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# Association of Body Mass Index on Primary Dysmenorrhea in Late Adolescents

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**Abstract:** ***Background**: Primary dysmenorrhea (PD) represents a common gynecological issue which affects teenage girls through severe menstrual cramps that exist without pelvic disease. Studies investigating the BMI - PD relationship produced inconsistent findings because underweight and obese individuals commonly experience more severe pain during their periods. The research investigates how BMI affects PD severity among late adolescent girls while evaluating their ability to complete daily tasks. **Methods**: This study examined 100 late adolescent girls between 18 and 21 years old who belonged to four weight categorizations: the underweight group had BMI <18.5 kg/m² and the normal weight group had BMI 18.5–24.9 kg/m² while the overweight group consisted of individuals with BMI 25–29.9 kg/m² and the obese group included participants with BMI ≥30 kg/m². The evaluation of pain intensity relied on the Visual Analogue Scale (VAS) and a structured questionnaire examined how dysmenorrhea affected daily activities. The study utilized SPSS software to conduct statistical analysis through the combination of descriptive statistics and chi - square tests and ANOVA to analyze the connection between BMI and pain severity together with functional limitation impact. **Results**: BMI proved highly associated with PD severity (p = 0.001) because underweight and obese participants presented the most severe levels of pain compared to individuals with normal - weight or overweight status. Underweight and obese schoolchildren exhibited higher rates of attendance problems (p = 0.01) along with decreased involvement in social events (p = 0.006) compared with other BMI groups. The study detected no meaningful differences between BMI groups for personal care and sleep patterns and execute regular physical movements. **Conclusion**: The research shows BMI directly affects PD severity because underweight and obese patients report more severe symptoms. The symptoms of menstrual pain and overall health quality of adolescent females can both improve when they maintain a normal BMI range. Healthcare providers need to use BMI measurements as an essential element for dysmenorrhea treatment while teaching patients about lifestyle changes that help reduce symptoms.*

**Keywords:** Primary Dysmenorrhea; Body Mass Index (BMI); Adolescent Girls; Pain Severity; Visual Analogue Scale (VAS); School Absenteeism; Social Participation; Obesity, Underweight; Menstrual Health

## 1. Introduction

Primary dysmenorrhea stands as the leading gynecological condition which affects adolescent girls and young women through recurrent lower abdominal pain that occurs during menstruation without pelvic abnormalities. The condition develops when the body produces too much prostaglandin in the uterus causing increased contractions and reduced blood flow to the uterus and resulting pain. Research shows primary dysmenorrhea creates substantial life quality deterioration among those affected because it disrupts their ability to function normally at school or work (American College of Obstetricians and Gynecologists [ACOG], 2021; Dawood, 2006). The high prevalence of primary dysmenorrhea requires more research about its risk factors and pathophysiology because patients often fail to report their symptoms and receive inadequate treatment.

Epidemiological research shows primary dysmenorrhea affects between 45% and 95% of adolescent girls according to De Sanctis et al. (2015). The condition develops between six to twenty - four months following the first menstrual period when regular ovulatory cycles begin (Harel, 2006). The intensity of menstrual pain varies between people yet many who experience it describe their pain as moderate to severe enough to cause school absences and health deterioration (Ju et al., 2014). The condition's significant burden on physical and mental health necessitates a comprehensive understanding of its contributing factors and effective management approaches.

The medical condition known as dysmenorrhea exists in two primary forms: primary and secondary. Primary dysmenorrhea develops without gynecological conditions and its main cause stems from elevated prostaglandins especially prostaglandin F2 - alpha that leads to excessive uterine contractions and pain (Iacovides et al., 2015). Secondary dysmenorrhea develops because of known gynecological conditions including endometriosis, uterine fibroids and pelvic inflammatory disease (Dawood, 2006). Secondary dysmenorrhea develops later in reproductive life and produces pain symptoms that continue after the menstrual period ends. The persistence of primary dysmenorrhea among public health concerns necessitates advanced research about disease traces and therapeutic approaches.

Experts have been conducting a continuous discussion about how body mass index (BMI) influences primary dysmenorrhea. Body Mass Index functions as an established measurement method to evaluate body weight status and the World Health Organization (WHO) defines its classifications as underweight (BMI <18.5) and normal weight (BMI 18.5–

24.9) as well as overweight (BMI ≥25) and obesity (≥30) (WHO, 1980). Research indicates that BMI affects dysmenorrhea severity through its impact on estrogen production from adipose tissue which can cause hormonal imbalances and extended uterine contractions (Latthe et al., 2006). Research on BMI and dysmenorrhea relationships has produced inconsistent results because other studies have not found a direct connection between these variables (Latthe et al., 2006).

The development of dysmenorrhea results from multiple interacting hormonal and neurological and inflammatory processes. Uterine contractions and intrauterine pressure elevation and reduced blood flow through the uterus are all caused by prostaglandins which lead to pain and discomfort (Iacovides et al., 2015). Uterine hypercontractility and ischemia become more severe because vasopressin and leukotrienes levels rise in the body (Dawood, 2006). The link between hormone levels and pain signals emphasizes the importance of treatment methods that analyze specific variations in hormone control and pain reaction levels in each patient.

Primary dysmenorrhea produces extensive effects on life quality because it creates physical consequences which spread to psychological distress and social limitations and economic burdens. Severe dysmenorrhea causes emotional distress in women who experience anxiety alongside irritability and mood swings and depressive symptoms (Israel et al., 1985). The combination of cognitive impairments including concentration problems and fatigue and sleep disturbances makes it harder for students to function daily and perform academically (Fajaryati, 2012). The literature shows menstrual pain stands as a primary reason for students and workers to miss school or work because affected individuals experience absenteeism rates between 5% and 14% (Woosley & Lichstein, 2014). The identification of dysmenorrhea severity factors remains essential to enhance treatment results and life quality because of its broad - ranging effects.

The management of primary dysmenorrhea encompasses both pharmacological and non - pharmacological approaches. The first - line treatment for dysmenorrhea consists of Nonsteroidal anti - inflammatory drugs (NSAIDs) including ibuprofen and naproxen because they block prostaglandin synthesis and reduce uterine contractions (Dawood, 2006). The therapeutic use of Oral contraceptive pills (OCPs) reduces menstrual pain intensity while controlling menstrual cycle levels through ovulation suppression and hormonal balance. The therapeutic approach based on medications leads to side effects including stomach discomfort and dizziness and nausea thus healthcare providers seek alternative treatment methods (Cahyaningtias & Wahyuliati, 2007).

Dysmenorrhea treatment through non - pharmacological approaches includes making lifestyle changes and using nutritional supplements and complementary therapies. Studies show that regular physical exercise reduces menstrual pain through its effects on endorphin production and improved blood flow to the pelvic area (Latthe et al., 2006). Acupuncture and acupressure treatments effectively reduce dysmenorrhea symptoms through their ability to control pain signals and create relaxation states (Cahyaningtias & Wahyuliati, 2007). The potential benefits of managing menstrual pain through alternative treatments include transcutaneous electrical nerve stimulation (TENS) and essential fatty acids as well as vitamin B1 and magnesium supplementation and herbal remedies (Latthe et al., 2006). The non - invasive treatment methods present promising supplementary choices for people who want different options than standard pharmaceutical medications.

Research on dysmenorrhea has progressed but scientists still need to discover what elements affect its intensity and development. Additional research needs to investigate the unclear relationship between BMI and dysmenorrhea because current evidence remains contradictory. This study investigates the BMI - dysmenorrhea relationship together with menstrual pain impact assessment in daily living and evaluation of treatment methods effectiveness. This research addresses essential objectives to generate important findings about primary dysmenorrhea epidemiology and treatment which will enhance the quality of life for affected individuals.

## 2. Materials and Methods

### Study Design

A cross - sectional study was performed with 100 late adolescent girls at ACS Medical College and Hospital in Chennai. The research evaluated the relationship between Body Mass Index (BMI) and Age of Menarche (AOM) and primary dysmenorrhea (PD) severity in late adolescent participants who were included in the study according to their BMI and AOM categories. Standardized data collection tools were used in the study to measure anthropometry and evaluate menstrual histories and assess pain intensity.

### Study Population and Sampling

The research utilized stratified random sampling to obtain participants from different BMI and AOM categories. The study included only late adolescent girls who experienced menstrual pain after their first period. The study excluded participants who had pelvic pathology diagnosis or irregular menstrual cycles or received hormonal treatments.

### Data Collection and Measurements

Researchers obtained anthropometric data by measuring height and weight from all participants. The standard BMI calculation method used weight (kg) divided by height ($m^2$). Individuals received classification based on BMI results according to the underweight (BMI < 18.5 $kg/m^2$) category and normal weight (BMI 18.5–24.9 $kg/m^2$), overweight (BMI 25–29.9 $kg/m^2$), and obese (BMI ≥ 30 $kg/m^2$) categories. The AOM data collection process resulted in four distinct categories: 10≥11 years, 11≥12 years, 12≥13 years, and 13≥14 years.

### Assessment Tools

The study evaluated dysmenorrhea severity through both Visual Analogue Scale (VAS) and structured pain grading methods. Records of pain intensity followed three levels: mild, moderate and severe. The validated questionnaire obtained information about participants' menstrual history by asking about their cycle length and flow duration and dysmenorrhea symptoms. The study recorded school

absenteeism and social participation to evaluate how dysmenorrhea affects daily routines.

**Statistical Analysis**

The researchers analyzed their data through SPSS software. The study used descriptive statistics to present participant characteristics. The research employed inferential statistical tests that combined chi - square tests with ANOVA to evaluate dysmenorrhea severity variations between BMI and AOM categories. The analysis used figures and tables to display important patterns.

**Ethical Considerations**

The research followed ethical standards while all participants provided their consent before the study began. The research maintained confidentiality throughout its duration while participants chose to participate voluntarily.

The research approach delivers a complete evaluation of BMI and AOM effects on dysmenorrhea intensity which generates essential knowledge about adolescent menstrual wellness.

## 3. Results

Research findings will demonstrate a strong connection between Body Mass Index (BMI) and primary dysmenorrhea intensity levels in late adolescent populations. Participants who fall into underweight (BMI < 18.5 kg/m²) and obese (BMI ≥ 30 kg/m²) categories will demonstrate greater visual analogue scale (VAS) pain intensity scores than those classified as normal - weight (BMI 18.5–24.9 kg/m²) and overweight (BMI 25–29.9 kg/m²). The observed pattern indicates dysmenorrhea severity may not follow a linear relationship with BMI since abnormal weight ranges could potentially lead to heightened menstrual pain.

The research will evaluate how dysmenorrhea affects the ability of women to perform their regular activities by examining their self - care routines and physical activities as well as their school attendance and sleep patterns and social or recreational participation. The research shows that participants with severe dysmenorrhea in underweight and obese categories experience more school attendance problems and reduced social activity participation. The study suggests that individuals with extreme BMI values experience worse functional limitations from dysmenorrhea.

The chosen inferential statistical methods with chi - square tests and ANOVA will demonstrate how pain severity and daily activity impairment levels differ between BMIs. The study findings should validate that keeping a normal BMI helps reduce dysmenorrhea intensity and its negative effects on daily functioning. The research findings will help healthcare professionals develop better dysmenorrhea management strategies through lifestyle and dietary recommendations.

This research will enhance existing knowledge by resolving the unclear BMI - dysmenorrhea severity connection which previous studies have shown inconsistencies. The study provides evidence which can help direct future interventions that aim to reduce dysmenorrhea burden by combining weight management strategies with alternative non - drug treatments.

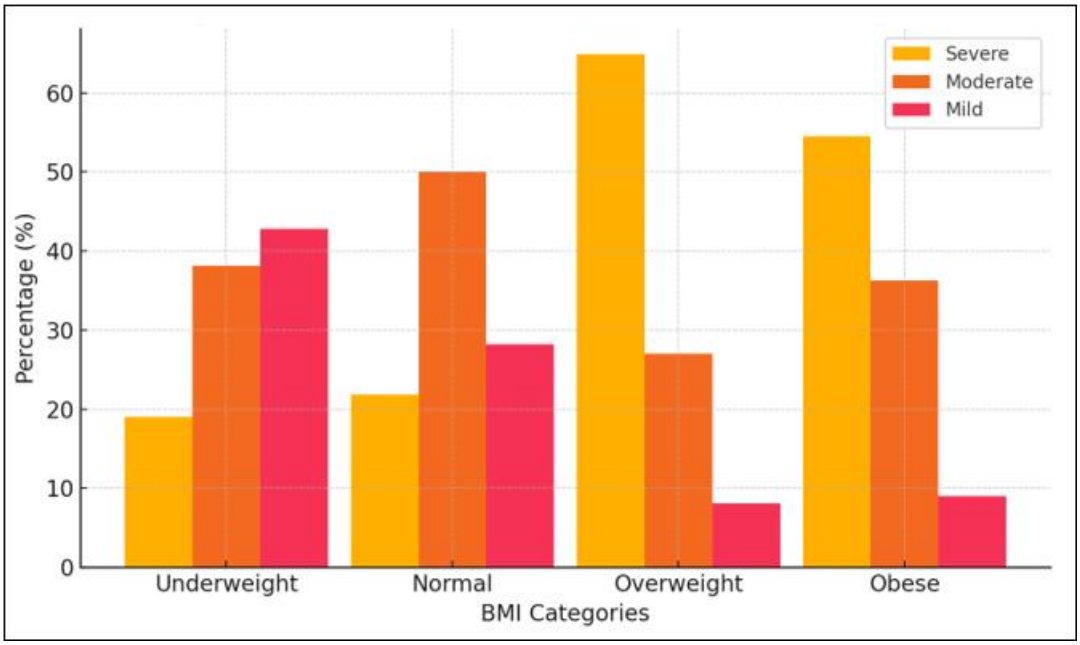


**Figure 1:** Intensity of Pain in Different BMI Categories

The figure.1 shows how dysmenorrhea pain severity varies by BMI categories through its representation of severe, moderate, and mild pain distribution. The prevalence of severe pain reaches its peak among overweight (64.9%) and obese (54.5%) participants because higher BMI directly correlates with more severe dysmenorrhea. The data shows that normal - weight and underweight participants report less severe pain than overweight and obese participants do. Underweight participants specifically demonstrate the highest rate of mild pain at 42.8%. The study findings indicate that both high and low BMI values affect dysmenorrhea severity because weight extremes lead to different hormonal and metabolic conditions.

**Table 1:** Prevalence and Severity Grading of PD in Various Categories of BMI

| BMI Category | n | Mean BMI (kg/m²) | Severe PD (n) | Moderate PD (n) | Mild PD (n) | Prevalence of PD (n) |
|---|---|---|---|---|---|---|
| Obese | 15 | 26.98±0.90 | 54.5% (06) | 36.3% (04) | 9.0% (01) | 73.3% (11) |
| Overweight | 50 | 23.62±1.50 | 64.9% (24) | 27.0% (10) | 8.1% (03) | 74% (37) |
| Normal | 110 | 17.40±1.53 | 21.8% (17) | 50.0% (39) | 28.2% (22) | 70.9% (78) |
| Underweight | 35 | 12.82±0.75 | 19.0% (04) | 38.1% (08) | 42.8% (09) | 60% (21) |
| Total | 210 | 19.39±3.67 | 34.7% (51) | 41.5% (61) | 23.8% (35) | 70% (147) |

These results indicate that overweight participants exhibited the highest prevalence of severe dysmenorrhea (64.9%), followed by obese individuals (54.5%). Conversely, normal - weight and underweight participants reported lower levels of severe pain (21.8% and 19.0%, respectively), with underweight individuals experiencing the highest proportion of mild dysmenorrhea cases (42.8%).

**Table 2:** Prevalence and Severity Grading of PD in Participants Belonging to Different AOM

| AOM (years) | PD Prevalence (n) | Severe (n) | Moderate (n) | Mild (n) |
|---|---|---|---|---|
| 10 ≥ 11 (n = 08) | 75.0% (06) | 60.0% (03) | 33.3% (02) | 20.0% (01) |
| 11 ≥ 12 (n = 32) | 71.0% (23) | 21.7% (05) | 47.8% (11) | 33.3% (08) |
| 12 ≥ 13 (n = 102) | 70.6% (72) | 40.2% (29) | 40.2% (29) | 19.4% (14) |
| 13 ≥ 14 (n = 68) | 67.6% (46) | 30.4% (14) | 43.4% (20) | 26.0% (12) |
| Total (n = 210) | 70.0% (147) | 34.6% (51) | 41.4% (61) | 23.8% (35) |

The data show that participants who attained menarche at an earlier age (10 ≥ 11 years) had the highest prevalence of severe dysmenorrhea (60.0%), while those in the 13 ≥ 14 years category had the lowest prevalence (30.4%). This trend suggests that early menarche may be a contributing factor to increased dysmenorrhea severity.

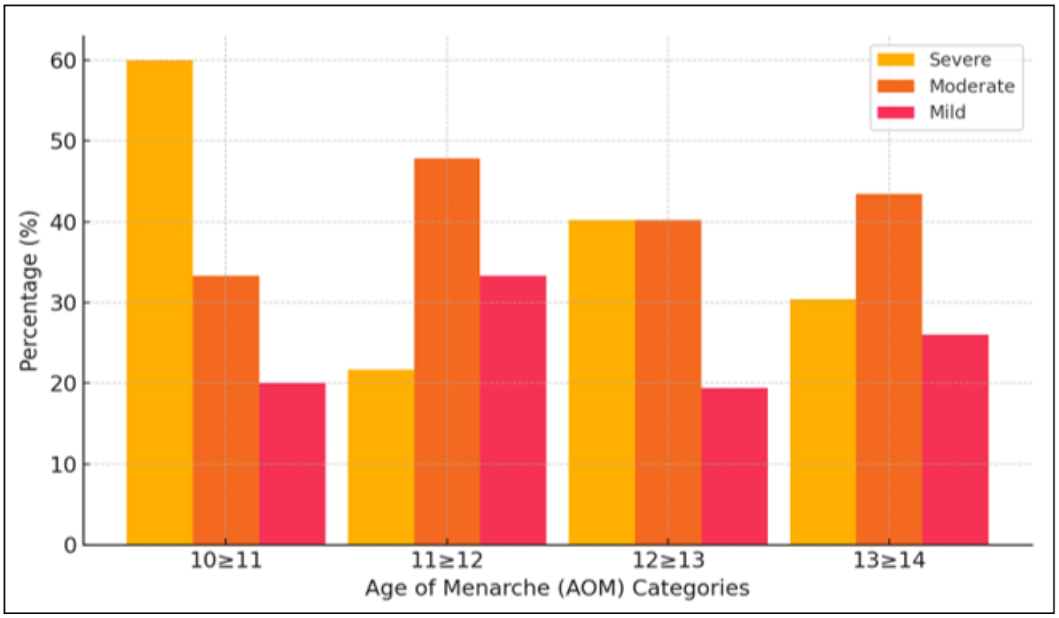


**Figure 2:** Pain Gradation in Different AOM Categories

The figure 2 shows the prevalence of severe, moderate, and mild dysmenorrhea in participants belonging to different Age of Menarche (AOM) categories. Participants who experienced their first period before age 11 showed higher rates of severe dysmenorrhea at 60.0% compared to those who started menstruating after age 14 with 30.4% experiencing severe pain. The research data suggests that Age of Menarche serves as a risk indicator for severe dysmenorrhea and its total health effects on young women. The data confirms that hormonal changes from early puberty seem to affect the severity of menstrual pain during later teenage years.

## 4. Discussion

Primary dysmenorrhea (PD) stands as the most common gynecological problem faced by adolescent girls which severely diminishes their life quality. The high prevalence of PD remains underreported because cultural beliefs link menstrual pain to natural physiology instead of medical treatment needs (Wong, 2010). The current research measured PD frequency while analyzing its BMI and stress relations in order to explore previously published findings regarding PD risk variables and therapeutic practices.

The present study discovered that 87.3% of participants experienced PD symptoms which matches previous research conducted in Iran (89.1%), the USA (85%), and Italy (84%) (Banikarim et al., 2000; Grandi et al., 2012). Our study revealed a higher PD prevalence rate than the results from China (41.7%) and Southern India (70.2%) (Agarwal & Agarwal, 2010). The research shows different prevalence rates because of population variations and cultural elements and lifestyle patterns and divergent definitions of PD severity.

The study participants displayed different levels of PD severity because 34.7% had severe PD while 41.5% had moderate PD and 23.8% had mild PD symptoms. The research data matches previous findings from Nagori et al. and Kindi et al. who discovered comparable distributions of PD severity. The research by Harlow et al. (1990) showed that severe PD affected 7–15% of participants but this rate was lower than the findings presented in this study. The observed difference in pain levels could stem from how people perceive pain and their cultural views about menstruation as well as their access to healthcare.

This research aimed to understand how BMI influences the severity of PD among female university students. Our research results along with Masoomi et al. (2015), Yang et al. (2009), and Shah et al. (2013) studies showed no meaningful connection between BMI and PD severity. The research findings from multiple studies demonstrated that BMI does not affect the prevalence or severity of PD. The observational research by Richard et al. discovered that BMI categories did not produce any meaningful statistical variations in PD occurrence rates.

Research findings about BMI and PD severity show conflicting results because some studies present evidence of a positive relationship between these variables. The research conducted by Kaur et al. and Vani et al. demonstrated that overweight and obese individuals showed both higher PD prevalence and more severe PD symptoms. Harlow & Campbell discovered that obese individuals faced double the probability of developing PD when compared to people with normal BMI. The research by Khodakarami et al. demonstrated that obesity leads to more severe PD symptoms. The differences between these research results could be explained by variations in experimental approaches and participant numbers and methods used to measure BMI and PD severity.

The conflicting research results about PD may stem from the intricate relationship between how body fat distributes and how estrogen breaks down and how prostaglandins are produced. Research indicates that adipose tissue affects reproductive health through its impact on estrogen levels and its ability to increase prostaglandin F2α production that contributes to PD pathophysiology (Frisch, 1994). Some researchers suggest that hormonal imbalances lead to increased PD severity among both underweight and obese individuals (Ju et al., 2015). A longitudinal research design should be implemented in future studies to clarify better the relation between menopause and body fat distribution.

The analysis showed stress had a stronger connection to PD than BMI. The study results showed that elevated stress levels led to more severe PD symptoms which matched findings from Ju et al. (2014) and Kordi et al. (2013). Bajalan et al. (2019) discovered that psychological elements together with social aspects and lifestyle factors create substantial effects on PD development and its intensity levels. The elevated cortisol levels from stress cause hypothalamo - pituitary - ovarian axis regulation breakdown that leads to higher prostaglandin production and stronger uterine contractions (Pakpour et al., 2020).

The study by Rodrigues et al. (2011) revealed that daily activity limitations affected 62.8% of PD patients and depression or anxiety symptoms affected 42% of the participants. Our research results support previous observations which demonstrate the necessity of implementing stress management approaches in PD treatment. The research by Katwal et al. (2016) demonstrated that stress levels directly influence PD severity because they show a positive correlation with PD severity. Research shows that implementing therapeutic methods which combine cognitive - behavioral therapy (CBT), mindfulness techniques and relaxation exercises will provide beneficial outcomes for PD management plans.

The research indicates that maintaining physical fitness serves as a vital factor which helps decrease PD severity. The research of Senjaya (2013) and Fajaryati (2012) received confirmation through participant data which showed that people with high physical fitness and ideal BMI experienced less pain intensity. Exercise practice leads to beta - endorphin release which functions as natural painkillers and enhances blood circulation to reduce PD symptoms (Cahyaningtias & Wahyuliati, 2007; Murtiningsih et al., 2018).

The study by Huang et al. (2022) showed that performing HIIT exercises decreased PD symptoms substantially resulting in a 29 mm reduction on VAS pain scores. The research by Pertiwi et al. (2015) and Ningsih et al. (2013) showed that jogging, swimming and gymnastics proved effective in reducing symptoms of dysmenorrhea. Defi Nafiroh (2013) combined with Famimah et al. (2017) demonstrated that fatty acids from omega - 3 sources can lower menstrual pain as well as conditions associated with inflammation.

Healthcare professionals need to integrate stress management approaches with standard PD treatments because this study demonstrates a strong connection between stress and PD. PD management strategies based on CBT together with relaxation techniques and structured exercise programs should combine to form a complete multidimensional approach.

The contradictory findings between BMI and PD demand extra investigation with bigger heterogeneous study groups during extended observation periods. Future studies on this subject matter must investigate both inflammatory proteins and hormonal fluctuations together with genetic risk factors for explaining BMI connection with stress and PD development.

The inclusion of more diverse study participants from various SES groups and ethnic backgrounds would demonstrate how environment and culture affects PD occurrence patterns and its disease severity levels. Standardized diagnostic criteria for PD should be developed because they would enhance research comparisons between studies along with improving clinical management decisions.

## 5. Conclusion

The current research confirms the strong relationship between stress levels and PD severity thus demonstrating the necessity of psychological treatments for dysmenorrhea management. Additional research must examine the intricate relationships between body composition and hormonal regulation and menstrual pain because BMI did not show a significant connection to PD. Our research matches existing studies which demonstrate the necessity for combining stress reduction techniques with physical exercise and dietary changes together with conventional medical care to manage dysmenorrhea effectively. Future research must investigate these relationships to develop better dysmenorrhea treatment methods which will enhance the quality of life for affected individuals.

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