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How Is the Quality and Quantity of Primary Dysmenorrhea Affected by Physical Exercises? A Study Among Iranian Students

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Abstract

Objectives: This study intended to evaluate the effect of 3 exercise programs on reducing symptoms of primary dysmenorrhea among some Iranian school girls.

Materials and Methods: This randomized clinical trial study was conducted on 70 students aged 15-18 years with primary dysmenorrhea. They were randomly assigned into 4 different groups: stretch group (n = 19), massage group (n = 19), combined group (n = 21), and control group (n = 19). To evaluate the effect, the treatment was applied as 8 weeks of physical activity, 3 sessions a week, twice a day, 10 minutes for massage group, 20 minutes for stretching group and 20 minutes for combination group and without exercise for control group on primary dysmenorrhea. Moreover, to measure the intensity and severity of pain McGill's questionnaire were used.

Results: The results revealed that performing a regular physical activity led to a significant reduction in the severity of dysmenorrhea pain ($P < 0.05$), Pain Rate Index (PRI) ($P < 0.05$), visual analog scale (VAS) ($P < 0.05$), present pain intensity (PPI) and total pain according to McGill's short form questionnaire (TP) ($P < 0.05$), and volume of bleeding ($P < 0.05$) in the 3 groups.

Conclusion: The results of this study indicated that lifestyle modifications including some physical activities would decrease the quality and quantity of pain in primary dysmenorrhea such as duration and intensity of pain.

Keywords: Physical activity, Massage, Stretching, Primary dysmenorrhea

Introduction

Identified as painful cramps happening during menstruation, dysmenorrhea is defined as the most common gynecologic problem in women in different age groups and races and as the most common cyclic pain (1,2).

In the absence of any specific pelvic disease, primary dysmenorrhea is one of the most frequent complaints of women which starts with the young girls' first experience of the ovulatory cycles (3). There is a wide range of the prevalence of dysmenorrhea (16.8% to 81%) in different societies (1,2). Its prevalence increases with the rise of the age during adolescence (15-17 years) and extends to its highest level in 20-24 years, then it gradually lowers steadily (4,5). The prevalence of dysmenorrhea has been reported as 74%-84% (6) in Iran.

It is assumed that symptoms of primary dysmenorrhea is caused by the elevated concentration of prostaglandin F2 (PGF2) leading to uterine contractions, and ischemia (7). There are many risk factors related to the dysmenorrhea including heavy menstrual loss, premenstrual symptoms, irregular menstrual cycles, age under 30 years, probable pelvic pain disease, menarche before 12 years, low body mass index (BMI), and sterilization (2). Family history may help distinguish primary from secondary dysmenorrhea. Dysmenorrhea may bring about physiological and mental problems in some women and reduce their active participation in the society (8). It negatively affects patient's quality of life (2) and it is a risk factor for fibromyalgia (9). Data from few longitudinal studies showed that the rate of primary dysmenorrhea-related absence at school is 34%-50% (10,11).

The diagnosis of primary dysmenorrhea is based on clinical history and physical examination (2). There is a range of treatments for primary dysmenorrhea, each having some advantages and disadvantages (12). Some medical and non-medical treatments are useful and effective in controlling dysmenorrhea. Some of them inhibit prostaglandin and reduce stress level. They include nonsteroidal anti-inflammatory drugs (NSAID) and hormonal contraceptives (2). However, dysmenorrhea and individuals' various responses to the different treatment methods including pharmacologic therapy, skin electrical stimulation, using topical heat, surgery, and various vitamins and minerals have been suggested in this regard (13).

A number of theories exist regarding the regular activity which can be a method of choice for dysmenorrhea

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treatment by decreasing different stress (14,15) and lowering the activity of sympathetic system (16). Different studies have shown controversial results about the effects of different physical movements on dysmenorrhea (2,17). In some studies, physical activity proved to help venous return through muscle contraction which in turn leads to an increase in the production of prostaglandins and the substances. Moreover, findings prevent their collection in the pelvis but it is important that an average level of practice and regular exercise can be effective on menstruation (16,18-20). Exercise affects the level of steroid hormones in blood circulation of the women in reproducing age (21,22). Exercise can also be a supplementary medical component reducing pain intensity, pain duration, and medication dose (21,22). Stretch and aerobic exercises are specific kinds of workouts which have positive effects on primary dysmenorrhea in some, but not all studies (1,14,15).

Given the limited evidence about the effect of stretch and massage and combination of both on preventing and treatment of primary dysmenorrhea, this study was designed to investigate the effects of these treatments on some Iranian school girls.

Materials and Methods

This study was a double blind randomized clinical trial conducted during 2014-2015. The research population consisted of female students aged 15-18 years in Atot and Fagher schools in 14th district of Tehran. The present study recruited 100 students with primary dysmenorrhea using convenient sampling procedure prescribed by an internist. Fifteen students declined to participate because they could not attend sport center and some of them did not have regular menstrual cycle. In the next step, 85 girls were allocated to the intervention. Afterwards, all selected participants were randomly assigned into a control, a massage, a stretch, and a combined group using a randomized number chart (23). The allocation sequence was concealed and it was generated using a table of random numbers. It was also blinded for the statistician and clinical evaluators.

The participants' selection process was carried out in each group by an independent trained researcher. After obtaining ethical approval from Ethics Committee of Islamic Azad University, research method was explained for participants and the written informed consents were obtained from them.

Inclusion criteria of the study participation was: being single within the age range of 15-18 years; no history of musculoskeletal disease, chronic diseases like diabetes, -hypertension, and-coronary vascular disease; not being professional athletes; no history of any medications or herbal medicine use during 3 menstrual cycles before the trial; and not suffering from any gynecology or pelvic disease such as endometriosis, fibromyoma, ovarian cyst, or other related problems.

Exclusion criteria included being absent for more than 2 sessions of exercise in the study and attending extra classes during 3 months prior to the start of the project, and having the history of secondary dysmenorrhea.

Based on the research objectives and the previous studies conducted on primary dysmenorrhea considering $\alpha = 0.05$, power of 80%, and variance of 1.5, and using the Pocock formula, 85-subject sample size (22 participants in each group of stretch and massage groups and 21 participants in combined group and 20 participants in control group) was determined for the study. Seven participants from stretch and massage, and control groups failed to attend the follow-up sessions, because they changed their schools. There were 78 participants in all 4 groups and they completed the different parts of Mc Gill's questionnaire before and after intervention (0-8 weeks).

Reliability and validity of this questionnaire were measured by Valiani et al (12) and Norbakhsh et al (14). Nonetheless, the reliability of the measures was assessed and confirmed as satisfactory in this study.

The first part of the questionnaire concerns demographic data and the second part includes questions on the type and number of drugs and quality and quantity of basic menstrual periods characteristics (pain and bleeding). The third part is used for measuring objective severity of pain of dysmenorrhea, pain rate index (PRI from 0 to 45), visual analog scale (VAS from 0 to 10) and present pain intensity (PPI from 0 to 5) and total pain according to McGill's short form questionnaire (TP from 0 to 60).

Training programs lasted for 8 weeks for all participants, 3 sessions a week, twice a day, 10 minutes for massage group, 20 minutes for stretching group, and 20 minutes for combination group (stretch and massage), and without exercise for control group. All exercises were taught to the participants by a trainer and a massager in Tehran's sports club on the first day of menstrual cycle.

In the massage group, the participants were asked to lie down in the supine position, then Effleurage massage of the upper part of symphysis pubis and umbilicus was started in a clockwise manner (each for 5 minutes). Furthermore, petrissage massage was performed with gentle and rotary strokes which were simple, soothing, and light. This process was performed in the second day of menstruation.

In the stretching exercise group, the participants performed 6 stretch manners in the abdomen, pelvis, and groin that were performed 3 days a week for 2 menstrual cycles, twice a day. The stretch consisted of 5 minutes warm up, 15-minute progressive stretch exercise specific for pelvic groin, abdomen, and hip girdle muscles then cool down. An extra 1 minute was added to the exercise every week.

In the third group, there was a combination of massage and stretch exercises. The participants performed a 20-minute practice which included all exercises, twice a day for every session. At the end of program, the

questionnaires were completed by subjects as post-test by 3 groups.

Statistical Analysis

Data were analyzed using mean and standard deviation (SD) for numerical variables and frequency (percent) for categorical variables. One-sample Kolmogorov-Smirnov test confirmed the normal distribution of numerical variables and hence parametric procedures. The baseline and demographic variables were compared among groups by one-way analysis of variance (ANOVA), Pearson correlation coefficient, and trend chi-square tests where appropriate. To assess the changes within groups, paired *t* tests and sign tests were used respectively for numerical and ordinal variables. Analysis of covariance (ANCOVA) and ordinal regressions were used to assess the effect of intervention adjusting for baseline measurements and covariates which were considered as potential confounders. All analyses were done using SPSS software version 16.0 (SPSS Inc., Chicago, IL, USA) by setting significance level on 0.05.

Results

Eighty-five (out of 100) were recruited as the participants. They were qualified for the study according to the inclusion and exclusion criteria and were divided into 4 groups. Only 78 students managed to finish the study (Figure 1).

The demographic characteristics are listed in Table 1. The mean age was 15.66 ± .82 within the age range of 15-18 years.

According to Table 2, there are no significant differences in demographic characteristics and menstrual characteristics (duration, interval, and severity) among all groups (all $P > 0.05$).

In this study, the age at the onset of menstruation in 4 groups had significant difference, the percentage of 13 years in massage group and the percentage of 12 years in control group, combination and stretch groups were higher.

Before exercise, there were no significant differences among 4 groups regarding the volume of bleeding, length of menstruation cycle, quality of menstruation, dysmenorrhea at time of onset, duration of pain, type of using drug, quality, and quantity of pain, anxiety and depression due to pain, and location of pain ($P \leq 0.005$)

When comparing the pain at time of onset before intervention, a significant difference was found among 4 groups ($P < 0.05$).

The intensity of pain in one day after bleeding in combination group was more normal than that in other groups.

The results of comparison between 4 groups in pre- and post-intervention are shown in Table 2.

In massage group, the significant decreases were observed in PPI ($P < 0.05$), VAS ($P < 0.05$), TP ($P < 0.05$), and volume of bleeding ($P < 0.05$) between before and after exercise. But in stretch group, the significant decreases

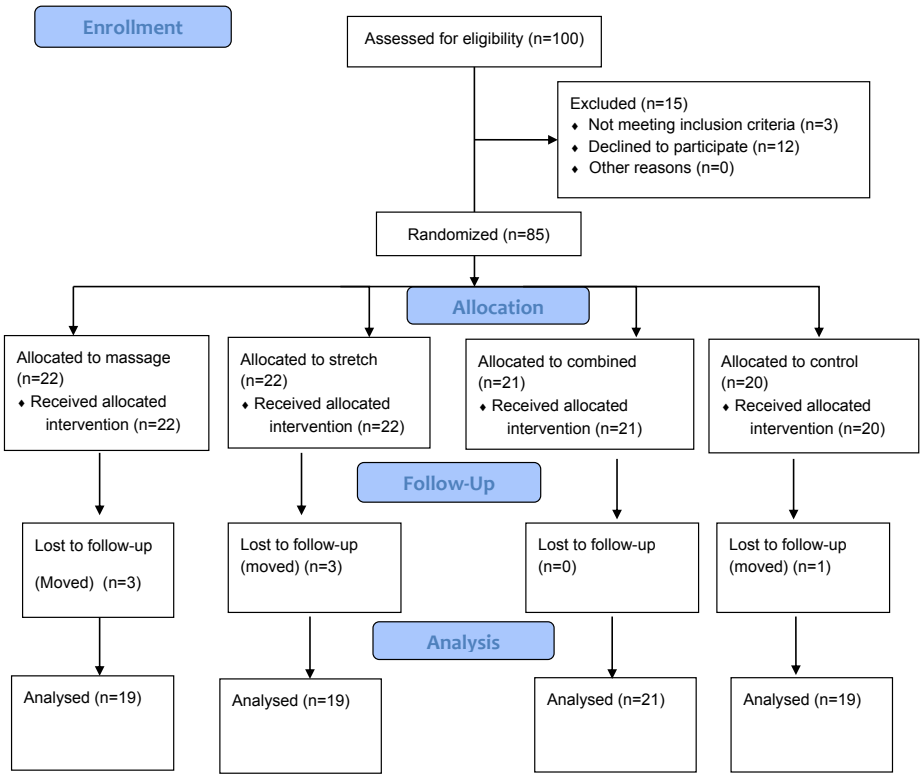

Figure 1. Flow Diagram of Participants in the Study.

Table 1. The Demographic Characteristics of Study Participants in 4 Groups

Variables	Massage	Stretch	Combined	Control	*P* value
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Age (y)	15.53 ± 0.7	15.68 ± 0.95	15.76 ± 0.83	15.54 ± 0.94	0.664
Weight (kg)	56.15 ± 9.97	54.15 ± 9.43	59.52 ± 9.99	54.15 ± 9.40	0.221
Height (cm)	162.52 ± 4.02	161.68 ± 5.26	161.91 ± 4.04	161.94 ± 5.20	0.833
Body mass index (kg/m^2)	21.20 ± 3.31	20.68 ± 3.33	22.64 ± 3.21	20.61 ± 3.30	0.154
Age at onset of menstruation (y)	12.89 ± 0.66	12.42 ± 0.61	12.24 ± 0.89	12.43 ± 0.67	0.02
Length of menstruation phase (d)	28.63 ± 3.23	23.37 ± 4.95	27.74 ± 3.26	28.37 ± 4.94	0.742
Length of menstruation cycle (d)	2.74 ± 0.65	3.21 ± 1.13	2.86 ± 0.73	2.65±0.52	0.71
Volume of bleeding (cc)	3.00 ± 1.25	2.79 ± 0.63	2.81 ± 1.29	2.70 ± 0.60	0.809
Pain rate index (0-45)	22.47 ± 10.18	24.05 ± 7.91	23.19 ± 9.66	24.53 ± 7.90	0.872
Visual analog scale (0-10)	6.47 ± 2.14	6.58 ± 2.14	5.95 ± 1.99	6.50 ± 2.10	0.596
Present pain intensity (0-5)	4.25 ± 2.69	4.00 ± 2.45	4.23 ± 2.07	7.40 ± 1.90	0.651
Total pain (0-60)	12.95 ± 8.12	14.37 ± 5.88	13.71 ± 7.17	54.10 ± 9.40	0.834

Table 2. The Summary Statistics of Study Variables Before and After Intervention

Variables		Massage (n=19)	Stretch (n=19)	Combined (n=21)	Control (n=21)
		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Weight	After Intervention	56.11 ± 9.94	54.1 ± 9.4	59.6 ± 10	54.1 ± 9.4
	Before Intervention	56.16 ± 9.97	54.2 ± 9.4	59.5 ± 9.9	54.1 ± 9.4
Body mass index	After Intervention	21.19 ± 3.36	20.6 ± 3.4	22.7 ± 3.2	20.6 ± 3.3
	Before Intervention	21.2 ± 3.31	20.7 ± 3.3	22.6 ± 3.2	20.6 ± 3.3
Length of bleeding	After Intervention	6.37 ± 1.77	6.9 ± 2.4	6.8 ± 1.3	7.4 ± 1.9
	Before Intervention	6.32 ± 1.63	7.3 ± 2.6	7 ± 1.2	7.4 ± 1.9
Length of menstruation cycle	After Intervention	28 ± 3.09	26.7 ± 4.5	27.8 ± 2.7	28.3 ± 4.9
	Before Intervention	28.63 ± 3.24	28.4 ± 4.9	27.7 ± 3.3	28.3 ± 4.9
Volume of bleeding	After Intervention	3.47 ± 1.17	3.3 ± 1.1	3.1 ± 1.5	2.7 ± 0.6
	Before Intervention	3 ± 1.25	2.8 ± 0.6	2.8 ± 1.3	2.7 ± 0.6
Visual analog scale	After Intervention	4.58 ± 2.76	4 ± 2.4	4.2 ± 2.1	6.5 ± 2.1
	Before Intervention	6.47 ± 2.14	6.6 ± 2.1	6 ± 2	6.5 ± 2.1
Pain rate index	After Intervention	14.68 ± 9.35	15.5 ± 9.5	15.2 ± 7.6	24.053 ± 7.9
	Before Intervention	22.47 ± 10.18	24.1 ± 7.9	23.2 ± 9.7	24.053 ± 7.9
Present pain intensity	After Intervention	4.53 ± 2.7	4 ± 2.4	4.2 ± 2.1	6.6 ± 2.1
	Before Intervention	6.47 ± 2.14	6.6 ± 2.1	6 ± 2	6.6 ± 2.1

were found in PPI ($P<0.05$), VAS ($P<0.05$), TP ($P<0.05$), volume of bleeding ($P<0.05$) and length of menstruation phase ($P<0.05$). This magnitude of effect was seen in combination group in PPI, VAS, and TP which decreased after having exercise.

In massage group, there was a significant difference for the location of pain after exercise ($P<0.05$). But this consequence was related to the location of pain and the number and kind of analgesic drugs. The severity of pain decreased more after intervention in all groups in comparison with the control group. In control group usage of analgesic was higher than that in other groups.

Regarding the weight of participants, there was no significant difference in all groups after the intervention.

The results of group comparisons are presented in Table 3.

Furthermore, in term of sensory pain dimension score in each group, it was demonstrated that there were significant decreases in PPI ($P<0.05$), VAS ($P<0.05$), TP ($P<0.05$) among 3 groups in comparison with the control group.

Discussion

In the present study, the application of massage and stretch programs and a combination of both produced a statistically significant improvement in evaluation of

Table 3. Within-Group Comparison of Primary Dysmenorrhea Characteristics of 3 Study Groups

Variables	Massage (n = 19)				Stretch (n = 19)				Combined (n = 21)			
	MD	95% CI		*P* Value	MD	95% CI		*P* Value	MD	95% CI		*P* Value
		Lower	Upper			Lower	Upper			Lower	Upper	
Weight	-0.05	-0.52	0.42	0.816	-0.05	-0.16	0.06	0.331	0.05	-0.13	0.22	0.576
BMI	-0.01	-0.20	0.18	0.887	-0.09	-0.21	0.03	0.144	0.02	-0.05	0.08	0.619
Pain intensity	-1.95	-2.51	-1.38	<0.001[a]	-2.58	-3.43	-1.72	<0.001[a]	-1.76	-2.32	-1.21	<0.001[a]
Length of menstruation cycle (days, mean ± SD)	0.05	-0.49	0.60	0.841	-0.42	-0.96	0.12	0.119	-0.24	-0.52	0.05	0.096
Length of menstruation phase (days, mean ± SD)	-0.63	-2.06	0.80	0.366	-1.63	-2.96	-0.30	0.019[a]	0.05	-0.94	1.04	0.921
Volume of bleeding	0.47	0.10	0.85	0.016[a]	0.53	0.03	1.02	0.037[a]	0.29	-0.38	0.95	0.379
Visual analog scale	-1.89	-2.49	-1.30	<0.001[a]	-2.58	-3.43	-1.72	<0.001[a]	-1.71	-2.19	-1.23	<0.001[a]
Total pain score	-7.79	-10.30	-5.28	<0.001[a]	-8.53	-12.67	-4.39	<0.001[a]	-7.95	-10.63	-5.28	<0.001[a]

[a] Significant.

primary dysmenorrhea symptoms.

According to the obtained results, intensity and duration of menstrual pain by using PPI, VAS, TP in all 3 groups had a significant difference before and after having exercise and in comparison with the control group.

There are scientific findings proving that an increase of prostaglandins released from endometrium occurs in menstrual phase which is responsible for the dysmenorrhea. A number of hypotheses emphasize the effect of exercise on decreasing dysmenorrhea or relieving menstrual pain. For the first time, Mosler in 1914 explained that exercise can relieve pelvic contraction by shunting uterine blood flow (24).

Other mechanisms for explaining exercise effect on dysmenorrhea are the release of endogenous opiates, the use of vasodilators, suppressing prostaglandins, decreasing stress and increasing mood (25,26).

It is acknowledged that stress affects the immune system. However, by exercising, individuals can alleviate stress- related dysmenorrhea (27).

Based on these findings, this study was designed to compare the effect of massage therapy and doing stretching exercise on primary dysmenorrhea among school girls. While the severity of dysmenorrhea is related to many biological factors, two of them are menarche age and duration of menstruation. Early menarche and increase in menstruation flow reinforced the severity of dysmenorrhea (10,28).

In this study, the mean age at menarche was within the range of 11-14 years, that is similar to the studies of Ou et al (29), Norbakhsh et al (14), Azima et al (1), and Kannan et al (24). Moreover, the results revealed that the quality and quantity of menstrual pain had significant differences after exercise in 3 groups compared to its earlier level before intervention. The severity of dysmenorrhea decreased by reducing the duration and the volume of bleeding. This evidence is in line with the study of Abbaspour et al (18).

Furthermore, VAR, PPI and TP was reduced which is in line with the study of Azima et al and Norbakhsh et al (1,14).

The current findings also showed that the length of menstrual cycle in stretch group decreased significantly compared with other 2 groups.

Furthermore, the results of Norbakhsh et al study on the effect of physical activity on primary dysmenorrhea of female university students revealed a more significant reduction in the intensity and duration of pain in the exercise group compared to the control group and before and after findings of the experimental group (14). The results of the current study were also in agreement with those of the above-mentioned studies, especially a systematic review performed by Kannan and Claydon showed the statistically significant reduction in pain severity due to several physiotherapy interventions such as using heat, transcutaneous electrical nerve stimulation, and yoga (30).

Since there was a drop in menstrual pain level, we found that the volume of bleeding decreased significantly in the massage and stretch groups which might be related to the hormonal change and balance (25,29). The evidence for supporting this finding was shown in the study of Norbakhsh et al (14); however, Shavandi et al in this study did not find a change in the volume of bleeding (31).

The findings of the current study also showed that the type and number of drugs consumed by the combination group decreased after intervention; a piece of findings which is similar to that of Norbakhsh et al, Shavandi et al and Daley studies (14,25,31).

Furthermore, it was found some reductions in the intensity of dysmenorrhea pain in 3 groups after the intervention. They were obtained from McGill questionnaire based on PRI and VAS for assessing the future and PPI. Several studies verified these evidence (1,14,32-34). There are 3 lines to the control of primary dysmenorrhea including pharmacological, non-pharmacological, and surgical lines (5).

Many different studies have investigated different complementary medicine methods. The study of Valiani et al showed that the intensity and duration of menstrual pain using VAS and PRI significantly decreased. In a similar vein, Ortiz et al evaluated the effect of a physiotherapy program on women with primary dysmenorrhea. In that study, stretch and muscle relaxation techniques were proved to be effective in reducing dysmenorrhea symptoms and the VAS decreased in physiotherapy group in third menstrual cycle (12,35). Furthermore, some research indicated the effect of acupuncture in the treatment of dysmenorrhea when there was contraindication for using NSAID or oral contraceptive (33-36).

The current study suffers from a number of limitations; one of them is that we did not evaluate dieting behaviour and habitual eating routines because nutrition deficiency was considered as one of the main factors that induce hypothalamic-pituitary ovarian dysfunction (37). The second limitation was the lack of any radiological exam such as colour Doppler ultrasound for evaluating uterine blood flow. Uterine blood flow in dysmenorrhea reduced and myometrial ischemia occurred (5). The third limitation was the small sample size. Further studies with larger sample size, and control over uterine blood flow by using technical radiologic exam and more monitoring on participants' diet are strongly suggested

Conclusion

The results of this study demonstrated that exercises such as massage and stretch and combination of both would reduce the quality and quantity of pain in primary dysmenorrhea including the duration and intensity of pain. These methods are inexpensive, easy to perform and time- saving and have no side effects.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

The Ethics Committee of Islamic Azad University approved the study (No. 0061) .

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