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Effectiveness of Non-Hormonal Treatment on Moderate to Severe Premenstrual Syndrome: A Double Blind Randomized Control Trial

Haleema Sadia, Nadia Zahid, Gulfreen Waheed, Sana Navid

Abstract

Objective: This study aimed to evaluate the effectiveness of calcium and vitamin D supplementation compared with placebo in reducing premenstrual symptom severity among female university students.

Study design and Setting: A double blind, randomised, placebo controlled, parallel trial was conducted involving 100 females aged 18 to 40 years diagnosed with PMS at the Department of Gynecology and Obstetrics, Avicenna Medical College Hospital, Lahore

Methodology: Participants were randomly divided into two equal groups: one received vitamin D (50,000 IU every two weeks) plus calcium (1,000 mg daily), and the other received a placebo for 12 weeks. Premenstrual symptoms were assessed using the Premenstrual Symptoms Screening Tool Adolescent (PSST A). Chi square, Student t test, and repeated measures ANOVA were applied for analysis using SPSS version 23.

Results: The calcium plus vitamin D group (mean age 25.7 ± 1.53 years) showed significant improvements in anger or irritability, anxiety or tension, and reduced interest in work ($p = 0.04, 0.03, 0.001$). Overeating or food cravings improved ($p < 0.001$), and physical symptoms and work efficiency improved at 6 months ($p = 0.04, 0.01$).

Conclusion: Calcium plus vitamin D supplementation significantly alleviated emotional and physical PMS symptoms and improved work efficiency compared with placebo.

Keywords: Calcium; Premenstrual Syndrome; Randomized Controlled Trial; Vitamin D; Women's Health

How to cite this Article:
Sadia H, Zahid N, Waheed G, Navid S. Effectiveness of Non-Hormonal Treatment on Moderate to Severe Premenstrual Syndrome: A Double Blind Randomized Control Trial. J Bahria Uni Med Dental Coll. 2026;16(1):03-10 DOI: https://doi.org/10.51985/JBUMDC2025721

INTRODUCTION

Premenstrual syndrome (PMS) is a combination of physically and psychologically observable signs of discomfort within the luteal phase of menstrual cycle. Such experiences normally cause significant distress and functional impairment amongst the affected individuals who normally show improvement of symptoms during the onset of menstruation.[1] Empirical findings confirm that prevalence rate of PMS in the world is about 50 % among women at childbearing age.[2]

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Received: 18-09-2025
Accepted: 15-12-2025 1st Revision: 27-10-2025

Though in most cases the symptomatology is mild and moderate, severe ones that can interfere with the day-to-day functionality are registered in 2.5-3 percent of patients. Women who attend the university, especially, show an increased rate of PMS.[1-3]

PMS is typified by mood alteration, stress, and anxiety, three of the most widespread symptoms in a range of around 200. Concomitant symptoms such as emotional imbalances, like stress, anxiety, insomnia, headaches, fatigue, changes in mood, emotional sensitivity and variations in libido are not uncommon, whereas alterations in the appetite, constipation, Nausea, tenderness of breasts or swelling, acne during the menstrual period, exhaustion, as well as pain or discomfort in the joints and muscles make up the respective somatic manifestation.[4] According to the criteria most regularly found in the literature, the primary complaint should include signs of serious emotional difficulties, in order to be eligible to fulfill diagnostic criteria of PMS.[4,5]

The aetiology of PMS remains unknown.[1] It is believed that PMS is not a singular disorder but rather a collection of symptoms with biological origins, encompassing psychological and social components. Consequently, both pharmacological and non-pharmacological treatments have been explored.[6] Treatment strategies generally focus on alleviating symptoms and minimizing the impact of PMS

on daily activities. Pharmacological approaches often involve combinations of diuretics, painkillers, antihistamines, antidepressants, and anti-anxiety medications targeting specific symptoms.[1]

More focus has recently been placed on alternative therapies, mostly derived from clinical experience, that attempt to lessen the frequency and intensity of PMS symptoms via as-yet-unidentified mechanisms. These include dietary changes like primrose oil or high-carb diets, which have drawn more attention, and supplementing with minerals including calcium, vitamin D, magnesium, vitamin E, and vitamin B6.[7]

Serum calcium and vitamin D levels have been observed to vary across the menstrual cycle, with numerous studies indicating a significant deficiency in women experiencing premenstrual syndrome (PMS) compared to those without the condition.[8] Calcium plays a vital role in neuromuscular transmission and hormonal balance, while vitamin D contributes to the regulation of inflammatory responses and neurotransmitter activity, both of which are implicated in PMS pathophysiology.[9] Supplementation with calcium and vitamin D has been associated with improvements in mood stability, reduction in anxiety and depressive symptoms, and alleviation of physical discomfort such as bloating and fatigue during the luteal phase.[10,11] Despite global research supporting their therapeutic potential, limited data exists from Pakistan evaluating the clinical efficacy of these nutrients in managing PMS symptoms. Given their roles in modulating endocrine and immune function, calcium and vitamin D supplementation may offer a safe, non-hormonal approach for symptom relief.[12] Therefore, the objective of the current study is to investigate, in a local setting, if combined calcium and vitamin D supplementation can lessen the intensity of PMS in women.

METHODOLOGY

The sample size of the study was determined via WHO sample size calculator of health studies; which relies on the formula of calculating a proportion with a given level of absolute precision. The assumptions were: confidence level of 95%, expected proportion of the population of 50% and an absolute precision of 10 percent (0.10).

Based on these parameters, a total sample size of 100 participants was calculated with 50 participants being assigned to each group by randomly choosing them. This was found to be a sufficient size to give a reasonable statistical power to find significant differences between the intervention and placebo groups. This research was a double-blind, randomised clinical trial conducted between March 25th, 2025 to August 25th, 2025. The study population comprised female aged 18–40 years with premenstrual syndrome (PMS), reporting in the Department of Gynecology and obstetrics, Avicenna Medical College Hospital, Lahore, Pakistan. Inclusion criteria encompassed participants aged 18–40 years with moderate to severe PMS, enrolled at Avicenna Medical College Hospital, and willing to participate in the trial. Exclusion criteria included individuals exhibiting symptoms of malnutrition or requiring calcium+vitamin D supplementation; those presenting with severe malnutrition; symptoms of systemic diseases such as sepsis, haemodynamic instability, or acute meningitis; diarrhoea (defined as three or more watery stools in the preceding 24 hours); known intolerance or sensitivity to calcium+vitamin D or calcium+vitamin D containing compounds; smoking; exposure to stressful situations; or a history of mental illness.

Participants were randomly assigned to two groups of equal size: One group received vitamin D supplementation at a dose of 50,000 IU every two weeks along with a daily intake of 1,000 mg of calcium, whereas the comparison group was administered a placebo under the same conditions for 12 weeks. Participants' symptoms were assessed at baseline, one month, three months, and six months following the commencement of the study. To allocate participants equally into the two groups, with 50 participants assigned to each group. By using a double-blind approach, the study reduced bias by guaranteeing that neither participants nor researchers knew the group assignments.

In order to participate in the study, individuals had to read and sign an informed consent form before it started. Demographic data, such as age, occupation, marital status, and level of education, were gathered and documented at the time of enrolling. In this study, the severity of PMS was evaluated using the Premenstrual Symptoms Screening Tool (PSST) questionnaire. The PSST consists of 19 questions that are separated into two sections: 14 items in the first segment cover emotional, somatic, and behavioural symptoms, and 5 questions in the second section assess how these symptoms affect participants' daily life. This tool was developed by McMaster University in Canada.[13] Participants completed the questionnaire at baseline, as well as one month, three months and six months after the study commenced. The Ethics Committee of Avicenna Medical College in Lahore, Pakistan, gave the study ethical approval

Table 1 Bifurcation of demographic characteristics with respect to intervention and control groups.

Variables	Categories	Calcium + Vitamin D group 50 (50.0%)	Control group 50 (50.0%)	p-value
Age (years)	Mean ± SD	25.7 ± 1.53	24.9 ± 1.79	0.21
Education	Primary	4 (8.0)	6 (12.0)	0.08
	Secondary	17 (34.0)	19 (38.0)	
	Graduation	21 (42.0)	22 (44.0)	
	Masters	8 (16.0)	3 (6.0)	
	Students	19 (38.0)	16 (32.0)	
Occupation	Homemaker	7 (14.0)	12 (24.0)	0.11
	Working women	24 (48.0)	22 (44.0)	

Table 2 Bifurcation of Psychological & Behavioural Symptoms (Mean ± SD) with respect to intervention (calcium + vitamin D) and control groups.

Variables	Categories	Treatment modalities		p-value
		Calcium + Vitamin D group 50 (50.0%)	Control group 50 (50.0%)	
Anger/irritability				0.67
	Mean ± SD	3.43 ± 0.12	3.37 ± 0.12	
Anxiety/tension				0.52
	Mean ± SD	3.60 ± 0.13	3.46 ± 0.11	
Tearful/increased sensitivity to rejection				0.71
	Mean ± SD	3.83 ± 0.13	3.77 ± 0.09	
Depressed mood/hopelessness				0.05
	Mean ± SD	3.43 ± 0.12	4.01 ± 0.07	
Difficulty concentrating				1.01
	Mean ± SD	4.12 ± 0.12	4.12 ± 0.06	
Fatigue/lack of energy				0.31
	Mean ± SD	3.76 ± 0.10	4.02 ± 0.11	
Overeating/food cravings				0.67
	Mean ± SD	3.19 ± 0.12	3.28 ± 0.15	
Insomnia				0.07
	Mean ± SD	3.50 ± 0.11	3.83 ± 0.13	
Hypersomnia				0.03
	Mean ± SD	3.63 ± 0.14	4.01 ± 0.10	
Feeling overwhelmed or out of control				0.48
	Mean ± SD	3.45 ± 0.15	3.59 ± 0.13	

Table 3 Bifurcation of Functional, Social & Physical Impairment Indicators (Mean ± SD) with respect to intervention (calcium + vitamin D) and control groups

Variables	Categories	Treatment modalities		p-value
		Calcium + Vitamin D group 50 (50.0%)	Control group 50 (50.0%)	
Decreased interest in work activities				0.12
	Mean ± SD	3.81 ± 0.13	4.06 ± 0.08	
Decreased interest in home activities				0.08
	Mean ± SD	3.68 ± 0.11	3.92 ± 0.10	
Decreased interest in social activities				0.51
	Mean ± SD	3.50 ± 0.10	3.59 ± 0.11	
Physical symptom (breast tenderness, headaches, muscle pain, bloating, and weight gain)				0.52
	Mean ± SD	3.21 ± 0.11	3.10 ± 0.11	
School or work efficiency				0.68
	Mean ± SD	4.30 ± 0.16	4.37 ± 0.12	
Relationship with friends, classmates				0.73
	Mean ± SD	3.56 ± 0.10	3.48 ± 0.14	
Relationship with family				0.39
	Mean ± SD	3.92 ± 0.11	3.81 ± 0.09	
Social life activity				0.06
	Mean ± SD	3.62 ± 0.12	3.74 ± 0.06	
Home responsibility				0.47
	Mean ± SD	3.91 ± 0.13	3.80 ± 0.07	

Table 4A Bifurcation of post treatment PSST-A components mean score with respect to intervention (Calcium + Vitamin D) and control groups.

Variables	Categories	Calcium + Vitamin D 50 (50%) mean ± SD	Control group 50 (50%) mean ± SD	p-value*	p-value for**	
					Treatment effect	Time effect
Anger/irritability					0.02	0.48
	After 1-month	3.64 ± 0.60	3.95 ± 0.62	0.04		
	After 3-month	3.52 ± 0.41	3.91 ± 0.74	0.03		
	After 6-month	3.03 ± 0.39	3.90 ± 1.01	0.001		
Anxiety/tension					<0.001	0.85
	After 1-month	3.78 ± 0.88	3.81 ± 0.90	0.01		
	After 3-month	3.64 ± 0.59	3.77 ± 0.84	0.04		
Tearful/increased sensitivity to rejection					0.83	0.47
	After 6-month	3.20 ± 0.47	3.80 ± 0.87	0.001		
	After 1-month	4.16 ± 0.47	4.33 ± 0.95	0.03		
	After 3-month	3.95 ± 0.52	4.29 ± 0.95	0.01		
Depressed mood/hopelessness					0.03	0.22
	After 6-month	3.68 ± 0.41	4.31 ± 0.84	0.02		
	After 1-month	4.07 ± 0.38	4.12 ± 0.77	0.04		
	After 3-month	3.82 ± 0.52	4.08 ± 1.26	0.02		
Difficulty concentrating					0.58	0.36
	After 6-month	3.04 ± 0.51	3.97 ± 0.91	0.001		
	After 1-month	4.01 ± 0.52	4.14 ± 0.96	0.003		
	After 3-month	3.83 ± 0.41	4.12 ± 1.09	0.001		
Fatigue/lack of energy					0.77	0.67
	After 6-month	3.08 ± 0.79	4.07 ± 0.68	0.002		
	After 1-month	4.15 ± 1.00	4.54 ± 1.10	0.08		
	After 3-month	4.06 ± 0.48	4.51 ± 0.86	0.03		
Overeating/food cravings					<0.001	0.40
	After 6-month	3.89 ± 0.41	4.49 ± 0.74	0.001		
	After 1-month	3.73 ± 0.78	4.02 ± 0.84	0.001		
	After 3-month	3.57 ± 0.49	3.98 ± 0.97	0.001		
	After 6-month	3.18 ± 0.31	4.01 ± 0.79	0.001		
Insomnia					0.48	0.98
	After 1-month	3.85 ± 0.66	4.07 ± 0.65	0.05		
	After 3-month	3.42 ± 0.60	4.09 ± 0.73	0.001		
	After 6-month	3.12 ± 0.20	4.08 ± 0.89	0.02		
Hypersomnia					0.97	0.29
	After 1-month	4.00 ± 0.62	4.14 ± 1.01	0.01		
	After 3-month	3.72 ± 0.48	4.08 ± 0.94	0.001		
	After 6-month	3.07 ± 0.52	4.12 ± 0.78	0.001		
Feeling overwhelmed or out of control					0.28	0.93
	After 1-month	3.94 ± 0.57	4.17 ± 0.77	0.02		
	After 3-month	3.78 ± 0.38	3.99 ± 1.26	0.01		
	After 6-month	3.55 ± 0.07	3.97 ± 1.09	0.01		

SD (standard deviation), *ANCOVA test, **repeated measure ANOVA test

Table 4B Bifurcation of post treatment PSST-A components mean score with respect to intervention (Calcium + Vitamin D) and control groups.

Variables	Categories	Calcium + Vitamin D 50 (50%) mean ± SD	Control group 50 (50%) mean ± SD	p-value*	p-value for**	
					Treatment effect	Time effect
Decreased interest in work activities					0.42	0.23
	After 1-month	3.82 ± 0.52	4.05 ± 0.91	0.003		
	After 3-month	3.59 ± 0.40	3.92 ± 1.12	0.012		
	After 6-month	3.11 ± 0.02	4.01 ± 0.90	0.001		
Decreased interest in home activities					0.28	0.38
	After 1-month	3.96 ± 0.53	4.08 ± 0.92	0.02		
	After 3-month	3.87 ± 0.37	4.02 ± 1.09	0.001		
	After 6-month	3.64 ± 0.22	3.99 ± 0.84	0.01		
Decreased interest in social activities					0.17	0.85
	After 1-month	4.15 ± 0.50	4.24 ± 0.88	0.001		
	After 3-month	3.76 ± 0.45	4.20 ± 1.03	0.001		
	After 6-month	3.81 ± 0.42	4.21 ± 1.09	0.001		
Feeling overwhelmed or out of control					0.28	0.93
	After 1-month	3.94 ± 0.57	4.17 ± 0.77	0.02		
	After 3-month	3.78 ± 0.38	3.99 ± 1.26	0.01		
	After 6-month	3.55 ± 0.07	3.97 ± 1.09	0.01		
Physical symptom (breast tenderness, headaches, muscle pain, bloating, weight gain)					<0.001	0.48
	After 1-month	3.62 ± 0.65	3.77 ± 1.19	0.24		
	After 3-month	3.54 ± 0.63	3.73 ± 0.94	0.05		
	After 6-month	3.22 ± 0.15	3.76 ± 1.12	0.04		
School or work efficiency					0.67	0.04
	After 1-month	4.42 ± 0.61	4.31 ± 1.10	0.03		
	After 3-month	4.31 ± 0.79	3.92 ± 1.25	0.02		
	After 6-month	4.05 ± 0.38	3.55 ± 0.92	0.01		
Relationship with friends, classmates and coworkers					0.003	0.62
	After 1-month	3.92 ± 0.51	3.80 ± 0.87	0.02		
	After 3-month	3.90 ± 0.62	3.60 ± 1.09	0.001		
	After 6-month	3.93 ± 0.22	3.18 ± 0.08	0.03		
Relationship with family					0.18	0.03
	After 1-month	4.38 ± 0.47	4.25 ± 0.67	0.03		
	After 3-month	4.35 ± 0.34	4.09 ± 0.86	0.001		
	After 6-month	4.40 ± 0.26	3.63 ± 0.74	0.01		
Social life activity					0.78	0.79
	After 1-month	4.01 ± 0.49	3.89 ± 0.81	0.001		
	After 3-month	4.02 ± 0.51	3.55 ± 0.97	0.02		
	After 6-month	4.01 ± 0.52	3.15 ± 1.08	0.001		
Home responsibility					0.05	0.36
	After 1-month	4.38 ± 0.47	4.05 ± 0.67	0.01		
	After 3-month	4.19 ± 0.61	4.06 ± 0.82	0.001		
	After 6-month	3.98 ± 0.24	3.84 ± 0.86	0.001		

SD (standard deviation), *ANCOVA test, **repeated measure ANOVA test.

(IRB/Avic/OB-Gyn/2025/101) in compliance with the Declaration of Helsinki's tenets.

Statistical analysis: All quantitative data were expressed as mean ± standard deviation (SD). The chi-squared test was employed to compare percentages or frequencies of parameters between the two groups. Continuous variables were compared between the groups using the independent Student's t-test. Analysis of covariance (ANCOVA) was utilised to compare the mean scores of PSST-A components between the groups, adjusted for baseline scores, across the specified time points. Additionally, In order to determine a change over time on the PSST-A component scores between the two participant groups, a repeated-measures analyses of variance (ANOVAs) were utilized. The present research used a p-value of less than 0.05 as statistically significant. The analysis of the data was carried out with the help of IBM SPSS v. 23 statistical program.

RESULTS

The mean age was slightly higher in the calcium + vitamin D (25.7 ± 1.53 years) compared to the control group (24.9 ± 1.79 years), with a p-value of 0.14, indicating no statistically significant difference. Regarding education levels, participants were categorised as primary, secondary, graduates, or master's degree holders. In the calcium + vitamin D group, 8.0% had primary education, 34.0% secondary, 42.0% were graduates, and 16.0% held master's degrees. In comparison, the control group included 12.0% with primary education, 38.0% secondary, 44.0% graduates, and 6.0% with master's degrees. The p-value for education was 0.08, indicating no significant difference between the groups. Occupational distribution showed a statistically significant difference (p = 0.001) between the two groups. Among the calcium + vitamin D group, 38.0% were students, 14.0% were homemakers, and 48.0% were working women. In the control group, 32.0% were students, 24.0% were homemakers, and 44.0% were working women as shown in Table 1.

In addition, in Table 2 and Table 3 across most variables, no statistically significant differences were observed between the groups. The mean scores for anger/irritability were 3.43 ± 0.12 in the calcium + vitamin D group and 3.37 ± 0.12 in the control group (p = 0.67). Similarly, scores for anxiety/tension were 3.60 ± 0.13 and 3.46 ± 0.11, respectively (p = 0.52). Increased sensitivity to rejection had scores of 3.83 ± 0.13 and 3.77 ± 0.09 (p = 0.71). A borderline significant difference was noted in depressed mood/hopelessness, with the calcium + vitamin D group scoring 3.43 ± 0.12 compared to 4.01 ± 0.07 in the control group (p = 0.05). Scores for decreased interest in work activities were 3.81 ± 0.13 in the calcium + vitamin D group and 4.06 ± 0.08 in the control group (p = 0.12), while scores for decreased interest in home activities were 3.68 ± 0.11 and 3.92 ± 0.10, respectively (p = 0.08). Difficulty concentrating showed identical mean scores of 4.12 ± 0.12 for the calcium + vitamin D group and 4.12 ± 0.06 for the control group (p = 1.01).

Furthermore, fatigue/lack of energy had mean scores of 3.76 ± 0.10 in the calcium + vitamin D group and 4.02 ± 0.11 in the control group (p = 0.31). Overeating/food cravings were scored at 3.19 ± 0.12 and 3.28 ± 0.15, respectively (p = 0.67). Insomnia had near-significant differences, with scores of 3.50 ± 0.11 in the calcium + vitamin D group and 3.83 ± 0.13 in the control group (p = 0.07), while hypersomnia showed a significant difference with scores of 3.63 ± 0.14 and 4.01 ± 0.10 (p = 0.03). Other variables, such as feeling overwhelmed or out of control, physical symptoms, school or work efficiency, relationships with friends or family, social life activity, and home responsibilities, did not exhibit statistically significant differences. Notably, social life activity had scores of 3.62 ± 0.12 in the calcium + vitamin D group and 3.74 ± 0.06 in the control group (p = 0.06). For anger/irritability, the calcium + vitamin D group showed significant improvement at all-time points (1, 3, and 6 months) with p-values of 0.04, 0.03, and 0.001, respectively, while the control group did not show similar results (p-value = 0.02 for treatment effect). Anxiety/tension also improved significantly in the calcium + vitamin D group, with p-values <0.001 at 1, 3, and 6 months. In contrast, tearful/increased sensitivity to rejection had no significant treatment effect but showed time-dependent changes (p-value = 0.02 for treatment effect). For depressed mood/hopelessness, the calcium + vitamin D group exhibited improvement after 6 months (p = 0.001), compared to the control group, which showed no significant effect across time. Decreased interest in work activities improved for the calcium + vitamin D group over time (p = 0.001), while fatigue/lack of energy did not show significant changes as shown in Table 4A and Table 4B. Notably, overeating/food cravings had a significant treatment effect (p < 0.001) for the calcium + vitamin D group at all three time points, while physical symptoms such as breast tenderness, muscle pain, and headaches improved significantly at 6 months (p = 0.04) for the calcium + vitamin D group, as compared to the control. Work efficiency also improved significantly at 6 months in the calcium + vitamin D group (p = 0.01), showing a treatment effect. Overall, the calcium + vitamin D group showed positive outcomes across many of the PSST-A components, especially emotional symptoms and work efficiency, whereas the control group had less significant improvement over time as shown in Table 3.

DISCUSSION

One of the most common conditions affecting women of reproductive age is premenstrual syndrome (PMS).[13-14] In contrast to a placebo, the present study presented that calcium + vitamin D supplementation improved all PSST-A questionnaire parameters. This improvement was only shown during the 1st month of the study, even though the placebo group also showed lower scores following the intervention. Previous research has established the positive effects of a

placebo[15], and some studies indicate that the placebo response can significantly affect results, especially in trials that target psychological symptoms or pain management.[16]

Potential effect of calcium and vitamin D supplements in modifying inflammatory pathways associated with premenstrual syndrome (PMS) is becoming increasingly acknowledged.[17] By affecting the cyclooxygenase and nuclear factor pathways, vitamin D has been demonstrated to decrease the creation of pro-inflammatory mediators like prostaglandins and cytokines through its regulatory effect on gene expression and immunological regulation.[18] This anti-inflammatory effect can help lessen the physical discomfort that is frequently linked to PMS, such as breast tenderness, muscular soreness, and fatigue.[19] A sufficient intake of calcium has also been linked to better physical function and less pain during the luteal phase. Calcium is also essential for neurotransmitter release and muscle contraction.[20]

Changes in serotonergic transmission are believed to be responsible for several emotional and behavioural symptoms of PMS, including low mood, irritability, anxiety, sleeplessness, and concentration difficulties.[21] The effects of vitamin D in mood stabilisation and emotional balance may be explained by its important involvement in serotonin synthesis and regulation. Additionally, vitamin D supports circadian rhythm and sleep quality, which are frequently disturbed in people with PMS, by influencing the production of melatonin.[22]

The pathophysiology of PMS has also been linked to oxidative stress; it is indicated that those who are impacted have higher levels of free radical activity and a reduced capacity for antioxidant defence.[23] Because of its antioxidant-like qualities, vitamin D may aid in lowering oxidative stress and restoring redox equilibrium. In a similar vein, calcium takes part in cellular signalling pathways that preserve physiological homeostasis under oxidative conditions.[24-25] These mechanisms collectively imply that calcium and vitamin D supplements may provide a non-hormonal, safe means of reducing the psychological and physical symptoms of moderate to severe PMS.

The current study's findings are consistent with a prior systematic review by Abdi et al. (2019), which suggests that taking supplements of calcium and vitamin D or following a diet naturally high in these nutrients may help restore physiological serum levels and subsequently lessen the severity of premenstrual syndrome symptoms.[7] The observed improvement in both physical and emotional dimensions among participants receiving the intervention supports the therapeutic potential of these micronutrients in PMS management. These findings reinforce existing recommendations advocating for calcium and vitamin D as an affordable, well-tolerated, and accessible non-hormonal strategy for alleviating PMS-related discomfort. Their role in modulating neurotransmitter function, hormonal balance, and inflammatory responses further strengthens the case for their inclusion in non-pharmacological treatment protocols for moderate to severe PMS.

This study's strengths include its double-blind design, which minimised bias. However, limitations include potential individual, personality, and genetic differences among participants, which were somewhat controlled by random sampling. Additionally, certain PMS confounders, including relationship status, lifestyle characteristics, and physical activity, were not taken into consideration in this study. Additionally, serum calcium and vitamin D levels were not measured before and during the intervention period in this study, which could have provided more accurate information about the physiological alterations linked to supplementation.

CONCLUSION

In conclusion, calcium and vitamin D supplementation emerged as a simple, accessible, and low-cost non-hormonal intervention that demonstrated measurable improvement in the symptoms of premenstrual syndrome (PMS). The findings of this study add to the increasing amount of data demonstrating the importance of these nutrients in PMS treatment. While hopeful, the findings are only a first step in determining the therapeutic benefit of vitamin D and calcium in this situation. To validate these results across larger and more varied groups, more research is necessary. Future research ought to look into the underlying physiological processes, figure out the best supplementation amount and duration, and evaluate the long-term effects of consistent use on PMS symptoms.

Conflicts of interest: Nil

Source of Funding: Nil

Acknowledgement: Nil

Authors Contribution:
Haleema Sadia: Introduction, abstract, literature review, data collection, result
Nadia Zahid: Abstract, literature review and results
Gulfreen Waheed: Dissuasion, literature review, data collection
Sana Navid: Literature review data collection

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