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Effect of Isometric Exercises on Primary Dysmenorrhea: A Randomized Controlled Clinical Trial

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Abstract

Background: Primary dysmenorrhea is the most common cyclic pelvic pain and is also the most common gynecological problem worldwide affecting quality of life. The present study is aimed investigating the effect of isometric exercises on intensity and duration of pain and level of anxiety among students with primary dysmenorrhea. **Materials and Methods:** In this randomized controlled clinical trial, 68 students living in dormitories of Shiraz University with primary dysmenorrhea were randomly assigned to both isometric exercises and control groups. The intervention group performed isometric exercises since the third day of their menstrual cycles for 8 weeks. Pain intensity was measured using Visual Analog Scale (VAS). In addition, anxiety level was assessed using Spielberger questionnaire. Data were analyzed using independent t-test, repeated measures ANOVA, and Bonferroni Post hoc test at the end of the second and third months of the study. Besides, $P < 0.05$ was considered statistically significant. **Results:** Pain intensity and duration of pain was significantly reduced in exercise groups ($P < 0.001$). However, no significant difference was found between two groups concerning mean anxiety levels. **Conclusion:** Primary dysmenorrhea is a common complaint among young women. Isometric exercises seem to be an easy, non-pharmacological method for reducing primary dysmenorrhea. [GMJ. 2015;4(1):26-32]

Keywords: Dysmenorrhea; Isometric Exercises; Anxiety; students; Iran

Introduction

Dysmenorrhea is the most prevalent periodical pelvic pain [1]. Approximately, 20-90% of women suffer from this problem during their reproductive age [2]. The main cause of dysmenorrhea is unknown; howev-

er, increased amount of prostaglandins is the most important known cause of this disorder [3]. Primary dysmenorrhea is not life-threatening and does not cause disabilities but it leads to absenteeism and significantly affects the quality of life [4-5]. Dysmenorrhea can be treated through pharmacological and

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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 [6]. On the other hand, complementary and alternative medicine include essential fatty acid, vitamins, supplements, Transcutaneous Electrical Nerve Stimulation (TENS), acupuncture, medicinal plants [1], aromatherapy [7], reflexology [8], acupressure [9], massage therapy [10], and exercises [11].

Today, broad studies are being conducted on complementary and alternative methods due to high costs, complications, and contraindications of some drug therapies as well as accessibility and public desire for using complementary treatments [8,10,12]. One of the complementary methods is doing exercises. Up to now, contradictory results have been obtained about the effects of doing exercises on primary dysmenorrhea [13-15]. Isometric exercises are a subgroup of exercises, during which the muscle length and joint angle remain constant [16]. Isometric exercises activate constant muscles which are of A-delta type and C fibers and reduce pain via inhibitory effects of pain [17]. Positive effect of isometric exercises on primary dysmenorrhea has been observed in some, but not all, studies [15,18-19]. Given the prevalence of primary dysmenorrhea, its undesirable symptoms and complications of some common treatments and the contradictory results of the studies conducted on the effects of doing exercises on primary dysmenorrhea, clarification is necessary for more reliable studies in this regard. Accordingly, this study was designed to investigate the effects of isometric exercises on intensity and duration of pain and level of anxiety among students with primary dysmenorrhea.

Materials and Methods

Subjects

The present randomized controlled clinical trial was conducted on 80 students living in dormitories of Shiraz University with primary dysmenorrhea. Considering the power of 80%, confidence interval of 95%, effect size

of about 60%, and the loss rate of 10% and using the following formula,

$$n = \frac{2s^2(z_{1-a/2} + z_{1-b})^2}{(\eta_1 - \eta_0)^2}, \text{ a 40-student}$$

sample size was determined for the current study.

Study design

This study was performed from November 2012 to May 2013. After completely explaining the research course to the participants and receiving their written informed consents, those who had the inclusion criteria were entered into the study. At the beginning of this work, pain intensity was measured using Visual Analog Scale (VAS) which is a 10-cm ruler on which, zero and 10 represent the lowest pain and the highest pain intensity, respectively. VAS measures of acute pain are valid and reliable, this instrument has been proven in different studies and its reliability was confirmed ($r=0.99$). [20-22]. Moreover, duration of pain was measured using pain hours. Furthermore, Spielberger questionnaire which includes 40 questions in personality and situational dimensions was filled out by the participants 24 h after pain peak. Agha Mohammadi et al. (2007) conducted a study on 150 patients under surgery using Spielberger questionnaire and reported its reliability to be 97%. The validity and reliability reported in the study by Agha Mohammadi et al. were the basis of the present study [23]. The inclusion criteria of the study were affliction with primary dysmenorrhea, pain intensity of 5 or above in VAS, not using pharmacological or non-pharmacological methods for pain relief during the study, not suffering from systemic diseases or diseases in the genital organs, having no limitations for performing the isometric exercises such as cardiovascular disease[24], and being willing to participate in the study. On the other hand, the exclusion criteria were unwillingness to continue one's cooperation and using other therapeutic methods during the study. Samples were selected through convenience sampling and were then assigned to an intervention and a control group by permuted block randomization. This

study was not blinded.

The intervention group students were required to perform isometric exercises since the third day of their menstrual cycle 5 days a week, two sessions a day, and 10 times per session for 8 weeks. The exercises in this study included 7 stages which were modified and confirmed by a specialized rehabilitation consultant. The protocol of isometric exercises was as follows:

- 1- Sleeping in supine position, extending feet next to each other, pressing feet on each other, holding for 5 second, and relaxing.
- 2- Sleeping in supine position, putting feet crossed and pressing them on each other, holding for 5s, and relaxing.
- 3- Sleeping in supine position, bending knees and thighs, putting a pillow between two knees, pressing knees to each other, holding for 5s, and relaxing.
- 4- Going back to the third position, putting hand below waist and pressing waist to the ground, holding for 5s, and relaxing.
- 5- Sleeping in supine position, bending knees and thighs and trying to raise head and neck above the ground level, holding for 5s, and relaxing.
- 6- Sleeping in supine position, bending knees and thighs and trying to move head and neck toward the right thigh, holding for 5s, and relaxing.
- 7- Repeating stage 6 toward the left thigh.
- 8- Taking one abdominal deep breath among above-mentioned movements (sleeping in supine position with bent knees and thighs and breathing through nose in a way that abdomen expands. One hand can also be placed on abdomen to ensure abdominal breath. Then, exhaling from mouth such a way that abdominal muscles stick to waist).

Control group students underwent no interventions. Overall, participants were investigated in three menstrual cycles. In the first month in which no intervention was performed, the intensity and duration of pain and anxiety level were evaluated in control and exercise groups. Study questionnaire was completed and VAS was assessed in both groups after the second and third menstrual cycles.

Statistical Analysis

Data were entered into SPSS statistical software (v. 20) and analyzed using independent t-test, repeated measures ANOVA, Mean and Bonferroni Post hoc test. Besides, $P < 0.05$ was considered statistically significant.

Ethical Considerations

After obtaining approval of the Research Vice-chancellor of Shiraz University of Medical Sciences and receiving ethics code (CT-91-6355) from the Ethics Committee and Iranian Registry of Clinical Trials (code: IRCT2012123011945N1), written informed consents were signed by all participants. Also, exercises were trained to the control group after the end of the study.

Results

This study was conducted on 80 female students. 68 students among 80 individuals (34 students in experimental group and 34 students in control group) completed the study. 12 students were excluded (6 students in exercise group and 6 students in control group) because of high pain intensity and poor response to exercise treatment or for not properly doing isometric exercises or unwillingness to continue one's cooperation. Before intervention, no significant difference was found between participants regarding the mean age ($P = 0.234$), BMI ($P = 0.979$), menarche age ($P = 0.259$), interval of menstrual cycles ($P = 0.931$), duration of bleeding ($P = 0.722$), and duration of menstrual cycles ($P = 0.651$) (Table 1).

Also, no significant difference was observed between these two groups concerning the mean of pain intensity and pain duration.

However, results revealed a significant difference between exercise and control groups in terms of pain intensity in the second and third months ($P < 0.001$) (Table 2). Also, a significant difference was observed between exercise and control groups regarding the mean of pain duration in the second and third months ($P < 0.001$) (Table 3). Nonetheless, no significant difference was detected between the two groups concerning mean anxiety levels in the second ($p = 0.251$) and third months ($P = 0.476$) (Table 4).

Table 1. Demographic Characteristics of the Two Groups.

Demographic characteristics	Group		P-value
	Control SD±mean	Exercise SD±mean	
Age	20.73±1.08	21.08±1.21	0.234
BMI	21.18±2.56	21.19±2.41	0.979
Age of Menarche	13.32±1.09	13.29±1.40	0.259
Interval of Menstrual cycle	25.82±3.45	25.55±4.26	0.931
Duration of Bleeding	4.76±1.15	4.52±1.10	0.722
Duration of Menstrual cycle	6.76±0.88	6.85±1.04	0.651

Table 2. Comparing Mean Scores of Pain Intensity in Two Groups

Pain intensity	Group		P-value
	Control mean±SD	Exercise mean±SD	
First month (before the intervention)	6.61±2.04	6.58±1.67	0.948
Second month	6.94±1.94	4.64±2.60	<0.001
Third month	6.67±1.96	4.17±2.12	<0.001
P-value	0.598	<0.001	

Table 3. Comparing Mean Duration of Pain in Two Groups

Duration of pain	Group		P-value
	Control mean±SD (hour)	Exercise mean±SD (hour)	
First month (before the intervention)	7.91±5.24	10.70±7.63	0.083
Second month	7.67±5.49	9.63±7.17	0.793
Third month	8.35±6.03	5.29±4.77	0.024
P-value	0.562	<0.001	

Table 4. Comparing Mean Anxiety Level in Two Groups

Anxiety level	Group		P-value
	Control mean±SD	Exercise mean±SD	
First month (before the intervention)	95.35±21.16	93.44±20.84	0.709
Second month	96.94±23.61	90.55±21.75	0.251
Third month	94.08±23.74	90.61±15.26	0.476
P-value	0.656	0.670	

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 dysmenorrhea [4].

The first objective of this study was to compare the mean score of pain intensity in isometric exercise and control groups. Results indicated a significant difference between the two groups regarding intensity and duration of menstrual pain after intervention. Shavandi *et al.* (2010) conducted a quasi-experimental study on 30 female students suffering from dysmenorrhea. The exercise group did 8 weeks of isometric exercises. Pain intensity and duration of pain decreased after 4 weeks [18]. Noorbakhsh *et al.* (2012) reported that doing 8 weeks of physical activity significantly decreased drug consumed, amount and duration of bleeding and intensity of pain in students with primary dysmenorrhea [25]. The present study findings were in agreement with these studies. The potential mechanism of the effect of isometric exercises is strengthening pelvic muscles, facilitating bleeding, and excretion of wastes containing prostaglandin which causes contraction. [18]. Regular exercise reduces stress and, as a result, decreasing the activity of sympathetic system causing contraction and pain in uterine muscles [25]. Also Different exercises increase pressure and thus reduce pain and high blood pressure increase happens during isometric exercises (17). Moreover, increasing proprioception and control of pelvic motions and muscular balance, lead to reduction of backache especially during pregnancy [18]. Contrary to the above results, Balkey *et al.* (2010) studied the effects of different exercises on dysmenorrhea of students and did not observe any association between exercise and primary dysmenorrhoea [15]. Also, Daley (2008) reported that in studies with sample size of more than 500 people, reduction of dysmenorrhea has not been observed. This review showed that small studies were less likely to have

blinded the study purpose or controlled for possible confounders, making their findings uncertain. [26].

The second objective of this study was to investigate the effect of isometric exercises on duration of menstrual pain. Based on the results, pain duration reduced in exercise group after intervention, which is in line with several studies conducted on the issue [18, 25, 27]. The pain reduction mechanism is facilitation of the release of prostaglandins from uterus after exercising [25]. Furthermore, physical exercises increased blood flow and metabolism in uterus and, consequently, reduced dysmenorrhea [18] and anti diuretic hormone is released during exercise and the vasoconstriction in pelvic blood flow may breakdown of prostaglandins [25]. The third objective of the present study was to investigate the effect of isometric exercises on the anxiety level. The study results showed no significant difference between the two study groups regarding anxiety levels. Nevertheless, evidence has shown that regular exercise activities lead to physical and mental health [28]. Doing exercises also plays an effective role in reducing anxiety [29]. The prevalence of anxiety among individuals with dysmenorrhea was reported to be 36% [30]. Doing exercise as a factor may reduce stress and endorphin changes [31]. Besides, findings of the study by Field *et al.* (2011) indicated that yoga reduced prenatal and prematurity depression [32]. Moreover, Broman-Fulks *et al.* (2004) showed that both high intensity and low intensity aerobic exercises reduced anxiety with high intensity exercises being more effective [33]. Studies have demonstrated that stress would lead to increased dysmenorrhea by increasing the stimulation of sympathetic system. Thus, reduction of stress can be effective in improving symptoms of dysmenorrhea [34].

Among limitations of this study was failing to measure quality of life, rate of bleeding and length of menstruation.

Another limitation of this study was the limited opportunity for follow-up and large number of questions in Spielberger questionnaire which might have caused students not to properly answer the items.

The difference between the present study and other researches might be due to the short pe-

riod of the study. Therefore, further long-term studies are required to be conducted on the issue in order to determine the effect of doing exercises on anxiety levels and menstrual bleeding.

Conclusion

Considering results of this study, it seems that performing isometric exercises for 8 weeks reduced the intensity and duration of primary dysmenorrhea. Since isometric exercises are easy, inexpensive, and not time-consuming, they seem to be an appropriate non-pharmacological method for reducing primary dysmenorrhea. Students are recommended to do isometric exercises in order to decrease negative impacts of dysmenorrhea. Yet, more studies with larger sample sizes and longer time periods are needed to be conducted on the issue.

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Conflicts of Interest

Authors declare that they do not have any conflicts of interest.

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