

The effects of regular aerobic exercise on primary dysmenorrhea in young girls

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Abstract

Introduction: Dysmenorrhea is a painful syndrome that accompanies the menstrual cycles. The effects of aerobic exercise on primary dysmenorrhea are not well known. The aim of the present study was to examine the effects of regular aerobic exercise on primary dysmenorrhea in young girls.

Material & Methods: This study was a randomized clinical trial of 20 colleagues girl students in Marvdasht city that suffering from severe dysmenorrhea. The subjects were randomly divided into exercise group (n=10) or control group (n=10). The subjects in the exercise group run 10 to 15 × 2 to 5 minute with 75 to 90% of maximum heart rate 3 days a week for 8 weeks. Estrogen and progesterone levels and psychological and physical symptoms of dysmenorrhea were measured before and after the intervention. Moo's Menstrual Distress Questionnaire was used to evaluate psychological and physical symptoms of dysmenorrhea.

Results: Physical premenstrual symptoms were significantly reduced (12.6 ± 3.2 vs. 7.1 ± 4.6) and estrogen levels were significantly increased (7.4 ± 4.4 vs. 9.4 ± 3.1 ng/ml) after the intervention compare to the control group. For psychological premenstrual symptoms (11.4 ± 7.6 vs. 11.9 ± 6.1) and progesterone levels (7.4 ± 6.4 vs. 7.5 ± 5.1 ng/ml) no significant changes were observed in response to 8 weeks aerobic exercise.

Conclusions: The results suggested that selected aerobic exercises positively influenced physical menstrual symptoms and its related hormones.

Keywords: Dysmenorrhea, Regular exercise, Girl students, Hormones

1. Introduction

Menstrual distress symptoms include pain, water retention, autonomic reactions, mental distress, impaired concentration, hormonal and behavior change, and arousal (1,2). Dysmenorrhea is the most familiar menstrual distress syndrome and one of the most common gynecologic problems in women of all ages (3,4). An estimated 10% of women who experience dysmenorrhea have pain severe enough to interfere with their functioning for 1–3 days a month (5). Although some women experience discomfort several hours before the onset of flow, symptoms usually begin with menstruation. Symptoms of dysmenorrhea may last several hours or several days. Pain is usually located in the suprapubic area or lower abdomen. Women commonly describe the pain as either sharp, cramping, gripping, or as a steady dull ache. Pain may radiate to the lower back or upper thighs (4). Primary dysmenorrhea, a condition associated with ovulatory cycles, is due to myometrial contractions induced by prostaglandins in the second half of the menstrual cycle. The uterine muscle of both normal and dysmenorrheic women is sensitive to prostaglandins, and the amount of prostaglandin produced is the major differentiating factor (6). Systemic responses to prostaglandin F_{2α} (PGF_{2α}) include vomiting, fatigue, backache, weakness, sweating, gastrointestinal symptoms, and central nervous system symptoms (4,7-

9). Most prostaglandins are released during the first 48 hours of menstruation, which coincides with the greatest intensity of symptoms (7,8).

Subjects suffering from dysmenorrhea are more susceptible to psychologic disorders such as depression, anxiety, and somatization (11). Alonso and Coe studied 184 young women with dysmenorrhea and reported that depression and anxiety were strongly associated with menstrual pain (12). Osterweis et al's theory of illness behavior provides a conceptual framework for the changes in perception, attribution, expression, and control of menstrual and premenstrual symptoms experienced by women suffering from dysmenorrhea (13). Dysmenorrhea is the leading cause of school and work absence in young women (11). In a study by Banikarim et al (2000), menstrual pain was significantly associated with school absenteeism and decreased academic performance, sports participation, and socialization with peers (9). Among adolescents and young adults, 51–54% of those experiencing menstrual discomfort reported being absent from school or work because of the discomfort (14).

Primary dysmenorrhea occurs when the uterus suffers from spasticity due to reduced blood supply. The release of prostaglandins and other inflammatory mediators in the uterus is thought to be one of the primary causes of dysmenorrhea. An increase in the amount of prostaglandins leads to ischemia and uterine contractions. In some studies, there is also a link between levels of hormones such as progesterone, estrogen, and vasopressin (15). The reason for pain in dysmenorrhea is the increase in the level of prostaglandins in the body, as the decrease in the amount of progesterone at the end of the luteal phase leads to stimulation of the lubricating action of the enzymes, which causes the release of arachidonic acid from the phospholipids along with activation of the cyclooxygenase pathway. Increasing the level of prostaglandins leads to uterine contraction, uterine ischemia, and increased sensitivity to pain fibers and ultimately causes pelvic pain (16).

In order to ameliorate or eliminate the symptoms a variety of treatment method including medical, surgical, alternative medical treatment are

recommended (17,18). Considering their side effects, medical and surgical therapies are used only in severe premenstrual syndrome and in case of no response to other therapeutic management, focusing on the safe exercise especially in woman with mild symptoms is suggested (19-21). Despite the widespread belief that exercise can reduce dysmenorrhea, evidence-based studies are limited. Several observational studies reported that physical exercise was associated with a reduced prevalence of dysmenorrhea, although numerous other studies found no significant association between outcomes. Previous observational studies examining this relationship showed inconsistent findings, with some studies suggesting a protective effect. Metheny and Smith (1989) measured positive and negative affect and found that women who exercised regularly reported more positive affect than non-exercisers (22). Jahromi et al. (2008) also reported that aerobic exercise positively influenced menstrual symptoms (23). Previous studies also indicated that sports activity may decrease the level of serum aldosterone by reducing the level of renin and increasing estrogen and progesterone and thus decreases and improves physical symptoms (24-26). The purpose of the present study was to examine the effects of regular aerobic exercise on primary dysmenorrhea in young girls.

2. Material & Methods

Subjects

A quasi experimental study was conducted at Islamic Azad University, Marvdasht branch and convenience sampling was used. The study consisted of 20 participants, 10 in each group. Females diagnosed with primary dysmenorrhea, in the age group of 20-25 years were included. They should have had a regular menstrual cycle and those who were willing to participate were included. After detailed enquiry of the medical history of the subjects, those with history of smoking, alcoholism, medical illness and participants with regular exercise history were excluded. Subjects on oral contraceptive pill, hormonal replacement therapy, drugs that alter the cardiovascular functions were also excluded from the study. Participants were explained the procedure and purpose of the study and written informed consent was taken in an

understandable language. After initial examination the participants were assigned randomly into two groups: exercise group and control group.

Anthropometric and physiological Measurements

Height and body mass were measured, and body mass index (BMI) was calculated by dividing body mass (kg) by height (m²). VO_{2max} was determined by Rockport One-Mile Fitness Walking Test. In this test, an individual walked 1 mile (1.6 km) as fast as possible on a track surface. Total time was recorded and HR was obtained in the final minute (27). VO_{2max} was calculated by following formula:

$$VO_{2\max} = [139.68 - (0.388 \times \text{age (year)})] - [0.077 \times \text{body mass (Pb)}] - [3.265 \times \text{time (min)}] - [0.156 \times \text{HR}]$$

Personal characteristics of the subjects are presented in the Table 1. No significant differences were observed in each variable between two groups at baseline.

Table 1. General variables of exercise and control group (Mean \pm SD)

Variables	Exercise group	Control group
Age (y)	21.0 \pm 1.0	22.5 \pm 1.9
Height (cm)	161.3 \pm 7.5	162.9 \pm 4.5
Body mass (Kg)	53.4 \pm 8.6	52.4 \pm 4.5
VO ₂ (ml.Kg ⁻¹ .min ⁻¹)	29.0 \pm 1.1	31.0 \pm 2.1

Psychological and physical symptoms of dysmenorrheal measurement

Moo's Menstrual Distress Questionnaire was used to evaluate psychological and physical symptoms of dysmenorrhea. Before and after 8 weeks exercise training, each subject was completed the Moo's Menstrual Distress Questionnaire. The Questionnaire consisted of a 5-Likert scale as described by Jahromi et al (2008). The outcome was the mean score of psychological and physical symptoms of dysmenorrhea over the study period.

Biochemical analyses

Fasted, resting morning blood samples (5 ml) were taken at the same time before and after 8 weeks intervention. For menstrual status, all the

participants were menstruating regularly and defined as eumenorrheic (28- to 32-day menstrual cycles during the previous year); all testing was performed during the follicular phase of the menstrual cycle. All the subjects fasted at least for 12 hours and a fasting blood sample was obtained by venipuncture. Plasma obtained was frozen at -80°C for subsequent analysis. The plasma estrogen and progesterone levels were measured in duplicate using Radio Immune Assay (RIA) kits (Immunotech A.S, France).

Exercise training

The subjects in the exercise group run 10 to 15 \times 2 to 5 minute with 75 to 90% of maximum heart rate 3 days a week for 8 weeks. Each participant was equipped with a heart rate monitor (Polar, FS3c, Finland) to ensure accuracy of the exercise level. The control group was instructed not to change their physical activity and diet.

Statistical Analysis

Results were expressed as the mean \pm SD and distributions of all variables were assessed for normality. Paired t-test and independent sample t-test were used to compute mean (\pm SD) changes in the variables before and after the intervention. The level of significance in all statistical analyses was set at $P \leq 0.05$. Data analyses were performed using SPSS software for windows (version 17, SPSS, Inc., Chicago, IL).

3. Results

Changes in symptoms of dysmenorrhea

Data on psychological and physical symptoms of dysmenorrhea before and after 8 weeks training are presented in the Figure 1 and 2. As shown in the Figure 1, physical premenstrual symptoms were significantly reduced ($P < 0.05$).

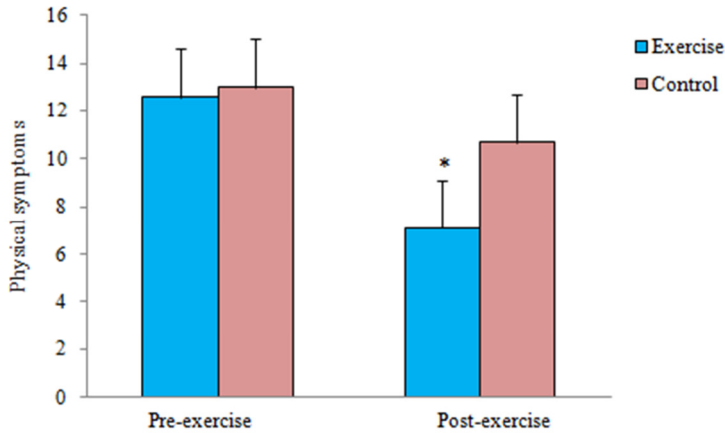


Figure 1. Changes of physical premenstrual symptoms in response to intensive aerobic exercise

For psychological premenstrual symptoms no significant changes were observed in response to 8 weeks aerobic exercise (Figure 2).

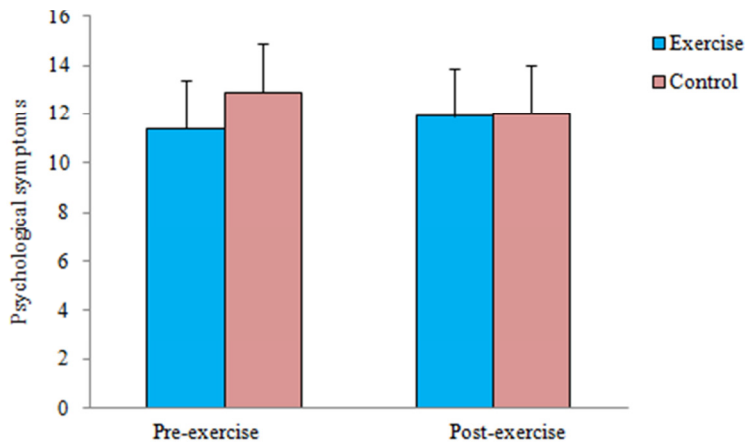


Figure 2. Changes of psychological premenstrual symptoms in response to intensive aerobic exercise

Changes in estrogen and progesterone levels

Changes in plasma estrogen and progesterone levels are presented in the Figure 3 and 4. The results indicated that estrogen levels were significantly increased after the intervention compare to the control

group ($P < 0.05$), however progesterone had not significant changes after the intervention.

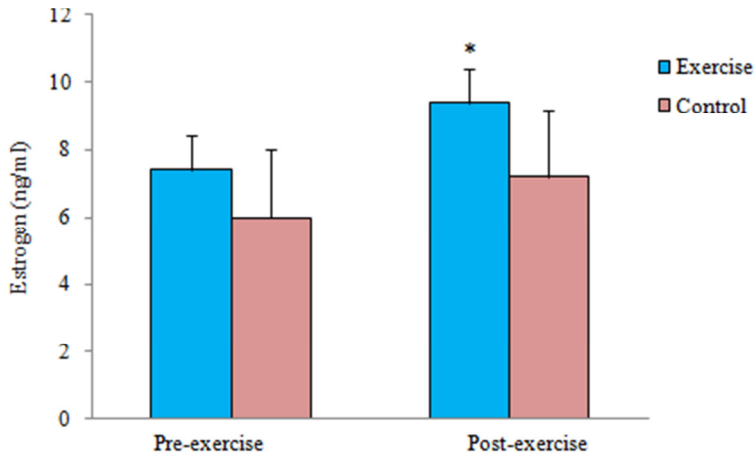


Figure 3. Changes of estrogen level in response to intensive aerobic exercise

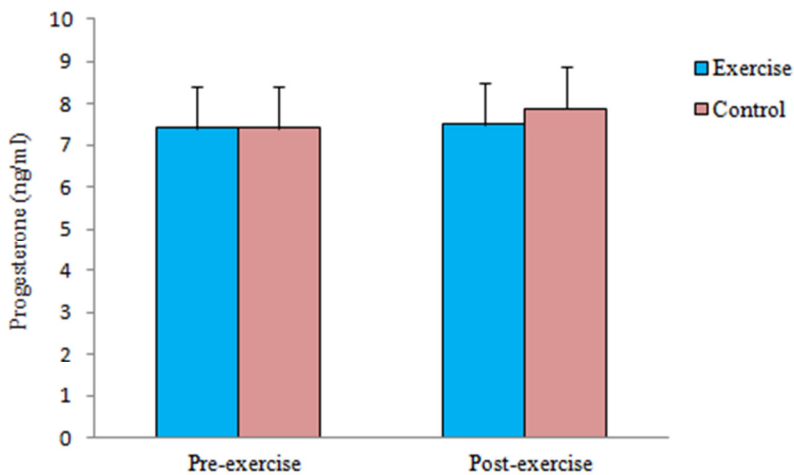


Figure 4. Changes of progesterone level in response to intensive aerobic exercise

4. Discussion

Today, different methods of treatment for primary dysmenorrhea have become prevalent, and uncomplicated treatments have found a special place in the research of researchers in the treatment of dysmenorrhea.

The present study was conducted to see the effect of regular aerobic exercises on primary dysmenorrhea in young girls. In present study, physical symptoms of dysmenorrhea have reduced in primary dysmenorrhea more in exercise group than in control group. Findings from various studies indicate that exercise therapy and physical activity are related to decreasing dysmenorrhea. Shahrjerdy et al. (2012) concluded that stretching exercises are effective in reducing pain intensity, pain duration, and the amount of painkillers used by girls with primary dysmenorrhea (28). Abbaspour et al. (2006) conducted a study to see the effect of exercise on primary dysmenorrhea and concluded that the exercise can decrease the duration and severity of dysmenorrhea (29). Onur (2012) studied the impact of home-based exercise on quality of life of women with primary dysmenorrhea and concluded that there is evidence that exercise has a positive effect in the treatment of dysmenorrhea (30). Shavandi et al. (2010) also examined the effect of 8 weeks of isometric exercises on primary dysmenorrhea in female students, and concluded that performing isometric exercises (including abdominal, pelvic and groin enhancement exercises) in reducing the severity and duration of pain and the rate of use of medication is effective (31). Also, Chantler et al. (2009) showed that exercising due to the release of endorphins, relaxation, stress relief and improved blood flow can reduce the severity and duration of dysmenorrhea (32). Mohammadi et al. (2012) also examined the effect of aerobic exercise on some menstrual symptoms of nonathletic students, and concluded that regular and continuous aerobic exercises can control initial dysmenorrhea and severe menstrual bleeding (33). Recently, Mohebbi Dehnavi et al. (2018) also examined the effect of aerobic exercise on primary dysmenorrhea and concluded that performing aerobic exercise can improve primary dysmenorrhea (16).

This improvement may be due to the increase in the blood flow and metabolism of the uterus during exercise which may be effective in the reduction of dysmenorrhea symptoms. A study done by Izzo and Labriola (1991) has shown that improved metabolism is a factor in the reduction of symptoms. It is also suggested that increased menstrual pain by uterine muscle contraction is derived from a nervous system that is innervated by the sympathetic nerve hence; stress through

hyperactivity of sympathetic nerve system via the increase contractibility of uterine muscles may lead to menstruation symptoms (34). A study done by Dawood (2006) has shown that therapeutic exercise can increase the secretion of endorphins from the brain, and these materials in turn raise the pain threshold of the body (35). Daley (2009) believed that contracted ligamentous bands in the abdominal region were the causative factor for physical compression of nerve pathways and their irritation, so the proposed series of stretching exercise was considered very effective (36).

In some studies, there is also a link between levels of hormones such as progesterone, estrogen, and vasopressin (15). The reason for pain in dysmenorrhea is the increase in the level of prostaglandins in the body, as the decrease in the amount of progesterone at the end of the luteal phase leads to stimulation of the lubricating action of the enzymes, which causes the release of arachidonic acid from the phospholipids along with activation of the cyclooxygenase pathway. Increasing the level of prostaglandins leads to uterine contraction, uterine ischemia, and increased sensitivity to pain fibers and ultimately causes pelvic pain (16). Sports activity decreases the level of serum aldosterone by reducing the level of renin and increasing estrogen and progesterone and thus decreases and improves physical symptoms (37-39). The results indicated that plasma estrogen levels were significantly increased after the intervention compare to the control group.

In present study, psychological symptoms of dysmenorrhea had no significant changes after the intervention. An interesting element of the relationship between exercise and dysmenorrhea is the involvement of stress. A number of studies have showed a correlation between life stress and gynecological with premenstrual syndrome (40). Exercise is widely accepted as a mean of moderating stress and biochemical changes in the immune system. A mechanism by which exercise may improve the symptoms of dysmenorrheal (reducing stress) has been articulated by Gannon (1986) (41). Menstrual pain probably stems from increased contraction of the uterine muscle, which is innervated by the sympathetic nervous system. Stress tends to enhance sympathetic activity, and may therefore increase menstrual pain by exacerbating uterine contraction. By relieving stress, exercise may decrease this

sympathetic activity, thereby alleviating symptoms. In fact, exercise is known to cause the release of endorphins, substances produced by the brain that raise the pain threshold (42). This discrepancy between the studies with this study is likely to be due to differences in the type of exercise protocol and participants in the study.

5. Conclusion

The results suggested that aerobic exercises positively influenced physical menstrual symptoms and its related hormones but it had not effective on psychological symptoms of dysmenorrheal.

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