

EXPLORING THE IMPACT OF CAFFEINE AND SUGAR CONSUMPTION, NUTRITIONAL AWARENESS AND PERCEIVED STRESS ON PREMENSTRUAL SYNDROME AMONG ADULT WOMEN

Original Research

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ABSTRACT

BACKGROUND: Premenstrual syndrome (PMS) affects a substantial proportion of adult women, influencing both physical and psychological well-being

OBJECTIVE: The study aimed to explore the relationships between caffeine and sugar consumption, nutritional awareness, perceived stress, and the severity of PMS symptoms among adult women.

METHODOLOGY: A cross-sectional analytical design was employed, with data collected through validated self-administered questionnaires assessing dietary habits, nutritional knowledge, perceived stress levels, and PMS symptomatology. Descriptive and inferential statistical analyses were conducted to examine associations among the variables.

RESULTS: Results indicated a significant positive correlation between high caffeine and sugar intake and increased PMS symptom severity. Nutritional awareness demonstrated a negative association with PMS, suggesting that women with better understanding of dietary practices experienced milder symptoms. Additionally, higher perceived stress levels were significantly associated with more severe PMS manifestations. These findings underscore the multifactorial nature of PMS and highlight the potential role of dietary habits, stress management, and nutritional education in mitigating symptom severity. Interventions aimed at reducing excessive caffeine and sugar consumption, improving nutritional literacy, and managing stress may contribute to better premenstrual health outcomes

CONCLUSION: The study concludes that dietary habits, nutritional knowledge, and stress management are key factors influencing PMS severity, and targeted interventions addressing these areas may help reduce PMS symptoms and improve overall premenstrual health

KEY TERMS: Premenstrual syndrome, PMS severity, caffeine consumption, sugar intake, nutritional awareness, perceived stress, adult women, dietary habit.

INTRODUCTION

Premenstrual syndrome (PMS) is a multifactorial condition affecting women of reproductive age, characterized by physical, emotional, and behavioral symptoms that can disrupt daily life, work performance, and personal activities¹. It typically occurs during the luteal phase of the menstrual cycle—the period between ovulation and menstruation—and symptoms usually subside shortly after menstruation begins². PMS has a biopsychosocial etiology, where hormonal changes interact with psychological and social factors to influence symptom severity. Mood disorders, stress, and women's social roles contribute significantly, while awareness and education can help in better recognition and management of symptoms. Research also highlights the role of physiological and lifestyle factors. Younger age, underweight status, anemia, and occupational stress are associated with higher PMS prevalence³. A more severe form, Premenstrual Dysphoric Disorder (PMDD), is classified in the DSM-5 as a depressive disorder with intense emotional and physical symptoms⁴. Globally, PMS cases have increased by 46.5%, rising from 652.5 million in 1990 to 956.0 million in 2019. However, age standardized prevalence and Years Lived with Disability (YLD) rates have remained relatively stable. The burden is higher in low- and middle-income regions, particularly South Asia, with Pakistan reporting one of the highest burdens⁵.

However, A cross-sectional study conducted in Karachi involving 1,600 women reported an overall PMS prevalence of 33.3% (6). The prevalence was slightly higher among married women (33.6%) compared to unmarried women (32.0%). Women from lower socioeconomic groups showed higher prevalence (43.3%) than those from higher groups (23.5%). Ethnic variations were also observed, with higher prevalence among Punjabi and Mohajir women (37%) and lower among Pathan women 11.6%⁶. PMS is diagnosed when at least one emotional symptom (such as depression, irritability, or anxiety) and one physical symptom (such as bloating, breast tenderness, or headache) occur during the 5 days before menstruation for at least three consecutive cycles⁷. These symptoms resolve within a few days after menstruation begins and do not recur until the mid-cycle phase.

Premenstrual syndrome (PMS) is a multifactorial condition affecting women of reproductive age, characterized by physical, emotional, and behavioral symptoms that can disrupt daily life, work performance, and personal activities. It typically occurs during the luteal phase of the menstrual cycle—the period between ovulation and menstruation—and symptoms usually subside shortly after menstruation begins. PMS has a biopsychosocial etiology, where hormonal changes interact with psychological and social factors to influence symptom severity. Mood disorders, stress, and women's social roles contribute significantly, while awareness and education can help in better recognition and management of symptoms. University students are Lifestyle factors play a significant role in PMS severity. Tobacco use, high intake of salt and sugar, and especially stress is associated with increased risk⁸. Stress has a strong impact, as studies show changes in brain activity, breathing patterns, and hormonal responses in women with PMS. Depression, closely linked with stress, further increases symptom severity, particularly among university students^{9,10}. In contrast, caffeine intake has not shown a strong association with PMS.

Healthy dietary practices, including the consumption of fruits and fish, may help reduce symptoms. Hormonal fluctuations, nutritional deficiencies (such as vitamin B6, magnesium, and calcium), and neurotransmitter imbalances involving serotonin and GABA are also believed to contribute to PMS. Women with PMS may experience over 200 symptoms, with 30–40% requiring medical treatment and 3–8% experiencing severe PMDD¹¹. Despite its high prevalence, PMS is often underdiagnosed and poorly managed. No single effective treatment exists, leading many women to seek alternative therapies. Diet is an important modifiable factor, although research remains limited. A balanced diet rich in fruits, vegetables, nuts, and lean proteins, along with reduced intake of sugar, fats, and processed foods, is recommended. Western dietary patterns are associated with increased PMS severity, while healthier diets show protective effects.

Sugar, caffeine, and stress also contribute to other health conditions. High sugar intake, especially through sugar-sweetened beverages, is linked to obesity, diabetes, cardiovascular diseases, and other health issues¹². Coffee, on the other hand, has both risks and benefits, with some evidence suggesting protective effects due to its bioactive compounds. Chronic stress negatively affects immune and cardiovascular systems by disrupting the hypothalamic–pituitary–adrenal (HPA) axis, leading to inflammation and increased disease risk^{13,14}. PMS is a significant concern among young women, yet its contributing factors are not fully understood, particularly in developing countries. Caffeine and sugar consumption, low nutritional awareness, and high stress levels can negatively affect hormonal balance, mood, and overall health, thereby worsening PMS symptoms. However, limited research has explored the combined impact of these factors. Therefore, this study aims to examine how lifestyle behaviors and psychological factors interact to influence PMS severity. The findings will help in developing targeted health education, dietary strategies, and stress management interventions to reduce PMS symptoms and improve women's overall well-being.

METHODS

A cross-sectional analytical study was conducted among 200 university students aged 18–30 years at Riphah International University, Lahore, over a period of four months from October 2025 to January, 2026. Participants were selected through a purposive sampling technique. Inclusion criteria included women with regular menstrual cycles (21–35 days) and habitual consumers of caffeine and sugar, while those with irregular menstrual cycle or amenorrhea, pregnant or breastfeeding women, and individuals diagnosed with conditions affecting menstrual cycles such as PCOS or thyroid disorders were excluded. Data was collected using a semi-structured questionnaire along with standardized assessment tools. The questionnaire comprised sections on demographic and lifestyle characteristics, anthropometric measurements (height, weight, and BMI calculated according to WHO

standards), caffeine and sugar consumption patterns, nutritional awareness, perceived stress, and premenstrual syndrome (PMS) symptoms after that the data collection was carried out after obtaining informed consent, ensuring confidentiality and voluntary participation. The collected data was coded and analyzed using SPSS version 26, and results were presented in the form of tables and graphs. The Chi-square test was applied to determine associations between variables, with a level of significance set at ≤ 0.05

RESULTS

Participant Demographics:

The study included 200 undergraduate students, all of whom were single (100%). Most participants were aged 21–24 years (88.5%), with smaller proportions aged 18–20 years (6.0%) and 25–30 years (5.5%). Regarding BMI, the majority had a normal BMI (50.5%), 26.0% were underweight, 10.0% were overweight, and 3.0% were obese. Overall, the sample showed a relatively uniform demographic profile.

Body Mass Index Distribution

Most participants had a normal BMI (50.5%), while 26.0% were underweight, 10.0% overweight, and 3.0% obese. BMI categories were underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥ 30). Overall, normal weight was most common, though a notable proportion were underweight.

Caffeine Consumption

Most participants reported moderate caffeine intake (51%), followed by high consumption (43%) and low intake (6%). Overall, caffeine consumption was moderate to high for the majority. It is recommended to maintain intake within 100–300 mg/day to avoid side effects, with sensitive individuals keeping it below 100 mg.

Sugar Consumption

Most participants consumed sugar at moderate to high levels, with (36%) high, (35%) moderate, and 29% low intake. Overall, sugar consumption was substantial for the majority. It is recommended to limit high intake to (≤ 25 g/day), moderate intake to (15–25 g/day), and maintain or adjust low intake as needed.

Nutritional Awareness

Most participants showed moderate nutritional awareness, with (56%) fair, (34%) poor, and (10%) good. Overall, awareness was generally moderate. Only a small proportion had a high level of nutritional knowledge.

Perceived Stress

Most participants experienced moderate to high stress, with 48.5% reporting high, 45.0% moderate, and 6.5% low stress levels. Overall, high stress was the most prevalent. This indicates that the majority of the study population faces significant stress.

Premenstrual Syndrome

Most participants experienced moderate to severe PMS, with 50.0% reporting severe, 44.5% moderate, and 5.5% mild symptoms. Overall, severe PMS was the most prevalent. This indicates that the majority of the study population suffered significant PMS symptoms.

Association Between Caffeine And PMS

A significant association was found between caffeine consumption and PMS among the study participants. Out of 200 students, 51.0% ($n = 102$) reported moderate intake, 43.0% ($n = 86$) high intake, and 6.0% ($n = 12$) low intake. Higher caffeine consumption was linked to increased PMS severity, with the association being statistically significant ($p = 0.003$), highlighting caffeine as an important lifestyle factor influencing PMS.

Association Between Sugar And PMS

A significant association was found between sugar consumption and PMS among the participants. Of 200 students, 36.0% ($n = 72$) reported high intake, 35.0% ($n = 70$) moderate, and 29.0% ($n = 58$) low intake. The association was statistically significant ($p = 0.039$), indicating that higher sugar consumption may contribute to increased PMS occurrence or severity.

Association Between Stress And PMS

A significant association was found between perceived stress and PMS among 200 participants. High stress was reported by 48.5% ($n = 97$), moderate by 45.0% ($n = 90$), and low by 6.5% ($n = 13$). The association was highly significant ($p = 0.000$), indicating that higher stress levels are strongly linked to increased PMS severity.

Table 1: Demographic Characteristics of Participants (N = 200)

Variables	Category	Frequency	Percentage (%)
Gender	Female	200	100%
	Male	0	0%

Age of the Participants	18-20	12	6.0%
	21-24	177	88.5%
	25-30	11	5.5%
Education of participants	Undergraduate	200	100%
	Graduated	0	0%
Marital Status of Participants	Single	200	100%
	Married	0	0%

Table 2: Body Mass Index (BMI) Distribution

Category	Frequency	Percentage (%)
Underweight	52	26%
Normal	121	60.5%
Overweight	20	10%
Obese	6	3%

Table 3: Caffeine Consumption Level

Category	Frequency	Percentage (%)
Low	12	6%
Moderate	102	51%
High	86	43%

Table 4: Sugar Consumption Level

Category	Frequency	Percentage (%)
Low	58	29%
Moderate	70	35%
High	72	36%

Table 5: Nutritional Awareness Level

Category	Frequency	Percentage (%)
Poor	68	34%
Fair	112	56%
Good	20	10%

Table 6: Stress Level of Respondents

Category	Frequency	Percentage (%)
Low	13	6.5%
Moderate	90	45%
High	97	48.5%

Table 7: Premenstrual Syndrome Distribution

Category	Frequency	Percentage (%)
Mild	11	5.5%
Moderate	89	44.5%
Severe	100	50%

Table 8: Association between Caffeine and PMS

Category	Percentage (%)	P value
Low	26.0%	0.003
Moderate	10%	
High	3.0%	

Table 9: Association between Sugar and PMS

Category	Percentage (%)	P value
Low	29.0%	0.039
Moderate	35.0%	
High	36.0%	

Table 10: Association between Stress and PMS

Category	Percentage (%)	P value
Low	6.5%	0.000
Moderate	45.0%	
High	48.5%	

DISCUSSION

Premenstrual syndrome (PMS) is a multifactorial condition affecting a large proportion of young female adults, particularly those in the reproductive age group. The present study identified a high prevalence of moderate to severe PMS symptoms among young women, indicating a substantial burden on their reproductive and overall health. The findings highlighted significant associations between PMS and lifestyle-related factors such as caffeine intake, sugar consumption, nutritional awareness, and perceived stress, supporting the multifactorial origin of the condition¹⁵. The study primarily focused on undergraduate females aged 21–24 years, a group particularly vulnerable to PMS due to hormonal fluctuations, academic pressure, and lifestyle-related stressors. The exclusion of participants with varying marital and occupational backgrounds strengthened internal validity by minimizing confounding variables. Similar patterns of PMS prevalence have been reported among university-aged women in Asian and Middle Eastern populations¹⁶.

Body Mass Index (BMI) distribution indicated that most participants had normal weight, although a notable proportion were underweight. While BMI did not show a direct association with PMS severity in this study, existing literature suggests that both underweight and overweight conditions can contribute to hormonal imbalances and micronutrient deficiencies, potentially exacerbating PMS symptoms¹⁷. Caffeine intake demonstrated a statistically significant relationship with PMS. High consumption of caffeine stimulates the central nervous system and increases catecholamine levels, leading to symptoms such as anxiety, irritability, and sleep disturbances during the premenstrual phase. Additionally, caffeine may interfere with calcium absorption, contributing to physical discomfort such as breast tenderness¹⁸.

Similarly, sugar intake showed a positive correlation with PMS symptoms. High sugar consumption can cause fluctuations in blood glucose levels, resulting in fatigue, irritability, and mood swings. These glycemic changes, along with increased inflammatory responses, may worsen PMS symptoms. Furthermore, women with PMS often report increased cravings for sweet foods, creating a cycle that intensifies symptom severity^{19,20}. Nutritional awareness emerged as an important factor influencing PMS. Most participants exhibited poor to moderate knowledge of nutrition, which was associated with unhealthy dietary patterns, including excessive caffeine and sugar intake. Studies indicate that better nutritional knowledge promotes healthier eating habits and may reduce the severity of PMS symptoms. Nutrition education programs have been shown to significantly improve menstrual health outcomes^{21,22}.

Perceived stress was strongly associated with PMS severity. High stress levels disrupt the hypothalamic-pituitary-adrenal (HPA) axis, leading to hormonal imbalances that intensify both emotional and physical symptoms of PMS. University students, in particular, experience elevated stress due to academic demands and lifestyle pressures, which may contribute to the higher prevalence and severity of PMS observed in this population^{23,24}. The study also revealed that a majority of participants experienced moderate to severe PMS symptoms, with severe cases being predominant. These findings align with existing research indicating that poor lifestyle habits, irregular diets, and inadequate coping mechanisms significantly influence PMS severity. Severe PMS has also been linked to reduced academic performance, absenteeism, and decreased quality of life²⁵.

An important interaction identified in the study was between caffeine intake and stress levels. While caffeine is often consumed to combat fatigue, it may further stimulate stress responses by activating the sympathetic nervous system. This bidirectional relationship may contribute to increased PMS severity in individuals with both high caffeine intake and elevated stress levels²⁶. Dietary patterns characterized by high sugar and processed food intake, along with low consumption of essential nutrients such as calcium, magnesium, and vitamin B6, may further aggravate PMS symptoms. These deficiencies are often linked to poor nutritional knowledge, reinforcing the importance of dietary awareness in managing menstrual health²⁷.

Psychological symptoms, including irritability, anxiety, and mood swings, were found to be highly prevalent among participants with severe PMS. These emotional disturbances are closely linked to stress perception and coping abilities, often leading to reduced social functioning and overall well-being²⁸. Additionally, lifestyle factors such as irregular eating habits, poor sleep patterns, and excessive screen time—common among university students—may further worsen PMS symptoms. Although sleep was not directly assessed in the study, high stress levels suggest a likelihood of sleep disturbances, which are known to exacerbate hormonal imbalance and symptom severity^{29,30}.

Overall, the findings emphasize the importance of lifestyle modification in managing PMS. Reducing caffeine and sugar intake, improving nutritional awareness, and adopting effective stress management strategies can significantly alleviate symptoms. The study supports a holistic, nonpharmacological approach to PMS management, highlighting the role of health education and early intervention in improving menstrual health outcomes among young women³¹.

CONCLUSION

The study shows that caffeine consumption among university students aged 18–30 is significantly associated with the severity of premenstrual syndrome (PMS). Students with higher caffeine intake reported more severe PMS symptoms, while those with moderate or low intake experienced milder symptoms. These findings highlight the impact of dietary habits on PMS and align with previous research on lifestyle factors affecting women's health. Encouraging moderation in caffeine consumption may help reduce PMS severity among young adult women.

AUTHOR'S CONTRIBUTION:

Author	Contribution
Qurat Ul Ain	Conceptualization, Methodology, Data Collection, Formal Analysis, Writing – Original Draft, Data Curation, Validation
Andleeb Shakoor	Supervision, Methodology Guidance, Writing – Review & Editing, Project Oversight, Final Approval

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