

The Effect of Three Months Regular Aerobic Exercise on Premenstrual Syndrome

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Received June 2008; Revised and accepted August 2008

Abstract

Objective: To determine the effects of three-month regular aerobic exercise on the PMS symptoms. Also correlations with age, education, marital status and severity of PMS symptoms were studied.

Materials and Methods: A Quasi- Experimental study was conducted on 91 volunteer women with regular menstrual cycle and no history of gynecological, endocrinological and psychological disorders. The study was done during March 2005- March 2007, in Tehran University of Medical Sciences. A Modified Menstrual Distress Questionnaire (MMDQ) was used in this study. Participants were divided into two groups: Non-exercised, they also didn't have any past experience of regular exercise (n= 48) and Exercised (n= 43). The exercise time duration was one hour and was carried out three times per week for three months. Emotional, behavioral, electrolyte, autonomic, neurovegetative and skin symptoms of PMS were compared between two groups. P value was considered significant at < 0.05.

Results: A significant difference was observed for electrolytic, neurovegetative and cognitive symptoms before and after the exercise. Also the severity of skin and neurovegetative symptoms were different in experimental groups with and without past history of doing regular exercise. There was no correlation between age, education, marital status and severity of PMS symptoms.

Conclusion: Three months of regular aerobic exercise effectively reduces the severity of PMS symptoms.

Keywords: Premenstrual syndrome, Aerobic exercise, Severity of symptoms.

Introduction

Premenstrual syndrome (PMS), a common cyclic disorder of young and middle-aged women and is characterized by emotional and physical symptoms that consistently occur during the luteal phase of the menstrual cycle (1). The symptoms must be present

for one to two weeks premenstrually with relief by day 4 of menses and should be documented prospectively for at least two cycles (2). Up to 85 percent of menstruating women report having one or more premenstrual symptoms, and 20 to 40 percent report the experience of definite syndrome. In 3- 8 percent of cases who report disabling, incapacitating symptoms the diagnosis of Premenstrual Dysphoric Disorder Syndrome (PMDD) is established (3-5). The etiology of PMS remains unknown and may be complex and multifactorial.

Some evidences suggest that the disorder is rela-

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ted to changes in magnesium and calcium serum levels. The role of ovarian hormones is unclear, but changes in ovarian steroid levels may influence centrally acting neurotransmitters such as serotonin. Impairment of renin-angiotensin-aldosterone pathway, other endocrine disorders and finally genetic and life style seem to play a role in etiology of PMS (1, 2, 6, 7).

The major somatic symptoms of PMS include: low back pain, breast tenderness, weight gain, headache, bloating and water retention leading to edema in extremities. Depression, anxiety, irritability, restlessness, anger, confusion and loneliness are common psycho-emotional and behavioral symptoms of PMS (1, 4).

Significant effects of PMS on general safety and quality of life, disrupting woman's function at work and inducing health costs mandates appropriate consideration to treatment guidelines for this syndrome (3-5).

In order to ameliorate or eliminate the symptoms a variety of treatment methods including medical (hormonal, anti depressant and pain killers), surgical (hysterectomy and salpingo-oophorectomy), and alternative medical treatments (acupuncture, dietary changes, cyropractice and acupressure) and finally physical exercise are recommended (1, 2, 4, 8).

Considering their side effects, medical and surgical therapies are used only in severe PMS and in the case of no response to other therapeutic managements, and focusing on the safe exercise especially in women with mild symptoms are suggested recently (1, 2, 7).

The effect of physical exercise on regulation of menstrual cycle and reproductive system was first considered in 1939 (9). Gannon in 1988 proposed the potential role of exercise on the alleviation of menstrual disorders and menopausal symptoms including dysmenorrhea, PMS and osteoporosis (10). In 1993 Greene showed the positive effect of exercise on decreasing stress (11). In a study by Steege in 1993 on the effect of aerobic in comparison to strength exercise in 23 women having PMS increased aerobic compliance and decreased depression were shown to be more significant in aerobic exercise, though participation in both types of exercise resulted in a decrease in many PMS symptoms (12). In 1994 Aganoff studied the effect of moderate aerobic exercise on mood states and menstrual cycle symptoms in two groups of exercising (n=97) and non-exercising (n=154) women. The results showed a

principle role of regular exercise in decreasing negative feelings e.g. anger, sin, disgust and pain (13). Though Barnhart in 1995 showed the positive outcome of aerobic exercise on general health without specific effect on PMS symptoms (14). The study of Salmon and Choi in 1995 on 143 women with PMS confirmed the positive effects of exercise on mood states in pre menstrual and menstrual periods (15). Cross sectional studies of Campbell on 310 Australian women aging 18-45 years showed that 85% of women reported a positive result of treatment protocol including pain killers, fluid consumption and exercise on symptom reduction (16). Scully evaluated the effect of exercise to be positive on psycho-emotional symptoms of PMS including depression and anxiety (17).

In a systematic review in 2001 Stevenson showed that alternative medical treatments including homeopathy, supplementary diet, relaxation, massage, reflex therapy, cyropractice and biofeedback lack significant effects on PMS treatment, but aerobic exercise is recommended as first line treatment in many studies (8, 18, 19). In a study by Lustyk published in 2004 exercise showed a non-linear relation with PMS symptoms. In latter study stress was shown to be more in women with irregular exercise in comparison to women with regular exercise or women not participating in exercise programs. The same study highlighted the effect of regular exercise program in reducing PMS symptoms (20).

Although the management of PMS symptoms is recommended by aerobic exercise in many studies, alteration, number of courses and duration of aerobic exercise remains under discussion. The present study aims to evaluate the effect of 3 month aerobic exercise on the severity of PMS symptoms.

Materials and Methods

This study was done during March 2005- March 2007, in Tehran University of Medical Sciences. A Quasi- Experimental study was conducted on 91 volunteer women aging 16-48 years old, with regular menstrual cycle and no history of thyroid, gynecological, diabetes mellitus and psychological disorders. The study was approved by ethics committee in Tehran University of Medical Sciences. Demographic characteristics of participants including age, weight, height, marital status, educational level, the age of menarch, duration of menstrual bleeding and medical history were recorded. A Modified Menstrual Distress Questionnaire (MMDQ) was applied for

Table 1: Symptom scores in experimental group before and after exercise

Symptoms	Mean score before exercise	Mean score after exercise	P-Value
Autonomic	0.85	0.88	NS
Behavioral	1.00	1.23	NS
Emotional	1.67	1.32	0.02
Electrolyte	3.91	3.25	0.05
Dermal	0.68	0.58	NS
Neurovegetative	2.05	1.26	0.003
Total	13.41	11.41	0.068

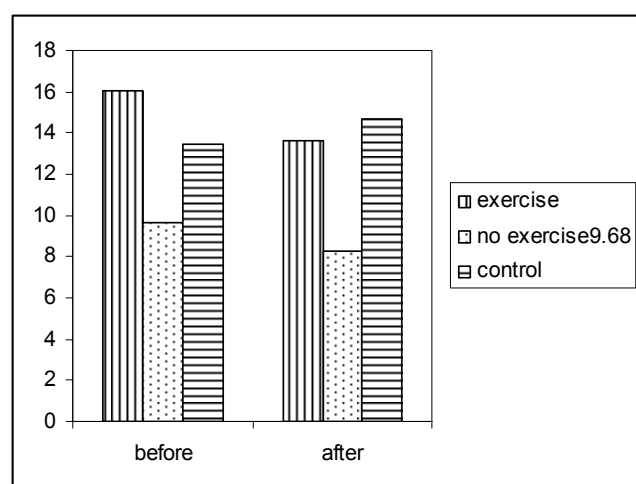


Figure 1: Total symptom score in three studied groups before and after exercise period.

all participants before and after the course of three month aerobic exercise in experimental group. Participants were divided into two groups: Non-exercised, they also didn't have any past experience of regular exercise (n= 48) and Exercised (n= 43). In exercised group 22 women had a past history of doing regular exercise. PMS symptoms were evaluated in following sets:

Emotional symptoms: anxiety, irritability, anger.

Behavioral symptoms: decreased activity, decreased efficacy, loneliness.

Electrolyte changes: puffiness, weight gain, decreased urine volume, headache, breast tenderness, low back pain.

Autonomic: nausea, diarrhea, palpitation and sweating.

Skin: acne, oily hair and dry hair.

Neurovegetative: sleep disorders, decreased appetite and libido.

PMS symptoms were scaled as below:

Mild: existing physical and behavioral symptoms do not affect woman's daily activities at home and job and are not significant.

Moderate: PMS symptoms are significant, interfere woman's activity and need medication.

Severe: The disturbance completely interrupts woman's daily activity.

The exercise program consisted of a five- minute warm up, 45 minutes limb and trunk fast exercise and a ten- minute cool down. The exercise time duration was one hour and was carried out three times per week for three months. In SPSS statistical software, ANOVA and paired t-test were used to compare mean values. P value was considered significant at <0.05.

Results

The study was done on 91 women aging 16-48 years old (31.6 ± 8). Mean age of women was 31.4 ± 7.5 in experimental group and 26.3 ± 5.9 in control group. Marital status, age of menarch and percentage of women with low fat diet were not significantly different in two groups. The mean of severity for total PMS symptoms was less in experimental group (with and without past history of exercise) in comparison to control group ($P=0.07$). A significant difference was found for electrolytic ($P=0.05$), neurovegetative ($P=0.03$) and cognitive ($P=0.02$) symptoms before and after the exercise. After completing 3 month course of exercise the experimental group without past history of exercise in comparison to control group had significantly less behavioral, skin and neurovegetative symptoms ($P= 0.063, 0.048, \text{ and } 0.002$ respectively). Comparing the experimental group to control group about past history of exercise there was no significant difference except for autonomic symptoms ($P=0.062$). The severity of skin and neurovegetative symptoms were also different in experimental groups with and without a past history of doing regular exercise ($P= 0.048 \text{ and } 0.0029$, respectively). There were no correlation between age, education, marital status and severity of PMS symptoms.

Discussion

In this study the effect of 3 month regular aerobic exercise on electrolyte, neurovegetative and psycho-emotional symptoms of PMS was evaluated and confirmed the results of several previous studies about the positive effects of regular aerobic exercise on PMS (1, 2, 12, 18, 19).

Prior et al have shown that 6 months of regular aerobic exercise results in decrease of water retention (puffiness) and breast tenderness (21). Electrolyte symptoms in PMS are suggested to be related to increased serum levels of aldosterone and prostaglandin E₂ and deficiencies of vitamin B₆ and magnesium (18). The reasons for increased serum aldosterone levels in late luteal phase are increased activity of rennin- angiotensin and decreased levels of progesterone and estrogen. Aerobic exercise is shown to decrease rennin and increase estrogen and progesterone levels leading to decreased serum level of aldosterone and improvement of electrolyte symptoms (3, 9, 22). Increased level of prolactin in late luteal phase is also known as another cause of breast tenderness and edema. Aerobic exercise in non athlete women reduces serum prolactin level and causes symptoms recovery (18). In contrast Razavi has found no effect of different levels of aerobic exercise on prolactin levels in non athlete girls (23). Agnoff also states aerobic exercise to be ineffectual on water retention (13). His study was conducted retrospectively on 97 athlete women and 159 non athletes without prospective evaluation of a definite exercise program effect.

The positive effect of exercise on Neurovegetative symptom relief was seen in present study. The changes in estrogen and progesterone levels in late luteal phase leading to insomnia will be compensated by exercise (9, 18, 24).

Impaired prostaglandin levels in late luteal phase decreases libido. Improved libido state after 3 month regular exercise in this study reflects the probable effect of exercise on prostaglandin levels. Though, libido is shown to be decreased by physical exercise in several other studies (9, 18).

Improved psycho-emotional symptoms after 3 months aerobic exercise in present study confirms the results of previous investigations (17, 21). Concerning decreased beta endorphin level in late luteal phase due to changes in ovarian steroids, psycho-emotional symptom relief could be explained as the effect of increased endorphin levels and related central neurotransmitters (9, 21, 25). Decreased levels of adipose tissue leading to decreased estrogen and increased progesterone levels affected by regular exercise are also known as effective factors in improvement of emotional symptoms (25). In contrary in a study by Roca et al in 2003 progesterone was shown not to be increased by exercise (26).

The positive effects of aerobic exercise on psy-

cho-emotional symptoms can also be explained in another way. According to cognitive – behavioral theory disturbing thoughts and cognitive disorders cause depression. Exercise declines negative feelings and induce positive thoughts and reduce depression in short term (13).

The mean severity of skin, autonomic and behavioral symptoms were not shown to have a significant difference before and after exercise. Comparing experimental group without past history of exercise, experimental group with past history of exercise and control group, the general severity of PMS symptoms was shown to be decreased in first group and reveals the positive effect of exercise. Comparing the second group with control group only autonomic symptoms were decreased. First group shows decreased neuro-vegetative symptoms in comparison to second group. The positive effect of having exercise history is shown in several studies (10, 13, 15, 22). Personal characteristics were not related to PMS symptoms in this study.

As a final conclusion this study shows that 3 months regular aerobic exercise improves PMS symptoms.

References

1. Dickerson LM, Mazyck PJ, Hunter MH. Premenstrual syndrome. *Am Fam Physician*. 2003 ; 67:1743-52.
2. Rapkin A. A review of treatment of premenstrual syndrome and premenstrual dysphoric disorder. *Psychoneuroendocrinology* 2003;28 Suppl 3:39-53.
3. Pearlstein TB, Halbreich U, Batar ED, Brown CS, Endicott J, Frank E. Psychosocial functioning in women with premenstrual dysphoric disorder before and after treatment with sertraline or placebo. *J Clin Psychiatry* 2000;61:101-9.
4. Mishell DR Jr. Premenstrual disorders: epidemiology and disease burden. *Am J Manag Care* 2005;11 473-9.
5. Tamjidi A. Epidemiologic evaluation of PMS in Tehran. Thesis. Shahid Beheshti University of Medical Sciences. 1995. Tehran.
6. Tempel R PMS in the workplace. An occupational health nurse's guide to premenstrual syndrome. *AAOHN J* 2001;49:72-8.
7. Gianetto-Berruti A, Feyles V. Premenstrual syndrome (Review). *Minerva Ginecol* 2002;54:85-95.
8. Stevinson C, Ernst E. Complementary/alternative therapies for premenstrual syndrome: a systematic review of randomized controlled trials. *Am J Obstet Gynecol* 2001;185:227-35.
9. Howlett T, Grossman A. *Oxford textbook of sports medicine*. England, Oxford: Oxford University Press, 1996:276-82.
10. Gannon L. The potential role of exercise in the alleviation of menstrual disorders and menopausal

- symptoms: a theoretical synthesis of recent research. *Women Health* 1988;14:105-27
11. Greene JW. Exercise-induced menstrual irregularities. *Compr Ther* 1993;19:116-20.
 12. Steege JF, Blumenthal JA. The effects of aerobic exercise on premenstrual symptoms in middle-aged women: a preliminary study. *J Psychosom Res* 1993;37:127-33.
 13. Aganoff JA, Boyle GJ. Aerobic exercise, mood states and menstrual cycle symptoms. *J Psychosom Res* 1994;38:183-92.
 14. Barnhart KT, Freeman EW, Sondheimer SJ. A clinician's guide to the premenstrual syndrome. *Med Clin North Am* 1995;79:1457-72.
 15. Choi PY, Salmon P. Symptom changes across the menstrual cycle in competitive sportswomen, exercisers and sedentary women. *Br J Clin Psychol* 1995;34 447-60.
 16. Campbell EM, Peterkin D, O'Grady K, Sanson-Fisher R. Premenstrual symptoms in general practice patients. Prevalence and treatment. *J Reprod Med* 1997; 42 637-46.
 17. Scully D, Kremer J, Meade MM, Graham R, Dudgeon K. Physical exercise and psychological well being: a critical review. *Br J Sports Med* 1998;32:111-20.
 18. Ugarriza DN, Klingner S, O'Brien S. Premenstrual syndrome: diagnosis and intervention. *Nurse Pract* 1998;23:40, 45, 49-52.
 19. Girman A, Lee R, Kligler B. An integrative medicine approach to premenstrual syndrome. *Am J Obstet Gynecol* 2003;188:S56-65.
 20. Lustyk MK, Widman L, Paschane A, Ecker E. Stress, quality of life and physical activity in women with varying degrees of premenstrual symptomatology. *Women Health* 2004;39:35-44
 21. Prior JC, Vigna YM. Ovulation disturbances and exercise training. *Clin Obstet Gynecol* 1991;34:180-90
 22. Johnson WG, Carr-Nangle RE, Bergeron KC. Macronutrient intake, eating habits, and exercise as moderators of menstrual distress in healthy women. *Psychosom Med* 1995;57:324-30.
 23. Aminian R. The effect of specific aerobic exercises on amenorrhea. Thesis. University of Tehran. 1995. Tehran.
 24. Andrus GM. Recent and future advances in the treatment of PMS, PMD, and menopause. *IDrugs* 2001;4:1373-81.
 25. Rapkin AJ. New treatment approaches for premenstrual disorders. *Am J Manag Care* 2005;11:S480-91.
 26. Roca CA, Schmidt PJ, Altemus M, Deuster P, Danaceau MA, Putnam K, Rubinow DR. Differential menstrual cycle regulation of hypothalamic-pituitary-adrenal axis in women with premenstrual syndrome and controls. *J Clin Endocrinol Metab* 2003;88:3057-63