



Comparison of the Effect of Stretching Exercises and Combination of Massage - Stretching Exercises on Primary Dysmenorrhea of Female Students of Razi University of Kermanshah

Akram Ahmadi Barati ¹, Leila Farhadi ² and Mozhgan Khalily ^{3,*}

¹Department of Physical Education and Sport Science, University of Tehran, Tehran, Iran

²Department of Physical Education and Sport Science, University of Kordistan, Sanandaj, Iran

³Department of Nursing and Midwifery, University of Kermanshah, Kermanshah, Iran

*Corresponding author: Faculty Member of Midwifery Department, Nursing and Midwifery School, Kermanshah, Iran. Email: khalili267@yahoo.com

Received 2020 March 01; Revised 2020 June 11; Accepted 2020 June 13.

Abstract

Background: Primary dysmenorrhea is chronic pain during menstruation without the presence of a pelvic pathologic complication.

Objectives: The aim this research was comparison of the effect of stretching exercises and combination of massage - stretching exercises on primary dysmenorrhea of female students of Razi University of Kermanshah.

Methods: This semi-experimental study was statistical population all female students of Razi University of Kermanshah. 90 students were selected through purposive and convenient sampling method. After obtaining consent and justification of the subjects from the research stages, they were randomly divided into three groups of 30 to practice the protocol. The research instrument consisted of two primary dysmenorrhea and McGill pain questionnaires as well as stretching exercise and massage protocol. The validity of the questionnaires was obtained formally using Cronbach's test. Exercise program for groups was performed in 8 sessions for 3 weeks. Data were analyzed by dependent t-test, one-way ANOVA and Kolmogorov-Smirnov test, to check the normality of the data distribution.

Results: The results showed that there were significant differences between the three methods of exercise (stretching, massage and massage- stretching movements) on pain severity ($P = 0.938$), duration of pain ($P = 0.095$) and the nature of pain ($P = 0.664$) There was no significant difference.

Conclusions: According to the results of the present study, massage and stretching exercise and massage-stretching combinations are almost as effective and effective as noninvasive methods in reducing the symptoms of sensory pain caused by primary dysmenorrhea. Assistance to girls with dysmenorrhea Selection and application of one of these methods will depend on the individual's abilities and circumstances.

Keywords: Stretching Exercises, Massage, Dysmenorrhea, Primary Dysmenorrhea

1. Background

The word dysmenorrhea is derived from the Greek word for "dysmenorrhea" which means hard, difficult and abnormal, meno means moon, and rhea means flow, and generally means monthly hard flow, to describe the problem of bleeding menstruation is used (1). Menstruation is one of the most important stages in the development of women which is sometimes considered to be puberty, but in principle it is one of the stages of puberty and is in the midst of this enormous process. Girls who have received enough information about this phenomenon find it to be one of the prominent stages of adolescence and can easily accept it (2). Dysmenorrhea means painful uter-

ine contractions during menstruation (3) and is usually cramp in nature and is clinically divided into two major primary and secondary groups. Primary dysmenorrhea is called painful menstruation in the absence of pelvic disease. Usually the pain starts with the onset of menstruation and can last 24 to 48 hours. Research shows that dysmenorrhea alone is a major cause of absenteeism and loss of working hours, resulting in approximately 600 million hours of work lost annually due to dysmenorrhea in the United States (4). In Iran, more than 70 percent of girls develop this pain (5). Dysmenorrhea is associated with pain due to muscle spasms in the lower abdomen, which may spread to the waist along the thighs. This pain can be ac-

accompanied by symptoms such as nausea, vomiting, diarrhea, headache, dizziness, fatigue, painful breasts, weakness, intestinal and gastrointestinal symptoms and in severe cases syncope. These symptoms may occur two days or more before menstruation begins and may continue for up to three days after the bleeding begins (6). There are various theories regarding the mechanism of dysmenorrhea, but according to one theory, chemical intermediates derived from arachidonic acid metabolism are involved in the pathogenesis by releasing fatty acids and especially acidic fatty acids by interrupting progesterone secretion before the monthly period. Prostaglandins and leukotrienes are uterine cells. The inflammatory response caused by these factors causes cramps and systemic symptoms such as nausea, vomiting, bloating, and headaches, as well as uterine symptoms such as ischemia and severe pain from stenosis (7, 8). These symptoms are commonly referred to as dysmenorrhea. Usually, the easiest way to treat and treat these periodic problems is to take non-steroidal anti-inflammatory drugs that reduce the synthesis of the cyclooxygenase pathway, reducing prostaglandin synthesis and thromboxane. Ibuprofen is one of the most commonly used NSAIDs (9, 10). The use of prostaglandin inhibitors, birth control pills, calcium channel blockers, and skin irritation are common treatments that are often expensive and time-consuming and sometimes lead to drug side effects. Even some people refuse to do so (11). Women may experience abdominal pain as they begin menstruation or a few days earlier, mainly due to contractions within the body's muscles and spasms that enter the uterus and its muscles during this period. These contractions, which most women experience once a month, cause circulatory disturbances in the uterus and thus make the menstrual cycle painful and stressful for women. Many women experience painful menstruation even after marriage and during pregnancy, and this is sometimes repeated throughout the year (12). According to a study by Hernandez and colleagues in 2000, one of the best ways to prevent and prevent menstrual cramps is to enjoy a massage that is generally focused on the function of the uterus and its associated muscles and the circulatory flow in the area (13). Massage is used as one of the therapeutic methods in many chronic cases and clinical problems (14). Massage has been defined as a systematic form of touching the soft tissues of the body by the hands for therapeutic purposes such as relieving pain, increasing the comfort and comfort of patients. It is generally thought that exercise therapy can alleviate the discomfort associated with dysmenorrhea. Scientific papers provide different information (15), and the results of various studies have shown that exercise intensity has decreased symptoms (16). Phys-

ical activity and exercise as a non-medication have found a special therapeutic status. However, some studies have not reported a relationship between menstrual pain and primary dysmenorrhea with exercise level. There is some evidence that factors such as stretching and mental relaxation are effective (17).

Various studies emphasize that regular exercise, including abdominal, hip and groin stretching exercises, has positive effects on menstrual syndrome, and the more the positive effects of exercise, the greater the increase (18). Exercise reduces renin levels and increases estrogen and progesterone, aldosterone levels decrease, thereby reducing and improving physical symptoms reduces shortness (19). Daly (2008) and Brown et al. (2017) based on some empirical evidence stated that regular participation in exercise reduces primary dysmenorrhea and related symptoms (20, 21) but according to the study of Blake et al. 2010) No association was found between participation in exercise and primary dysmenorrhea (22). Given the prevalence of dysmenorrhea and its effects on the quality of individual and social life and the general acceptance of complementary and non-toxic therapies, which can replace pharmacological methods and find the best way to control pain and avoid any side effects, the question is whether there is a difference between the effect of stretching and massage and the combination of massage-stretching on primary dissemination of female students of Kermanshah University of Medical Sciences?

Now, considering the possible effects of stretching and massage training on dysmenorrhea and on the other hand, the specific nature of the researcher's intended exercises, it is important to study the effect of these exercises on dysmenorrhea and its specific manifestations. Therefore, due to the adverse effects of dysmenorrhea on the function of women, especially young girls, the numerous physical, psychological and social problems they cause, as well as the possibility of inappropriate, ineffective and occasional treatment with adverse effects, the present study may be applicable and Girls and women can also benefit from these benefits, so considering the importance of this issue, it seems necessary to investigate these disorders among students who have a major role in advancing the scientific and health goals of the community.

2. Objectives

The aim of this study was to compare the effect of combination of stretching and massage on primary dissemination of female students in Razi University of Kermanshah.

3. Methods

The present study is a semi experimental. The study population consisted of female students of Razi University of Kermanshah. Ninety 90 students who were eligible for inclusion in the study were voluntarily selected after completing their informed consent form.

The research tool was a researcher-made questionnaire for primary dysmenorrhea and the revised McGill pain questionnaire. Primary Dysmenorrhea researcher-made questionnaire included demographic characteristics, questions such as the nature of pain, pain location, duration of pain, time of onset of pain, history of menstrual pain in mother, history of menstrual pain in sister. Content validity was used by experts, physicians, health care workers, and professors to assess the content of the instrument and the purpose of the study. To determine the reliability of the questionnaire, the Alpha-Cronbach test was used, which was confirmed with a 0.72 index (23). Also, the results of exploratory and confirmatory factor analysis of the revised McGill Pain Questionnaire indicated that there were four subscales of continuous pain, varied pain, neuropathic pain and affective pain that the Cronbach's alpha coefficients were 0.87, 0.87, 0.83 and 0.86, respectively was (24).

After selecting the subjects and performing the initial tests, the exercise program consisted of (including 6 stretching exercises of abdominal, pelvic and groin) and Swedish massage and combination of massage and stretching exercises, respectively, regularly for 8 weeks, 3 sessions per week, and each session took about 15 minutes to complete (25).

Descriptive and inferential statistics were used for data analysis. Descriptive statistics, mean, standard deviation, and inferential statistics were used to compare the mean of three groups of massage, stretching exercises and massage-stretching group before and after the intervention and pre- and post-test by t-test Paired and one-way ANOVA with alpha level less than 0.05 was used to compare between exercises. It should be noted that Kolmogorov-Smirnov test was used to show the normal distribution of data at each factor level. SPSS software was used for statistical analysis.

4. Results

For analyze the results and test the hypotheses in this study, dependent t-test and one-way ANOVA were used and Kolmogorov-Smirnov test were used to check the normality of the data (Table 1).

According to the results of Kolmogorov distribution of scores for all three groups (massage, combination and

stretching) in pain intensity variables, pain duration had normal distribution. However, the nature of the pain was non-normal for all three groups, so nonparametric tests should be used to determine the efficacy of the independent variable and to examine intra- and inter-group differences.

First hypothesis: There is a significant difference between the effect of stretching, massage and massage-stretching combination on the intensity of primary dissemination pain before and after the intervention in the stretching group.

The results of Table 2 show that pain intensity in the stretching, massage and massage-stretching group before and after the exercise was significant, indicating a significant effect of these exercises on the severity of primary dysmenorrhea.

Second hypothesis: There is a significant difference between the effects of stretching, massage and massage-stretching combination on the severity of primary dissemination pain before and after the intervention in the 3 groups.

The results of Table 3 showed that there was no significant difference in pain severity between the three groups before and after the intervention, indicating a significant effect of all three exercises on the severity of primary dysmenorrhea.

Third hypothesis: There is a significant difference between the effect of stretching, massage and massage-stretching combination on the duration of primary dissemination pain before and after the intervention in the stretching group.

As Table 4 shows, the duration of pain in the stretching group before and after the exercise was not significant, indicating no significant effect of stretching exercises on the duration of primary dysmenorrhea. That is, tensile training did not have a significant effect on decreasing the duration of primary dysmenorrhea. Pain duration in massage and massage-stretching combination was significant, indicating a significant effect of these exercises on the duration of primary dysmenorrhea. That is, these exercises had a significant effect on decreasing the duration of primary dysmenorrhea.

Fourth hypothesis: There is a significant difference between the effect of stretching exercises, massage and massage-stretching combination on the duration of primary dissemination pain before and after the intervention in the 3 groups.

Table 5 shows that there was no significant difference in pain duration between the three groups before and after the intervention, which indicates a significant effect of all three exercises on the duration of primary dysmenorrhea

Table 1. Significance Level of Kolmogorov-Smirnov Test (K-S)

Variables	Massage Group		Stretching Group		Combined Practice Group	
	Mean \pm SD	P Value	Mean \pm SD	P Value	Mean \pm SD	P Value
Severity of McGill pain (pre-test)	71.86 \pm 42.10	0.281	71.43 \pm 40.33	0.156	75.70 \pm 39.40	0.052
Severity of McGill pain (post-test)	55.76 \pm 37.16	0.269	54.20 \pm 35.52	0.282	52.60 \pm 29.82	0.086
Duration of pain (pre-test)	2.67 \pm 1.24	0.163	2.63 \pm 1.27	0.099	2.73 \pm 1.38	0.175
Duration of pain (post-test)	2.37 \pm 1.09	0.082	2.50 \pm 1.10	0.22	2.03 \pm 0.928	0.051
The nature of pain (pre-test)	1.23 \pm 0.430	0.00	1.30 \pm 0.466	0.00	1.37 \pm 0.490	0.00
The nature of pain (post-test)	1.83 \pm 0.379	0.00	1.90 \pm 0.481	0.00	1.93 \pm 0.365	0.00

Table 2. Paired T-Test Before and After the Intervention

	Mean \pm SD	T	Df	P Value
Stretching training group	17.23 \pm 6.07	15.53	29	0.00
Massage group	16.10 \pm 10.22	8.62	29	0.00
Combined practice group	23.10 \pm 15.36	8.23	29	0.00

Table 3. ANOVA Comparison of Three Training Methods

	Sum of Squares	Df	The Mean Square	F	P Value
Before intervention				0.100	0.905
Intragroup	867.33	2	433.16		
Intergruop	133.14	87	749.16		
After intervention				0.064	0.938
Intragroup	422.15	2	211.75		
Intergruop	367.10	87	556.11		

Table 4. Dependent T-Test for Pain Duration Before and After the Intervention

	Mean \pm SD	T	Df	P Value
Stretching training group	0.133 \pm 1.59	0.459	29	0.650
Massage group	0.433 \pm 1.04	2.282	29	0.030
Combined practice group	0.833 \pm 1.57	2.893	29	0.007

Table 5. ANOVA Test Comparison of Three Training Methods

	Sum of Squares	Df	The Mean Square	F	P Value
Before intervention				0.046	0.559
Intragroup	0.156	2	0.078		
Intergruop	14.500	87	1.695		
After intervention				2.417	0.095
Intragroup	5.422	2	2.711		
Intergruop	97.567	87	2.417		

does not exist.

Fifth hypothesis: There is a significant difference between the effect of stretching exercises, massage and massage-stretching combination on the nature of primary dysmenorrhea before and after the intervention in the stretching group.

Table 6. McNemar Test of the Nature of Pain Before and After the Intervention

	Number	Exact Sig. (2-tailed)
Stretching training group	30	0.00
Massage group	30	0.00
Combined practice group	30	0.00

Table 6 showed that the nature of pain in the stretching, massage and massage-stretching group was significant, indicating a significant effect of these exercises on the nature of primary dysmenorrhea. That is, these exercises had a significant effect on reducing the nature of primary dysmenorrhea.

Sixth hypothesis: There is a significant difference between the effect of stretching exercises, massage and massage-stretching combination on the nature of primary dysmenorrhea before and after the intervention in the 3 groups (Table 7).

Table 7. Nature of Pain Before and After Intervention in 3 Groups

	Number	Mean
The nature of pain (pretest)		
Massage	30	50.42
Stretching exercises	30	50.45
Massage combination - stretching exercises	30	50.48
The nature of pain(posttest)		
Massage	30	50.43
Stretching exercises	30	50.46
Massage combination - stretching exercises	30	50.46

Table 8. Comparison of The Effect of Stretching, Massage and Massage-Stretching Exercises on the Nature of Pain

	The Nature of Pain (Pre-test)	The Nature of Pain (Post-test)
Chi-square	1.256	0.819
Df	2	2
P value	0.534	0.664

As Table 8 shows, there was no significant difference in the nature of pain between the three groups before and after the intervention, indicating a significant effect of all

three exercises on the nature of primary dysmenorrhea. On the other hand, there was a significant difference between the three exercise methods in the nature of pain there is no.

5. Discussion

There was a significant difference between the effect of stretching exercises, massage effect and also the effect of massage-stretching combination on the severity of primary dissemination pain before and after the intervention. On the other hand, according to the results of the second hypothesis, there was no significant difference between the effects of stretching exercises and massage-stretching combination on the severity of primary dissemination pain before and after the intervention in the three groups.

The results of this study showed that 8 weeks of stretching exercises, massage individually and massage-stretching combination had a significant effect on decreasing the pain intensity of primary dysmenorrhea in girls. One of the mechanisms of menstrual pain is severe pelvic muscle contraction when blood is drawn out of the uterus. Pain occurs when the muscular wall of the uterus shrinks. Painful and mild contractions persist in the uterus, but for most women, the pain is so mild that they do not feel the pain. During menstruation, the lining of the uterus is strongly contracted to separate the inner lining of the uterine cavity (endometrium) and menstrual bleeding occurs. As the muscles of the uterine wall contract, the blood vessels of the inner layer of the endometrial uterus are pressurized; this temporarily results in a severe decrease in blood supply and oxygenation to the uterus (26).

Lack of oxygen leads to the release of chemicals in the body and eventually causes pain. When the pain-causing chemicals are released into the body, another chemical called prostaglandin is released into the body, which causes the prostaglandin itself to cause more severe uterine contractions and ultimately more pain. One of the mechanisms of pain during menstruation is the severe contraction of the pelvic muscles when blood is released from the uterus (27).

During stretching, flexibility and elasticity of the abdominal and pelvic muscles are increased and severe cramps and contractions are reduced and pain is reduced (28). Studies have shown that with increased flexibility of the abdominal and pelvic muscles, spasm and muscle contraction are reduced and as a result, pain is reduced (28), therefore, given the tensile nature that focuses on muscle elasticity and flexibility, Exercises have been able to reduce the severity of menstrual pain, the results of which are

consistent with those of Salehi et al. (2012); Abbaspour et al. (2006); Shahrekordi Studies, Maslaj-Nejad et al. (2007); Blake et al. (2010). Daly (2008) and Brown et al. (2010), Chandler et al. (2009) agree (19, 20, 22, 29-33), and disagree with Label (1990) and Harlow (1996) (7, 34).

To justify the mean reduction in pain intensity before and after the massage and tensile exercise, the effect of massage-tensile exercise in the three groups was apparently due to the significant decrease in pain intensity. Stretching has been equally effective in reducing pain intensity. Therefore, according to the results of the present study, massage and stretching exercise as well as the effect of massage-stretching combination as non-invasive methods are almost equally effective and effective in reducing the symptoms of sensory pain caused by primary disseminator. Helping girls with dysmenorrhea Select and apply one of these methods will depend on the individual's circumstances and circumstances.

Sometimes some of the pain is due to anxiety, so it may be possible to reassure the patient that these symptoms are periodic (especially with the daily registration of symptoms) and that they are caused by hormonal changes, which can cause anxiety and thus the severity of their pain decrease (35). It is also likely that the decrease in psychological symptoms caused by massage is that massage reduces the symptoms of the syndrome, which reduces stress hormone levels, cortisol, and reduces symptoms such as depression and anxiety, resulting in relaxation and thus reduced pain.

It is worth noting that in explaining no significant difference in pain severity symptoms between the three methods of stretching, massage, as well as the combination of massage-stretching, the researcher failed to find a clear and precise cause for this issue and where this difference did not arise. Further studies are recommended to be considered in future research.

According to the third hypothesis, there is no significant difference between the effect of stretching exercises on the duration of primary dissemination pain before and after the intervention in the stretching group, but between the effect of massage and also the effect of massage-stretching combination on the duration of primary dissemination pain before and after intervention. Intervention There was a significant difference in the stretching group. On the other hand, according to the results of the fourth hypothesis, there was no significant difference between the effect of stretching exercises and massage-stretching combination on the duration of primary dissemination pain before and after the intervention in the three groups.

Unlike other sports for the long haul, he showed that

the traits involved with blood flow, the proliferator involved, were involved. On the other hand, it can be directed to stress cells, blood circulation, endotracheal intubation and transduction of eyes and kidneys (36). Exercise at the time of pain; the transfer of most waste and processors, which may cause pain to be sustained from the abdomen and pain to the kidney (38%). Cats have shown that they are more likely to be affected by cancer and by increasing their pain and inflammation, and by reducing pain (37). The results of the present study showed that there is no significant relationship between stretching exercises on the duration of pain in girls with primary dysmenorrhea and the results of this study with Shahrekordi and Sheikh Hosseini (2009) (8 weeks training). Salehi et al. (139) (Impact of a Pilates Exercise Course), Chandler et al. (2009) (19, 30, 33);

Researchers have not yet observed the same study, in addition to the limitations of the present study, there can be no definitive and precise reason to justify a significant difference between the groups of stretching, massage and massage-stretching groups.

There was a significant and negative relationship between the uses of massage on pain duration, meaning that the duration of pain massage decreased.

According to the fifth hypothesis, there is a significant difference between the effect of stretching exercises, massage and also the effect of massage-stretching combination on the nature of primary dysmenorrhea pain before and after the intervention in the stretching group. On the other hand, according to the results of the sixth hypothesis, there was no significant difference between the effect of stretching exercises and the combination of massage-stretching exercises on the nature of primary disseminated pain before and after the intervention in the three groups. The results of this study are in line with the research of Ghaedi et al. (2010), Kim (2004), Hernandez et al. (2000) (13, 38, 39).

According to the results of this study, there was a significant difference between the effect of stretching, massage and also the effect of massage-stretching combination on the nature of primary disseminated pain before and after the intervention in the stretching group. Significantly reduces symptoms of the nature of pain although the mechanism of this effect has not yet been elucidated, uterine contractions appear to be responsible for the development of painful menstrual cramps (40). It has on the uterine muscles as it ruptures Dan muscle tension and break the vicious cycle of stress and pain, pain in the reduced (41).

5.1. Conclusions

Finally, by summing up the results of the present study, there was no significant difference between the physi-

cal symptoms of severity, duration and nature of pain in all three groups of stretching, massage and massage-stretching combination. Symptoms among the three groups were that subjects received out-of-control information and training due to the researcher's subsequent awareness of the syndrome, the likelihood of individuals becoming sensitive to the syndrome. So this case probably caused a significant difference and a significant difference in performance. The experimental group relative to each other is not established.

Other possible causes for the lack of significant differences in physical symptoms between the groups of stretching exercises, massage, as well as the combination of massage - stretching movements, interactions associated with chemical constituents and neurotransmitters by endocrine glands in the body. It is secreted, as well as the physiological changes that occur as a result of the three methods mentioned in the body and are similar in all three ways (42).

Therefore, given the results of the present study, massage and stretching exercise, as well as their combination as noninvasive methods, were nearly equally effective in reducing the symptoms of primary dysmenorrhea. Dysmenorrhea can be equally effective in the treatment of symptoms associated with primary dissemination, and the use of one of the above methods can be equally effective and depends on the individual's facilities and conditions.

Acknowledgments

In this respect, the researchers would like to express their gratitude and appreciation to the dear students who participated in this study for their hard work and cooperation. This research is based on the project of Kermanshah University of Medical Sciences.

Footnotes

Authors' Contribution: All authors made substantial contributions to conception and design; Akram Ahmadi Barati and Mozghan khalily made contributions to acquisition of data, analysis, and interpretation of data; with Akram Ahmadi Barati making a substantial contribution in participating in drafting the article; and Akram Ahmadi Barati and Leila Farhadi making a contribution to revising it. All authors give final approval of the version to be submitted and also any revised version.

Clinical Trial Registration Code: IR.UT.SPORT.REC 1398.

Conflict of Interests: There is no conflict of interests.

Ethical Approval: This research was conducted under the supervision of the Ethics Committee of the University of Tehran.

Funding/Support: This study was conducted with the personal funds.

References

- Lin JA, Wong CS, Lee MS, Ko SC, Chan SM, Chen JJ, et al. Successful treatment of primary dysmenorrhea by collateral meridian acupuncture therapy. *J Manipulative Physiol Ther.* 2010;**33**(1):70-5. doi: [10.1016/j.jmpt.2009.11.003](https://doi.org/10.1016/j.jmpt.2009.11.003). [PubMed: [20114103](https://pubmed.ncbi.nlm.nih.gov/20114103/)].
- Abbaspour Z, Rostami M, Najjar S. [The effect of exercise on primary dysmenorrhea]. *J Res Health Sci.* 2006;**6**(1):26-31. Persian.
- Bakhshani NM, Mousavi MN, Khodabandeh G. [Prevalence and severity of premenstrual symptoms among Iranian female university students]. *J Pak Med Assoc.* 2009;**59**(4):205-8. Persian. [PubMed: [19402278](https://pubmed.ncbi.nlm.nih.gov/19402278/)].
- Dmitrovic R, Peter B, Cvitkovic-Kuzmic A, Strelec M, Keresi T. Severity of symptoms in primary dysmenorrhea: A doppler study. *Eur J Obstet Gynecol Reprod Biol.* 2003;**107**(2):191-4. doi: [10.1016/S0301-2115\(02\)00372-X](https://doi.org/10.1016/S0301-2115(02)00372-X).
- Zaafane F, Faleh R, Melki W, Sakouhi M, Gaha L. [An overview of premenstrual syndrome]. *J Gynecol Obstet Biol Reprod (Paris).* 2007;**36**(7):642-52. doi: [10.1016/j.jgyn.2007.01.007](https://doi.org/10.1016/j.jgyn.2007.01.007). [PubMed: [17321695](https://pubmed.ncbi.nlm.nih.gov/17321695/)].
- Marsden JS, Strickland CD, Clements TL. Guaifenesin as a treatment for primary dysmenorrhea. *J Am Board Fam Pract.* 2004;**17**(4):240-6. doi: [10.3122/jabfm.17.4.240](https://doi.org/10.3122/jabfm.17.4.240). [PubMed: [15243011](https://pubmed.ncbi.nlm.nih.gov/15243011/)].
- Harlow SD, Park M. A longitudinal study of risk factors for the occurrence, duration and severity of menstrual cramps in a cohort of college women. *Br J Obstet Gynaecol.* 1996;**103**(11):1134-42. doi: [10.1111/j.1471-0528.1996.tb09597.x](https://doi.org/10.1111/j.1471-0528.1996.tb09597.x). [PubMed: [8917003](https://pubmed.ncbi.nlm.nih.gov/8917003/)].
- Mannix LK, Martin VT, Cady RK, Diamond ML, Lener SE, White JD, et al. Combination treatment for menstrual migraine and dysmenorrhea using sumatriptan-naproxen: two randomized controlled trials. *Obstet Gynecol.* 2009;**114**(1):106-13. doi: [10.1097/AOG.0b013e3181a98e4d](https://doi.org/10.1097/AOG.0b013e3181a98e4d). [PubMed: [19546766](https://pubmed.ncbi.nlm.nih.gov/19546766/)].
- Schaeffer AJ. Dysmenorrheal repaired from Australian family physician. *J Pediatr.* 2005;**35**:2741-8.
- Batlouni M. [Nonsteroidal anti-inflammatory drugs: cardiovascular, cerebrovascular and renal effects]. *Arq Bras Cardiol.* 2010;**94**(4):556-63. doi: [10.1590/S0066-782X2010000400019](https://doi.org/10.1590/S0066-782X2010000400019). [PubMed: [20498929](https://pubmed.ncbi.nlm.nih.gov/20498929/)].
- Kistner RW, Ryan KJ, Berkowitz RS, Barbieri RL. *Kistner's gynecology: Principles and practice.* Mosby Inc; 1995.
- Gehlert S, Song IH, Chang CH, Hartlage SA. The prevalence of premenstrual dysphoric disorder in a randomly selected group of urban and rural women. *Psychol Med.* 2009;**39**(1):129-36. doi: [10.1017/S003329170800322X](https://doi.org/10.1017/S003329170800322X). [PubMed: [18366818](https://pubmed.ncbi.nlm.nih.gov/18366818/)]. [PubMed Central: [PMC2752820](https://pubmed.ncbi.nlm.nih.gov/PMC2752820/)].
- Hernandez-Reif M, Martinez A, Field T, Quintero O, Hart S, Burman I. Premenstrual symptoms are relieved by massage therapy. *J Psychosom Obstet Gynaecol.* 2000;**21**(1):9-15. doi: [10.3109/01674820009075603](https://doi.org/10.3109/01674820009075603). [PubMed: [10907210](https://pubmed.ncbi.nlm.nih.gov/10907210/)].
- Smith JM, Sullivan SJ, Baxter GD. Massage therapy services for health-care: a telephone focus group study of drivers for clients' continued use of services. *Complement Ther Med.* 2009;**17**(5-6):281-91. doi: [10.1016/j.ctim.2009.07.001](https://doi.org/10.1016/j.ctim.2009.07.001). [PubMed: [19942108](https://pubmed.ncbi.nlm.nih.gov/19942108/)].
- Locke RJ, Warren MP. Exercise and primary dysmenorrhoea. *Br J Sports Med.* 1999;**33**(4):227. [PubMed: [10450473](https://pubmed.ncbi.nlm.nih.gov/10450473/)].
- Israel RG, Sutton M, O'Brien KF. Effects of aerobic training on primary dysmenorrhea symptomatology in college females. *J Am*

- Coll Health*. 1985;**33**(6):241-4. doi: [10.1080/07448481.1985.9935033](https://doi.org/10.1080/07448481.1985.9935033). [PubMed: [4045017](https://pubmed.ncbi.nlm.nih.gov/4045017/)].
17. Rakhshae Z. Effect of three yoga poses (cobra, cat and fish poses) in women with primary dysmenorrhea: a randomized clinical trial. *J Pediatr Adolesc Gynecol*. 2011;**24**(4):192-6. doi: [10.1016/j.jpog.2011.01.059](https://doi.org/10.1016/j.jpog.2011.01.059). [PubMed: [21514190](https://pubmed.ncbi.nlm.nih.gov/21514190/)].
 18. Choi PY, Salmon P. Symptom changes across the menstrual cycle in competitive sportswomen, exercisers and sedentary women. *Br J Clin Psychol*. 1995;**34**(3):447-60. doi: [10.1111/j.2044-8260.1995.tb01479.x](https://doi.org/10.1111/j.2044-8260.1995.tb01479.x). [PubMed: [8845783](https://pubmed.ncbi.nlm.nih.gov/8845783/)].
 19. Salehi F, Marefati H, Arabpour S, Modares Nejad V. [Comparison of premenstrual syndrome status and primary dysmenorrhea in active and non-active students]. *Iran J Obstet Gynecol Infertil*. 2012;**15**(10):21-9. Persian.
 20. Daley AJ. Exercise and primary dysmenorrhea : a comprehensive and critical review of the literature. *Sports Med*. 2008;**38**(8):659-70. doi: [10.2165/00007256-200838080-00004](https://doi.org/10.2165/00007256-200838080-00004). [PubMed: [18620466](https://pubmed.ncbi.nlm.nih.gov/18620466/)].
 21. Brown J, Brown S. WITHDRAWN: Exercise for dysmenorrhea. *Cochrane Database Syst Rev*. 2017;**2**. CD004142. doi: [10.1002/14651858.CD004142.pub3](https://doi.org/10.1002/14651858.CD004142.pub3). [PubMed: [28194755](https://pubmed.ncbi.nlm.nih.gov/28194755/)]. [PubMed Central: [PMC6464570](https://pubmed.ncbi.nlm.nih.gov/PMC6464570/)].
 22. Blakey H, Chisholm C, Dear F, Harris B, Hartwell R, Daley AJ, et al. Is exercise associated with primary dysmenorrhea in young women? *BJOG*. 2010;**117**(2):222-4. doi: [10.1111/j.1471-0528.2009.02220.x](https://doi.org/10.1111/j.1471-0528.2009.02220.x). [PubMed: [19459861](https://pubmed.ncbi.nlm.nih.gov/19459861/)].
 23. Khasi B, Gilasi H, Suki Z, Kohzadi S. [Investigate the prevalence of dysmenorrhea and some related factors in female students in Kashan University of Medical Sciences]. *Zanco J Med Sci*. 2015;**16**(50):27-34. Persian.
 24. Tanhaee Z, Fathi-Ashtiani A, Amini M, Vahedi H, Shaghghi F. [Validation of a revised version of the Short-form McGill Pain Questionnaire (SF-MPQ-2) for IBS patients]. *Govaresh*. 2012;**17**(2):91-7. Persian.
 25. Guissard N, Duchateau J. Effect of static stretch training on neural and mechanical properties of the human plantar-flexor muscles. *Muscle Nerve*. 2004;**29**(2):248-55. doi: [10.1002/mus.10549](https://doi.org/10.1002/mus.10549). [PubMed: [14755490](https://pubmed.ncbi.nlm.nih.gov/14755490/)].
 26. Tousignant-Laflamme Y, Marchand S. Excitatory and inhibitory pain mechanisms during the menstrual cycle in healthy women. *Pain*. 2009;**146**(1-2):47-55. doi: [10.1016/j.pain.2009.06.018](https://doi.org/10.1016/j.pain.2009.06.018). [PubMed: [19592167](https://pubmed.ncbi.nlm.nih.gov/19592167/)].
 27. Peyron R, Aubeny E, Targosz V, Silvestre L, Renault M, Elkik F, et al. Early termination of pregnancy with mifepristone (RU 486) and the orally active prostaglandin misoprostol. *N Engl J Med*. 1993;**328**(21):1509-13. doi: [10.1056/NEJM199305273282101](https://doi.org/10.1056/NEJM199305273282101). [PubMed: [8479487](https://pubmed.ncbi.nlm.nih.gov/8479487/)].
 28. Noakes KF, Pullan AJ, Bissett IP, Cheng LK. Subject specific finite elasticity simulations of the pelvic floor. *J Biomech*. 2008;**41**(14):3060-5. doi: [10.1016/j.jbiomech.2008.06.037](https://doi.org/10.1016/j.jbiomech.2008.06.037). [PubMed: [18757058](https://pubmed.ncbi.nlm.nih.gov/18757058/)]. [PubMed Central: [PMC2596957](https://pubmed.ncbi.nlm.nih.gov/PMC2596957/)].
 29. Reyhani T, Jafarnejad F, Behnam H, Ajam M, Baghaei M. [The effect of brisk walking on primary dysmenorrhea in girl students]. *Iran J Obstet Gynecol Infertil*. 2013;**16**(46):14-9. Persian.
 30. Shahrjerdi S, Hosaini S. [The effect of 8 weeks stretching exercise on primary dysmenorrhea in 15-17 aged high school student girls in Arak]. *J Shahrekord Univ Med Sci*. 2010;**11**. Persian.
 31. Mosallanejad Z, Ali GA, Leila M. The effect of continuous aerobic exercise on premenstrual syndrome: a randomized clinical trial. *Tehran Univ Med J*. 2008;**65**(13):49-53.
 32. Brown J, Brown S. Exercise for dysmenorrhea. *Obstet Gynecol*. 2010;**116**(1):186-7. doi: [10.1097/AOG.0b013e3181e5ef4d](https://doi.org/10.1097/AOG.0b013e3181e5ef4d). [PubMed: [2056786](https://pubmed.ncbi.nlm.nih.gov/2056786/)].
 33. Chantler I, Mitchell D, Fuller A. Diclofenac potassium attenuates dysmenorrhea and restores exercise performance in women with primary dysmenorrhea. *J Pain*. 2009;**10**(2):191-200. doi: [10.1016/j.jpain.2008.08.006](https://doi.org/10.1016/j.jpain.2008.08.006). [PubMed: [19038583](https://pubmed.ncbi.nlm.nih.gov/19038583/)].
 34. Liebl NA, Butler LM. A chiropractic approach to the treatment of dysmenorrhea. *J Manipulative Physiol Ther*. 1990;**13**(2):101-6. [PubMed: [2137850](https://pubmed.ncbi.nlm.nih.gov/2137850/)].
 35. Smith RP. Cyclic pelvic pain and dysmenorrhea. *Obstet Gynecol Clin North Am*. 1993;**20**(4):753-64. [PubMed: [8115089](https://pubmed.ncbi.nlm.nih.gov/8115089/)].
 36. Motahari-Tabari N, Shirvani MA, Alipour A. Comparison of the effect of stretching exercises and mefenamic acid on the reduction of pain and menstruation characteristics in primary dysmenorrhea: A randomized clinical trial. *Oman Med J*. 2017;**32**(1):47-53. doi: [10.5001/omj.2017.09](https://doi.org/10.5001/omj.2017.09). [PubMed: [28042403](https://pubmed.ncbi.nlm.nih.gov/28042403/)]. [PubMed Central: [PMC5187401](https://pubmed.ncbi.nlm.nih.gov/PMC5187401/)].
 37. Kloubec JA. Pilates for improvement of muscle endurance, flexibility, balance, and posture. *J Strength Cond Res*. 2010;**24**(3):661-7. doi: [10.1519/JSC.0b013e3181c277a6](https://doi.org/10.1519/JSC.0b013e3181c277a6). [PubMed: [20145572](https://pubmed.ncbi.nlm.nih.gov/20145572/)].
 38. Moradi M. Assessment of the effects of massage therapy on premenstrual syndrome. *Zahedan J Res Med Sci*. 2011;**13**(2).
 39. Kim JY. A study of aerobic exercise and sport massage effect on premenstrual syndrome in female high school student. Sookmyung women's university. *Korea J Sport Sci*. 2004;**13**(2):663-72.
 40. Carsten ME, Miller JD. A new look at uterine muscle contraction. *Am J Obstet Gynecol*. 1987;**157**(5):1303-15. doi: [10.1016/s0002-9378\(87\)80320-4](https://doi.org/10.1016/s0002-9378(87)80320-4).
 41. Chapman C, Gavrini J. Suffering: the contributions of persistent pain. *Lancet*. 1999;**353**(9171):2233-7. doi: [10.1016/s0140-6736\(99\)01308-2](https://doi.org/10.1016/s0140-6736(99)01308-2).
 42. Fritz M, Fritz MA, Speroff L. *Clinical gynecologic endocrinology and infertility*. Philadelphia: Lippincott Williams and Wilkins, a Wolters Kluwer business; 2011.