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Resistance training improves primary dysmenorrhea symptoms in young girls: A randomized controlled trial

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Abstract

Introduction: Primary dysmenorrhea is defined as difficulty in menstrual flow in the absence of any pelvic pathology. It is the most common gynaecological problem among adolescent females. The effects of resistance training (RT) on primary dysmenorrhea are not well known. The aim of the present study was to examine the effects of RT on primary dysmenorrhea in young girls.

Material & Methods: The present quasi experimental study included 20 girls of age 20-23 years with primary dysmenorrheal were selected from Marvdasht branch, Islamic Azad University. The subjects were randomly divided into experimental group (n=10) or control group (n=10). The RT program was composed of exercises for different body segments (trunk, upper and lower limbs) that were performed with 10-12 maximal repetitions at 30-65% of 1-RM. The RT consisted of 50-60 min of circuit weight training per day, 3 days a week, for 8 weeks. Moo's Menstrual Distress Questionnaire was used to evaluate psychological and

physical symptoms of dysmenorrheal. Estrogen and progesterone levels and psychological and physical symptoms of dysmenorrhea were measured before and after the intervention. Paired sample t-test and independent sample t-test were used to compute changes in the variables before and after the intervention.

Results: Physical premenstrual symptoms were significantly reduced (11.0 ± 5.1 *vs.* 6.6 ± 3.9; P = 0.001) while estrogen (6.0 ± 4.6 *vs.* 8.2 ± 5.7 ng/ml; P = 0.012) and progesterone levels (6.6 ± 2.8 *vs.* 8.0 ± 5.2 ng/ml; P = 0.017) were significantly increased after the intervention compare to the control group. For psychological premenstrual symptoms (10.4 ± 6.4 *vs.* 10.4 ± 5.1; P = 0.13) no significant changes were observed in response to 8 weeks of RT.

Conclusions: Primary dysmenorrhea is a common complaint among young women. RT seems to be a practical method for reducing primary dysmenorrhea.

Keywords: Resistance training, Dysmenorrhea, Hormones, Menstrual distress syndrome

1. Introduction

Dysmenorrhoea means cramping pain accompanying menstruation (1). The word dysmenorrhoea is obtained from Greek word "Dys" (difficult, painful, abnormal), "meno" (month) and "rrhea" (flow) (2). Dysmenorrhrea, or painful menstruation is one of the most important causes of school absenteeism amongst adolescent girls, because it affects their academic performance, school and sports activities (3). Approximately, 20-90% of women suffer from this problem during their reproductive age (4). Dysmenorrhoea not only affects the quality of life in females but also is responsible for highest number of absentees which results in loss of work hours and economic loss (5). Dysmenorrhea may be accompanied by nausea, vomiting, diarrhea, headache, irritability or anorexia (6). The main cause of dysmenorrhea is unknown; however, increased amount of prostaglandins is the most important known cause

of this disorder (7). Dysmenorrhea can be treated through pharmacological and non-pharmacological methods. Pharmacotherapy includes using Oral Contraceptive Pills (OCP), Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), and analgesic tablets which reduce menstrual pain by affecting the level of prostaglandins (8). On the other hand, complementary and alternative medicine include essential fatty acid, vitamins, supplements, Transcutaneous Electrical Nerve Stimulation (TENS), acupuncture, medicinal plants (9), aromatherapy (10), reflexology (11), acupressure (12), massage therapy (13), and exercises (14). Dysmenohrrea is most commonly relieved by medication ranging from commercially available formulas to oral contraceptives. The side effects from such medications are well known (nausea, breast tenderness, and intermenstrual bleeding, dizziness, drowsiness, hearing and visual disturbances) (15). 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 (16-18). Up to now, contradictory results have been obtained about the effects of doing exercises on primary dysmenorrheal (19-21). 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. Azima et al. (2014) reported that pain intensity and duration of pain was significantly reduced after 8 weeks of isometric exercises, however, no significant difference was found between exercise group and control group concerning mean anxiety levels (22). Jahromi et al. (2008) also reported that aerobic exercise positively influenced menstrual symptoms (23). Previous studies also indicated that sports activity may decreases 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). There is a very little information about the effect of resistance training (RT) on primary dysmenorrheal and by our knowledge to date, there have been no studies conducted on acute hormone responses to RT in young girls with primary dysmenorrhea. In

an only available study, Saadat nejad et al. (2015) was studied the effects of ginger *vs.* RT on primary dysmenorrhea in female students of Shiraz University. Their results indicated that physical symptoms of dysmenorrheal reduced in Ginger group but no significant statistically changes were found between RT group and control group. For psychologic symptoms of dysmenorrheal no significant differences were observed between Ginger group, RT group or control group (27). The purpose of the present study was to examine the effects of 8 weeks RT 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 20-23 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.

Resistance training

Two familiarization sessions were designed to habituate subjects with the testing procedures and laboratory environment. The main aim of these sessions was to familiarize subjects with different resistance exercises using weight-training machines and also to familiarize them with performing the 1-RM test. Maximal strength was determined using a concentric, 1-RM (28), as previously described (29). The warm-up consisted of riding a stationary bicycle for 5 min, two sets of progressive

resistance exercises similar to the actual exercises utilized in the main experiment, and 2-3 min of rest accompanied by some light stretching exercises. After the warm-up, subjects performed the 1-RM test, and the heaviest weight that could be lifted once using the correct technique was considered as 1-RM for all the exercises and used to calculate the percentage of resistance. During the familiarization sessions, it was ensured that all the subjects used the correct techniques for all exercises prior to taking part in the main test sessions. Subjects executed nine resistance exercises selected to stress the major muscle groups in the following order: barbell curl, chest press, lateral rise, leg extension, back extension, sit-ups, leg curls, thigh abduction and thigh adduction. RT consisted of 50-60 min of circuit weight training per day, 3 days a week, for 8 weeks. This training was circularly performed in 9 stations and included 2-3 sets with 10-12 maximal repetitions at 30-65% of 1-RM in each station. Each circuit and set was separated by 2-3 min and 90 s rest respectively. General and specific warm-up were performed prior to each training session, as explained for the 1-RM determination, and each training session was followed by cool-down.

Psychological and physical symptoms of dysmenorrheal measurement

Moo's Menstrual Distress Questionnaire was used to evaluate psychological and physical symptoms of dysmenorrheal (30). 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) (23). 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 ^{oC} for

subsequent analysis. The plasma estrogen and progesterone levels were measured in duplicate using Radio Immune Assay (RIA) kits (Immunotech A.S, France).

Statistical Analysis

Results were expressed as the mean ± SD and distributions of all variables were assessed for normality. Paired sample t-test and independent sample t-test were used to compute mean (± 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 RT are presented in the Figure 1 and 2. As shown in the Figure 1, physical premenstrual symptoms were significantly reduced ($P<0.05$).

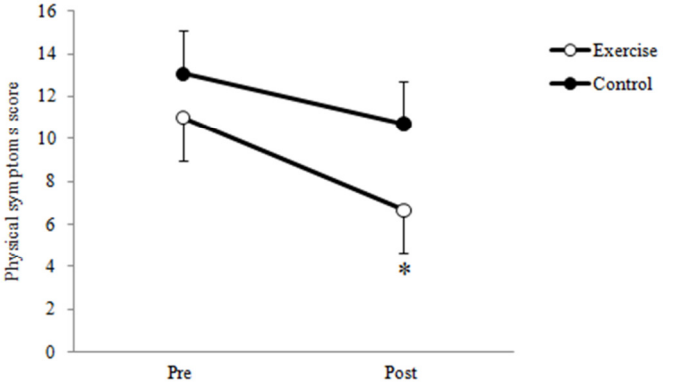

Figure 1. Changes of physical premenstrual symptoms in response to RT

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

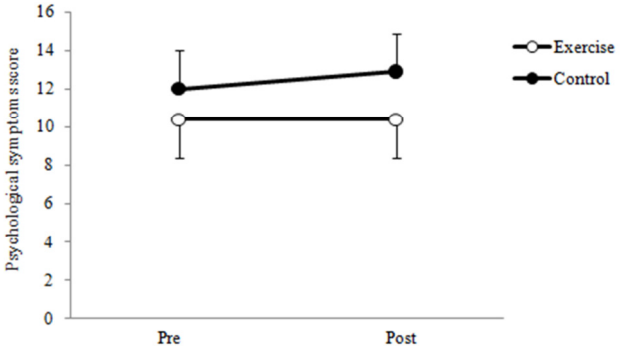

Figure 2. Changes of psychological premenstrual symptoms in response to RT

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 and progesterone levels were significantly increased after 8 weeks RT compare to the control group ($P<0.05$).

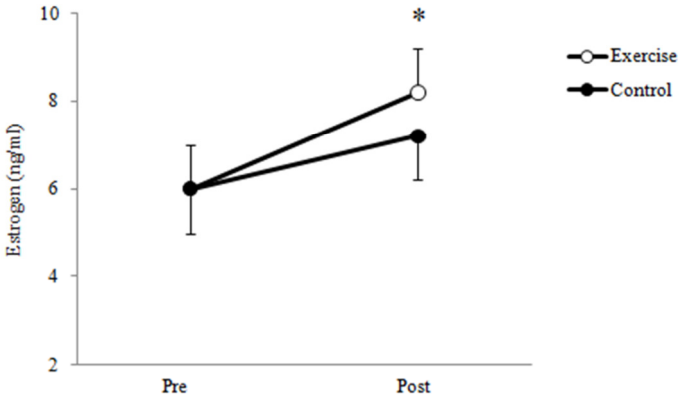

Figure 3. Changes of estrogen level in response to RT

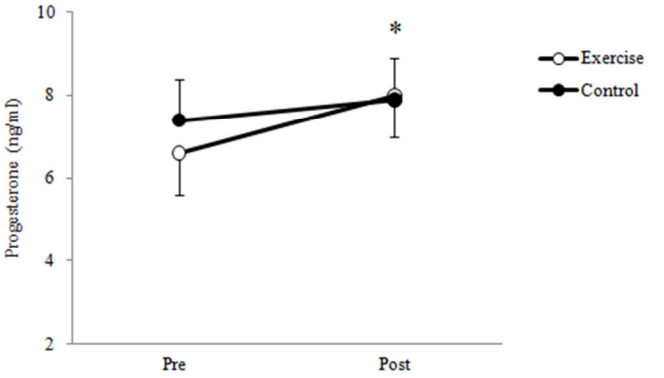

Figure 4. Changes of progesterone level in response to RT

4. Discussion

Based on our current knowledge, an excessive or imbalanced amount of prostaglandins is released from endometrium while menstruation. Subsequently, uterus is contracted frequently and dysrhythmically, with increased basal tone and active pressure. This reduces uterine blood flow and increases peripheral nerve hypersensitivity eventually resulting in dysmenorrheal (31). The aim of the present study was to examine the effects of RT 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. There is a very little information about the effect of RT on primary dysmenorrheal. In an only available study, Saadat nejad et al. (2015) was studied the effects of ginger *vs.* RT on primary dysmenorrhea in female students of Shiraz University. Their results indicated that physical symptoms of dysmenorrheal reduced in Ginger group but no significant statistically changes were found between RT group and control group (27). Recently, our results indicated that aerobic exercise reduces physical symptoms of dysmenorrheal in young girls (32). 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 dysmenorrheal (33). 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 dysmenorrheal (34). 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 dysmenorrheal 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 (35). 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 (36). 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 (37).

Our results in line with the results of Saadat nejad et al. (2015) revealed that psychological symptoms of dysmenorrheal had no significant changes in response to RT (27). However, some previous study results suggest that women who undertake regular, moderate, aerobic exercise show significantly lower levels of negative mood states, (anger, contempt, disgust, sadness, hostility, fear, shame, shyness, and guilt), than nonexercisers (38,39). An interesting element of the relationship between exercise and dysmenorrhea is the involvement of stress. 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) (40). 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 (41). 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.

In some studies, there is also a link between levels of hormones such as progesterone, estrogen, and vasopressin (42). 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 (43). 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 (44-46). The results indicated that plasma estrogen and progesterone levels were significantly increased after the intervention compare to the control group.

5. Conclusion

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

6. Acknowledgment

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