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ORIGINAL ARTICLE

Obesity and Its Relationship with Menstrual Irregularities and PMS-Related Psychological and Behavioral Symptoms Among Medical Students

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ABSTRACT

Background*: Premenstrual Syndrome (PMS) involves recurring emotional and behavioral symptoms before menstruation, often intensified by stress, anxiety, depression, and poor sleep. While previous studies show significant impacts, many lacks broader applicability. This study aimed to examine the association between obesity, menstrual irregularities, and PMS-related psychological and behavioral symptoms among medical students.* ***Methods & Materials:*** *This cross-sectional study at Dhaka Medical College Hospital included 80 female students (18–25 years) with regular cycles, divided into non-obese and obese groups. Data on socio-demographics, reproductive history, lifestyle, and psychological factors were collected via questionnaire, and PMS severity was assessed using a validated tool. Analysis used SPSS 26 with appropriate statistical tests ($p < 0.05$). Ethical approval and informed consent were obtained.* ***Results:*** *Obese participants had higher age, weight, and BMI, longer and heavier menstrual flow, and greater PMS severity (PMSS 113.83 ± 12.54 vs. 62.5 ± 14.31). Psychological symptoms (anxiety 85% vs. 50%, depression 97.5% vs. 47.5%) and behavioral issues (social withdrawal 60% vs. 22.5%, impaired work 77.5% vs. 35%) were also more frequent, showing a strong link between obesity and PMS severity.* ***Conclusion****: Obesity was associated with higher PMS severity, more psychological and behavioral symptoms, longer and heavier menstrual flow, and increased clinical complaints, highlighting the need for weight management and supportive interventions to improve well-being.*

Keywords: *Obesity, Menstrual Irregularities, PMS, Psychological, Behavioral, Medical Students*

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INTRODUCTION

Premenstrual Syndrome consists of cyclic physical, emotional, and behavioral symptoms that appear in the week before menstruation and typically improve once menstrual bleeding begins. The symptoms recur monthly and vary in type and severity [1]. PMS affects 20–32% of women, while the more severe PMS affects 3–8%. PMS causes significant functional impairment [2].

The cause of PMS is uncertain but likely multifactorial. Hormonal fluctuations, altered sensitivity to progesterone, serotonin imbalance, impaired prostaglandin production, and genetic factors may all contribute, even though hormone levels often remain normal [3]. Physically, women commonly report breast tenderness, abdominal bloating or cramps, headaches, back pain, swelling (water retention), and general pain or aches — in addition to fatigue, joint or muscle pain, and changes in appetite (including food cravings or increased appetite) [4]. Psychological symptoms of PMS often include irritability, mood swings, anxiety, tension, depression or low mood, emotional lability, tearfulness, difficulty concentrating, and lowered self-esteem [5].

Behaviorally, many women report sleep disturbances, fatigue or low energy, reduced motivation in daily activities, social withdrawal, lower work or academic performance, and general functional impairment during the luteal phase [6].These psychological and behavioral changes frequently interfere with daily life and quality of life during the premenstrual period [7].Psychological and behavioral factors such as perceived stress, prior trauma, anxiety and depressive symptoms, poor sleep quality, and low physical activity are consistently associated with greater premenstrual symptom burden and—where tested—predict higher odds of more severe PMS [8].

A large multilevel meta-analysis found a positive correlation between stress and premenstrual symptom severity ($r \approx 0.29$) and reported that individuals with a history of trauma have markedly higher odds of premenstrual disorders [8]. Prospective and cross-sectional studies likewise show that higher anxiety and depression scores are linked to increased PMS severity and that average nightly sleep hours and poor sleep quality independently relate to worse symptoms [9].

A study in Virginia shows that Among 874 women, 8.3% had PMS, which was associated with higher stress, alcohol use, younger age, Black race, longer menses, and greater physical activity [10]. Another study result shows that among 6,697

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women, PMS prevalence was 61–97%, with psychological symptoms more frequent than physical; higher BMI and apple-shaped bodies were linked to greater symptom severity [11].

A study report found that PMDD among Bangladeshi university students was associated with higher depression, anxiety, and stress, increasing the risk of suicidal thoughts and attempts. However, as a single-site study, it may not be generalizable and did not explore underlying causes or coping strategies [12]. Similarly, another study reported a high prevalence of PMS, which negatively affected daily life, academics, and social interactions, but did not assess co-existing mental health issues or management strategies [13]. Together, these studies highlight the significant physical and psychological impact of menstrual disorders while revealing gaps in generalizability, causality, and intervention group research [12,13].

The aim of this study was to investigate the relationship between obesity and menstrual irregularities, as well as the psychological and behavioral symptoms associated with premenstrual syndrome (PMS), among medical students.

METHODS & MATERIALS

Study-Design: This study was a cross-sectional observational study aimed at identifying psychological and behavioral predictors of premenstrual syndrome (PMS) severity among young women.

Study Setting and Population: The study was conducted at the Department of Physiology, Dhaka Medical College Hospital, Dhaka, from January 2023 to December 2023. The study population comprised all female medical students of Dhaka Medical College, from 1st to 5th year, irrespective of any age.

Sample Size and Selection criteria: Eighty female students aged 18–25 years with regular menstrual cycles were recruited using purposive sampling and divided into two groups: non obese (n=40) and obese (n=40). Participants with irregular cycles, secondary dysmenorrhea, neurological or back pain, polycystic ovarian disease, or other medical conditions were excluded.

Study variable: Socio-Demographic: Age, study year, residence, family income, mother's education, marital status, smoking.

Clinical/Reproductive: Age at symptom onset, menarche, cycle duration, menstrual flow, contraceptive use, co-morbidities, physical activity, multivitamin use.

Psychological/Behavioral: Anxiety, depression, disordered eating, stress/coping patterns.

Data-Collection-Procedure: Participants were informed about the study and provided written consent. Data were collected via a semi-structured questionnaire through short interviews, including socio-demographics, menstrual history, lifestyle, and psychological assessments. PMS severity was assessed using a validated questionnaire, and incomplete responses were excluded.

Data-Analysis: Data were analyzed using SPSS version 26. Continuous variables were presented as mean ± SD and categorical variables as frequency and percentage. Chi-square or Fisher's exact test was used for categorical variables, t-test or ANOVA for continuous variables, and Pearson correlation for associations. Significance was set at $p < 0.05$.

Ethical-Considerations: Ethical approval was obtained from the Institutional Review Board of Dhaka Medical College Hospital. Confidentiality was maintained, and written informed consent was obtained from all participants after explaining the study purpose and procedures.

RESULTS

Among 80 female medical students, obese participants were older and had significantly higher weight and BMI than non-obese participants ($p < 0.001$). They also experienced longer (>6 days, 67.5% vs. 10%) and heavier menstrual flow (72.5% vs. 12.5%). PMS severity was higher in obese participants, with most reporting moderate to severe symptoms, compared to predominantly mild symptoms in non-obese participants. Psychological symptoms—such as anxiety, depression, loss of concentration, irritability, fatigue, and restlessness—and behavioral symptoms, including social withdrawal, lack of interest, impaired work performance, and over-sensitivity, were more pronounced in obese participants, while anger and lack of self-control showed no significant difference. These findings indicate a clear association between obesity and increased PMS severity with more pronounced psychological and behavioral effects.

Table I shows obese participants were older than non-obese (22.2 ± 1.22 vs. 19.55 ± 0.68 years, $p < 0.001$). Most participants in both groups were urban residents (95%), with no difference in residence ($p > 0.999$). Maternal education ($p = 0.001$) and family income ($p < 0.001$) differed between groups, while marital status was similar ($p = 0.314$). Overall, age, maternal education, and income varied, but residence and marital status were comparable.

Table – I: Participant Socio demographic Characteristics

Variables	Non obese n (%) (n=40)	Obese n (%) (n=40)	Total n (%) (n=80)	p value
Age (year)	19.55 ± 0.68	22.2 ± 1.22	20.88 ± 1.66	<0.001**
Residence				>0.999*
Urban	38 (95)	38 (95)	76 (95)	
Rural	1 (2.5)	0	1 (1.3)	
Suburban	1 (2.5)	2 (5)	3 (3.8)	
Education of mother				0.001*
Secondary level	4 (10)	1 (2.5)	5 (6.3)	
Higher secondary level	9 (22.5)	16 (40)	25 (31.3)	
Graduate	16 (40)	23 (57.5)	39 (48.8)	
Post-graduate	11 (27.5)	0	11 (13.8)	
Monthly income				<0.001*
<10,000 tk	23 (57.5)	9 (22.5)	32 (40)	
10,000–20,000 tk	3 (7.5)	30 (75)	33 (41.3)	
20,000–30,000 tk	2 (5)	1 (2.5)	3 (3.8)	
30,000–40,000 tk	4 (10)	0	4 (5)	
>40,000 tk	8 (20)	0	8 (10)	
Marital status				0.314*

Unmarried	39 (97.5)	40 (100)	79 (98.8)
Married	1 (2.5)	0	1 (1.3)

Table II shows obese participants had significantly higher weight and BMI (83.2 ± 11.37 kg, 32.46 ± 3.04 kg/m^2) than non-obese participants (53.89 ± 4.84 kg, 21.76 ± 1.84 kg/m^2, p < 0.001) and experienced notably longer (>6 days, 67.5% vs. 10%) and heavier menstrual flow (72.5% vs. 12.5%), while spotting was rare and similar in both groups, indicating a clear association between obesity and more pronounced menstrual irregularities.

Table – II: Anthropometric and Menstrual Characteristics by Group

Variable	Non-obese (n=40) n (%) / Mean ± SD	Obese (n=40) n (%) / Mean ± SD	Total (n=80) n (%)	p-value
Weight (kg)	53.89 ± 4.84	83.2 ± 11.37	–	<0.001
BMI (kg/m^2)	21.76 ± 1.84	32.46 ± 3.04	–	<0.001
Length of menses				<0.001*
≤ 6 days	36 (90%)	13 (32.5%)	49 (61.3%)	
> 6 days	4 (10%)	27 (67.5%)	31 (38.8%)	
Menstrual flow				<0.001*
Heavy	5 (12.5%)	29 (72.5%)	34 (42.5%)	
Normal	34 (85%)	10 (25%)	44 (55%)	
Spotting	1 (2.5%)	1 (2.5%)	2 (2.5%)	

Table III shows Obese participants reported significantly higher rates of all clinical symptoms, including weight gain, abdominal pain, back pain, headache, swelling, nausea, and constipation, compared to non-obese participants (p ≤ 0.008), indicating a strong association between obesity and increased PMS-related clinical manifestations.

Table – III: Comparison of Clinical Symptoms Between Non-Obese and Obese Participants (*n*=80)

Clinical Presentation	Non obese n (%) (n=40)	Obese n (%) (n=40)	Total n (%) (n=80)	p-value
Weight gain	7 (17.5)	18 (45)	25 (31.3)	0.008
Abdominal pain	16 (40)	39 (97.5)	55 (68.8)	<0.001
Back pain	16 (40)	38 (95)	54 (67.5)	<0.001
Low back pain	20 (50)	38 (95)	58 (72.5)	<0.001
Headache	11 (27.5)	29 (72.5)	40 (50)	<0.001
Swelling & tenderness	11 (27.5)	34 (85)	45 (56.3)	<0.001
Nausea	9 (22.5)	29 (72.5)	38 (47.5)	<0.001
Constipation	7 (17.5)	26 (65)	33 (41.3)	<0.001

Table IV shows PMS severity was significantly higher in obese participants, with 45% having moderate and 55% severe symptoms, while most non-obese participants had mild symptoms (77.5%). Mean PMSS scores were also higher in obese (113.83 ± 12.54) than non-obese (62.5 ± 14.31) participants (p < 0.001).

Table – IV: PMS Severity by Group

Severity	Non-obese n (%)	Obese n (%)	p-value
No symptoms	6 (15)	0 (0)	<0.001
Mild	31 (77.5)	0 (0)	
Moderate	3 (7.5)	18 (45)	
Severe	0 (0)	22 (55)	
Mean PMSS score	62.5 ± 14.31	113.83 ± 12.54	<0.001

Table V shows obese participants showed significantly higher rates of psychological PMS symptoms than non-obese participants, including anxiety (85% vs. 50%, p = 0.001), depression (97.5% vs. 47.5%, p < 0.001), loss of concentration (70% vs. 10%, p < 0.001), irritability (90% vs. 60%, p = 0.002), fatigue (90% vs. 55%, p < 0.001), and restlessness (92.5% vs. 55%, p < 0.001). Anger was not significantly different (55% vs. 42.5%, p = 0.263).

Table – V: Psychological Symptoms by Group

Symptom	Non-obese n (%)	Obese n (%)	p-value
Anxiety	20 (50)	34 (85)	0.001
Depression	19 (47.5)	39 (97.5)	<0.001
Loss of concentration	4 (10)	28 (70)	<0.001
Irritability	24 (60)	36 (90)	0.002
Fatigue	22 (55)	36 (90)	<0.001
Restlessness	22 (55)	37 (92.5)	<0.001
Mood swings & crying	25 (64.1)	35 (89.7)	0.007
Anger	17 (42.5)	22 (55)	0.263

Table VI shows the table shows the prevalence of behavioral PMS symptoms among non-obese and obese participants. Obese participants reported significantly higher rates of social withdrawal (60% vs. 22.5%, p = 0.001), lack of interest (42.5% vs. 20%, p = 0.030), impaired work performance (77.5% vs. 35%, p < 0.001), and being over-sensitive (65% vs.

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32.5%, p = 0.004) compared to non-obese participants. There was no significant difference in lack of self-control between the two groups (32.5% vs. 25%, p = 0.459). Overall, behavioral symptoms were more pronounced in obese participants.

Table – VI: Behavioral Symptoms by Group

Symptom	Non-obese n (%)	Obese n (%)	p-value
Social withdrawal	9 (22.5)	24 (60)	0.001
Lack of self-control	10 (25)	13 (32.5)	0.459
Lack of interest	8 (20)	17 (42.5)	0.030
Impaired work performance	14 (35)	31 (77.5)	<0.001
Over-sensitive	13 (32.5)	26 (65)	0.004

DISCUSSION

Our study reports shows that participants in obese were significantly older than those in non-obese (mean age 22.2 ± 1.22 vs 19.55 ± 0.68 years, p < 0.001). Age is a well-recognized factor associated with increasing risk of overweight and obesity among women in Bangladesh [14].

While place of residence was similar between groups (≈ 95% urban in both), other socioeconomic variables differed significantly. Marital status was not significantly different between groups (p = 0.314); nearly all participants were unmarried, which reduces potential confounding by factors associated with marital status.

Maternal education differed significantly between groups (p = 0.001), with more graduate-educated mothers in obese. Higher maternal education may improve health awareness and access to resources, influencing child and adolescent health outcomes [15].

Family income differed significantly between groups (p < 0.001), with non-obese having lower-income participants and obese mostly from middle-income families. Higher family income is linked to better health, nutrition, and access to education [16].

Our results show that obese participants had higher weight (83.2 ± 11.37 kg vs. 53.89 ± 4.84 kg) and BMI (32.46 ± 3.04 kg/m^2 vs. 21.76 ± 1.84 kg/m^2, p < 0.001) than non-obese participants, which was associated with longer (>6 days: 67.5% vs. 10%) and heavier menstrual flow (72.5% vs. 12.5%), while spotting remained rare. These findings are consistent with existing literature indicating that higher BMI and body weight are linked to menstrual irregularities. Excess adiposity can alter hormonal balance, particularly estrogen production from adipose tissue, which may disrupt endometrial regulation and lead to prolonged and heavier menses [17,18]. Therefore, obesity appears to be a significant factor influencing both the length and volume of menstrual bleeding, underscoring the importance of weight management in reproductive health [17,18].

In our study, obese participants reported significantly higher rates of weight gain, pain, headache, swelling, nausea, and constipation than non-obese participants (p ≤ 0.008). These findings support a strong association between higher body mass (and obesity) and increased risk of menstrual- and premenstrual-related clinical symptoms. The variety of symptoms reported — from pain (abdominal, back) to gastrointestinal (nausea, constipation), fluid-retention or swelling, and systemic symptoms (weight gain) — align broadly with the symptom profile of Premenstrual Syndrome (PMS) and related menstrual disorders described in clinical sources; PMS physical symptoms commonly include abdominal pain or cramps, backache, headaches, nausea, constipation or other gastrointestinal complaints, fluid retention (leading to swelling and weight gain), and breast or body tenderness [19].

The association between increased BMI (obesity) and a greater burden of PMS/menstrual symptoms also finds support in epidemiological and prospective data. For example, a long-term cohort study showed that women with higher BMI had increased risk of developing PMS compared with lean women; symptoms strongly associated with higher BMI included backache, abdominal cramping, swelling, and constipation or diarrhea [20].

In our study, PMS severity was significantly higher in obese participants, with 45% moderate and 55% severe symptoms, while most non-obese participants had mild PMS (77.5%) or were symptom-free (15%) (p < 0.001). Mean PMSS scores were also higher in obese participants (113.83 ± 12.54 vs. 62.5 ± 14.31), indicating a greater overall symptom burden. These findings indicate that obesity is associated not only with increased frequency of PMS symptoms but also with greater severity, affecting both physical and emotional domains. Similar associations between higher BMI and more severe PMS symptoms have been reported in prior studies, showing that obese women are more likely to experience moderate to severe PMS compared with non-obese counterparts [20, 21].

The findings from our study indicate that obese participants experienced significantly higher rates of most psychological premenstrual symptoms compared with non-obese participants. Anxiety was notably more prevalent among obese participants (85% vs. 50%, *p*=0.001), consistent with prior research linking higher body mass index (BMI) to increased anxiety and stress responses in women with PMS, potentially mediated by hormonal and inflammatory mechanisms [22]. Depression was particularly elevated in the obese group (97.5% vs. 47.5%, *p*<0.001), supporting evidence of a bidirectional relationship between obesity and depressive symptoms, which may be further amplified in the premenstrual period due to neuroendocrine and inflammatory dysregulation [23]. Loss of concentration was reported by 70% of obese participants compared with only 10% of non-obese participants (*p*<0.001), reflecting the cognitive and attentional difficulties commonly observed in PMS, which can be intensified by obesity-related metabolic and inflammatory changes [24].

Similarly, irritability (90% vs. 60%, *p*=0.002), fatigue (90% vs. 55%, *p*<0.001), restlessness (92.5% vs. 55%, *p*<0.001), and mood swings with crying (89.7% vs. 64.1%, *p*=0.007) were all significantly more prevalent among obese participants, in line with literature highlighting the higher affective and behavioral symptom burden in women with elevated BMI during the luteal phase [25]. Anger, though slightly more common in obese participants (55% vs. 42.5%), was not significantly different (p=0.263), indicating that not all mood symptoms are equally influenced by adiposity. Overall, obesity appears to worsen psychological PMS symptoms, likely through biological, hormonal, and psychosocial mechanisms, highlighting the importance of interventions targeting both weight and mental health.

Obese participants exhibited higher rates of behavioral PMS symptoms compared with non-obese participants. Social withdrawal was significantly more common in obese women

(60% vs. 22.5%, p = 0.001), consistent with evidence linking obesity to social disengagement and low self-esteem [26]. Lack of self-control did not differ significantly (32.5% vs. 25%, p = 0.459), suggesting it may be less influenced by adiposity or individual coping strategies [26]. Lack of interest was higher among obese participants (42.5% vs. 20%, p = 0.030), reflecting reduced engagement in daily activities, a common PMS symptom [27]. Impaired work performance was markedly elevated in the obese group (77.5% vs. 35%, p < 0.001), consistent with evidence of functional limitations linked to obesity and PMS [11]. Finally, over-sensitivity was more frequent among obese participants (65% vs. 32.5%, p = 0.004), indicating heightened emotional reactivity during the luteal Overall, these findings suggest that obesity amplifies behavioral PMS symptoms, affecting social, occupational, and emotional functioning phase [26]. Overall, these findings suggest that obesity amplifies behavioral PMS symptoms, affecting social, occupational, and emotional functioning.

CONCLUSION

In this study of female medical students, obesity was significantly associated with increased PMS severity and a higher prevalence of both psychological and behavioral symptoms. Obese participants experienced more pronounced anxiety, depression, irritability, fatigue, restlessness, mood swings, social withdrawal, lack of interest, impaired work performance, and over-sensitivity compared with non-obese participants, while anger and lack of self-control did not differ significantly. Obesity was also linked to longer and heavier menstrual flow, as well as greater burden of clinical symptoms such as pain, swelling, and gastrointestinal disturbances. These findings highlight that excess body weight not only affects physical health but also exacerbates emotional and behavioral disturbances during the premenstrual period. Targeted interventions addressing weight management, mental health support, and lifestyle modification may help reduce PMS severity and improve overall well-being among obese women.

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