



The Effect of Yoga on Women's Premenstrual Syndrome: A Randomized Controlled Clinical Trial

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Abstract

Objectives: Women with premenstrual syndrome (PMS) show emotional, physical and behavioral symptoms regularly every month. Mild physiological symptoms of PMS appear in 95% of women at their reproductive age. We hypothesized to evaluate the effect of yoga exercise on PMS.

Materials and Methods: A randomized controlled clinical trial was conducted from April to October of 2015. Eligible women for inclusion were selected conveniently from women that had randomly referred to selected private obstetrics and gynecology clinics in Tabriz, Iran. Thereafter, 62 subjects were selected for the study. Subjects were randomly divided into 2 groups: 31 subjects for yoga and 31 subjects for control groups with blocks 4 and 6. The yoga group performed yoga for 10 weeks in 3 sessions with each session of 60 minutes duration. Subjects of control group did not do any yoga. Subjects completed the Premenstrual Symptoms Screening Tool (PSST) questionnaire for evaluation of the effect of yoga exercise on emotional, behavioral, physical symptoms and quality of life of subjects with PMS before and after the intervention. Data were analyzed by covariance.

Results: The mean \pm standard deviation (SD) of emotional, physical, behavioral symptoms and impact of yoga exercise on quality of life in yoga were 26.28 ± 16.54 , 32.69 ± 20.81 , 10.90 ± 14.10 , 22.8 ± 14.56 , and in the control group were 54.91 ± 21.31 , 72.01 ± 22.24 , 44.05 ± 22.32 , 54.00 ± 20.33 , respectively ($P < 0.05$).

Conclusion: Results highlight that yoga significantly relieves the PMS symptoms and can be prescribed for treatment of PMS.

Keywords: Premenstrual syndrome, Quality of life, Yoga

Introduction

Women with premenstrual syndrome (PMS) show majority of symptoms, particularly during luteal phase, regularly every month. These symptoms are classified into 3 emotional (EM), physical (PHY) and behavioral (BE) categories (1). The common symptoms of PMS are: bloating, breast tenderness, headache, frequent urination, loss of appetite, insomnia, irritability, depression, lack of energy and increased or decreased of libido (1,2). Andrew et al (3) have shown that patients with PMS have lower work performance (27.5%), impaired working relationships (23.1%), disputation with their husbands (8.82%), relationship problems with their children (6%) and social relationship problems (41%). PMS interferes with the life of patients directly by treatment expenditures and indirectly by inefficient working hours, absenteeism and productivity (4) and requires cure and management (5). Routinely, women with PMS use pharmacological (1) and non-pharmacological approaches (6) to decrease the severity of PMS symptoms. Whereas, prescribed medications (alprazolam, progesterone, fluoxetine and gonadotropin releasing hormone) have shown side effects such as exhaustion, insomnia, headaches, menstrual dysfunction, decreased sexual ability, nausea and vomiting

(1,7-9). Recently, yoga as a safe treatment has also been introduced (10).

Yoga is a Sanskrit word, meaning connection of the mind, body, emotions, logic and attention to the action. Yoga exercise is composed of physical (Asana), breathing (Pranayama) and mental (Pratt Hara) practices, resulting in health, relaxation and positive awareness. Yoga stretching practices with deep breathing and meditation strengthens muscles and protects the spine and joints of body (11). Evidences indicated that physical and mental health benefits of yoga occur through negative moderation of hypothalamic-pituitary-adrenal axis in association with sympathetic nervous system (SNS). Yoga exercise, negatively, via vagal nerves, regulates secretion of hormones (cortisol, glucose, plasma's renin, epinephrine and norepinephrine) into the bloodstream which are responsible for body functions (10). Yoga reduces the negative effects of induced stress to immune system by regulating positively the adjustment of immunoglobulin A (12). Additionally, yoga exercise reduces harmful inflammatory secretions, which make women with PMS, comfortable. Studies in India have shown positive impacts of yoga exercise on women with PMS on decreasing heart beats, blood pressure and anxiety (6,13).

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With considering: (a) the positive effects of physical exercises on global women's health (14-16), (b) the negative attitudes of the Iranian society towards women's sports (17), (c) the low percentage (0.3%) of participation of women in sports in East Azerbaijan, Iran (18,19), (d) lack of any kind of study from Iran on PMS and yoga, and (e) the effects of culture on PMS (20), the current investigation was designed to study the effects of yoga on women with PMS in reproductive age, in Tabriz society.

Materials and Methods

A controlled randomized clinical trial was conducted on women with PMS that had referred to private obstetrics and gynecology clinics in Tabriz, Iran from April to October of 2015. Randomly, 20 private obstetrics and gynecology clinics were selected using random numbers table. Researcher selected 150 subjects from referred patients to the private clinics complaining of PMS. Researcher, selected eligible subjects for the study based on objective criteria (convenience).

The names, phone numbers and addresses of subjects were recorded. To ensure PMS, Premenstrual Symptoms Screening Tool (PSST) questionnaire was provided to the subjects to complete them in two consecutive months. Subjects were requested to complete the demographic questionnaire as well. Two months after monitoring the patients using PSST questionnaire, 62 subjects with PMS entered the study. Eligible criteria included age between 20-45 years old, having PMS according to the PSST questionnaire, having regular menstrual periods, being non-athletic for duration of 3 months, not being under any treatment with chemical/herbal medications or oral contraceptives, having no depression and genital tract diseases, not drinking alcohol or smoking cigarettes, not to be a tobacco or illicit drug user, not having any joint diseases, rheumatoid arthritis or surgeries that could affect yoga exercise, not to be a caffeine user (expressed by subjects) and have a willingness to participate in the study. The subjects were excluded if they had no willingness to continue the investigation and/or have had experienced yoga exercise before.

Based on the research by Kanojia et al (21), the number of the subjects to be involved in the study was calculated by considering 95% interval confidence and 80% of power for 26 cases for yoga group (-17.50 ± 12.43) and 26 cases for control group (-0.65 ± 27.54). A 20% dropout was considered in cases, so 31 subjects were calculated per group. The allocation was done randomly for the yoga and the control group in the form of 4 and 6 blocks. To make the allocation blindness, researchers used opaque envelopes containing the names of the groups which were labeled with numbers. The envelopes were prepared by non-involved researcher. The first envelope was given to the first subject. Before allocation, the researcher or subjects were not aware of the allocation results. The researcher and analyzer were unaware until the end of the study. Totally, 31 subjects were assigned to yoga and 31 subjects to control groups.

A coach with valid certification in yoga, worked with the yoga group over a period of 10 weeks in 3 sessions for 60 min/wk. The first 2 weeks of the yoga exercise were just for physiological adaptations, then subjects continued the yoga for 10 weeks (22-24).

Researchers were in contact with control group subjects by phone calls. The first phone call was made 30 days after admission to the study and the second phone call was done after finishing the intervention in the yoga group. The aim of the phone calls was following the requirements of the control group and reminding them to fill out the questionnaires, asking about any probable using or used medications and filling out the PSST questionnaire at the end (Figure 1).

Experimental Design and Statistical Analyses

The data collection tools were both demographic and PSST questionnaires. The demographic questionnaire consisted of age, education level, marital status and menstrual cycle. The PSST questionnaire was composed of 19 questions including 4 criteria namely: not at all, mild, moderate and severe, scoring from zero to 3. PSST questionnaire consisted of 2 categories; the first category had 14 questions about EM, PHY and BE symptoms and the second category had 5 questions considering the effects of PMS on quality of life. The total score was computed based on summing over the items which ranged between 0 to 100 for each category. The average score was calculated in each case. The questionnaire of PSST is rated at the University of McMaster in Canada. In Iran Hariri et al (25) standardized the PSST questionnaire in Iranian population. Both the reliability and validity index for PSST questionnaire are reported 0.7 and 0.8, respectively. The validity of content was assessed by 10 experts specialized in sport sciences, midwifery and gynecology. The internal consistency of reliability was assessed by Cronbach α . The values obtained were: EM 0.73, PHY 0.74, BE and the effects of PMS on quality of life were 0.94 and 0.73, respectively. The PSST questionnaire was completed 3 times (2 times before yoga exercise intervention and one time after yoga exercise intervention).

Data was analyzed by IBM SPSS version 20.0 (IBM Corp. Armonk, NY, USA). Data was analyzed for frequencies, percentages, and quantitative variables with mean \pm SD. Normality of the quantitative variables were assessed using Kolmogorov-Smirnov test. Intention-to-treat was applied (87% of ITT: Yoga, n = 26; Control, n=28; total 54). All of variables were normal. The basic and demographic variables were analyzed by chi-square and student *t* test. Paired *t* test was used for within-group comparisons. For analyzing the covariance, the effect of the yoga intervention was measured through comparison and adjustments on the baseline. Finally, results were considered with a 95% CI.

Results

Of the 150 women assessed for eligibility, finally 62 women were randomized in the yoga (31 subjects) and

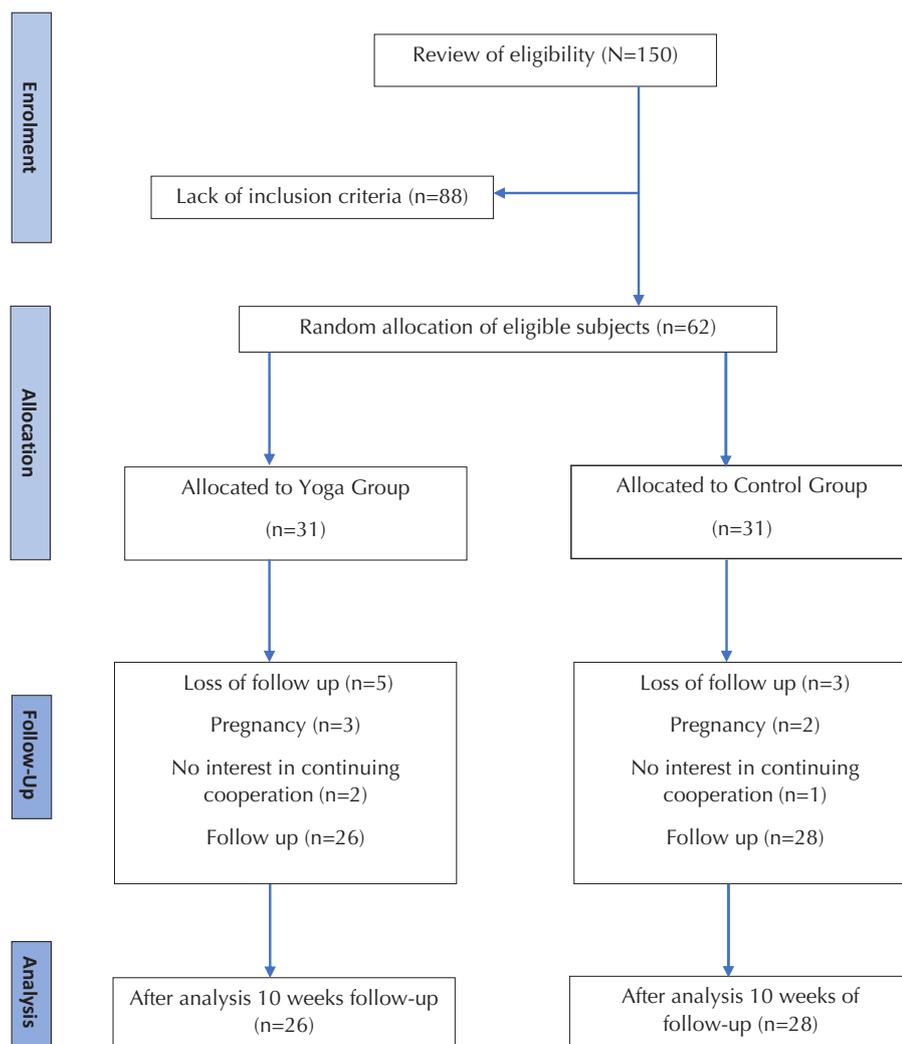


Figure 1. Flowchart of the Subjects Through Each Stage of the Trial.

control (31 subjects) groups. Some of the subjects left the study because of becoming pregnant (3 in the yoga and 2 in the control) or not being willing to continue further (2 in the yoga and 1 in the control) (Figure 1).

The mean \pm SD for age was 34.4 ± 5.3 and 30.1 ± 6.2 for yoga and control groups, respectively. Both yoga and control groups were similar in means in terms of the demographic characteristics, except employment status. Comparisons for the demographic characteristics of the subjects in each group are provided in Tables 1 and 2.

The variables were compared between yoga and control groups before and after intervention (Table 3).

Results showed no significant difference in both yoga and control groups before intervention for EM, PHY and BE variables. However, after intervention there was a significant difference in all EM, PHY and BE variables between yoga and control groups ($P < 0.001$).

There was no significant difference on the “impact of PMS on the life” before applying intervention in both yoga and control groups; however after yoga intervention there were significant differences ($P < 0.001$).

Furthermore, data analysis by paired t test showed no significant difference before and after intervention in the control group.

Discussion

The current study highlighted that yoga decreases the symptoms of PMS in women. Results from this study confirm the previous outcomes of physical and aerobic exercises that showed a reduction in the symptoms of PMS (26-30).

Nowadays, western remedies beside the complementary and alternative medicines are not able to provide enough satisfactions for women with PMS (9,31,32).

Studies have indicated that yoga decreases the different symptoms of PMS affecting positively the effects of yoga on relaxation and controlling of the nervous system. In a study, it has been shown that Hatha yoga increases relaxation of the mind and body, reduces tension of the muscles and stress, which subsequently improves sleeping with less anxiety. This study examined vital symptoms and showed Hatha yoga exercise reduces sympathetic activity,

Table 1. Demographic Characteristics of the Subjects of Yoga and Control Groups

Variables		Control (n = 28)	Yoga (n = 26)	P Value ^a
Job statement	Housekeeper	4 (14.3)	11 (42.3)	0.033
	Practitioner	24 (85.7)	15 (57.7)	
Marital status	Single	11 (39.3)	12 (46.2)	0.574
	Married	15 (53.6)	14 (53.8)	
	Divorced	2 (7.1)	0 (0)	
Number of children	0	16 (57.1)	15 (57.7)	0.642
	1	9 (32.1)	6 (23.1)	
	2	3 (10.7)	5 (19.2)	
Education statement	Diploma	5 (17.9)	3 (11.5)	0.473
	Associate degree	3 (10.7)	1 (3.8)	
	Bachelor	18 (64.3)	17 (65.4)	
	Master	2 (7.1)	5 (19.2)	
Body mass index	≤25	20 (74.1)	15 (57.7)	0.399
	25.1-30	5 (18.5)	9 (34.6)	
	<30.1	2 (7.4)	2 (7.7)	

^a P value denotes chi-square tests.

Table 2. Comparison of the Mean of the Demographic Characteristics in the Yoga and Control Groups

Time	Control (n = 28) (Mean ± SD)	Yoga (n = 26) (Mean ± SD)	P Value ^a
Age	30.179 ± 6.290	34.462 ± 5.368	0.010
Period duration	6.214 ± 1.371	6.692 ± 2.074	0.319
Period Time	28.821 ± 2.539	29.923 ± 2.799	0.135
Age of first period	13.357 ± 1.747	13.115 ± 1.306	0.570

^a P value denotes independent t test.

Table 3. Variables of EM, PHY, BE and the Effects of PMS on the Quality of Life Between Yoga and Control Groups

Variable	Time	Yoga (n = 26) Mean ± SD	Control (n = 28) Mean ± SD	P Value ^a
Emotional (EM)	Before intervention	62.34 ± 16.26	54.32 ± 19.16	0.11
	After intervention	26.28 ± 16.54	54.91 ± 21.31	<0.001
	P value ^b	<0.001	0.856	
Physical (PHY)	Before intervention	71.15 ± 22.39	78.57 ± 14.95	0.155
	After intervention	32.69 ± 20.81	72.01 ± 22.24	<0.001
	P value ^b	<0.001	0.077	
Behavioral (BE)	Before intervention	45.51 ± 19.89	44.04 ± 18.54	0.078
	After intervention	10.90 ± 14.10	44.05 ± 22.32	<0.001
	P value ^b	<0.001	1	
Impact of PMS on the quality of life	Before intervention	58.79 ± 14.61	54.85 ± 14.68	0.327
	After intervention	22.8 ± 14.56	54.00 ± 20.33	<0.001
	P value ^b	<0.001	0.711	

^a P value in ANCOVA test

^b P value in T-test Paired Samples

Note: Controlled potential confounders were: employment status, age and education.

stress pressure and increases relaxation of women with PMS (30).

Rani et al (29) in a study on women with irregular menstruation, have shown that yoga Nidra significantly decreases any pain caused due to gastrointestinal and urogenital problems, or cardiovascular disorders. Furthermore, Rani et al (28) in a study on women with irregular menstruation, acute anxiety and severe depression, have shown that yoga exercise cannot significantly improve severe symptoms but rather mild symptoms. Dvivedi et al (30) have shown that sedation exercise can improve symptoms of PMS caused from stress. These researchers used electromyograms to measure muscle tension and stress that were stored in the form of muscle tension. Patients who performed yoga exercise experienced a reduction in muscle tension because of reduction in stress. Stress-related disorders such as increased activity of the sweat glands, are shown to decrease by yoga exercise. Furthermore, the effects of yoga exercise might be related to its functions that involves the person's mind and body and makes the person calm and relax.

In the current study, the symptoms of PMS decreased in the yoga group including anger or irritability, anxiety or stress, crying or rising sensitivity to negative issues, depressed mood or hopelessness, loss of interest to work activities, decreased interest to house activities, loss of interest to social activities, concentration problems or lack of focus on the lesson. Dvivedi et al (30) reported that 80% of subjects doing yoga exercise have shown improvement in the symptoms of irritability. In contrast with the current study, Safavi-Naeni (26) reported that by doing both aerobic and physical exercises, symptoms of PMS showed less positive effects compared to the control group. These researchers recommended that a fitness exercise might reduce the symptoms of PMS.

Recent studies highlighted that a regular exercise habit

probably decreases some physical and psychological PMS symptoms. Pain is one of the common symptoms of PMS that affects mood and behaviour of the women with PMS by promoting different brain regions during cognitive tasks (33). It has been described that a short-term yoga in women with PMS improved attention and women felt better (34). Furthermore, yoga exercise by inducing an enhancement in alpha-brain-wave production causes slower abdominal breathing (33). Yoga affects positively the activity of brain wave where alpha-brain waves are associated with peace, relaxation, mood, and secretion of serotonin helping patients to feel relaxed after yoga intervention. Moreover, a reduction in the symptoms of PMS, increases with exercise of yoga as well (27).

Additionally, a study in India using randomized controlled trial emphasized that yoga Nidra improved hormone disorders in dysmenorrhea, oligomenorrhea, menorrhagia, metrorrhagia, and hypomenorrhea (27). Yoga poses such as cobra, cat, and fish reduce the severity and duration of primary dysmenorrhea (35). The severity of dysmenorrhea disorder and serum homocysteine concentrations decrease 8 weeks after yoga exercise (36).

Dvivedi et al (30) concluded that during premenstrual cycle the weight of breasts increased by 83%, abdominal pain by 76%, back pain and vaginal discharge by 67 and 53%, respectively. These authors, using relaxation therapy, showed higher relaxation and lower sympathetic activity. During stress, heartbeats, systolic and diastolic blood pressure, muscle tension, skin contractions and respiration were increased, whereas parasympathetic activity was decreased. They indicated that negative effects of PMS using yoga exercise reduced with relaxation poses. Similarly, the current study showed a significant decrease in physical symptoms of PMS ($P < 0.001$; Table 3). Furthermore, it be noted that slowly stretched muscles decrease muscle pain and body pose affected by PMS. Indeed, yoga exercise by strengthening muscles, increasing flexibility of the muscles, and facilitating the diaphragmatic breathing, regulates the functions of the muscles in viscera, glands, blood vessels, nerves and consequently lymphatic circulation.

On the other hand, the current study showed that yoga exercise significantly improved the behavioral symptoms of PMS such as overeating or food cravings, insomnia, oversleeping or desire to sleep, feeling of confusion or uncontrollable behaviors ($P < 0.05$). Newham et al (37) described that yoga exercise reduced anxiety and feeling of confusion in pregnant women. However, yoga exercise affects the appetite and insomnia of patients with breast cancer (38,39). On the other hand, Vadiraja et al found a positive correlation between physical and mental symptoms such as exhaustion, fatigue, nausea and vomiting, pain, shortness of breath, insomnia, loss of appetite and constipation in the patients with breast cancer. They explained yoga exercise significantly decreases the negative effects of cancer (38).

It has been shown that PMS affects the quality of life. Women with PMS may see negative effects of PMS at their

job or school performance, relationship with colleagues and friends, relationship with husband and children, social activities and family responsibilities. In the current study, subjects expressed that the quality of their life improved by doing yoga exercise ($P < 0.05$). Accordingly, Woodyard et al (40) stressed that continued yoga exercise improved the quality of life, self-awareness and having positive energy to stay stable and happy. Moreover, yoga exercise can cause a physiological statement and provide a feeling of balance and unity between mind and body (41).

Since PMS without treatment can cause problems and affect the quality of life of women, it is essential to look for tools and treatments that can relieve the symptoms of PMS that are affordable in individual. The results showed that yoga is a peaceful and effective approach for decreasing PMS symptoms. Therefore, yoga exercise is recommended for women with PMS as it does not have any side effects and is safe. Women can do yoga exercise by themselves at any time and any place (42-44).

Limitations

All the subject's responses in the current study were considered to be honest and right. Detection of the accuracy of the responses collected from subjects were beyond the researcher's capacity.

Strengths

The researcher and analyzer were unaware until the end of the study. Additionally, as obstetrics and gynecology private clinics were randomly selected, the result can be generalized to Iranian women society.

Suggestions for Future Studies

The effect of yoga exercise on hormones and blood metabolites concentrations are not studied enough and concentrations should be investigated before and after yoga intervention.

Conclusion

In conclusion, yoga exercise reduced the symptoms of PMS in women with PMS during regular reproductive cycle. Consequently, quality of life of women with PMS considerably increased as the symptoms of PMS decreased and women felt calmer with less pain. Therefore, medical therapy might be just needed in severe situation.

Ethical Issues

The required approvals were documented from the ethical committees of Tabriz University of Medical Science (No. 93184). Then documents were submitted to Iranian Registry of Clinical Trials (<http://irct.ir/>, identifier: IRCT201501216582N9). Participation of women with PMS in the present study was voluntary, where they were selected randomly. The aim was explained to the researcher and the objectives and methods of the study to all subjects. Thereafter, written informed consent and oral assent was obtained from all subjects who agreed to participate. All procedures of gathering and managing of

data were done carefully and anonymously, considering the security of the data.

Conflict of Interests

The authors have no conflict of interest to disclose.

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