ORIGINAL ARTICLE

Arch AHS

Archives of Allied Health Sciences 2023; 35(1): 49-57.

Effect of yoga on premenstrual symptoms, flexibility, and quality of life in university students with premenstrual syndrome: a pilot study

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KEYWORDS
Yoga;
Menstruation;
Menstrual disorders;
Exercise;
Quality of life.

ABSTRACT

The common symptoms of premenstrual syndrome (PMS) include stomach discomfort, headache, back pain, exhaustion, anxiety, and lack of attention; hence PMS negatively impacts health and quality of life. Non-pharmacological methods, such as yoga, are often favored in the treatments of PMS because they are safe and have minimal adverse effects. However, evidence supporting yoga's effectiveness to relieve the symptoms of PMS is limited. Therefore, the objective of this study was to investigate the effect of yoga on premenstrual symptoms, flexibility, and health-related quality of life in female adolescents with moderate to severe PMS. This study was conducted as a pilot study among 10 university students with premenstrual syndrome. The participants performed yoga at a duration of 20 minutes per session, 3 times a week for 8 weeks. All of the variables were assessed at baseline and at the end of the study. There was a significant increase in flexibility measured by sit-and-reach test after the training (p-value < 0.05). Premenstrual symptoms measured by premenstrual symptoms screening tool (PSST) showed a significant decrease in the domains of mental symptoms, physical symptoms, impacts of the disease, and PSST total score (p-value < 0.05). Moreover, health-related quality of life measured by SF-36 revealed a significant increase in the domains of bodily pain, vitality, social functioning, mental health, and SF-36 total score (p-value < 0.05). Although additional research is required for further investigation, this pilot study indicates the yoga program may be used as an alternative treatment option for young females who suffer from PMS.

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Received: 22 November 2022/ Revised: 14 December 2022/ Accepted: 25 December 2022

Introduction

Epidemiological surveys estimate that up to 80% of women of reproductive age suffer from premenstrual syndrome (PMS)[1]. PMS is characterized by a spectrum of physical, behavioral, and emotional symptoms that manifest during the luteal phase of the menstrual cycle[2]. PMS has a negative impact on women's quality of life, as well as their economic and social performance[3-5]. According to Victor et al[6], 49.9% of university students enrolled in health-related courses had PMS. In addition, PMS was found to affect the students' quality of life in all domains, including physical, mental, social relationships, and environmental domain. PMS can be treated using pharmacological and non-pharmacological methods[7]. Nonpharmacological methods such as diet therapy, acupressure, aerobic exercise, and yoga are often favored in the treatment of PMS because they are safer and have less adverse effects[8-11]. In addition, yoga has been demonstrated to alleviate premenstrual symptoms more effectively than aerobic exercise and acupressure[12,13].

Little is known regarding the effect of yoga on premenstrual symptoms in Thai university students with PMS. Recent study by Yonglitthipagon et al[14] determined the effects of 12-week home-based yoga program in young adolescents with PMS aged 18-22 years. The participants showed improvements in the areas of premenstrual symptoms, back and leg muscle strength, and flexibility. However, this study was restricted by the absence of a standardized instrument for assessing premenstrual symptoms, the absence of a health-related quality of life assessment, and the ambiguity of PMS severity. In addition, the effect of an 8-week home-based yoga program on premenstrual symptoms, flexibility, and health-related quality of life in university students with moderate to severe PMS has not been investigated. Therefore, the objective of this study was to investigate the effect of an 8-week home-based yoga program on premenstrual symptoms, flexibility, and health-related quality of life in university students with moderate to severe PMS.

Materials and methods

Study design and participants

This pilot study was approved by the Ethics Committee of Center for Ethics in Human Research, Khon Kaen University (HE622292). All participants provided their informed consent prior to participation. The recruitment began in May 2020 and continued until January 2021, when the final participant completed the research. Finally, 10 female students with moderate to severe PMS from Khon Kaen University participated in the research voluntarily. A flowchart of the study enrollment is presented in figure 1. The inclusion criteria for this pilot study were as follows: (1) female students aged 18 to 22 years, (2) experience of moderate to severe PMS[15], (3) body mass index (BMI) of 18.5-29.9 kg/m^2, and (4) the ability to comprehend and adhere to research protocols. The exclusion criteria were as follows: (1) being pregnant, (2) having neurological, cardiovascular, or musculoskeletal diseases; (3) having routinely exercised (moderate intensity training, more than one hour per week) within three months before the recruitment, and (4) taking oral contraceptives.

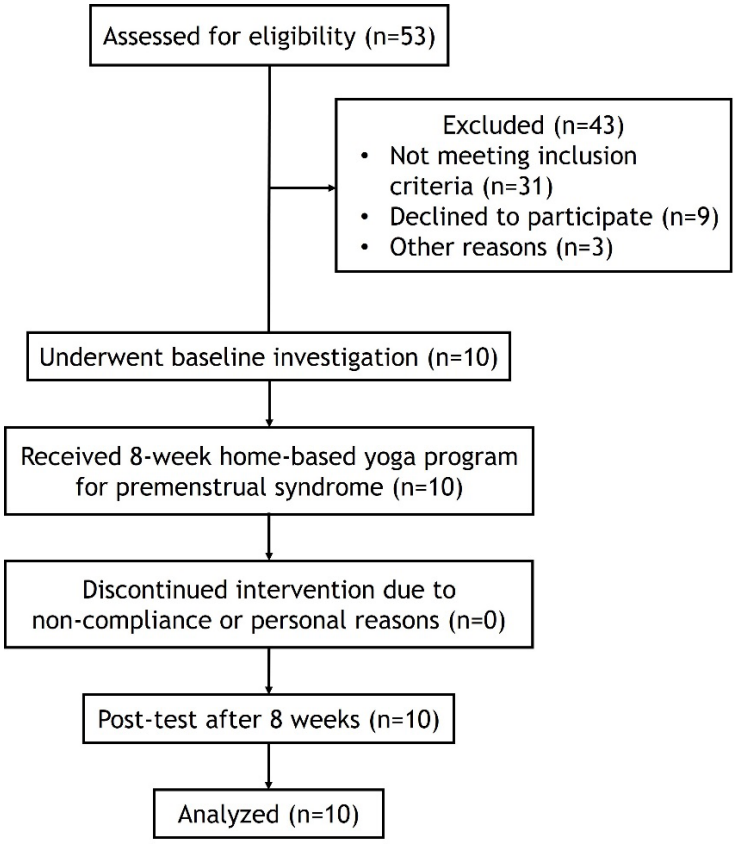
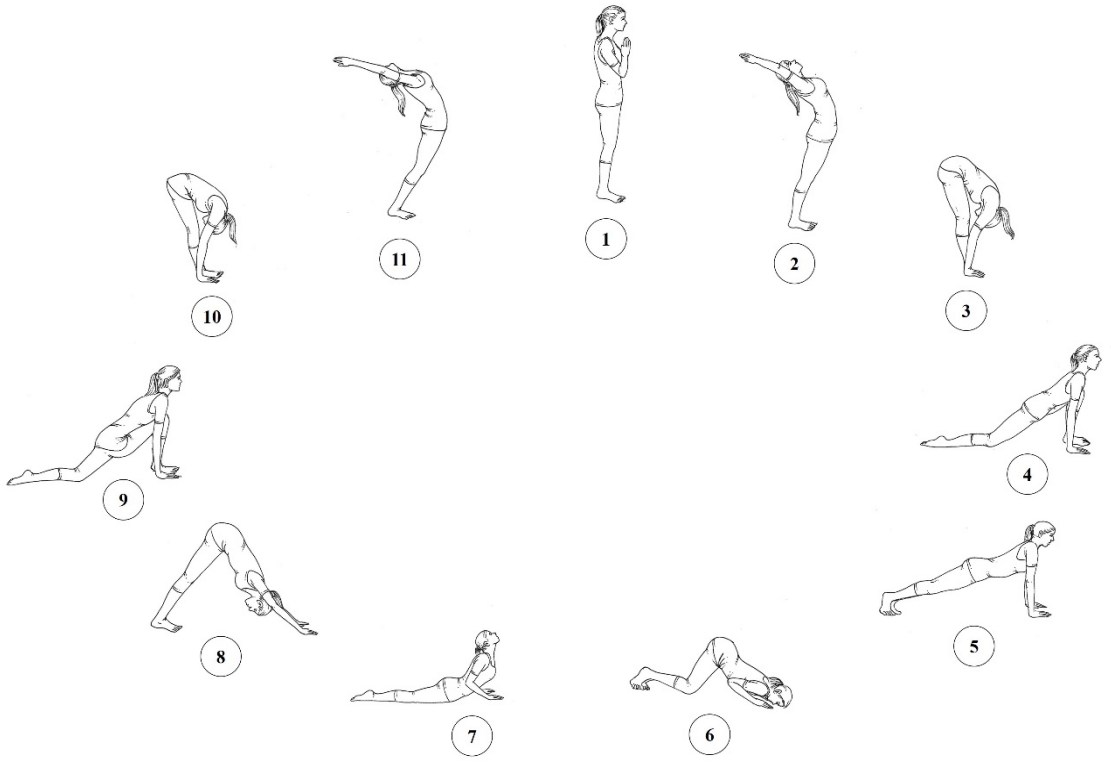


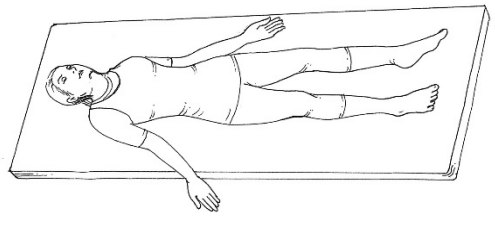
Figure 1 Study flowchart.

Intervention

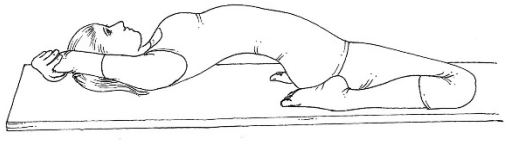
The yoga poses employed in this study were derived from those discovered by Yonglitthipagon et al[14], who found that they could improve premenstrual symptoms, back and leg muscle strength, and flexibility in young women with PMS aged 18-22 years. The yoga poses for 8-week home-based yoga program shown in figure 2 were as follows: Corpse pose or Shavasana (3 minutes), Sun salutation or Surya Namaska (3 sets of this pose for 6 minutes), Diamond pose or Supta Vajarasana (2 minutes), Head-to-knee pose or Janu Sirsasana (3 sets of this pose for 3 minutes), Seated forward bend or Paschimottanasana (3 minutes), and Shavasana (3 minutes), respectively. The participants were instructed for one hour by a yoga instructor who had five years of expertise teaching yoga to women with PMS. After becoming familiar with all poses, they were instructed to practice yoga at home for eight weeks, three times each week for 20 minutes per session. All participants were given the 'Yoga for Premenstrual Syndrome' pamphlet, which was created specifically for this study. Despite the fact that yoga is usually better instructed by a yoga teacher, the selected yoga poses were not too difficult for participants to do at home by following the clear instructions in the pamphlet. Additionally, after an hour of yoga instruction, the participants were able to perform these poses correctly. Exercise diary was used to keep record of exercise participation as well as any adverse events that occurred during the at-home yoga program. During their participation in this program, the participants were advised not to engage in any other forms of physical activity because doing so could affect the outcomes. In order to verify that each participant adhered to the intervention and practiced yoga correctly, the participants received a weekly phone call to provide encouragement and discourage dropout. Each participant included in the final analysis was required to have at least 90% compliance (≥ 20 sessions) with the yoga intervention.



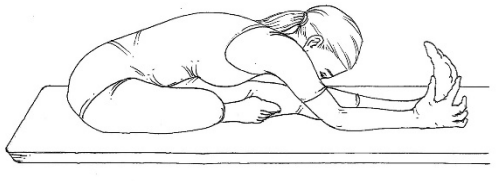
(a) Surya Namaskar



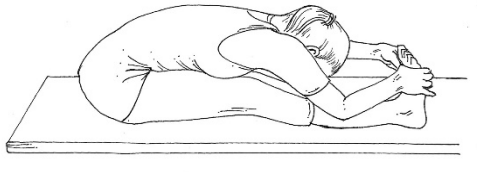
(b) Shavasana



(c) Supta Vajarasana



(d) Janu Sirasasana



(e) Pashimotanasana

Figure 2 Home-based yoga program for adolescent females with premenstrual syndrome.

Outcome measurements

Sit-and-reach test

The low back and hamstring flexibility was assessed by the sit-and-reach test (SRT)[16]. Participants were asked to sit on the floor with legs fully extended, and the soles of both feet must be placed against the sit-and-reach box. Then they placed both hands together, and reach those hands forward along the measuring line as far as possible. The average of the 3-time reach distances was used for data analysis.

Premenstrual symptoms screening tool

Thai version of premenstrual symptoms screening tool (PSST) with high value of internal consistency (Cronbach's alpha > 0.9) was used to determine the severity of PMS in this study[17]. The PSST consists of 19 questions that are divided into three domains including mental symptoms, physical symptoms and impacts of the disease[17]. Each question was scored between 0 and 3 based on the severity of the symptoms. The range of PSST scores was from 0 to 57. In this study, participants with moderate to severe PMS were recruited if they had greater than 20 scores with the following three conditions: 1) at least one moderate or severe symptom reported from questions 1-4 in the questionnaire, 2) at least four moderate or severe symptoms were indicated from question 1-14 in addition to first condition, and 3) at least one moderate or severe symptom was reported from the last five questions in the questionnaire[1,15].

The 36-Item Short Form Health Survey

A short form 36 (SF-36) health survey questionnaire (Thai version) was used to evaluate quality of life[18]. It consists of 36 questions across eight domains including physical functioning, role limitation due to physical problems, bodily pain, general health perception, vitality, social functioning, role limitation due to emotional problems, and mental health. The score range is between 0-100, where 0 is the lowest and 100 is the highest state of health[19].

All outcomes were measured at baseline and after 8 weeks of the yoga program.

Statistical analysis

IBM SPSS Statistics version 23.0 software (Khon Kaen University licensed) was used for all statistical analyses. The descriptive statistics were applied to explain participants' demographic. The Shapiro-Wilks test was used to determine the normality of the data. Non-parametric statistics were used due to the small sample size and normality violations. The pre- and post-intervention flexibility, PSST, and SF-36 data were compared using Wilcoxon Signed-Rank test. The statistical significance was set at p-value < 0.05.

Results

Ten participants have completed the 8-week of home-based yoga program. During the time that the yoga program was being carried out, the participants did not experience any complications. Table 1 shows the demographic information of the participants in this study.

Table 1 Baseline characteristics of the participants (n = 10)

Variable	Median (IQR)
Age (year)	21.00 (2.25)
Weight (kg)	53.00 (7.38)
Height (cm)	161.00 (9.25)
BMI (kg/m^2)	19.96 (3.07)

Note: IQR, interquartile range; BMI, body mass index.

Table 2 presents within-group analyses of the sit-and-reach test, PSST, and SF-36. After participating in the yoga program for eight weeks, there was a statistically significant increase in the low back and hamstring flexibility measured by the sit-and-reach test (p-value < 0.05). Further, premenstrual symptoms measured by PSST showed a significant reduction in the domains of mental symptoms, physical symptoms, impacts of the disease, and PSST total score (p-value < 0.05). Additionally, health-related quality of life measured by the SF-36 revealed a significant increase in the domains of bodily pain, vitality, social functioning, mental health, and SF-36 total score (p-value < 0.05).

Table 2 Within-group analysis for the outcomes of the study

Variable	Baseline	After 8 weeks	*p*-value
Sit-and-reach test (cm)	0.40 (13.43)	5.35 (10.18)	0.005*
PSST (score)			
- Mental symptoms	20.00 (2.50)	6.00 (5.00)	0.005*
- Physical symptoms	15.00 (4.25)	5.50 (3.50)	0.004*
- Impacts of the disease	11.40 (2.50)	3.40 (1.50)	0.005*
- PSST total score	45.50 (8.50)	16.00 (9.50)	0.005*
SF-36 (score)			
- Physical functioning	80.00 (13.75)	85.00 (18.75)	0.076
- Role - physical	75.00 (56.25)	100.00 (50.00)	0.161
- Bodily pain	28.25 (37.50)	67.50 (24.88)	0.020*
- General health	47.50 (33.75)	55.20 (20.00)	0.285
- Vitality	47.50 (26.25)	65.00 (10.00)	0.015*
- Social functioning	62.50 (37.50)	75.00 (15.63)	0.046*
- Role - emotional	50.00 (75.00)	100.00 (33.33)	0.105
- Mental health	54.00 (29.00)	72.00 (11.00)	0.007*
- SF-36 total score	59.43 (26.54)	76.07 (13.01)	0.022*

Note: The values are presented in median (interquartile range) using the Wilcoxon Signed-Rank test for non-parametric data, *significant difference from baseline. PSST, premenstrual symptoms screening tool; SF-36, the 36-item short form health survey.

Discussion

Our findings suggest that the 8-week home-based yoga program may be used as an alternative treatment option for university students with PMS. When compared with before exercise training, this yoga program could improve premenstrual symptoms, flexibility, and quality of life in university students with PMS (Table 2). Furthermore, no adverse events associated with the yoga training were reported by any participants. The improvements in those 3 outcome measures shown in the current study should result in enhanced physical function in the participants' daily activities[14,20].

Due to the fact that low back pain is a common symptom of PMS[21], it is possible that women with PMS would experience decreased hamstring and low back flexibility[22]. The significant increase in low back and hamstring flexibility seen in the present study may be related to thrice-weekly 20-minute yoga sessions for 8 weeks of forward bending yoga poses such as Surya Namaskar, Janu Sirasasana, and Pashimotanasana that stretch the lower back and hamstring muscles. The results of this study are in line with those of a study by Yonglitthipagon et al[14] and Yonglitthipagon et al[23], who found that twice-weekly 30-minute yoga sessions for 12 weeks can improve the flexibility of young adolescents with premenstrual syndrome and women with primary dysmenorrhea, respectively. It is interesting to note that changes in female hormones, particularly estrogen and progesterone during the menstrual cycle, are the primary cause of increased ligament looseness, which leads to increased flexibility, and decreased neuromuscular performance, which leads to decreased muscle strength[24]. Therefore, the increase in low back and hamstring flexibility observed in our study could be attributed not only to the yoga program but also to hormonal changes during the menstrual cycle.

Further, the current study found a statistically significant improvement in premenstrual symptoms across all PSST domains (emotional, physical, and impacts of the disease) as well as total PSST score (Table 2). PMS is known to induce physical, behavioral, and emotional problems[2]. Previous studies[14,20] have also found that PMS symptoms decreased following the completion of yoga programs. Based on a systematic review and meta-analysis in 2022[25], yoga was beneficial in alleviating premenstrual symptoms. This advantage was observed in all PMS sub-domains except the physical sub-domain. Research is still needed to determine whether yoga has any impact on the pathophysiology of PMS, particularly on the hormonal imbalance. Kanojia et al[26] investigated the effect of yoga in adolescent girls with PMS and found that participants who practiced yoga six days per week for the duration of three menstrual cycles had significant improvements in their weight, resting heart rate, resting blood pressure, frustration, depression, and anxiety level compared to the control group. Tsai et al[20] also reported that twice-weekly 50-minute yoga sessions for 12 weeks significantly decreased the use of analgesics during menstruation and improved premenstrual symptoms as well as health-related quality of life among Taiwanese female employees. In addition, earlier studies have demonstrated that yoga was more effective than acupressure[12] and aerobic exercise[13] in alleviating premenstrual symptoms.

In addition, the current study demonstrated that the health-related quality of life, as evaluated by the SF-36, significantly increased in the domains of bodily pain, vitality, social functioning, mental health, and SF-36 total score. The mechanism by which yoga improves quality of life in people with premenstrual syndrome is unclear. The improvement in quality of life is probably due to the result of a reduction in premenstrual symptoms across all PSST domains (emotional, physical, and impacts of the disease) and also an increase in lower back and hamstring flexibility. Our findings are in line with those of Tsai et al[20], who discovered that a 12-week yoga intervention not only reduced premenstrual symptoms, but also improved quality of life in the domains of physical function and bodily pain in Taiwanese female employees with PMS. According to Wu et al[27], women with PMS who engaged in short-term yoga practice during the luteal phase were able to make themselves feel better and maintain a higher level of concentration by increasing in alpha wave production in the brain. Previous studies have shown that yoga and meditation increase alpha waves by slowing abdominal breathing[28,29]. Kamie et al[30] also revealed that yoga practice led to an increase in alpha wave production and a drop in serum cortisol, the body's stress hormone. Brain waves in the alpha range are attributed to feelings of calm, relaxation, motivation, and better mood[31]

The major limitations of this pilot study were that the study employed an overly simplistic experimental design that compared before and after a single intervention without the use of control group or random assignment. Therefore, additional research for contributing comparison groups or random allocation design is recommended. This will show whether young females with PMS who engage in the yoga program improve their premenstrual symptoms, flexibility, and quality of life as compared to controls. Secondly, the limited sample size and the fact that the participants were sedentary university students aged 18-22 years old may have reduced the impact of our findings, making it less likely that our results can be generalized to all women of reproductive age. Additional research is needed to evaluate if the same improvements in premenstrual symptoms, flexibility, and quality of life observed in this study would be found in other populations (e.g., athlete college students, women of reproductive age a broader age range). Finally, the demographic data of the participants provided few meaningful insights. Demographic data on age of menarche, menstrual characteristics, and personal lifestyle factors such as alcohol consumption, smoking, and exercise habit should be obtained in future studies.

Conclusion

Although additional research is required with larger participant cohorts to further evaluate efficacy, the results of our study show that the yoga program could be an alternative therapeutic option for university students with PMS.

Take home messages

When it comes to university females who suffer from premenstrual syndrome, an 8-week home-based yoga program can improve the severity of premenstrual symptoms, as well as lower body flexibility, and health-related quality of life.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgements

The authors would like to thank all participants who contributed to this study.

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