a reliable estimate of BMI, and the majority of our questionnaires (n = 212) were given to participants in printed paper. Two languages, English and Kurdish (local language) were used to write the questionnaire in order to make it easier for respondents to understand. To comprehensively evaluate the findings, it is important to acknowledge the limitations of this study. This study was restricted to the area of Sulaymaniyah, Iraq. Future studies can be designed with a broader scope to encompass a larger region within Kurdistan to enhance generalizability. Furthermore, data collection time constraints limited the sample size. Also, the study relied on self-reported data, which can be susceptible to biases like social desirability or recall bias. A convenience sampling technique was employed, potentially limiting the representativeness of the sample. A formal sample size calculation was not performed. Future studies can benefit from a priori sample size calculation to ensure adequate statistical power. This study employed a cross-sectional design, which cannot establish causal relationships between variables. The study participants were all university students. Future research can be designed to include participants with varying educational backgrounds. Further studies and research need to be conducted to explore these potential connections and to confirm the findings.

Conclusion

This study demonstrated that dysmenorrhea is highly prevalent among the participants, highlighting its relevance as a public health concern in young female populations. The analysis showed no statistically significant association between dysmenorrhea and body mass index, marital status, mood changes, or depressive symptoms. In contrast, chronic illness and a positive family history were significantly related

to the occurrence of dysmenorrhea.Additionally, the average BMI values were within the normal range across all pain severity categories, including those without symptoms, indicating no observable relationship between BMI and dysmenorrhea severity. Future research with broader samples and improved designs is recommended to validate and further explore these outcomes.

Recommendations

We recommended that further research should be conducted on the relationship between dysmenorrhea and BMI, to find the exact cause and risk factor of dysmenorrhea, and also to find management of dysmenorrhea. Further studies on greater sample size, involving people from both public and private institutions and using random techniques in selecting sample size in order for the results and outcomes become more accurate. General awareness about dysmenorrhea being published among the population, to attend to the condition. Health education programs regarding menstruation, proper nutrition and healthy lifestyle should be established in the schools to give students age-appropriate information regarding these important issues.

Consent and Ethical Approval

This study was approved by the Ethics Committee of the College of Medicine, University of Sulaimani. The study was conducted in accordance with international guidelines and the 2008 Declaration of Helsinki.Written Informed consent was obtained from all participants. Participants were assured of the confidentiality of their personal information, and participation was voluntary.

Availability of data:

The data used to support the findings of this study are included within the article.

Competing interests

The authors confirm that there are no competing interests.

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