Original Paper

Biomedical Human Kinetics, 4, 127 – 132, 2012

DOI: 10.2478/v10101-012-0024-y

Effects of stretching exercises on primary dysmenorrhea in adolescent girls

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Summary

Study aim: To assess the effect of one term of stretching exercise on primary dysmenorrhea in high school students.
Material and methods: 179 single girls aged 15-17 years with moderate-to-severe primary dysmenorrhea were selected from 6 high schools located in 2 different city zones. The students were non-athletes and volunteered for the study. The participants were randomly divided into 2 groups: an experimental group (n = 124) and a control group (n = 55). In the intervention group, the subjects were requested to complete an active stretching exercise for 8 weeks (3 days per week, 2 times per day, 10 minutes each time) at home. In the pre-test, all of subjects were examined for pain intensity (10-point scale), pain duration, and the use of sedative tablets in 2 continuous menstruation cycles. The post-test was examined 8 weeks later.
Results: After 8 weeks, pain intensity was reduced from 7.65 to 4.88, pain duration was decreased from 7.48 to 3.86 hours, and use of sedative tablets was decreased from 1.65 to 0.79 tablets in the experimental group ($p<0.05$). In the control group, a significant decline was only noted for pain duration ($p<0.001$).
Conclusions: Stretching exercises are effective in reducing pain intensity, pain duration, and the amount of painkillers used by girls with primary dysmenorrhea.

Key words: Muscle exercise stretching – Dysmenorrhea – Adolescence

Introduction

Primary dysmenorrhea is a difficult menstrual flow in the absence of any pelvic pathology. It is the most common gynecologic problem among adolescent females [7, 9,10,12,20]. Incidence of primary dysmenorrhea was reported to be between 50% and 90% in different societies [4,5,20,24]; its incidence in Iran has been estimated to be between 74% and 84.1% [12,15,27]. It is characterized by lower abdominal pain that potentially could radiate to the back and thigh regions. The pain may be associated with headache, fatigue, nervousness, nausea, vomiting, mood swings, and (rarely) in severe cases syncope [20]. Primary dysmenorrhea reportedly stops spontaneously after 1-3 years; however, sometimes it is possible to continue until childbirth [3,4,11].

The idea that various type of active or passive exercise might help in alleviating pain in primary dysmenorrhea is not a new issue. It is widely thought that exercise reduces the frequency and / or the severity of dysmenorrheal syndrome. Suggestions for primary dysmenorrhea, such the use of stretching exercises [7], sports and regular exercise, are considered to be effective procedures in the prevention and treatment of primary dysmenorrhea. Generally, it seems that exercise therapy may alleviate discomfort associated with dysmenorrhea; however, scientific articles in this area are controversial [21]. The results of various studies have shown that with sport activity, the intensity of symptoms and pain has decreased [17]. Yet at the same time, the frequency of dysmenorrhea in high school girls who were actively involved in sports activities was considerably less than the compared group [13]. Women that participated in heavy sports, as compared with those who occasionally took part in sports, experienced fewer occurrences of symptoms of dysmenorrhea [18]. In some published articles, no correlation was found between physical activity level and dysmenorrhea [14,16,19]. Moreover, after checking with depression and mood swings, they found that sport in some women induce higher levels of symptoms along with menstruation [23].

Several studies have shown that the reduction of dysmenorrhea in women who regularly exercise may be due to effects of hormonal changes on uterine epithelial tissues or an increase in endorphin levels. It appears that exercise has analgesic effects that act in a non-specific way [22,26]. Research in the general population has shown

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that regular exercise can alleviate some types of symptoms including mood transitions, fatigue and abdominal bloating in females with primary dysmenorrhea, but these data are usually empirical and anecdotal rather than evidence based [7]. Results have shown that women who took part in regular, moderate, aerobic exercise had fewer negative effects, such as impaired concentration, pain and behavioral changes, than non-exercisers during period cycles [2]. Primary dysmenorrhea is considered the leading cause of absenteeism from work in young girls [7]. So it seems that this complication is a general problem in young girls, and developing conservative methods to reduce its complications is completely necessary. Since researches have shown contradictory results about the role of exercise therapy in treatment of primary dysmenorrhea [12], there is need for new research about this connection. It was 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 [7–9]. This study was designed to determine the value of stretching exercises in reducing the signs and symptoms of dysmenorrhea in student-aged girls.

Material and Methods

Study design: A research with a quasi-experimental design was performed in 2 groups that were selected from 6 secondary schools in the 2007-2008 scholastic year in Arak, in central Iran. A simple randomized controlled design was used for the allocation of educational districts into intervention or control groups. In Arak, 2 educational districts were sampled that covered all economic and social statuses and were randomly allocated to intervention or control status. A total of 6 schools were randomly selected from the different economic areas of the city. A total of 519 students were screened for the presence of primary dysmenorrheal. Eventually, 179 students aged 15-17 years, single, and non-athletes (without any regular exercise activity) met the inclusion criteria to participate in this project. The selected high schools were divided by simple randomization into experimental group (n = 124; students form 4 high schools) and control group (n = 55; students form 2 high schools with subjects). This meant that in each educational district of a city 2 high schools were assigned as intervention groups and 1 high school as a control group. With purposeful sampling, all participants experienced moderate to severe symptoms of dysmenorrhea. The selection processes of subjects were based on the diagnosis of a specialist with pelvic examination and a thorough history. In some cases of doubt in differentiating primary or secondary dysmenorrhea, sonographic assessment was used. Participants with a history of specific disease, compulsory use of special drugs, or having symptoms such as tingling, itching, discharge, irregular menstruation cycles, or subjects with regular exercise history (3 days per week and a daily average of 30-45 min) were excluded from the study. In the experimental group, the mean age, body height, body mass and age of first menstrual episode was 16 years, 162 cm, 54 kg, 13 years, respectively; in the control group, the mean was 16 years, 161 cm, 53 kg and 12 years, respectively. Additionally, 52.6% had regular exercise occasionally (regular exercise was defined as an exercise performed 3 times a week 30-45 minutes), 37.6% never had any regular exercise, and 9.7% reported performing mostly regular exercise.

All participants were given information written and verbally about the objectives and methods of implementation. Students who agreed to take part in this study were asked to complete a self-administered questionnaire at school in the 2 phases of research that was distributed among subjects with dysmenorrhea pain. Student participation was voluntary after filling out of written consent form. Ethics approval was granted by Arak University.

Methods: The subjects completed a demographic questionnaire that addressed: age, body height, body mass and age at first menstruation; information about levels of exercise activity; amount of analgesic consumption during menstruation; pain intensity assessment by using a visual analogue scale (VAS) during period and a consent form. Meanwhile, subjects were given 2 pre-test questionnaires and asked to answer the questionnaires after the first and second menstrual cycle, and to give information about the most severe pain according the visual analog scale (VAS) [23,26]. The questionnaire used the VAS scale to measure intensity of pain and some questions relating to consumption of analgesics and duration of menstrual pain, which was confirmed in their reliability and validity by the cooperation of 4 gynecologists. Cronbach's α, which determines the internal consistency of items in a survey instrument, was 91%. Based on the VAS scale, those subjects with pain intensity of 4 to 7 were classified as the moderate group. The subjects with a pain score between 7 and 10 were considered to be a severe form of dysmenorrhea. The subjects with pain intensity less 4 were excluded from the research design.

The experimental group was given a questionnaire prior to the stretching exercises, which included 6 stretching exercises in the abdominal, pelvic, and groin regions [25]. The subjects were requested to perform the active stretching exercises for 8 weeks at home (3 days per week and 2 times per day for 10 minutes) Furthermore, they were asked to avoid performing stretching exercises during the period cycle. The correct techniques of per-

forming stretching exercises were explained by a qualified and experienced instructor and were told to do stretching exercises short of the discomfort zone. Furthermore, their performances were controlled from time to time by a physical education teacher in the high school. The subjects completed the questionnaires again after 8 weeks of stretching exercises. The prescribed exercises were as follows:

In the first stretching exercise, the subject was asked to stand behind a chair, bend trunk forward from the hip joint so that the shoulders and back were positioned on a straight line and the upper body was placed parallel to the floor (Fig 1.A). Duration of holding time was 5 seconds; repetition was 10 times.

In the second stretching exercise, the subject was requested to stand 10-20 cm behind a chair, then raise 1 heel off the floor, then repeat the exercise with the other heel alternatively (Fig 1.B). The exercise was performed 20 times.

In the third exercise, the subject was asked to spread their feet shoulder width, place trunk and hands in forward stretching mode, then completely bend her knees and maintain a squatting position (Fig 1.C). Duration of this position was 5 seconds; the subject then raised her body and repeated the same movement 10 times.

In the fourth exercise, the subject was asked to spread her feet wider than shoulder width. Then the subject was asked to bend and touch left ankle with her right hand while putting her left hand in a stretched position above her head, so that the head was in the middle and her head was turned and looked for her left hand (Fig 1.D). This exercise was repeated for the opposite foot with the same method. The exercise was repeated alternatively 10 times for each side of the body.

In the fifth exercise, the subject was asked to lie down in the supine position so that the shoulders, back, and feet were kept on the floor. In this position the knees was bent with the help of her hands and reached to her chin (Fig 1.E). The repetition frequency was 10 times.

In the sixth and last exercise, the subject was asked to stand against a wall and put her hands behind her head and elbows pointed forward in the direction of the eyes (Fig 1.F), then without bending the vertebral column, the abdominal muscle wall was contracted for 10 seconds. This exercise was repeated 10 times.

The control group was asked to complete the same questionnaires in the following 2 menstrual cycles. They were asked to avoid regular physical exercise during this period. After completing the study projects, the stretching exercises that used the same procedures were taught to the control group in the hope of performing these exercises.

Data analysis: Kolmogorov-Smirnov test was used to determine data normality. This test showed that pain intensity pre-test and post-test demonstrated normal scattering. Pain duration variable and data for the amount of consumed medicine were not normally distributed or were discrete values. Thus, the data were analyzed with independent/paired *t*-test or nonparametric U Mann-Whitney/ Wilcoxon tests where appropriate. Differences between fractions were assessed using chi-square test. All analyses were conducted using the SPSS software; the level of significance was set at $\alpha = 0.05$.

Results

The total number of tablets consumed on average during the cycle was 1; the maximum number was 3 tablets per day. In the experimental group, 19.4% of students reported that they did not consume any kind of analgesics, 36.3% took Profen tablets, 10.5% acetaminophen codeine, 11.3% used Mefenamic acid capsules for pain relief, 16.1% took a combination of Profen and Mefenamic acid capsules, and 6.1% consumed non-chemical drugs. In the control group, the respective fractions were 7.3% for analgesics ($p<0.05$), 47.3% Profen tablets, 5.5% acetaminophen codeine, 5.5% Mefenamic acid capsules, 32.7% a combination of Profen and Mefenamic acid capsules ($p<0.05$), and 1.8% for non-chemical medicine.

The majority (49.2%) of students from both the experimental and control group reported pain in the abdomen and low back area, about 30.2% of students irrespective of group experienced pain in the suprapubic, low back, and in the buttocks, 14.5 % reported pain in suprapubic area and 6.1 experienced low back pain. These symptoms were not evaluated following an intervention procedure. The average menstrual cycle length during the study period in the subjects was 6 days in both experimental and control group. Fifty-nine percent of subjects had regular

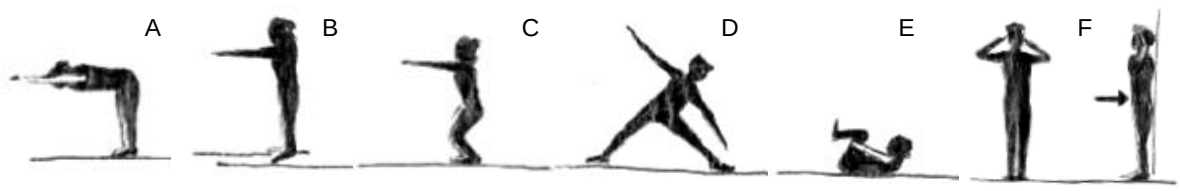


Fig. 1. The active stretching exercises prescribed

menstrual periods; no significant between-group differences were found in this regard.

Of the participants, 38.0% occasionally had regular exercises (regular exercise was defined as an exercise which performed 3 times a week 30-45 minutes); 61.3% of students from the experimental group, and 30.1% from the control group ($p<0.001$) never had any regular exercise; 3.2% and 25.5% respectively ($p<0.001$) reported mostly performing regular exercise.

The descriptive statistics for pain intensity, pain duration, and use of medication recorded in both groups before and after completion of the experiment are presented in Table 1. It was found that following the intervention pain intensity, pain duration, and amount of consumed medications decreased significantly ($p<0.001$) in the experimental group, while in the control group a significant decline was only noted for pain duration ($p<0.001$). Hence, after intervention the mean values for estimated pain intensity were in the control group 2.3 pts higher ($p<0.001$), experienced pain duration was by more than 1 hour longer, and the amount of consumed medications was about 20% higher compared to the experimental group.

Table 1. Mean values (±SD) of studied variables recorded in experimental and control group before and after 8 weeks of intervention

Variable	Experimental Group (n = 124)		Control Group (n = 55)	
	Before	After	Before	After
Pain intensity	7.65 ± 1.94	4.88 ± 1.92***	7.77 ± 1.50	7.16 ± 1.42$^{\#\#\#}$
Pain duration (h)	7.84 ± 5.26	3.86 ± 2.50***	5.59 ± 1.33$^{\#}$	4.95 ± 1.28***$^{\#\#\#}$
Use of medication (n)	1.65 ± 1.02	0.79 ± 0.69***	1.05 ± 0.72	0.95 ± 0.24$^{\#\#\#}$

Legend: *** Significantly ($p<0.001$) different from the respective *Before* value; Significantly different from the respective value in experimental group: $^{\#}p<0.05$; $^{\#\#\#}p<0.001$;

Discussion

Findings of different studies have shown that therapeutic exercise and physical activity was related with reduced incidence of dysmenorrhea, whereas in some of studies did not demonstrate such a correlation statistically [6]. Results of Israel *et al.* [17] showed that after 12 weeks of aerobic training, the intensity of symptoms decreased. Golub *et al.* [13] expressed that dysmenorrhea in high school girls who were involved in sports and physical activities were less than non-exerciser group. According to Izzo and Labriola [18], women involved in heavy sport activities experienced fewer signs and symptoms of dysmenorrhea in comparison with women who had occasional sport practice. In a few articles, no correlation between levels of physical activity and dysmenorrhea-related symptoms was found [14,16,19]. According to Metheny and Smith [23], after adjusting for depression and mood changes, the level of discomfort due to dysmenorrhea was accompanied by intensity of physical activity. Therefore, the results obtained from their study illustrated that physical activity could lead to improvement of painful dysmenorrhea by reducing depression; however, doing physical activity did not directly effect the reduction of symptoms of dysmenorrhea. Golomb *et al.* [12] studied the effects of exercise therapy on the frequency of dysmenorrhea and premenstrual problems in high school girls for more than 3 years. Their findings showed that 39% of students in the experimental group compared with 61% of the control group experienced dysmenorrheal symptoms. The researchers did not differentiate between primary and secondary dysmenorrhea in their study protocol; it was not blind for students and could possibly increase bias probability. However, the prescribed exercises were effective in reducing menstrual symptoms and were important to perform on daily base.

Other studies have shown that dysmenorrhea was decreased in athletes who started sport activities prior to menarche. Furthermore, after initiating sport activity there has been observed improvements in the symptoms of dysmenorrhea, and that sportswoman who had participated in heavy physical activities had less symptomatic menstrual cycles [18]. Moreover, performing exercise reduced the intensity of pain, pain frequency, and the amount of analgesics medication. This had a positive association with the results of current study [1]. Perceived stress is considered to be a critical element in the relationship between exercise and treatment of dysmenorrhea. There was significant dose-response and temporal associations between perceived stress in one menstrual cycle and the incidence of dysmenorrhea in the following cycle. There are several studies that have shown considerable correlation between tensional stress in life and premenstrual symptoms [23]. The role of exercise therapy as a tool for reducing stress and biochemical changes in the immune system was considered extensively as well [13]. Physiologic mechanisms through which exercise might improve symptoms resulting from the menstrual

cycle are not clear. However, some hypotheses are being proposed for its explanation. Izzo and Labriola [18] proposed that the increase in the blood flow and metabolism of the uterus during exercise may be effective in the reduction of dysmenorrheal symptoms. In another words, 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. Consequently, it might be possible to reduce dysmenorrheal symptoms by decreased sympathetic over-activity through exercise. Another hypothesis suggests that therapeutic exercise can increase the secretion of endorphins from the brain, and these materials in turn raise the pain threshold of the body [8].

It has been suggested that therapeutic exercise is helpful for the treatment of primary dysmenorrhea through various modes such as decrease stress, attenuate menstrual symptoms through increase of local metabolism, and increase local blood flow at the pelvic level and increase of endorphin production. It is a multidimensional problem and has various aspects that are a combination of organic, psychological, and sociocultural factors that result in its symptoms. However, findings of current research illustrate that exercise may have a key role in alleviating these problems. Age was an important element in the intensity of perceiving menstrual changes. With increasing age, decreases in pain level, negative states, impaired concentration, and behavior swings have been reported [2]. The findings of this study illustrate that girls with primary dysmenorrhea report less pain than the non-exercising group, which is in accord with Aganoff *et al.* [2]. However, the results contradict the findings of Metheny and Smith [23] who reported higher levels pain and negative moods with performing regular exercise in dysmenorrheal girls.

Exercise in various forms including stretching, aerobic exercise, free exercise, or competitive athletic performance has been believed to improve or even completely resolve primary dysmenorrhea for half a century. Studies were performed to prove the presence of such a relationship; however, each one had methodological handicaps and researchers were led to contradictory results, so there is a need to do more research. In particular, blind studies are needed to eliminate the psychological effects of exercise from its physical effects. The type and level of physical activity and frequency of movement was under control for every subject in the present study. However, as the nature of this research suggests, it is not possible to control this factor entirely. It is also suggested that further research be conducted in different age groups and in different treatment regimens. Furthermore, future research should be done in such a way that take into account the measurement of psychosocial and stress variables, until findings derived from a study purely demonstrate the role and effects of stretching on primary dysmenorrhea. A certain limitation of this study is the cross-sectional nature of the research, as it does not reflect any temporal changes. Furthermore, the study was performed on a relatively small sample; therefore, generalizations of results in terms of the entire female population ought to be made with caution.

Summing up, the findings of this study suggest that there is a beneficial impact of physical exercise on menstrual cycle symptoms. Whether or not the effects of exercise could be long-term should be the subjects of further research. According to the results of this study, performing 8 weeks of selected stretching exercises reduces pain intensity, diminishes pain duration, and decreases the consumption of analgesics drugs in students with moderate-to-severe primary dysmenorrhea during the menstruation cycle.

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Received 09.07.2012
Accepted 17.12.2012

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