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The relationship between body mass index and dysmenorrhea in adolescents: A Literature Review

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Abstract

Introduction: Dysmenorrhea is defined as menstrual cramps which are considered as one of the most common gynecological disorders in women of childbearing age, especially adolescents, dysmenorrhea occurs due to the production of high levels of prostaglandins. Not a few women with dysmenorrhea experience the impact of decreased daily activities to the use of painkillers because the pain is unbearable. Around 70-90% of cases of menstrual pain occur during adolescence so that it will affect academic, social and sports activities. Previous studies have shown that BMI can affect the risk of dysmenorrhea. Further research is needed to better understand how these factors can influence each other.

Method: This study is a literature review, drawing from sources in Google Scholar, PUBMED, and Science Direct, focusing on research published between 2019 and 2024. The study included only original research articles in English or Indonesian with all the required components.

Result and Discussion: From the literature search, 10 studies met the inclusion criteria. Among them, 9 studies found a correlation between BMI and dysmenorrhea, while 1 study found no correlation.

Conclusion: According to reviews, BMI is associated with the risk of dysmenorrhea in adolescents, although some studies have not shown an association.

Keywords: Body Mass Index (BMI); Dysmenorrhea; Adolescents; Underweight; Overweight

1. Introduction

Dysmenorrhea, commonly referred to as menstrual cramps or pain, is a significant condition caused by elevated levels of prostaglandins during menstruation (1). While some women consider dysmenorrhea a normal part of menstruation, many experience severe pain that disrupts daily activities, leading to the use of pain-relief medications. Dysmenorrhea affects 70-90% of adolescents, significantly influencing their academic, social, and athletic performance (2). A study by Assefa et al., revealed that dysmenorrhea has several negative effects on adolescent girls' lives, including decreased learning capacity (88.3%), school absenteeism (80%), difficulty concentrating (66.8%), inability to complete household chores (21%), and social withdrawal (31.7%)(3).

According to the World Health Organization (2017), 90% of women experience dysmenorrhea, with 10-15% suffering from severe cases. A cross-sectional study in India and Iran involving 1,000 women aged 11-28 years found that the prevalence of primary dysmenorrhea was 70.2%. Many of these women experience pain ranging from mild to severe,

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leading to absenteeism for 1-2 days per month (4). Similarly, a study in France by Hadjou et al., reported that 92.9% of 953 girls analyzed experienced menstrual pain, with 8% describing it as very severe (5).

One of the key factors influencing dysmenorrhea is body mass index (BMI). Research by Martini et al., highlights that women with overweight or obesity tend to have excessive fat tissues, which can compress blood vessels in the reproductive organs (6). This compression causes vasospasms in these organs, triggering excessive uterine contractions and severe menstrual pain. Women with BMI above the normal range also exhibit higher prostaglandin levels, especially Prostaglandin F2 (PGF2), which leads to uterine hyperactivity and heightened pain sensitivity (7). Additionally, the excessive release of prostaglandins into the bloodstream causes vasoconstriction and tissue ischemia, exacerbating the pain (8). On the other hand, underweight women are not exempt from dysmenorrhea. Research by Larasati and Alatas indicates that insufficient nutrition in underweight women increases the risk of anemia, a known factor contributing to primary dysmenorrhea (9).

This study aims to investigate the relationship between BMI and dysmenorrhea in adolescents further. The goal is to enhance the understanding of healthcare professionals and adolescents, enabling them to anticipate and mitigate risk factors associated with dysmenorrhea. Raising awareness about this condition is essential for reducing its impact on adolescents' physical and psychological well-being, ensuring their overall quality of life.

2. Material and methods

This article is a literature review that examines 10 selected articles based on certain inclusion criteria. The selected articles present original research findings on the relationship between Body Mass Index (BMI) and dysmenorrhea, especially in adolescents. Articles were published between 2019 and 2024 (in the last five years) and in English or Indonesian. Exclusion criteria were applied to all articles discussing body mass index in relation to dysmenorrhea using methods other than original research. Articles were sourced from several basic data, including Google Scholar, PUBMED, and Science Direct. Each article displayed will be analyzed descriptively, which includes the author and year of publication, research location, research method, research subject, and summary of research findings.

3. Results

Ten articles— six in Indonesian and four in English—have been reviewed and analyzed as follows.

Table 1 Results of Review of 10 Articles

No	Author	Research Title	Location	Method	Subject	Result
1	Wibowo, S. (2023)	Pengaruh Status Gizi Terhadap Skor Nyeri Dismenore Pada Remaja Berdasarkan Dokumen Rekam Medis	Independent Midwife Practice Facility in the Genuk Area, Semarang City, Indonesia.	Purposive sampling.	27 medical record documents of reproductive health of adolescent patients.	Most respondents experienced dysmenorrhea pain that slightly interfered with activities and pain that somewhat interfered with activities. The respondents' BMI was mostly ideal and thin BMI. The research showed that adolescent nutritional status (BMI) had an effect on dysmenorrhea pain scores in adolescents (p-value 0.030).
2	Widiyanto, A., *et al.* (2020).	Hubungan Indeks Massa Tubuh dengan Dismenorea	STIKES Mamba'ul 'Ulum Surakarta, Indonesia.	Cross-sectional analytical study with accidental sampling technique.	213 female students of Mamba'ul 'Ulum Surakarta Health College.	The characteristics of the majority of respondents were menarche in early adolescence, menstrual duration ≤7 days and menstrual cycle 28-35 days. The majority of respondents had normal BMI and experienced mild dysmenorrhea. The results of the Spearman Rank Correlation analysis showed a significance value of 0.180> 0.05, so there was no significant relationship between the BMI variable and dysmenorrhea.

3	Kurniati, B., *et al.* (2019).	Hubungan Indeks Massa Tubuh dengan Kejadian Dismenore pada Mahasiswi Angkatan 2015 Fakultas Kedokteran Universitas Baiturrahmah Padang	Faculty of Medicine, Baiturrahmah University, Padang, Indonesia.	Quantitative analysis with cross-sectional study.	54 female students of the Faculty of Medicine, Baiturrahmah University, Padang, class of 2015.	Most respondents have a normal BMI category, namely 32 people (59.3%). Most experienced mild dysmenorrhea, namely 28 people (51.9%). And there is a relationship between body mass index and the incidence of dysmenorrhea in female students of the 2015 batch of the Faculty of Medicine, Baiturrahmah University p = 0.009 (p <0.05) and the correlation coefficient value = 0.353.
4	Surur, A., *et al.* (2019).	Body Mass Index and Dysmenorrhea in Female Teenagers	State High School 21 Makassar, Indonesia.	descriptive cross-sectional and purposive sampling.	110 teenage girls.	Most adolescents have normal BMI (35.4%), while the distribution of menstrual pain levels is dominated by moderate pain (74.5%). Based on statistical analysis using SPSS, the value of P = 0.001 (P <0.05) shows that there is a significant relationship between BMI and the degree of menstrual pain (dysmenorrhea).
5	Rusydi, R., *et al.* (2021).	Hubungan Indeks Massa Tubuh Dengan Kejadian Dismenorea Primer Pada Remaja	SMAN 9 and SMAN 15 Padang, Indonesia.	Observational analytical research with a cross-sectional approach. Sampling was carried out using multistage random sampling.	133 teenage girls in grade XI.	Most respondents who have a low BMI and experience primary dysmenorrhea are 32 people (94.1%) and respondents who have a high BMI and experience primary dysmenorrhea are 24 people (92.3%). In the bivariate analysis, a value of (p = 0.021) was obtained, which means there is a relationship between BMI and the incidence of primary dysmenorrhea in adolescents.
6	Ramadhan, R., *et al.* (2024).	Hubungan Indeks massa Tubuh (IMT) dengan Kejadian Dismenore Primer pada Siswi SMK Az-Zahra Sepatan Kabupaten Tangerang	Az-Zahra Vocational School, Sepatan, Tangerang Regency, Indonesia.	Quantitative research with a cross-sectional approach.	125 teenage girls.	The majority of adolescents have a BMI in the normal category of 70 respondents (56.0%), while the distribution of primary dysmenorrhea images, most adolescents do not experience dysmenorrhea (59.2%). There is a significant relationship between BMI and the incidence of primary dysmenorrhea in female students of Az-Zahra Vocational High School, Tangerang Regency with a p-value of 0.000 <0.05.
7	Donayeva, A., *et al.* (2023).	The relation between primary dysmenorrhea in adolescents and body mass index	Marat Ospanov West Kazakhstan Medical University (WOKU), Aktobe, Kazakhstan.	Quantitative analysis with cross-sectional study.	210 teenagers aged 12-18 years.	There was a moderate positive relationship between the visual analog scale of dysmenorrhea and BMI in the obese adolescent group (9.4 ±0.6) compared to the underweight adolescent group (8.7 ±0.8) (p = 0.000001), normal weight (6.5 ±0.5) (p = 0.000001), and

					overweight adolescent group (6.3 ±0.6) (p = 0.000001).
8	Nermeen T. Mostafa, M.Sc. & H. Yosseuf, Ph.D., (2020).	Effect of Body Mass Index on Primary Dysmenorrhea and Daily Activities in Adolescents	Beni-Mazar Secondary School for Girls, Minya Governorate, Mesir.	Correlation study.	100 teenage girls aged 16-25 years.	Differences in body mass index affect primary dysmenorrhea; obese and underweight subjects suffer from primary dysmenorrhea more than normal and overweight subjects and there is no difference in daily activities except for absence from school and social activities which are higher in obese and underweight subjects.
9	Aktaş, D., *et al.* (2023).	The Relationships Between Primary Dysmenorrhea with Body Mass Index and Nutritional Habits in Young Women	Universities in Türkiye.	Quantitative analysis with cross-sectional study.	307 young women.	The prevalence of primary dysmenorrhea was 55.7%. The average severity of menstrual pain was 7.16 ± 1.95. The prevalence of primary dysmenorrhea was significantly correlated with age, age at menarche, body mass index, and dietary index. The prevalence of primary dysmenorrhea was 1.06 times higher among young women who were overweight/obese according to body mass index compared to those who were underweight and normal. There was a moderate correlation between menstrual severity, BMI, and dietary pattern.
10	Jamali, T., *et al.* (2023).	Severity and relation of primary dysmenorrhea and body mass index in undergraduate students of Karachi. A cross sectional survey	Two districts in Karachi, Pakistan.	Cross-sectional research.	384 female students aged 15-25 years who had reached menarche at the appropriate age.	Most of the students experienced mild dysmenorrhea (39%), moderate dysmenorrhea (37.8%), and severe dysmenorrhea (23.2%). Dysmenorrhea was associated with radiating pain in 265 (69%) and vomiting in 111 (28.9%). Nutritional status was normal in 235 (61.2%) subjects, 88 (22.9%) were underweight, and 61 (15.9%) were overweight and obese. Significant differences were observed in dysmenorrhea among underweight students (p <0.05). Dysmenorrhea was found to have a significant association with body mass index and age.

4. Discussion

4.1. Correlation between BMI and dysmenorrhea

Based on a review of 10 articles, 9 articles showed a significant correlation between body mass index and the incidence of dysmenorrhea in adolescents. These studies emphasized that abnormal BMI categories (underweight, overweight, and obese) were linked to an increased risk of menstrual pain. However, one article found no significant association between BMI and dysmenorrhea.

A study conducted at an independent midwife practice in Semarang city using Purposive sampling showed that most adolescents with obesity experienced pain that somewhat interfered with activities, and in adolescents with thin BMI, most adolescents experienced pain that interfered with activities, while adolescents with normal BMI, most adolescents experienced little menstrual pain (10). his shows that low BMI has a major influence on primary dysmenorrhea pain in adolescents. So that the study is in line with research by Jamali et al, that significant differences were observed in dysmenorrhea among underweight students (p <0.05). Dysmenorrhea was found to have a significant relationship with body mass index and age (11). Research shows that women who have a low body mass index (BMI) can experience dysmenorrhea due to lack of nutrition obtained by the body so that it can cause the risk of anemia which is one of the triggers for primary dysmenorrhea (9).

Research by Donayeva et al, showed a positive correlation between BMI and the incidence of dysmenorrhea in adolescents, using a visual analog scale of dysmenorrhea, where the obese adolescent group was more likely to experience dysmenorrhea compared to other adolescent groups such as thin, normal, and fat (12). This shows that the study is in line with research by Aktaş et al, which stated that the prevalence of primary dysmenorrhea was 1.06 times higher among young women who were overweight/obese according to body mass index compared to those who were underweight and normal (13).

In a study conducted in Minya Governorate, Egypt, using a correlation study on 100 female adolescents aged 16-25 years showed that subjects who had been measured and identified as obese and underweight suffered from primary dysmenorrhea more severely compared to subjects with normal weight. This causes obese and underweight adolescents to have problems with school attendance and higher social activity disorders. This shows that both the obese and underweight groups have higher pain intensity and lower pain threshold compared to the normal weight and overweight groups (14).

Likewise, research Kurniati et al, explained that there was a relationship between body mass index and the incidence of dysmenorrhea in female students of the 2015 batch of the Faculty of Medicine, Baiturrahmah University p = 0.009 (p <0.05) and the correlation coefficient value = 0.353 which means the level of correlation of variables in the weak category with a positive direction. Most respondents experienced mild dysmenorrhea 51.9% with most respondents having normal body weight, namely 59.3% (15). This study is in line with research Surur et al, which stated that most adolescents also have a normal BMI (35.4%), while the distribution of the degree of menstrual pain is dominated by moderate pain (74.5%). Based on statistical analysis using SPSS, the value of P = 0.001 (P <0.05) was obtained, indicating that there is a significant relationship between BMI and the degree of menstrual pain (dysmenorrhea) (16). The cause of dysmenorrhea occurs due to increased levels of prostaglandins and vasopressin levels. but many other factors can also affect prostaglandin and vasopressin levels, for example stress levels, genetics, menstrual cycle history, lifestyle and others (17).

Rusydi et al., reported a significant correlation between BMI and the incidence of dysmenorrhea in adolescents (p = 0.021). In their study, 32 out of 34 adolescents with low BMI experienced dysmenorrhea (94.1%), and 24 out of 26 adolescents with high BMI also experienced dysmenorrhea (92.3%) (18). Body Mass Index (BMI) is influenced by various factors such as age, diet and nutritional intake, physical activity, and gender. Most women with abnormal BMI tend to experience primary dysmenorrhea. Women with BMI in the undernourished category are usually more susceptible to pain due to lower immune system compared to women with normal BMI or good nutrition. Meanwhile, women with BMI in the overnourished category often have excess body fat which can trigger hormonal imbalance (19).

In the study by Ramadhan et al., it was stated that the majority of adolescents had a body mass index in the normal category of 70 respondents (56.0%). Meanwhile, the distribution of the picture in this study, the majority did not experience primary dysmenorrhea as many as 74 students (59.2%). The study assumes that a combination of a healthy diet and regular exercise, adolescents can maintain their ideal BMI, which in turn reduces the risk of dysmenorrhea (20). Dysmenorrhea, or menstrual pain, is often associated with unhealthy diets and lack of physical activity. By maintaining a balanced diet and exercising regularly, adolescents not only reduce the risk of dysmenorrhea, but also improve their overall reproductive health. This healthy lifestyle contributes to long-term health, helps prevent various chronic diseases, and improves overall quality of life (21).

Meanwhile, in the study by Widiyanto et al., on 213 adolescents who were the sample of the study, the majority of adolescents menarche in early adolescence, menstrual duration ≤7 days and menstrual cycle 28-35 days. The majority of respondents had normal BMI and experienced mild dysmenorrhea. The results of the Spearman Rank Correlation analysis showed a significance value of 0.180> 0.05 so that no significant correlation was found between the BMI variable and dysmenorrhea (22). This is in accordance with the theory that BMI is unable to describe the proportion of fat contained in a person's body. Assessment of adolescent nutritional status must be carried out periodically so that

the nutritional status of adolescents is known and actions can be taken immediately to return adolescents to good nutritional status, so that the development of the adolescent reproductive system develops properly. Good nutritional status in adolescents can be obtained by consuming balanced nutrition according to needs during adolescence (8).

5. Conclusion

A review of ten journal articles revealed that most of them showed an association between BMI and dysmenorrhea. Adolescents with abnormal BMI (underweight, overweight, and obesity) were more likely to experience dysmenorrhea. However, it is important to realize that BMI is not the only factor that influences the occurrence of menstrual pain or dysmenorrhea. However, by maintaining BMI within the ideal category, it can be a step to reduce the risk of dysmenorrhea in adolescents. Health care professionals play an important role in this context. In addition to screening, they can provide education and counseling on nutritional status and menstrual pain management.

Compliance with ethical standards

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Disclosure of conflict of interest

There is one finding that contradicts the theory.

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