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Original Article

Comparative study of effect of anuloma-viloma (pranayam) and yogic asanas in premenstrual syndrome

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Abstract

The present study was planned to investigate the effects of Anuloma-viloma and specific yogic asanas in Premenstrual syndrome (PMS). The study group comprised of 60 females suffering from PMS between the age group of 18- 40 years, having 28-34 days regular menstrual cycle, further subdivided into 3 groups having equal number (n=20) of subjects-group A (no intervention), group B (Anuloma-viloma) and group C (yogic asanas). Age-matched 30 healthy female subjects were taken as control. In all the subjects, a baseline recording of the systolic (SBP) and diastolic blood pressure (DBP) from the right arm was taken using an automated sphygmomanometer. The heart rate (HR/min), electromyogram (EMG; mV), galvanic skin response (GSR;kΩ), respiratory rate (RR/min), peripheral temperature (T;°F), were recorded simultaneously, on an automated biofeedback apparatus Relax 701. The subjects of group A and group B performed yogic exercises, regularly for 7 days prior to the expected date of menstruation for 3 consecutive menstrual cycles. The parameters were recorded again at the end of 7 days in each menstrual cycle. We observed that, in the group A and group B, HR, SBP, DBP, EMG, GSR and RR showed a very significant reduction ($P<0.001$) and T rose more significantly ($P<0.001$) after the 3rd menstrual cycle, when compared with their basal levels. On computing the percentage difference between the baseline and post values in all the three groups and than comparing this percentage difference, we found a y significant difference ($P<0.05$) between the groups. In the present study, the relaxation response in the females suffering from PMS showed a reduction in an abnormally high basal sympathetic activity and a heightened relaxation response in both the study groups (group B and Group C) in comparison with group A.

Introduction

Premenstrual syndrome (PMS) also called PMT or premenstrual tension refers to the cyclic recurrence, of a combination of distressing physical, psychological or behavioral changes, during the luteal phase of the menstrual cycle that interfere with family, social or work related activities (1). PMS is most common in women between age group of 25 to 45 years, having a history of depression and positive family history of PMS. It is estimated that 80% of women experience some type of premenstrual changes during their reproductive period (2). Most women with PMS must have at least one prominent mood symptom and four other somatic symptoms for at least two consecutive cycles which include mild psychological symptoms, bloating, weight gain, breast tenderness, swelling,

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aches and pains, poor concentration, sleep disturbance and appetite change. It must be restricted to the luteal phase of the cycle, ceasing around menstruation and must not be present for at least one week between the onset of menses and ovulation (3).

Research has proved that PMS is a stress induced psycho physiological disorder and that stress is a cause of symptoms of PMS (4, 5, 6). The exact cause of PMS has not been identified. Studies suggest that symptoms of PMS are probably due to complex interaction of ovarian hormones, central neurotransmitters, and the autonomic nervous system. Suggested etiologic theories of PMS include psychological abnormalities, nutritional deficiencies, aberrations in the renin-angiotensin-aldosterone axis, altered prostaglandin activity, hormonal imbalances, and changes in endogenous opioid peptide activity (7).

Till date there is no definite pharmacological treatment of PMS but non-pharmacological intervention such as aerobic exercise, relaxation and meditation are helpful in relieving premenstrual symptoms. Relaxation techniques and psychotropic therapies have been advocated in most of the recent advances in treatment of PMS. Some simple stress relieving exercises performed on a regular basis can bring a feeling of peace and calm. Therefore, the present study was planned to investigate the effects of anuloma-villoma and specific yogic asanas on this stress induced disorder.

Materials and methods

The study was conducted in the yoga laboratory of department of physiology, Subharti medical college, Meerut. Approval of the study was taken from the research and ethical committees of the institute. On the basis of a premenstrual distress questionnaire, developed under guidelines from previous research publications (8, 9), 60 females suffering from PMS (study group) and 30 healthy controls, between the age group of 18-40 years, having regular menstrual cycles from 28-34 days, were selected from the students and staff members of Swami Vivekananda Subharti University campus.

One prominent mood symptom and four other somatic symptoms for at least two consecutive cycles which include mild psychological symptoms, bloating, weight gain, breast tenderness, swelling, aches and pains, poor concentration, sleep disturbance and appetite change should be present for a subject to be diagnosed as PMS. It must be restricted to the luteal phase of the cycle, ceasing around menstruation and must not be present for at least one week between the onset of menses and ovulation (3).

Before conducting the study, informed written consent was taken from each subject.

After a detailed history and thorough clinical examination, the study group was further subdivided into 3 groups each consisting of 20 subjects.

Group A – No intervention

Group B – Performed anuloma–viloma

Appendix I – Premenstrual Syndrome Questionnaire

Date	:
Name/Age/Address	:
Marital Status	: Married/Unmarried
Education	: Doctor/Nurse/House wife
Age at Onset of PMS (Years)	:
Date of Last Menstruation	:
Duration of menses (days)	: 26 28 30 32 More
Premenstrual problems	
Lower abdominal pain	: Yes/No/Sometimes
Headache	: Yes/No/Sometimes
Low backache	: Yes/No/Sometimes
Swelling in abdomen	: Yes/No/Sometimes
Heaviness in breast	: Yes/No/Sometimes/Painful/ Tender/Sore
How frequently you observe these premenstrual problems ?	: Every cycle/Alternate cycle/ Sometimes.
Any other feature you want to highlight	:
Psychological symptoms	
Irritability	: Yes/No/Sometimes
Anxiety	: Yes/No/Sometimes
Lack of sleep/More sleep	: Yes/No/Sometimes
Depression/loneliness/crying	: Yes/No/Sometimes
Mood swings	: Yes/No/Sometimes
Appetite	: Increased/Decreased/Normal
Constipation/Diarrhea	: Yes/No/Sometimes
Nausea/Vomiting	: Yes/No/Sometimes
Preference for food	: Bitter/Salty/Sweet/Sour/High fat
Frequency of micturition	: Yes/No/Sometimes
Acne face	: Yes/No/Sometimes
Greasiness of scalp and hair	: Yes/No/Sometimes

Group C – Performed yogic asanas

Inclusion criteria : Healthy females having regular menstrual cycles from 28-34 days.

Exclusion criteria : The subjects with any physical (musculoskeletal problem), psychiatric illness or on medication were excluded from the study.

The subjects reported to the yoga lab, in the morning between 9 am – 11 am, 7-8 days prior to expected date of menstruation. Subjects were then made to lie down on a couch in a comfortable position. After the rest of 10 min. a baseline recording of the systolic (SBP) and diastolic blood pressure (DBP) from the right arm was taken using an automated sphygmomanometer (Panasonic Omron). The heart rate (HR), electromyogram (EMG), galvanic skin response (GSR), respiratory rate (RR), peripheral temperature (T), were recorded simultaneously, on an automated biofeedback apparatus relax 701. The subjects were asked to report to the yoga lab daily, empty stomach at 9am where they performed the yogic exercises under the guidance of a trained yoga instructor, according to the group assigned to them. The parameters were then recorded again at the end of 7 days in each menstrual cycle.

Group B:

Breathing Exercise (Pranayama) - Alternate Nostril (Anuloma Viloma)

Subjects performed alternate nostril breathing for 8-10 min. Anuloma Viloma is also called the Alternate Nostril Breathing Technique. In this Breathing Technique, the subjects inhale through one nostril, retain the breath, and exhale through the other nostril in a ratio of 2:8:4.

Group C

The subjects performed asanas for 8-10 min.

Uttanasana

The subject was instructed to stand with feet together, then hinging forward from the hips, letting the head hang, with palms placed flat on the floor near the feet. The pose provides a complete stretch to the entire back of the body, particularly the hamstrings.

Adho Mukha Svanasana

Downward-Facing Dog Pose, Downward Dog, or Down Dog.

Statistical analysis

Statistical analysis was done using Graph Pad Instat 3.10, 32 bit (Graph Pad software Inc.) for windows created July 10, 2009. Mean and standard deviations (±SD) of all the observations were calculated. The percentage difference between the baseline and post values was calculated in all the three groups. This percentage difference was than compared by one-way ANOVA and post-hoc by Tuky-krammer test. Student's't'-test (paired) for intragroup comparisons and student's't'-test (unpaired) for comparison between control and test group.

Results

In Table I, comparison of PMS and control group shows statistically significant difference (P<0.05) was in HR, GSR and RR, While a very significant difference (<0.01) was found in the DBP, EMG and T. No statistically significant difference was observed in SBP. In Table II, on comparing pre and post values in PMS group without intervention statistically

TABLE I : Comparison of basal parameters of PMS (n=60) and control group (n=30).

Parameters	*Control group (n=30)*	*PMS (n=60)*	*P value*
1. HR (beats/min)	79.06±8.78	85.26±14.19	0.0313
2. SBP (mm of Hg)	120.60±9.38	119.68±6.92	0.6017
3. DBP (mm of Hg)	74.30±8.58	79.78±8.06	0.0038
4. EMG (mV)	149.10±66.4	97.71±47.86	0.0112
5. GSR (μV)	412.76±58.42	436.51±37.84	0.0223
6. RR (breaths/min)	23.93±6.85	79.78±8.06	<0.0001
7. T (°F)	98.58±0.09	97.33±0.49	<0.0001

Data presented are mean±S.D. Analysis of data was done by unpaired t test. P<0.05** - significant, P<0.01*** - highly significant. HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, EMG: Electromyogram, GSR: Galvanic skin response, RR: Respiratory rate, T: Temperature.

TABLE II : Comparison between Basal and Post values of the subjects in group A, PMS group without any intervention (n=20).

Parameters	*Basal*	*3rd menstrual cycle*	*P value*
1. HR (beats/min)	83.75±11.16	82.60±10.20	0.3350
2. SBP (mm of Hg)	118.35±8.13	121.30±7.49	0.0489
3. DBP (mm of Hg)	76.70±4.96	78.60±4.68	0.0512
4. EMG (mV)	82.90±41.52	80.25±41.50	0.4156
5. GSR (μV)	80.25±41.50	438.65±28.00	<0.0001
6. RR (breaths/min)	24.10±5.01	25.40±5.53	0.0328
7. T (°F)	97.45±0.55	97.96±0.39	<0.0001

Data presented are mean±S.D. Analysis of data was done by unpaired t test. P<0.05** - significant, P<0.01*** - highly significant. HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, EMG: Electromyogram, GSR: Galvanic skin response, RR: Respiratory rate, T: Temperature.

significant difference (P<0.05) was observed in SBP and RR, while a very significant difference (P<0.001) was found in the GSR and T. No statistically significant difference was observed in EMG, DBP and HR. In Table III, in the PMS group performing anuloma-viloma, we observed that all the parameters showed a significant change, when compared with the basal levels. In the 3rd menstrual cycle, HR, SBP, DBP, EMG, GSR and RR showed a very significant reduction (P<0.001) and T rose more significantly (P<0.001). In Table IV, we found that comparison of basal and post-relaxation parameters in the PMS group performing yogic asanas showed a very significant change (P<0.001) in all the parameters in the 3rd menstrual cycle. On computing percentage difference between baseline and post values in groups A, B and C, than comparing this percentage difference amongst the three groups, we found a significant difference (P<0.05) between the groups (Table V).

TABLE III : Basal parameters and post relaxation parameters in Group B (n=20) performing anuloma-viloma.

Parameters	*Basal*	*3rd menstrual cycle*	*P value*
1. HR (beats/min)	90.10±11.80	74.60±4.82	<0.0001
2. SBP (mm of Hg)	121.35±5.23	108.60±3.89	<0.0001
3. DBP (mm of Hg)	83.90±6.78	76.00±6.39	<0.0001
4. EMG (mV)	116.15±47.36	64.15±20.79	<0.0003
5. GSR (μV)	441.85±33.38	380.25±44.60	<0.0001
6. RR (breaths/min)	23.80±3.52	17.30±1.89	<0.0001
7. T (ºF)	97.34±0.53	98.58±0.10	<0.0001

Data presented are mean±S.D. Analysis of data was done by unpaired t test. P<0.05** - significant, P<0.01, *** - highly significant. HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, EMG: Electromyogram, GSR: Galvanic skin response, RR: Respiratory rate, T: Temperature.

TABLE IV : Basal parameters and post relaxation parameters in Group C (n=20) performing yogic asanas.

Parameters	*Basal*	*3rd menstrual cycle*	*P value*
1. HR (beats/min)	81.95±17.93	68.75±14.42	<0.0001
2. SBP (mm of Hg)	119.35±7.11	106.25±4.04	<0.0001
3. DBP (mm of Hg)	78.75±10.11	71.55±7.99	<0.0001
4. EMG (mV)	94.10±50.44	46.05±25.83	0.0003
5. GSR (μV)	451.50±9.12	386.30±7.50	<0.0001
6. RR (breaths/min)	27.45±14.09	20.20±13.00	<0.0001
7. T (°F)	97.21±0.38	98.55±0.20	<0.0001

Data presented are mean±S.D. Analysis of data was done by unpaired t test. P<0.05-significant, P<0.01 - highly significant. HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, EMG: Electromyogram, GSR: Galvanic skin response, RR: Respiratory rate, T: Temperature.

TABLE V : Comparison of the percentage difference (between the baseline and the post values in all the three groups) between PMS group with intervention and PMS group without intervention.

Parameters	*Group A*	*Group B*	*Group C*	*P value*
1. HR (beats/min)	10.99±8.23	19.13±11.27	19.45±15.55	0.05
2. SBP (mm of Hg)	4.89±4.13	11.05±3.75***	12.06±5.78###	0.0001
3. DBP (mm of Hg)	5.20±4.56	9.43±4.57*	10.62±6.28###	0.0044
4. EMG (mV)	26.49±24.30	53.66±37.85	62.61±50.97#	0.0142
5. GSR (μV)	6.61±7.49	13.75±10.23	13.66±11.31	0.0376
6. RR (breaths/min)	10.21±6.84	31.70±12.51***	32.67±18.38###	<0.0001
7. T (°F)	0.53±0.30	1.27±0.51***	1.36±0.44###	<0.0001

Data presented are mean±S.D. Analysis of data was done by one-way ANOVA and post hoc by Tuky-Krammer test. The * depicts comparison with group B and the # depicts comparison with group C. *P<0.05 - significant; ### P<0.001- highly significant. HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, EMG: Electromyogram, GSR: Galvanic skin response, RR: Respiratory rate, T: Temperature.

Discussion

Practice of breathing exercises like pranayama is known to improve autonomic function by changing sympathetic or parasympathetic activity. It has been suggested that well-performed slow yogic breathing decreases sympathetic activity during altitude induced hypoxia, by increasing oxygenation without altering minute ventilation (10). In pranayamic type of slow and deep breathing, oxygenation of blood increases without changing minute ventilation, as alveolar ventilation increases (11, 12).

In the present study also, we observed an extremely significant improvement in all the parameters, in the subjects practicing pranayam for 3 consecutive menstrual cycles. Similarly in a study, increased parasympathetic activity and decreased sympathetic activity were observed in the slow breathing group, whereas no significant change in autonomic functions was observed in the fast breathing group (13).

Several researchers have reported that pranayama techniques are beneficial in treating a range of stress related disorders (14), improving autonomic functions (13), relieving symptoms of asthma (15) though a different study (16) did not find any improvement and reducing signs of oxidative stress (17, 18).

The Yogic physical exercises are called asanas, a term which means steady pose. This is because the Yoga Asana (or posture) is meant to be held for some time (19). The body is as young as it is flexible. Yoga exercises focus on the health of the spine, its strength and flexibility. The spinal column houses the all-important nervous system, the telegraphic system of the body. By maintaining the spine's flexibility and strength through exercise, circulation is increased and the nerves are ensured their supply of nutrients and oxygen. The asanas also affect the internal organs and the endocrine system. In the present study, the basal fingertip temperature of women who suffered from PMS was significantly lower than the control subjects, indicating the presence of stress in the subjects of PMS group. When the sympathetic system is activated, skin (especially in the hands and feet) becomes cold because its blood supply is diminished by vasoconstriction and it becomes clammy because sweat glands flood the surface of body with moisture, which evaporates; further reducing the skin temperature. The relaxation response, which reduces the abnormally high sympathetic tone, thereby decreasing tone of the smooth muscle that encircles arteries and arterioles, allowing these vessels to dilate, causes a rise in the skin temperature towards normal levels (20, 21).

In the present study the subjects suffering from PMS showed an extremely significant improvement in the stress parameters. Other studies have also proved the beneficial effects of yogic asanas in various stress related conditions. Our study showed that subjects suffering from PMS performing yogic exercises (group B, C), on comparison with those who are not practicing yogic exercises (group A), on applying one way ANOVA showed a very significant difference amongst all the groups. HR, SBP, DBP, EMG, GSR and T showed a very significant difference while there was no significant difference in RR in the groups. It is evident from the results that yogic exercises performed on a regular basis can bring about significant decrease in the anxiety levels as compared to those who are not doing.

Conclusion

In the present study the relaxation response in the females suffering from PMS showed a reduction in an abnormally high basal sympathetic activity and a heightened Relaxation response in both the study groups (group B and Group C). Intergroup comparisons between the females suffering from PMS given different forms of yogic interventions (group B and Group C) and those without any intervention (group A) showed a very significant difference. Thereby proving the effectiveness of these interventions.

Limitations

As the sample size is too less, further studies should be done in a larger sample size to substantiate the therapeutic validity of these yoga practices in PMS.

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