

The Effect of Water Yoga Exercises on the Intensity and Pain Duration in Girls with Primary Dysmenorrhea

Nessa Hashemi^{1*}, MSc; Farideh Babakhani², PhD; Rahman Sheikhhoseini³, PhD

¹Master of Sports Pathology and Corrective Exercises, Department of Corrective Movements and Sports Medicine, Faculty of Physical Education, Allameh Tabatabai University, Tehran, Iran

²Department of Sports Pathology and Corrective Exercises, Department of Complete Movement and Sports Medicine, Faculty of Physical Education, Allameh Tabatabai University, Tehran, Iran

³Department of Sports Pathology and Corrective Exercises, Department of Corrective Movements and Sports Pathology, Faculty of Physical Education and Sports Sciences, Allameh Tabatabai University, Tehran, Iran

*Corresponding author: Nesa Hashemi, MSc; Master of Sports Pathology and Corrective Movements, Department of Corrective Movements and Sports Medicine, Faculty of Physical Education, Allameh Tabatabai University, Tehran, Iran. Tel: +98 9365251070; Email: nessi.hashemi@gmail.com

Received August 28, 2021; Revised December 03, 2021; Accepted January 20, 2022

Abstract

Background: Dysmenorrhea or painful menstruation is considered as the most prevalent problem in women. Therefore, this study aimed to evaluate the effects of eight-week yoga exercises in water on the intensity and duration of pain in female students with primary dysmenorrhea.

Methods: In this clinical trial study, we recruited 40 female students aged 18 to 26 years old with primary dysmenorrhea. They were divided into experimental and control groups. Both groups completed the pre- and post-test questionnaires. The experimental group participated in an eight-week yoga exercise plan in water. Shapiro-Wilk test was used for the assessment of the normality of the data. The Wilcoxon test was employed to compare the data. $P \leq 0.05$ was considered statistically significant. Also, this clinical trial was registered in the Iranian Registry of Clinical Trials with the code of IRCT20120215009014N245.

Results: After eight weeks of yoga practice in water, a significant decrease was observed in the severity of pain ($P=0.001$), pain duration ($P=0.001$), and the number of painkillers used in the experimental ($P=0.001$) group whereas no significant changes were found in the controls.

Conclusion: Doing yoga exercises in water can be an appropriate strategy to help reduce the severity and duration of pain and the number of pills used by females with primary dysmenorrhea.

Keywords: Yoga, Students, Pain, Severity of suffering

How to Cite: Hashemi N, Babakhani F, Sheikhhoseini R. The Effect of Water Yoga Exercises on the Intensity and Pain Duration in Girls with Primary Dysmenorrhea. Women. Health. Bull. 2022;9(2):61-69. doi: 10.30476/WHB.2022.92560.1144.

1. Introduction

Dysmenorrhea is a Greek term meaning the difficult flow of menstruation; it describes painful menstruation (1). Dysmenorrhea is caused by painful cramp originating in the uterus and is one of the most important causes of pain in the pelvis, abdomen, and lower back in the first few days of menstruation and menstrual disorders in women (2). Women with dysmenorrhea are more sensitive to menstrual pain in and out of the uterus compared to those without dysmenorrhea (3). Dysmenorrhea can be categorized into two types, namely primary and secondary types. The menstrual pain occurring in the absence of verified pelvic diseases can be defined as the primary dysmenorrhea, which is the most common complaint of young women with menstrual disorders (4) and lasts for one to three days. Secondary dysmenorrhea is the occurrence of painful bleeding due to pelvic diseases, such as endometriosis, pelvic inflammatory disease, cervical stenosis, bicornuate uterus, and uterine leiomyomas (5). Primary dysmenorrhea or menstrual pain occurring in the absence of pelvic disease can be

considered as a prevalent debilitating disease affecting 45-95% of women (6). The main symptoms of primary dysmenorrhea are muscle spasms in the suprapubic area during 8-72 hours after menstruation, increasing in the first few days of menstruation. It is much similar to labor pain accompanied by abdominal cramp and the pain extends to the lower abdomen into the thighs. In addition to painful cramp, the majority of women with this disorder suffer from other symptoms related to menstruation, including back pain, thigh pain, fever, watery bowel movements, nausea, and throwing up (7, 8). Pain on one side of the pelvis or abdomen is the most common primary dysmenorrhea-associated symptom. Hypertension, reduced uterine circulation, and increased peripheral nerve sensitivity can also intensify the pain (9). It is shown that inappropriate life habits, such as insufficient sleep and nutrition, are associated with primary dysmenorrhea (10). The most common pain is in the second decade of life reducing at the age of 35 years (some women with primary dysmenorrhea have severe pain of 3-33% lasting 1-3 days) (11). According to the available evidence, dysmenorrhea attributes to

certain outcomes, such as painful menstruation, pain sensitivity, along with changes in sleeping pattern, QOL (quality of life), and mood of females. In severe cases, it causes disability and inefficiency accompanied by absenteeism from school or work (3). Modification of lifestyle factors, such as exercise, can be an effective step in preventing, controlling, and even treating primary dysmenorrhea (12); for example, it was shown that birth control pills, including low-dose estrogen, reduce the pain of dysmenorrhea. However, some women cannot take pills due to drug and chemical allergies (13). Hence, they use non-chemical and non-medical methods, such as medicinal herbs and traditional medicine, rest, sleep, heat, and exercise to reduce the pain (13). According to the above-mentioned information, one of the measures taken for the treatment of primary dysmenorrhea is physical activity that has been recommended by physicians for primary dysmenorrhea since the 1930s (14).

One of the proposed exercises for improving primary dysmenorrhea is yoga. Yoga is a sport that reduces stress through reducing sympathetic activity (15, 16). This sport can decline menstrual pain and increase the ability to better accept and control the pain (17).

In addition, it boosts mental function and various aspects of health related to physical fitness in young and healthy people, especially women (18, 19). Research has indicated that Ball and Asana Yoga exercises are conducive to relieving severe menstruation pain in women with diabetes (20). Moreover, a previous study demonstrated significant improvement in menstrual pain, quality of life, and physical fitness in young women with primary dysmenorrhea after prescribing yoga (21).

Since thousands of years ago, water has been used for treating a variety of physical diseases, which is today introduced as hydrotherapy and exercise in water. Floating is a unique property of water that causes a beneficial physiological response. It is particularly useful for patients with chronic pain because when people float at different depths, the force of gravity is minimized, the hydrostatic resistance, muscular endurance, and strength is improved, and the pain of primary dysmenorrhea is reduced (22, 23).

Therefore, according to the studies and the high percentage of students with primary dysmenorrhea, we conducted this research to investigate the effects of yoga and hydrotherapy on reducing pain severity and duration in those with primary dysmenorrhea.

2. Methods

This was a randomized controlled trial under the IRCT registration number IRCT20120215009014N245. Based on previous research (24), using G*Power version 3.1 software, a sample of size $n=40$ was obtained based on convenience sampling method considering the following factors: $\alpha=0.05$, $\beta=0.20$, pre-test pain intensity= 7.65 ± 2.94 , post-test pain intensity= 4.88 ± 2.92 for dependent t-test of pain intensity of the experimental group. The subjects were selected and allocated to either the experimental group ($n=20$) or control group ($N=20$) using simple blocked randomization method. The study population included female students with primary dysmenorrhea, who participated in this experiment voluntarily. The inclusion criteria were having primary dysmenorrhea according to the physician's diagnosis, being single, being 18 to 26 years old, and not having physical activities and exercises in the previous year. The exclusion criteria including a history of second dysmenorrhea, having a regular exercise program, a history of sports-limiting diseases, and the presence of obvious static malalignment based on the New York scale. All the participants signed an informed consent form (22). The research variables comprised independent and dependent variables. The independent variables were yoga exercises in water while the dependent ones included pain intensity, pain duration, and the number of drugs used by the subjects. The control and experimental groups did not have any intervention, except for completing the McGill and Pain Diary questionnaires during menstruation. Pre- and post-test questionnaires were given to the participants.

2.1. Procedures

The study subjects participated in this study voluntarily. They were recruited if they met the aforementioned inclusion criteria.

In the first step, the participants completed the pre-test questionnaires. Subsequently, the participants in the experimental group performed yoga exercises in water under the supervision of an instructor and researcher, twice a week; each session lasted for 45 min and the entire exercise plan was conducted for eight weeks in a pool with water temperature of 28 °C in the Bu Ali University Pool in the summer. A water temperature of 28-30 °C is suitable for increasing blood circulation in those with primary dysmenorrhea (25, 26). The control group was also asked not to do any specific activity during the eight weeks, except for daily activities. At the end of the training sessions,

both groups completed Pain Diary and McGill questionnaires again as the pre-test. In addition, the control group voluntarily participated in the same protocol performed by the researcher under the same conditions as the experimental group after the end of the research period.

2.2. Measurement

McGill Pain Questionnaire (MPQ)

This questionnaire is a tool for measuring pain, which is one of the most complex processes in the human body with different physical and psychological dimensions. As a multidimensional verbal scale of pain, MPQ has five dimensions: pain intensity, location, pattern, quality, alleviating, and aggravating factors. Previous research has proven the reliability of the Persian version of MPQ in Iranian population (27).

2.3. Pain Diary Questionnaire

This questionnaire was developed for the prospective measurement of pain severity, pain-related disability, and taking drug. By using this questionnaire, menstrual pain (for seven days) and activities that are limited or lost during the menstruation period were recorded. Primarily, the subjects were asked to report their activities since the first day of menstruation to the end in Pain Diary Table. In order to determine the pain for each person at the site of pain, pain intensity (rated on a scale of 0 to 10), OTC pills (over-the-counter), and the number of pills were recorded. In the current study, the average pain severity during seven days was obtained for all the participants. In addition, the total number of OTC pills taken by the subjects to reduce the pain during seven days was obtained (28).

McGill Test measures pain severity and includes six levels, namely none (0), mild (1), uncomfortable (2), distressing (4), very bad (4), severe (5), and excruciating (6).

This scale can be used at different times of the day or daily to measure the severity of pain during a day.

2.4. Exercise Protocol

Yoga exercises in water were performed in a pool with dimensions of 16 * 25 m in Bu Ali pool in Hamedan, Iran for eight weeks. Sponge noodle was also used as a means of staying afloat and exercising in water. These exercises were conducted at three

stages. Initially, yoga mental relaxation and breathing (pranayama) was performed; yoga breathing is an important part of spiritual health and spirituality in the Hindu traditions. Pranayama can quickly bring the brain back to the present moment and reduce stress. Moreover, clinical evidence has shown that yoga breathing techniques can be used to treat the symptoms of anxiety and/or depressive disorder and PTSD (post-traumatic stress disorder) depression, anxiety, and post-traumatic stress disorder (29). These techniques can contribute to reducing the intensity of pain and its duration in people with primary dysmenorrhea (30, 31). This exercise was done for 5 min.

2.5. Yoga Stretching Exercises (Asana)

Asana exercises reduce fatigue, stress, and depression, increase well-being, and improve emotional function, and the quality of life. These exercises were done in three sets with 15 repetitions, which lasted for 30 min (31).

2.6. Yoga Relaxation (Shavasana)

At the end of the exercise, Shavasana was practiced for 10 min. Shavasana is relaxation of the body while lying on water (immersion in the back) (19).

In this study, after collecting and entering the data in SPSS version 20, descriptive statistics, including frequencies, means, percentages, and standard deviations, were employed to analyze the data. We also utilized Shapiro-Wilk test to assess the normality of the data. Wilcoxon test at a significance level of 0.05 was used to compare the pre-test and post-test data obtained from both groups.

Regarding insignificance of Shapiro-Wilk test, non-parametric Wilcoxon test was employed to compare the pre-test and post-test data of the control and experimental groups.

2.7. Protocols

Pranayama

1. The subject should first sit in a chair in water, with the shoulders and head out. They should place their right hand palm in front of their face, then, try to gather their fingers together. They then place their thumb on the left nostril and respire via their right nostril.

2. They close their right nostril using the pinky

finger and breathe through the left nostril (3 sets for each nostril, 20 rep).

3. The subject should float on water (those who do not have good buoyancy should float on the water using sponge noodles), then close the eyes and inhale and exhale through the nose (3 sets of 30 seconds).

4. With or without the use of sponge noodles, the subjects should inhale through the nose and then squat into the water and exhale into the water through the nose (3 sets, 15 rep).

2.8. Stretching Exercises (Asana Exercises)

Tree Movement:

1. The subject stands in the position of Tadasana (mountain) (3 sets, 10 rep).

2. As they exhale, they lift their left foot and place it on their groin, with toes pointing down (3 sets, 10 rep).

3. Using a rope, open the arms to the sides. In this case, the palms should be facing the ground (3 sets, 10 rep).

4. They exhale, palms facing up (3 sets, 10 rep).

5. They raise their arms at the same time and try to stare at a point in front of them and breathe from abdomen to maintain the balance (3 sets, 10 rep).

Warrior 2:

1. The subject stands in a mountain position (Tadasana) (3 sets, 10 rep each side).

2. They spread the legs twice the width of the shoulders (3 sets, 10 rep each side).

3. Now they open both arms and place them parallel to the ground and turn the head to the left (3 sets, 10 rep each side).

4. They should place left foot at a 90-degree angle and bend the knee, keep their hips in line with arms (180 degrees) and stay in this position for 30 seconds to 1 minute (3 sets, 10 rep each side).

Warrior 3:

1. They stand in the Tadasana (mountain) position

(3 set, 10 rep each side).

2. The subjects raise both hands and stand straight. The palms of the hands should face each other (3 set, 10 rep each side).

3. They bring the left leg back, slowly bending it forward, straighten their back and stretch the arms well. Their arms and legs should be in the same direction (3 set, 10 rep each side).

4. They raise the left foot and at the same time straighten the right foot, keeping hands parallel to the ground. In this position, they raise the legs and place the torso and arms parallel to the ground (3 set, 10 rep each side).

Cobra movement:

1. The subjects should stand by the pool wall facing the wall, and the water level should be up to the chest (3 set, 15-20 sec).

2. They place hands gently against the pool wall (3 set, 15-20 sec).

3. Turning the head back is the next stage, so that the back of the curve and the head of the subject hit the water (3 set, 15-20 sec).

4. They stand on the tip of their foot and push their body against the wall from the bottom (3 set, 15-20 sec).

5. They should now hold their breath for a moment, and then exhale gently in order to return to their original position (3 set, 15-20 sec).

Triangle:

1. They stand one meter away from the pool wall while the water level should be up to the waist (3 set, 15-20 sec each side).

2. The right side of the body should be next to the pool wall. They place the right hand next to the right leg. The subject's arm should be parallel to the water (3 set, 15-20 sec each side).

3. The subjects spread their legs shoulder-width apart and point the right foot toward the pool wall and the left foot forward (3 set, 15-20 sec each side).

4. They take a deep breath and raise the left arm and

lie on their head until the left side of the body is bent towards the pool wall (3 set, 15-20 sec each side).

5. They keep the left foot firmly on the floor of the pool and will feel the stretch along the left side of the body (3 set, 15-20 sec each side).

6. They need to keep this position for a moment, release, and repeat it on the other side (3 set, 15-20 sec each side).

Pull to the sides:

1. The subjects experiment stand in the Tadasana (mountain) position and breathe slowly (3 set, 15 sec each side).

2. They raise the right arm straight with the rope and touch it with the ear (3 set, 15 sec each side).

3. With the exhale, they give more tension to the right arm and bend from the right side and breathe slowly (in this movement, the stretch is completely to the right). This movement is repeated in the other directions (3 set, 15 sec each side).

Nataraja Sana:

1. The subjects stand in condition Tadasana (mountain) and breathe slowly (3 set, 15 sec each leg).

2. The subjects should lift all their weight on the sole of the right foot and bend the left foot from the knee and hold the ankle or toe with the left hand. They lower the toe toward the buttocks so that the muscle on the thigh of the left foot is stretched (3 set, 15 sec each leg).

Shavasana:

1. The subjects first place a sponge noodle under the knee and the other under the head, and gently bring their hands to the end of the noodle.

2. The buttocks should go slightly below the body.

3. The subjects tilt the head slightly and float on water.

4. They float the whole body on water for 5 minutes.

Statistical Analysis

Shapiro-Wilk test was carried out to examine data distribution. Afterwards, we utilized non-parametric Wilcoxon test for examining the within group differences for the study variables. All the data analyses were performed via SPSS version 20, and P value<0.05 was considered statistically significant.

3. Results

40 single female students with primary dysmenorrhea participated in this study (Figure 1). The inclusion criteria were: 1. Age range of 18 to 26 years; 2. Having primary dysmenorrhea according to the doctor's diagnosis; 3. Being single.

Table 1 represents the demographic characteristics of the study participants, such as age, weight, height, and body mass index (BMI).

As shown in Table 2, there was a significant difference between the mean scores of pain intensity in the pre-and post-test of the experimental group ($P=0.001$).

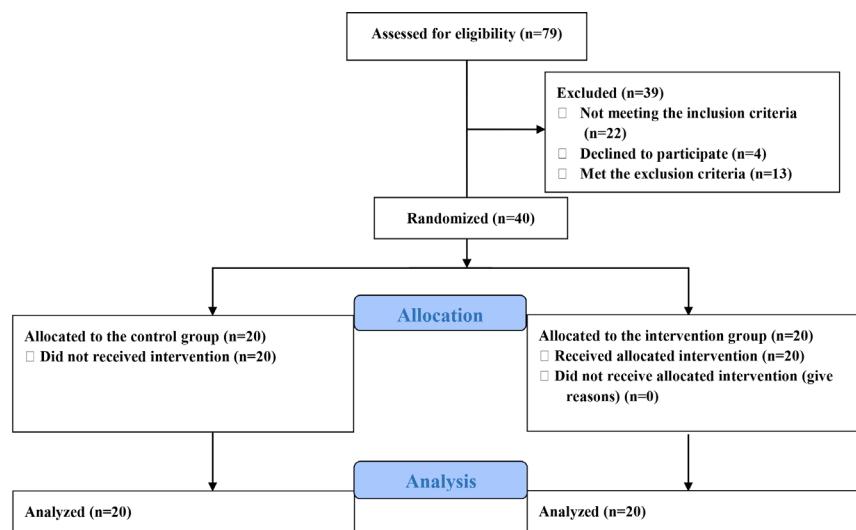


Figure 1: The figure shows the CONSORT flow diagram of the study.

Table 1: Demographic characteristics of the study participants

Groups	Experimental group	Control group	P value
	Mean±SD	Mean±SD	
Age (years)	22.2±65.11	22.1±20.85	0.26
Height (Cm)	165.5±55.17	164.4±80.83	0.638
Weight (kg)	60.8±23.65	61.14±15.36	0.806
BMI (BMI)	21.2±95.82	22.4±46.73	0.679

*SD: Standard Deviation

Table 2: The effect of water yoga exercises on the pain intensity, pain duration, and drug consumption in female students with primary dysmenorrhea

Variables	Groups	Pre-test		Post-test		P value
		Mean	SD**	Mean	SD**	
Pain Intensity (pom*)	Experimental group	7.35	1.75	1.70	2.27	0.001*
	Control group	7.16	1.74	7.67	1.85	0.173
Pain Duration	Experimental group	2.45	1.01	1.10	1.20	0.001*
	Control group	2.47	1.43	2.68	1.33	0.336
Drug Consumption	Experimental group	2.45	1.57	0.65	1.09	0.001*
	Control group	2.05	1.40	2.26	1.24	0.331

*Period of menstruation; **SD: Standard Deviation

Meanwhile, there were no significant differences concerning the mean scores of pain intensity in the pre- and post-test of the controls ($P=0.173$).

Furthermore, we observed a significant difference between the mean scores of pain duration in the pre- and post-test of the experimental group ($P=0.001$). However, there were no significant differences between the mean scores of pain duration in the pre- and post-test of the controls ($P=0.336$).

Additionally, a significant difference was found between the mean scores of drug consumption in the pre- and post-test of the experimental group ($P=0.001$). Nevertheless, concerning the mean scores of drug consumption, we observed no significant differences between the pre- and post-test of the controls ($P=0.331$).

After the eight-week yoga practice in water, the severity of the pain in the female students reduced from 7.35 to 1.70 ($P<0.05$), the duration of pain reduced from 2.25 to 1.45 ($P<0.05$), and the number of pills taken reduced from 2.45 to 0.65 ($P<0.05$). Meanwhile, no significant changes were observed in the control group.

The statistical sample of the study includes female students of Bu Ali Sina University. Those with first dysmenorrhea, which was recognized by the statistical community, as well as those who consented to participate in the research were then selected according to the inclusion criteria. The present study revealed the positive effects of an eight-week yoga exercise plan in water.

4. Discussion

The obtained results revealed that eight weeks of water yoga practice positively affected the pain intensity in female students with primary dysmenorrhea; a significant difference was observed concerning pain intensity between the experimental group and the control group. It was also shown that eight weeks of water yoga practice had an effect on the duration of pain in female students with primary dysmenorrhea; there was a significant difference in terms of the duration of pain in the experimental group and the control group. The results also implied that the applied exercise plan had an effect on the drug use of female students with primary dysmenorrhea; the drug use was significantly different in the experimental group with that in the control group.

Yoga activates muscle coagulation. It increases muscle strength and flexibility and reduces pain severity (32). This sport is also believed to reduce blood progesterone levels and the severity of pain in primary dysmenorrhea (33). Ganesh and colleagues investigated the effect of pranayama in slow and fast phases on the quality of life and pain of physiotherapist girls with primary dysmenorrhea. The results showed that slow pranayama (nadi shodhana) was effective in improving the quality of life and pain severity; this is consistent with our results (34).

Ulaa and co-workers stated that yoga was the most effective intervention on reducing the duration

of pain of primary dysmenorrhea (35). Their study results are in line with those of Kim (36) and Yang and Kim (15). Kim evaluated the effects of a yoga program on menstruation pain in women who had primary dysmenorrhea and the results showed that yoga exercises could significantly reduce menstruation pain (36). In this regard, Yang et al. investigated the impact of yoga exercise on primary dysmenorrhea occurring in female students. They also concluded that yoga interventions may reduce menstrual cramp and discomfort in undergraduate female students with primary dysmenorrhea (15). Moreover, it was shown that Pilates (37) and stretching (24) exercises may be effective in reducing the severity and duration of pain in the primary dysmenorrhea.

In this regard, Vaziri and colleagues (8) reported that stretching and aerobic exercises were effective in reducing pain severity in those with primary dysmenorrhea. According to the results reported by Gamit and co-workers (38), stretching exercises were effective in declining pain in young girls with primary dysmenorrhea.

Hydrotherapy can be conducive to decreasing the pain intensity and ameliorating the symptoms associated with primary dysmenorrhea. In this line, a previous study reported that hydrotherapy was highly effective in patients with primary dysmenorrhea and can decrease the pain (39). Other study showed that a 12-week hydrotherapy exercise were effective and lowered the primary dysmenorrhea-related pain intensity and pain duration; this is in agreement with our results (22).

Therefore, exercise, as an effective factor, reduces the symptoms of dysmenorrhea by decreasing the activity of the sympathetic system. In addition, exercise increases the pain threshold of people by giving rise to the secretion of endorphins by the brain (40). A study by Fallah and Mirfeizi reported that lifestyle changes, including some physical activities and quality, and the quantity of pain affect the reduction in the duration of pain in primary dysmenorrhea (41). Exercise improves blood circulation in the uterus and increases its metabolism, thereby declining the pain and medication taking (9). Studies indicated that physical activities, including yoga and stretching exercises, diminish medication taking (9, 22, 39, 41), which is consistent with our results. We conducted the current work only on non-athlete and single female students in the age range of 18 to 26 years old. Herein, the effect of yoga in water, and yoga by those with

primary dysmenorrhea, and taking medication during menstruation was investigated. This study has four main limitations, as follows: it was performed only on single girls; it was conducted on non-athlete girls; the study population comprised only subjects aged 18 to 26 years; the exercises were performed in water. It could be recommended that further research be designed on the statistical sample. Female athletes and married women with primary dysmenorrhea must be taken into consideration as well. Furthermore, a larger sample size could result in more generalizable outcomes.

5. Conclusions

This study shed light on the fact that yoga exercises in water affect the severity and duration of pain in female students with primary dysmenorrhea. They were also found to be effective in reducing medication taking and even in some cases, excluding medication.

Ethical Approval

The Ethics Review Board approved the present study with the code of IR.UMSHA.REC.1397.451

Acknowledgment

The present article was extracted from master's thesis of Ms. Nessa Hashemi in Allameh Tabatabai University in the field of sport injuries and corrective exercises.

Conflict of Interest: None declared.

References

1. Brown J, Brown S. Exercise for dysmenorrhoea. *Obstet Gynecol*. 2010;116(1):186-7.
2. Kumar KH, Elavarasi P. Definition of pain and classification of pain disorders. *Journal of Advanced Clinical and Research Insights*. 2016;3(3):87-90.
3. Iacovides S, Avidon I, Baker FC. What we know about primary dysmenorrhea today: a critical review. *Human reproduction update*. 2015;21(6):762-78.
4. Chiou M-H, Wang H-H. The relationship between dysmenorrhea and menstrual attitudes among female students in vocational nursing schools. *Hu li za zhi The Journal of Nursing*. 2004;51(4):45-52.
5. Norton P, Peterson M. Menstrual disorders and other common gynecology. *Hum Reproduct Clin Pathol Pharmacol*. 1997;4(4):255-9.
6. Keating XD, Guan J, Piñero JC, Bridges DM. A

- meta-analysis of college students' physical activity behaviors. *Journal of American college health*. 2005;54(2):116-26.
7. Proctor M, Farquhar C. Diagnosis and management of dysmenorrhea. *Bmj*. 2006;332(7550):1134-8.
 8. Vaziri F, Hoseini A, Kamali F, Abdali K, Hadianfard M, Sayadi M. Comparing the effects of aerobic and stretching exercises on the intensity of primary dysmenorrhea in the students of universities of bushehr. *Journal of family & reproductive health*. 2015;9(1):23.
 9. Dawood MY. Primary dysmenorrhea: advances in pathogenesis and management. *Obstetrics & Gynecology*. 2006;108(2):428-41.
 10. De Sanctis V, Soliman A, Bernasconi S, Bianchin L, Bona G, Bozzola M, et al. Definition and self-reported pain intensity in adolescents with dysmenorrhea: a debate report. *Rivista Italiana di Medicina dell'Adolescenza*. 2016;14(2).
 11. Bernardi M, Lazzeri L, Perelli F, Reis FM, Petraglia F. Dysmenorrhea and related disorders. *F1000Research*. 2017;6.
 12. Dehghanzadeh N, Khoshnam E, Nikseresht A. The effect of 8 weeks of aerobic training on primary dysmenorrhea. *European Journal of Experimental Biology*. 2014;4(1):380-2.
 13. Rajabzadeh F, Fazljou SM, Khodaie L, Abbasalizadeh S, Sahebi L. Effects of hot temperament herbs on primary Dysmenorrhea: a systematic review. *World Family Medicine Journal: Incorporating the Middle East Journal of Family Medicine*. 2018;99(5897):1-7.
 14. Matthewman G, Lee A, Kaur JG, Daley AJ. Physical activity for primary dysmenorrhea: a systematic review and meta-analysis of randomized controlled trials. *American journal of obstetrics and gynecology*. 2018;219(3):255. e1-. e20.
 15. Yang N-Y, Kim S-D. Effects of a yoga program on menstrual cramps and menstrual distress in undergraduate students with primary dysmenorrhea: a single-blind, randomized controlled trial. *The Journal of Alternative and Complementary Medicine*. 2016;22(9):732-8.
 16. Panigrahi A, Behera BK, Sarma NN. Clinical Epidemiology and Global Health.
 17. Cramer H, Lauche R, Haller H, Langhorst J, Dobos G, Berger B. "I'm more in balance": a qualitative study of yoga for patients with chronic neck pain. *The Journal of Alternative and Complementary Medicine*. 2013;19(6):536-42.
 18. Bera TK, Shete SU, Verma A, Sharma N. Psychophysiological responses across the menstrual cycle in low fit college women after yoga training. *Yoga Mimamsa*. 2017;49(1):3.
 19. Tran MD, Holly RG, Lashbrook J, Amsterdam EA. Effects of Hatha yoga practice on the health-related aspects of physical fitness. *Preventive cardiology*. 2001;4(4):165-70.
 20. Padmanabhan K, Sudhakar S, Aravind S, Kumar CP, Monika S. Efficacy of Yoga Asana and Gym Ball Exercises in the management of primary dysmenorrhea: A single-blind, two group, pretest-posttest, randomized controlled trial. *CHRISMED Journal of Health and Research*. 2018;5(2):118.
 21. Siahpour T, Nikbakht M, Rahimi E, Rabiee M. The effect of 8 weeks aerobic exercise and yoga on primary dismenorrhea. *Armaghane danesh*. 2013;18(6):475-83.
 22. Rezvani S, Taghian F, Valiani M. The effect of aquatic exercises on primary dysmenorrhea in nonathlete girls. *Iranian journal of nursing and midwifery research*. 2013;18(5):378.
 23. McIntyre D. Aquatic Therapy and Pain in the Rehabilitation Patient. *Comprehensive Pain Management in the Rehabilitation Patient*: Springer; 2017. p. 347-55.
 24. Shahr-Jerdy S, Hosseini RS, Gh ME. Effects of stretching exercises on primary dysmenorrhea in adolescent girls. *Biomedical Human Kinetics*. 2012;4(1):127-32.
 25. BNYS HB, BNYS NB, BNYS MRR. Management of pelvic pain in primary dysmenorrhea using a hot hip-bath: a pilot study. *Alternative therapies in health and medicine*. 2012;18(1):24.
 26. Barbosa TM, Marinho DA, Reis VM, Silva AJ, Bragada JA. Physiological assessment of head-out aquatic exercises in healthy subjects: a qualitative review. *Journal of sports science & medicine*. 2009;8(2):179.
 27. Adelmanesh F, Arvantaj A, Rashki H, Katabchi S, Montazeri A, Raissi G. Results from the translation and adaptation of the Iranian Short-Form McGill Pain Questionnaire (I-SF-MPQ): preliminary evidence of its reliability, construct validity and sensitivity in an Iranian pain population. *Sports Medicine, Arthroscopy, Rehabilitation, Therapy & Technology*. 2011;3(1):1-7.
 28. Walsh TM, LeBlanc L, McGrath PJ. Menstrual pain intensity, coping, and disability: The role of pain catastrophizing. *Pain Medicine*. 2003;4(4):352-61.
 29. Brown RP, Gerbarg PL. Yoga breathing, meditation, and longevity. *Annals of the New York Academy of Sciences*. 2009;1172(1):54.
 30. Rakhshaee Z. Effect of three yoga poses (cobra, cat and fish poses) in women with primary dysmenorrhea: a randomized clinical trial.

- Journal of pediatric and adolescent gynecology. 2011;24(4):192-6.
31. Gobec S, Travis F. Effects of maharishi yoga asanas on mood states, happiness, and experiences during meditation. International Journal of Yoga. 2018;11(1):66.
 32. Sharma M. Yoga as an alternative and complementary approach for stress management: a systematic review. Journal of evidence-based complementary & alternative medicine. 2014;19(1):59-67.
 33. Kauts A, Sharma N. Effect of yoga on academic performance in relation to stress. International journal of yoga. 2009;2(1):39.
 34. Ganesh B, Madhushree P, Andrea R. Comparative study on effect of slow and fast phased pranayama on quality of life and pain in physiotherapy girls with primary dysmenorrhoea: Randomized clinical trial. Int J Physiother Res. 2015;3(2):928-37.
 35. Ulaa M, Lismidiati W, Hapsari ED. Differences Use of Yoga and Self-Tapping Towards Long Pain of Primary Dysmenorrhea on Adolescent. IJNP. 2017;1(3):124-32.
 36. Kim S-D. Yoga for menstrual pain in primary dysmenorrhea: A meta-analysis of randomized controlled trials. Complementary therapies in clinical practice. 2019;36:94-9.
 37. Abbaspour Z, Rostami M, Najjar S. The effect of exercise on primary dysmenorrhea. Journal of Research in Health sciences. 2006;6(1):26-31.
 38. Gamit KS, Sheth MS, Vyas NJ. The effect of stretching exercise on primary dysmenorrhea in adult girls. Int J Med Sci Public Health. 2014;3(5):549-51.
 39. Susila C, Suganthi S. Effectiveness of hydrotherapy on dysmenorrhea among adolescent girls. TNNMC Journal of Nursing Education and Administration. 2017;5(2):14-8.
 40. Israel RG, Sutton M, O'Brien KF. Effects of aerobic training on primary dysmenorrhea symptomatology in college females. Journal of american college health. 1985;33(6):241-4.
 41. Fallah F, Mirfeizi M. How is the quality and quantity of primary dysmenorrhea affected by physical exercises? A study among Iranian students. International Journal of Women's Health and Reproduction Sciences. 2018;6(1):60-6.