

Yoga Versus Aerobic Exercise: An Experimental Study in Adolescent Girls with Premenstrual Syndrome

Seema Sunil Kumar Sharma¹, Dr. Ranveer Kumar Mahato (PT)²,
Dr. Megha Modi (PT)³

¹Masters of Physiotherapy in Community and Preventive Health, Pioneer Physiotherapy College, Vadodara, Gujarat, India.

²Principal, Pioneer Physiotherapy College, Vadodara, Gujarat, India.

³Assistant Professor, Pioneer Physiotherapy College, Vadodara, Gujarat, India.

Corresponding Author: Seema Sunil Kumar Sharma

DOI: <https://doi.org/10.52403/ijrr.20260585>

ABSTRACT

Background: Premenstrual Syndrome (PMS) is a common condition affecting adolescent girls and is characterized by physical, psychological, and behavioural symptoms occurring during the luteal phase of the menstrual cycle. These symptoms negatively affect daily activities, academic performance, emotional health, and quality of life. Non-pharmacological approaches such as yoga and aerobic exercise have been increasingly recommended for PMS management because of their safety, accessibility, and holistic benefits.

Aim: To compare the effects of yoga and aerobic exercise on Premenstrual Syndrome symptoms and pain intensity among adolescent girls.

Methodology: An experimental study was conducted among 38 adolescent girls aged 14–20 years diagnosed with PMS. Participants were randomly allocated into two groups: Group A (Yoga Group, n=19) and Group B (Aerobic Exercise Group, n=19). Both groups underwent intervention sessions for 45 minutes, three times per week for one menstrual cycle. Outcome measures included the Premenstrual Syndrome Scale (PMSS) and Numeric Pain Rating Scale (NPRS). Statistical analysis

was performed using SPSS version 29.0. Wilcoxon Signed Rank Test was used for within-group comparison and Mann–Whitney U Test for between-group comparison.

Results: Both interventions demonstrated statistically significant improvement in PMSS and NPRS scores following treatment ($p < 0.05$). In the Yoga Group, PMSS scores improved from 122.16 ± 17.49 to 79.26 ± 14.76 and NPRS scores reduced from 6.15 ± 1.06 to 3.68 ± 1.05 . In the Aerobic Group, PMSS scores improved from 125.9 ± 21.71 to 86.15 ± 20.51 and NPRS scores reduced from 5.84 ± 1.06 to 3.42 ± 1.01 . However, no statistically significant difference was found between the two groups post-intervention.

Conclusion: Both yoga and aerobic exercise are effective non-pharmacological interventions for reducing PMS symptoms and pain intensity among adolescent girls. Neither intervention was found to be superior, suggesting that both may be recommended as safe and beneficial treatment approaches for PMS management.

Keywords: Premenstrual Syndrome, Adolescent Girls, Yoga, Aerobic Exercise, PMSS, NPRS.

INTRODUCTION

Premenstrual Syndrome (PMS) is a cyclic condition characterized by physical, emotional, psychological, and behavioural symptoms occurring during the luteal phase of the menstrual cycle and subsiding shortly after menstruation begins. PMS significantly affects the quality of life and daily functioning of women and adolescent girls.^[1] Symptoms may range from mild discomfort to severe impairment in social, academic, and occupational performance.

Globally, PMS affects nearly 48% of women, with a higher prevalence among adolescents due to hormonal fluctuations and psychological stressors associated with puberty and growth. The condition is associated with fluctuating levels of Estrogen and progesterone,^[2] which influence neurotransmitter activity, especially serotonin, thereby contributing to mood swings, irritability, anxiety, fatigue, depression, abdominal cramps, bloating, breast tenderness, and musculoskeletal pain.^[3]

Adolescence represents a critical developmental phase characterized by rapid physical, hormonal, emotional, and cognitive changes.^[4] During this period, girls commonly experience menstrual irregularities and PMS symptoms, which may interfere with academic performance, interpersonal relationships, self-esteem, and overall well-being.^[5,6,7]

Conventional management of PMS commonly includes pharmacological interventions such as non-steroidal anti-inflammatory drugs (NSAIDs), hormonal therapy, oral contraceptive pills, and antidepressants. Although these methods provide symptomatic relief, long-term medication use may be associated with side effects and limited patient compliance.^[8] Therefore, there is increasing interest in safe and effective non-pharmacological interventions.

Physical exercise has been identified as an effective approach for improving hormonal balance, mood, blood circulation, and endorphin release.^[9] Aerobic exercise

reduces stress and improves emotional health, while yoga combines physical postures, breathing exercises, and relaxation techniques that enhance physical and psychological balance.^[10,11]

Yoga is an ancient Indian practice integrating body, mind, and breathing through asanas, pranayama, and meditation.^[12] Studies suggest yoga reduces stress hormones, improves emotional stability, and decreases physical symptoms associated with PMS.^[13] Similarly, aerobic exercise improves circulation, hormonal regulation, and release of beta-endorphins, which help reduce menstrual pain and mood disturbances.^[14,15]

Despite growing evidence supporting exercise-based interventions, comparative studies examining the effectiveness of yoga versus aerobic exercise in adolescent girls with PMS remain limited. Therefore, this study aimed to compare the effects of yoga and aerobic exercise on PMS symptoms and pain intensity among adolescent girls.^[16,17] and to screen girls suffering from Premenstrual Syndrome (PMS) using the Premenstrual Syndrome Scale (PMSS) and to evaluate pain intensity using the Numeric Pain Rating Scale (NPRS). The study also aimed to evaluate the effects of yoga and aerobic exercise on PMS symptoms and pain intensity, and to compare the effectiveness of both interventions using PMSS and NPRS outcomes respectively.

MATERIALS & METHODS

Study Design- Experimental Study.

Sampling Technique- Simple Random Sampling.

Study Population- Adolescent girls diagnosed with Premenstrual Syndrome.

Study Setting- Schools and colleges in Vadodara, Gujarat.

Study Duration- One year (2024–2025).

Sample Size- 38 participants was recruited and equally distributed into two groups: Group A (Yoga Group) – 19 participants Group B (Aerobic Exercise Group) – 19 participants Sample size calculation was

performed using G*Power software version 3.1.9.7 considering PMSS as the primary outcome variable with 80% power and 95% confidence interval.

Inclusion Criteria

- Age: 14–20 years
- PMSS score >80
- Regular menstrual cycle (24–35 days)
- Able to understand the protocol

Exclusion Criteria

- Musculoskeletal, cardiovascular, respiratory, or neurological disorders
- Diagnosed gynaecological conditions
- Irregular menstrual cycles
- Use of IUCDs, OCPs, hormonal therapy, or analgesics
- Pregnancy
- Exercise intolerance
- Professional athletes

METHOD

Ethical approval for the study was obtained from the Institutional Ethical Committee prior to commencement of the study. Participants were informed about the aim and procedure of the study, and written informed consent was obtained from all participants fulfilling the selection criteria. The participants were randomly allocated into two groups using the chit method: Group A (Yoga Group) and Group B (Aerobic Exercise Group).

The assessor was blinded to group allocation (single-blind). Baseline demographic data were collected prior to intervention. Outcome measures included the Numeric Pain Rating Scale (NPRS) [18] for assessment of menstrual pain and the Premenstrual Syndrome Scale (PMSS) [19] for evaluation of PMS symptoms. Both groups underwent 12 supervised intervention sessions of 45 minutes each over one menstrual cycle (3 sessions/week for 4 weeks). Post-intervention assessment was conducted at the end of one month using NPRS and PMSS.

Participants in Group A underwent a structured yoga intervention program consisting of warm-up exercises, yoga asanas, Surya Namaskar, and relaxation techniques. The warm-up included neck rolls, shoulder rolls, arm swings, waist twists, and knee bends. This was followed by yoga asanas including Tadasana, Vakrasana, Matsyasana, Marjari Asana, Paschim-Utтанasana, Janu Sirasana, and Bhujangasana.^[20] Surya Namaskar^[21] comprising twelve sequential postures was also incorporated into the session. The intervention concluded with cool-down and breathing exercises including Kapalabhati and Anulom-Vilom Pranayama to promote relaxation and mental calmness.

Participants in Group B underwent a supervised aerobic exercise program consisting of warm-up, aerobic training, and cool-down exercises. The warm-up phase included jogging. The aerobic training consisted of jumping jacks, jump squats, jump rope, high knees, butt kicks, bear crawls, and lateral plank walks^[22] aimed at improving cardiovascular endurance, muscular strength, coordination, and overall physical fitness. The session concluded with cool-down stretching exercises including hamstring stretch, triceps stretch, and trunk rotator stretch to enhance flexibility and reduce post-exercise muscle tightness. All sessions in both groups were supervised to ensure proper technique, safety, and adherence to the intervention protocol.

Statistical Analysis

A total of 38 participants were recruited and equally allocated into two groups (n=19 each). Data were entered into Microsoft Excel and analyzed using SPSS version 29.0. Normality of data was assessed using the Shapiro–Wilk test, which showed non-normal distribution of outcome measures. Descriptive statistics were expressed as mean and standard deviation. Within-group comparisons for PMSS and NPRS scores were analyzed using the Wilcoxon Signed Rank Test, while between-group comparisons were performed using the

Mann–Whitney U Test. The level of significance was set at $p < 0.05$ with a 95% confidence interval.

RESULT

Table-1. Pre-menstrual Syndrome Scale Sub-Components (PRE)

PMSS (subcomponent)	Group A (Mean±SD)	Group B (Mean±SD)	Difference	Z-value	P-value
Physiological	47.47±8.44	52.89±12.33	0.096	-1.680	.093
Psychological	43.157±6.56	47.42±7.64	0.070	-1.814	.070
Behavioural	32.05±6.703	26.84±7.27	0.033	-2.135	.033*

($p < 0.05$)

The table presents a comparative analysis of premenstrual syndrome (PMS) subcomponents physiological, psychological, and behavioural symptoms between two groups A and B, each subcomponent is reported with its mean and standard deviation (SD) for both groups,

along with the difference, Z and P-value. There was no statistically significant difference in Psychological ($p=0.070$) as well as physiological ($p=0.093$) subcomponents of PMSS scale between group A and group B.

Table-2. Pre-menstrual Syndrome Scale Sub-Components (POST)

Physiological	31.37±9.46	36.47±13.21	-5.11	-1.369	0.179
Psychological	29.63±7.09	34.58±9.41	-5.32	-1.966	0.057
Behavioral	18.63±7.10	16.15±6.70	2.47	1.076	0.289

The table presents a comparison of post-test scores for the Pre-menstrual Syndrome Scale (PMSS) sub-components between Group A and Group B. The physiological ($p=0.179$), psychological ($p=0.057$), and behavioral ($p=0.289$) symptoms indicate that

none of the differences between the groups are statistically significant. This suggests that, overall, there is no strong evidence to conclude that one group experienced significantly different PMS symptoms compared to the other after the intervention.

Table-3. PRE-POST DIFFERENCE BETWEEN GROUP A

PMSS (subcomponent)	Pre (Mean ± SD)	Post (Mean ± SD)	Difference	Z-value	P-value
Physiological	47.47±8.44	31.37±9.46	16.10	29.0	0.00*
Psychological	43.157±6.56	29.63±7.09	13.53	10.0	0.00*
Behavioral	32.05±6.703	18.63±7.10	13.42	22.0	0.00*

($p < 0.05$)

The pre-post difference in Group A's Pre-menstrual Syndrome Scale (PMSS) sub-components is shown in the table. Following the intervention, the result shows a statistically significant decrease in PMS symptoms. The substantial reduction in

mean scores for each sub-component indicates that Group A intervention is effective in reducing Physiological ($p=0.00$), Psychological ($p=0.00$) and behavioral ($p=0.00$) symptoms.

Table-4 PRE-POST DIFFERENCE BETWEEN GROUP B

PMSS (subcomponent)	PRE (Mean ± SD)	POST (Mean ± SD)	Difference	Z-value	P-value
Physiological	52.89±12.33	36.47±13.21	16.42	60.0	0.00*
Psychological	47.42±7.64	34.58±9.41	12.84	30.0	0.00*
Behavioral	26.84±7.27	16.15±6.70	10.69	44.0	0.00*

($p < 0.05$)

The table shows a significant reduction in Physiological, Psychological, and Behavioral symptoms of Premenstrual Syndrome Scale (PMSS) in Group B after

the intervention. These results suggest that the intervention was highly effective in alleviating PMS symptoms in this group.

Table 5. Within Group Difference of PMSS and NPRS in Yoga Group.

	VARIABLE	MEAN	SD	Z-value	P-value
GROUP A	Pre-PMSS	122.16	17.49	-3.82	0.00*
	Post-PMSS	79.26	14.76		
	Pre-NPRS	6.15	1.06	-3.90	0.00*
	Post-NPRS	3.68	1.05		

(p < 0.05)

In the participants of Yoga Group, PMSS score at baseline was 122.16±17.49, following the intervention for 4 weeks it reduced to 79.26±14.76 on comparison of means of Pre and Post PMSS score the difference was found to be statistically

significant, and NPRS score at baseline was 6.15±1.06, which reduced to 3.68±1.05 post intervention, which was statistically significant suggesting that yoga improved the symptoms of PMSS and NPRS both among the participants.

Table-6. Within Group Difference of PMSS and NPRS in Aerobic Group

	VARIABLE	MEAN	SD	Z-value	P-value
GROUP B	Pre-PMSS	125.9	21.71	-3.82	0.00
	Post-PMSS	86.15	20.51		
	Pre-NPRS	5.84	1.06	-3.88	0.00
	Post-NPRS	3.42	1.01		

(p < 0.05)

The PMSS score of the Aerobic Group participants was 125.9±21.71 at baseline, but after the 4-week intervention, it reduced to 86.15±20.51. When the means of the Pre and Post PMSS scores were compared, the change was determined to be statistically

significant. And NPRS mean pre-intervention was 5.84±1.06 which reduced to 3.42±1.01 after intervention, which showed significant difference. Implying that aerobic exercise helped the participants PMSS symptoms and NPRS scoring.

Table-7. POST PMSS SCORE FOR BOTH YOGA AND AEROBIC GROUP

POST PMSS	MEAN	SD	Z-value	P-value
Group A	79.26	14.76	-1.417	0.157
Group B	86.15	20.51		

Table 7 displays the score of PMSS post intervention, following the intervention of Yoga and Aerobics group, post intervention they had score of Group A 79.26±14.76 and

of Group B 86.15±20.51. On applying Mann-Whitney U Test, it shows that both the groups had similar effect onto the score of PMSS.

TABLE-8 POST NPRS FOR YOGA AND AEROBICS

POST NPRS	MEAN	SD	Z-value	P-value
Group A	3.68	1.05	-1.165	0.244
Group B	3.42	1.01		

This table shows the NPRS score after the Yoga and Aerobics groups' intervention. Group A score was 3.68±1.05 and Group B

was 3.42±1.01. The results of the Mann-Whitney U Test indicate that both groups had an identical effect on the NPRS score.

Both Group A and Group B showed significant improvement in premenstrual symptoms and pain intensity following the intervention. Therefore, both yoga and aerobic exercise were found to be equally effective in the management of Premenstrual Syndrome among adolescent girls.

DISCUSSION

Premenstrual Syndrome (PMS) is a common condition among adolescent girls that affects their physical, psychological, emotional, and behavioural well-being. The present study aimed to compare the effectiveness of yoga and aerobic exercise in reducing PMS symptoms and pain intensity among adolescent girls aged 14–20 years.

The findings of this study showed that both yoga and aerobic exercise significantly reduced PMS symptoms and pain intensity after intervention. Post-intervention PMSS and NPRS scores improved in both groups. Group A (Yoga) showed a slightly lower mean PMSS score compared to Group B (Aerobic Exercise), but the difference between groups was not statistically significant ($p = 0.157$). Similarly, NPRS scores improved in both groups, with no statistically significant difference observed between them ($p = 0.244$). These findings indicate that both yoga and aerobic exercise are equally effective in reducing PMS symptoms and menstrual pain.

The results of the present study are consistent with previous research. Mishra D and Vaghela N (2019) compared yoga and aerobic exercise over one menstrual cycle and found that both interventions significantly reduced PMS symptoms, pain intensity, and psychological disturbances. Their study suggested that yoga may provide a more holistic effect on physical and mental well-being. Similarly, Pathak NC et al. (2023) reported that both aerobic exercise and yoga effectively reduced dysmenorrhea and PMS symptoms among adolescent girls, with neither intervention

proving superior in reducing pain intensity and symptom severity.^[22]

Several authors have suggested that yoga provides benefits comparable to or greater than other forms of exercise because of its combined effects on physical and psychological health.^[26,27] Previous studies have shown that regular yoga practice can effectively reduce depressive symptoms, anxiety, anger, irritability, fatigue, mood swings, difficulty concentrating, food cravings, and physical symptoms associated with PMS.^[23-29] Yoga is believed to regulate the hypothalamic-pituitary-adrenal axis and reduce stress hormone secretion such as cortisol, adrenaline, and norepinephrine. Since stress and anxiety are closely associated with PMS severity, yoga may help in reducing both psychological and physical symptoms through relaxation and emotional regulation.

Aerobic exercise also plays an important role in PMS management. It enhances blood circulation, regulates hormonal balance, and stimulates the release of endorphins, which help reduce pain and improve mood.^[27]

Aerobic exercise may also decrease serum aldosterone levels and facilitate faster removal of prostaglandins from the uterus, thereby reducing menstrual pain and discomfort. These physiological mechanisms may explain the significant improvement observed in the aerobic exercise group in the present study.

The findings are further supported by Chen et al. (2023), who reported that students participating in physical exercise at least twice weekly had a significantly lower risk of PMS compared to less active students.^[28]

This highlights the importance of regular physical activity as an effective non-pharmacological intervention for PMS management. In the present study, both interventions positively affected physiological, psychological, and behavioural components of PMS, as reflected by improvements in all PMSS subcomponents.

Differences in PMS prevalence and symptom severity across studies may be

influenced by cultural practices, lifestyle, dietary habits, stress levels, and study methodology. [29-32] Adolescents are particularly vulnerable to PMS due to hormonal fluctuations and academic stress. Therefore, incorporating regular exercise into daily routines may help improve overall well-being and reduce PMS-related disturbances.

Yoga and aerobic exercise are both safe, cost-effective, and non-invasive approaches for PMS management. Unlike pharmacological treatments, these interventions have minimal side effects and can easily be incorporated into school and college health programs. Overall, the findings of the present study suggest that both yoga and aerobic exercise are beneficial in reducing PMS symptoms and pain intensity in adolescent girls, with neither intervention showing statistical superiority over the other

CONCLUSION

The study aimed to evaluate the effectiveness of Yoga in Group A and Aerobics in Group B, two exercise modalities in alleviating PMS symptoms. The findings indicate that both yoga and aerobic exercise significantly reduced PMS symptoms and pain intensity, as measured by the Premenstrual Syndrome Scale (PMSS) and Numeric Pain Rating Scale (NPRS). However, no statistically significant difference was found between the two groups, suggesting that both interventions are equally effective

Declaration by Authors

Ethical Approval: Approved. Ethical approval was obtained from the Institutional Ethical Committee of Pioneer Physiotherapy College. Proposal Number: PPC/OW/684A/2024.

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Seema Sunil Kumar Sharma, Ranveer Kumar Mahato, Megha Modi. Yoga versus aerobic exercise: an experimental study in adolescent girls with premenstrual syndrome. *International Journal of Research and Review.* 2026; 13(5): 839-846. DOI: <https://doi.org/10.52403/ijrr.20260585>
