



The Effect of a Course of Yoga Exercises on Menstrual Pain and Distress in Women with Primary Dysmenorrhea with and Without Lumbar Hyperlordosis

Hadi Miri^{1,*}, Hanieh Rezaei², Armin Zareiyan³

¹ Department of Physical Education and Sport Sciences, Amirkabir University of Technology, Tehran, Iran

² Corrective Exercise and Sport Injury, Raja Non-profit University, Qazvin, Iran

³ Department of Health in Disaster and Emergencies, Research Center of Cancer Screening and Epidemiology, School of Nursing, AJA University of Medical Sciences, Tehran, Iran

*Corresponding Author: Department of Physical Education and Sport Sciences, Amirkabir University of Technology, Tehran, Iran. Email: hd.miri@aut.ac.ir

Received: 30 August, 2024; Accepted: 14 September, 2024

Abstract

Background: Primary dysmenorrhea is the most common complaint related to menstrual disorders among women and young girls. The goal of this research was to examine the effect of yoga exercises on menstrual pain and distress in female students aged 20 - 35 years with primary dysmenorrhea, both with and without lumbar hyperlordosis. Despite the research and studies conducted in the field of primary dysmenorrhea, many aspects of the condition remain unknown. This study aims to provide new insights for the audience.

Objectives: The aim of this study was to evaluate the effect of a course of yoga exercises on menstrual pain and distress in women with primary dysmenorrhea, both with and without lumbar hyperlordosis.

Methods: The statistical population of the present study included 60 eligible female patients aged 20 to 35 years, selected through available and targeted sampling. Participants were divided into an experimental group (15 individuals with hyperlordosis and 15 individuals without hyperlordosis) and a control group (15 individuals). Those with hyperlordosis had a lumbar lordosis angle above 30 degrees. Patients in the experimental group participated in yoga exercises for eight weeks, with three sessions per week, each lasting one hour. Variables were evaluated before and after the eight-week intervention. Menstrual pain, menstrual distress, and lumbar lordosis were measured using the Visual Analog Scale (VAS), the Menstrual Distress Questionnaire (MMDQ), and a flexible ruler, respectively. Data analysis was conducted using the Shapiro-Wilk test, covariance analysis, and paired t-tests to compare the variables. The final results were confirmed using covariance analysis.

Results: The findings demonstrated that yoga exercises in the experimental group led to a significant reduction in menstrual pain, menstrual distress, and the lumbar lordosis angle after the intervention ($P \leq 0.05$).

Conclusions: Based on the findings of the current research, yoga exercises, as a non-invasive method, significantly improved menstrual pain, menstrual distress, and the lumbar lordosis angle in the experimental group.

Keywords: Hyperlordosis, Menstrual Distress, Primary Dysmenorrhea, Pain, Yoga

1. Background

Women naturally experience three physiological events in their life cycle and stages of growth: Menstruation, pregnancy, and menopause (1). Menstruation is one of the stages of puberty in the development of women (2). During these phases, women's mental and physical health can transition into

new physiological and psychological states. Therefore, the different stages of these changes can be considered central to every woman's mental well-being and social adjustment (1).

The normal duration of the menstrual cycle is 21 to 35 days, consisting of three phases: The follicular phase, ovulation, and the luteal phase (3). During this period, fluctuations in sex hormones significantly affect the

entire body, leading to changes in physical, mental, and emotional functioning (4).

Primary dysmenorrhea (painful menstruation) refers to painful contractions of the lower abdomen and uterus (5). Dysmenorrhea is the most common menstrual disorder complaint among women and young girls (6), often accompanied by mood disturbances and pain that begin just before or during menstruation (7, 8). Menstrual pain is caused by an abnormal increase in the production of vasoactive prostaglandins in the endometrium (9, 10). Prostaglandins facilitate the expulsion of the endometrium, leading to uterine contractions (11, 12).

Based on pathophysiology, dysmenorrhea is classified as primary or secondary (13). Primary dysmenorrhea is defined as painful, spasmodic cramping in the lower abdomen just before or during menstruation, in the absence of any detectable macroscopic pelvic pathology (14). Secondary dysmenorrhea, on the other hand, is associated with identifiable pathological conditions, such as endometriosis, adenomyosis, fibroids (myomas), and pelvic inflammatory disease, and can onset at any time (13).

Women with primary dysmenorrhea report that menstruation negatively affects their quality of life (15). Pain is one of the main factors contributing to a reduced quality of life. Yoga has been shown to improve the quality of life for women with primary dysmenorrhea, significantly alleviating physical pain and discomfort, improving sleep, concentration, and emotional well-being, enhancing social relationships, boosting work capacity, and increasing energy levels (16, 17).

Yoga alleviates pain and sympathetic responses, coordinates the functioning of the endocrine system, and ultimately reduces physical pain while improving overall quality of life (16, 18). Pain relief remains the primary focus in the treatment of menstrual pain. Previous studies indicate that yoga reduces menstrual pain by decreasing the production of prostaglandins and mitigating myometrial ischemia through its effects on the hypothalamus-pituitary-adrenal axis and the sympathetic nervous system (19).

Yoga increases the pain threshold by enhancing endorphin secretion in the brain (20). Regular yoga exercises lead to physiological and functional improvements, playing an important role in central

nervous system processing, peripheral nerve function, and the body's natural response to environmental stimuli (21).

Yoga is recognized as a form of mind-body medicine and is classified by the National Institutes of Health as a type of complementary and alternative medicine (CAM) (22). Many researchers identify changes in lumbar arch size as a significant factor in chronic back pain (23). One of the common causes of back pain in women, especially during menstruation, is an increased curvature of the lumbar arch, or hyperlordosis (24). Increased concavity in the posterior lumbar spine region is a common complication, with the excessive type referred to as lumbar hyperlordosis (23).

Since trunk muscles play a vital role in maintaining proper body control and spinal posture, women with weak trunk muscle endurance are more prone to back pain (25). Recent research supports the effectiveness of yoga in achieving better physical posture and muscle flexibility (26). By emphasizing mindfulness during yoga asanas, this practice has been found to facilitate faster improvements in physical functions. Many studies have reported the effectiveness of yoga in alleviating distress and menstrual pain (27-30).

Today, other treatment methods are often based on clinical experiences that aim to reduce the prevalence and severity of menstrual symptoms, though the mechanisms may remain unclear. Regular physical exercise has demonstrated significant health benefits (31). Considering the importance of yoga as a low-cost complementary medical method, further investigation and attention are needed, particularly for sports science specialists, to optimize therapeutic exercise methods. Therefore, this study aims to investigate the effect of yoga exercises on primary dysmenorrhea in women, including its impact on pain, menstrual distress, and lumbar hyperlordosis.

2. Objectives

The researcher in the present study aims to answer the question: "Are yoga exercises effective in reducing menstrual pain and the lumbar lordosis angle in women with primary dysmenorrhea?"

3. Methods

The current research method is applied and semi-experimental, and its design is pre-test-post-test in two

experimental groups and two control groups.

3.1. The Method of Collecting Information and the Method of its Implementation

The statistical population of the present study was made up of women with primary dysmenorrhea with and without lumbar hyperlordosis from Islamic Azad University, Gohardasht Karaj Branch. At first, nearly 150 undergraduate students were randomly selected to identify primary dysmenorrhea through an interview form and to evaluate lumbar lordosis using the New York test. After applying the inclusion and exclusion criteria and obtaining the full consent of the volunteers, 60 qualified subjects in the age group of 20 - 35 years were selected using an available and targeted sampling method.

3.2. Instrument

After the initial evaluation and completion of the consent form and information collection form, all participants were screened using the New York Organizational Test method to identify and separate those suffering from lumbar lordosis. Pain intensity was measured using the Visual Analog Scale (VAS), and pain duration, as well as mood and emotional states, were assessed using the adjusted Menstrual Distress Questionnaire (MMDQ). Among these participants, those with hyperlordosis were re-evaluated using a flexible ruler to accurately measure the lumbar arch. At the end, 30 subjects with a curvature angle of more than 30 degrees were classified as having lumbar hyperlordosis and were randomly divided into two groups: An experimental group (n=15) and a control group (n = 15). Similarly, participants without hyperlordosis were divided into an experimental group (n=15) and a control group (n=15).

3.3. Procedure

The number of samples was determined using G*Power software (2.9.1.3) with an alpha level of 0.05, an effect size of 0.80, and power of 0.85. The software determined that 60 samples were required, which were then equally divided into 30 participants for the control group and 30 participants for the experimental group. All participants were aged 20 - 35 years, and their inclusion depended on the absence of hormonal drug use and structural damage in the pelvis. They reported

moderate to severe primary dysmenorrhea during most menstrual periods, particularly in the last three months. A regular menstrual cycle and bleeding duration of 3 - 10 days were also inclusion criteria for the study.

Finally, after eight weeks of training in the experimental group and control group, the final test (post-test under pre-test conditions) was conducted. The data were recorded and analyzed.

3.4. Protocols Used in the Research

3.4.1. Yoga Group

For the experimental group, the yoga practice protocol was explained in detail and performed over eight weeks for 24 sessions (3 sessions per week) of 60 minutes each. Each session began with mindfulness and Nadi Shudana breathing exercises, followed by general warm-up exercises and six cycles of the Surya Namaskar asanas. The main asanas included Cobra Pose, Cat Pose, Shoulder Bridge Pose, Full Back Stretch Pose, Leg Lock Pose, Half Boat Pose, Shoulder Stand Pose, Fish Pose, Grasshopper Pose, Simple Bow Pose, and Camel Pose, each held for 10 breaths in 3 repetitions. Cooling down and general stretching exercises concluded the session, followed by Shavasana and one-hand exercises for 10 minutes.

3.5. Statistic

Data were analyzed after collection using statistical software (SPSS23). In the descriptive statistics section, the mean, standard deviation, and relevant tables were used. The Shapiro-Wilk test was applied to check the normal distribution of variables. In the second part, which is related to inferential statistics, the proposed hypotheses of the research were tested. Considering the relationship between the pre-test and post-test scores and the presence of an independent variable, a univariate covariance test was used to analyze group differences, and a paired *t*-test was employed to examine intra-group differences. For covariance analysis, the assumption of homogeneity of the regression slope was first tested, followed by Levene's test for homogeneity of variances. The results showed that the regression slope assumption was met for all variables (pain = 0.123, distress = 0.993, lordosis angle = 0.050). Levene's test also confirmed that variances were equal across all

Table 1. Mean and Standard Deviation of Demographic Index

Groups	Mean \pm SD
Yoga	
Age	29.30 \pm 3.715
Height	167.60 \pm 2.608
Weight	69.30 \pm 3.109
Body Mass Index	23.697 \pm 1.2238
Control	
Age	29.13 \pm 3.569
Height	165.83 \pm 2.627
Weight	67.90 \pm 3.305
Body mass index	23.550 \pm 1.0368

Table 2. Descriptive Statistics of Pre-post-test Dependent Variables of Experimental and Control Groups

The Dependent Variables	Yoga	Control
Pre-test pain intensity	6.33 \pm 1.470	5.87 \pm 1.925
Post-test pain intensity	3.67 \pm 1.709	4.73 \pm 1.741
Pre-test distress	68.27 \pm 4.218	69.93 \pm 5.369
Post-test distress	60.03 \pm 4.567	69.10 \pm 5.241
Pre-test lordosis	36.70 \pm 5.066	32.77 \pm 5.230
Post-test lordosis	30.70 \pm 2.718	35.10 \pm 5.461

variables (pain = 0.847, distress = 0.130, lordosis angle = 0.339).

4. Results

The subjects in the experimental group had a mean and standard deviation for age, height, weight, and Body Mass Index (BMI) of 29.30 \pm 3.715, 167.60 \pm 2.608, 69.30 \pm 3.109, and 23.697 \pm 1.2238, respectively. Similarly, the control group had values of 29.13 \pm 3.569, 165.83 \pm 2.627, 67.90 \pm 3.305, and 23.550 \pm 1.0368, respectively. The results of the demographic data analysis are shown in [Table 1](#), and the results of data normalization from the Shapiro-Wilk test are presented in [Tables 2](#) and [3](#).

According to the results of covariance analysis ([Table 4](#)), there is a significant difference in the post-test mean for pain intensity ($P < 0.001$), menstrual distress ($P < 0.001$), and lordosis angle ($P < 0.001$), indicating the positive effect of the yoga protocol on the improvement of women with primary dysmenorrhea.

According to [Table 5](#), after correlated t analysis, the results before and after the research for pain intensity ($P < 0.001$), menstrual distress ($P < 0.001$), and lordosis angle ($P < 0.001$) were significant in the intra-group

comparison, demonstrating the positive impact of the yoga protocol. Yoga effectively improved the condition of women with primary dysmenorrhea.

5. Discussion

The purpose of this study was to investigate the effect of yoga exercises on menstrual pain and distress in female students aged 20 - 35 years with primary dysmenorrhea. The results of covariance analysis for the variables of pain intensity ($P = 0.001$, effect size = 0.197), menstrual distress ($P = 0.001$, effect size = 0.034), and the lordosis angle range ($P = 0.001$, effect size = 0.282) indicated a significant difference between the research groups.

The results of correlation t -tests for pre- and post-research values in pain ($P = 0.001$, effect size = 0.197), menstrual distress ($P = 0.001$, effect size = 0.981), and the lordosis angle range ($P = 0.001$, effect size = 0.644) showed significant differences between the groups. In terms of reducing pain intensity, menstrual distress, and the degree of the lordosis angle, the experimental group demonstrated a significant difference compared to the control group.

Table 3. Descriptive Statistics of Pre-post-test Dependent Variables of Experimental and Control Groups

Dependent Variables	Shapiro-Wilk	
	Degrees of Freedom	Significance Level
Pre-test pain intensity		
Yoga	30	0.059
Control	30	0.270
Post-test pain intensity		
Yoga	30	0.145
Control	30	0.249
Pre-test distress		
Yoga	30	0.421
Control	30	0.455
Post-test distress		
Yoga	30	0.981
Control	30	0.378
Pre-test lordosis		
Yoga	30	0.201
Control	30	0.130
Post-test lordosis		
Yoga	30	0.303
Control	30	0.270

Overall, the effect of yoga exercises on the variables is considered excellent. Women with primary dysmenorrhea benefited significantly from yoga exercises in terms of pain intensity, menstrual distress, and lumbar lordosis angle. Primary dysmenorrhea causes numerous challenges in personal, social, and economic aspects of life, as well as in the physical and psychological health of women due to physical pain and hormonal changes (32). Many women with primary dysmenorrhea are unable to perform their usual work, leading to absenteeism from work and education. Some researchers estimate that 600 million working hours are lost annually due to dysmenorrhea (33, 34). Additionally, there is a higher likelihood of accidents and decreased work quality among individuals who continue working despite dysmenorrhea (35).

The results of the present study showed that yoga exercises have a significant effect on reducing pain in women with primary dysmenorrhea. This finding aligns with studies conducted by other authors, which evaluated the overall effect of yoga on menstrual pain in primary dysmenorrhea, also confirmed that yoga is an

effective intervention for reducing menstrual pain in women with primary dysmenorrhea, consistent with the present study's findings.

Previous studies have shown that yoga exercises reduce menstrual pain by stimulating uterine muscle contractions and suppressing pain through lowering prostaglandin production and myometrial ischemia via the hypothalamus-pituitary-adrenal axis and the sympathetic nervous system (36-38). Additionally, yoga exercises regulate the nervous system, alleviate pain and fatigue, improve the functioning of internal glands and the digestive system, and enhance muscle function and flexibility (20, 25).

According to previous research and the obtained results, yoga can reduce menstrual pain and the social and psychological discomfort associated with this condition. As a potential treatment method, it can improve quality of life without side effects. One of the common causes of back pain in women, especially during menstruation, is increased curvature of the lumbar arch or hyperlordosis. Women with back pain often have poor trunk muscle endurance due to

Table 4. Results of Covariance Analysis

Variables	Effect Size	Significance Level	F	Average of Squares	Degrees of Freedom
Intensity of pain	0.197	0.001	13.498	24.107	1
Menstrual distress	0.034	0.001	74.021	903.613	1
Lordosis angle	0.282	0.001	22.343	251.283	1

Table 5. Correlated *t* Analysis Results

Variables	Effect Size	Significance Level	<i>t</i>	Difference of Means	Degrees of Freedom
Intensity of pain	1.97	0.001	7.102	1.900	59
Menstrual distress	0.981	0.001	6.671	4.533	59
Lordosis angle	0.644	0.001	2.247	1.833	59

weaknesses in the abdominal muscles and thigh extensors, as well as anterior pelvic tilt. Trunk muscles play an important role in maintaining proper body control and spinal posture, making women with weak trunk muscle endurance more prone to back pain.

In the present study, the lumbar lordosis angle significantly decreased in the experimental group after the yoga intervention. In a comparative study of the effects of yoga exercises, TRX, and combined exercises on the lordosis angle in women with chronic back pain and increased lordosis, a significant difference in the lordosis angle before and after the interventions was found. Similarly, another study reported that 8 weeks of yoga exercises significantly improved spinal curvatures in women with mechanical back pain. Yoga exercises stretch shortened back muscles, psoas, and sphincter muscles while strengthening weakened abdominal and hamstring muscles, reducing anterior pelvic tilt and lordosis. Additionally, yoga postures alleviate pressure on nerves between vertebrae by improving physical fitness and training proper posture.

5.1. Conclusions

Menstruation is a completely natural phenomenon, and most women experience premenstrual syndrome and primary dysmenorrhea. Therefore, this condition does not necessitate a change in lifestyle. Women can still enjoy life, exercise, and have fun. Moreover, considering all the factors influencing this condition, performing yoga exercises a few times a week is likely to have beneficial effects. It is essential to take steps to

ensure that all women are aware of the benefits of yoga and its effectiveness in managing menstrual pain.

Primary dysmenorrhea is a common problem among women and can interfere with family, work, and social activities. An educational program covering nutrition, stress management, and understanding the body's physiological conditions during menstruation could serve as a valuable and effective tool for improving women's health.

This topic is still relatively new and has not been extensively researched. There is a lack of comprehensive information in this area, necessitating further studies and exploration.

Acknowledgements

The present article is taken from the master's thesis on sports pathology and corrective movements of H. R. under the supervision of H. M. and the advice of H. Sh. We are grateful to all the people who participated in this research.

Footnotes

Authors' Contribution: H. M. and H. R. performed the experiment. A. Z. wrote this version with H. M.'s support. H. M., A. Z., and H. R. made the samples. H. R. helped supervise this project. H. R. had the initial idea and H. M. supported it. A. Z. supervised this project.

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: The research proposal was approved by the Deputy of Research and Technology and the Ethics Committee was approved by the Ethics Committee (Secretariat of the Ethics Working Group on Research at the Institute of Sport Sciences) (IR.SSRC.REC.1401.035).

Funding/Support: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Informed Consent: Written informed consent was obtained from all samples. All the research units were assured that the personal information would be considered completely confidential and they could withdraw from the cooperation whenever they wanted without any problem.

References

- Ghasemi T, Agha Yari Abbasali Azar. [Comparison of the effect of 8 weeks of Vioga aerobic exercises on premenstrual syndrome in non-athletic female students aged 18-25 years of Payam Noorsari University]. Tehran, Iran: Payam Noor University; 2010. FA.
- Tahereh S, Masoud NE, Iskandar R, Mohammad AR. [The effect of eight weeks of aerobic exercise and yoga on primary dysmenorrhea]. *Armaghane Danesh J.* 2013;**18**(6):475-83. FA.
- Khalilzade L, Mohammadzade H. [The effect of yoga exercises on premenstrual syndrome in women aged 20 to 35, Urmia: Ministry of Science, Research and Technology] [Master]. Urmia, Iran: Urmia University; 2000. FA.
- Bambaeichi E, Marandi SM, Karshenas N. [The effect of eight weeks of selected yoga exercises on reaction time, menstrual stress and resting blood pressure of inactive healthy women in different stages of the menstrual cycle: Ministry of Science, Research and Technology]. Faculty of Physical Education and Sports Sciences; 2011. FA.
- Rapkin AJ, Winer SA. Premenstrual syndrome and premenstrual dysphoric disorder: quality of life and burden of illness. *Expert Rev Pharmacoecon Outcomes Res.* 2009;**9**(2):157-70. [PubMed ID: 19402804]. <https://doi.org/10.1586/erp.09.14>.
- Halbreich U, Kahn LS. Hormonal aspects of schizophrenias: an overview. *Psychoneuroendocrinology.* 2003;**28**:1-16. [https://doi.org/10.1016/s0306-4530\(02\)00124-5](https://doi.org/10.1016/s0306-4530(02)00124-5).
- Coco AS. Primary dysmenorrhea. *American family physician.* 1999;**60**(2):489-96.
- Perry M. Treatment options for dysmenorrhoea. *Practice Nursing.* 2012;**23**(4):195-8. <https://doi.org/10.12968/pnur.2012.23.4.195>.
- Chien LW, Chang HC, Liu CF. Effect of yoga on serum homocysteine and nitric oxide levels in adolescent women with and without dysmenorrhea. *J Altern Complement Med.* 2013;**19**(1):20-3. [PubMed ID: 22963270]. <https://doi.org/10.1089/acm.2011.0113>.
- Rani M, Singh U, Agrawal GG, Natu SM, Kala S, Ghildiyal A, et al. Impact of Yoga Nidra on menstrual abnormalities in females of reproductive age. *J Altern Complement Med.* 2013;**19**(12):925-9. [PubMed ID: 23647406]. <https://doi.org/10.1089/acm.2010.0676>.
- Bieglmayer C, Hofer G, Kainz C, Reinthaller A, Kopp B, Janisch H. Concentrations of various arachidonic acid metabolites in menstrual fluid are associated with menstrual pain and are influenced by hormonal contraceptives. *Gynecol Endocrinol.* 1995;**9**(4):307-12. [PubMed ID: 8629459]. <https://doi.org/10.3109/09513599509160464>.
- Pickles VR. Prostaglandins and dysmenorrhea. Historical survey. *Acta Obstet Gynecol Scand Suppl.* 1979;**87**:7-12. [PubMed ID: 380252]. <https://doi.org/10.3109/00016347909157782>.
- Proctor M, Farquhar C. Diagnosis and management of dysmenorrhoea. *BMJ.* 2006;**332**(7550):1134-8. [PubMed ID: 16690671]. [PubMed Central ID: PMC1459624]. <https://doi.org/10.1136/bmj.332.7550.1134>.
- Dawood MY. Primary dysmenorrhea: advances in pathogenesis and management. *Obstet Gynecol.* 2006;**108**(2):428-41. [PubMed ID: 16880317]. <https://doi.org/10.1097/01.AOG.0000230214.26638.0c>.
- Sahin N, Kasap B, Kirli U, Yeniceri N, Topal Y. Assessment of anxiety-depression levels and perceptions of quality of life in adolescents with dysmenorrhea. *Reprod Health.* 2018;**15**(1):13. [PubMed ID: 29373981]. [PubMed Central ID: PMC5787268]. <https://doi.org/10.1186/s12978-018-0453-3>.
- McGovern CE, Cheung C. Yoga and Quality of Life in Women with Primary Dysmenorrhea: A Systematic Review. *J Midwifery Womens Health.* 2018;**63**(4):470-82. [PubMed ID: 29902363]. <https://doi.org/10.1111/jmwh.12729>.
- Yonglitthipagon P, Muansiangsai S, Wongkhumngern W, Donpunha W, Chanavirut R, Siritaratiwat W, et al. Effect of yoga on the menstrual pain, physical fitness, and quality of life of young women with primary dysmenorrhea. *J Bodyw Mov Ther.* 2017;**21**(4):840-6. [PubMed ID: 29037637]. <https://doi.org/10.1016/j.jbmt.2017.01.014>.
- Payam R, Payam T, Mushud M, Ahmad H. [Yoga training (pictured and step by step)]. Iran; 2008. FA.
- Kim SD. Yoga for menstrual pain in primary dysmenorrhea: A meta-analysis of randomized controlled trials. *Complement Ther Clin Pract.* 2019;**36**:94-9. [PubMed ID: 31383452]. <https://doi.org/10.1016/j.ctcp.2019.06.006>.
- Gannon L. The potential role of exercise in the alleviation of menstrual disorders and menopausal symptoms: a theoretical synthesis of recent research. *Women Health.* 1988;**14**(2):105-27. [PubMed ID: 3072770]. https://doi.org/10.1300/J013v14n02_07.
- Udupa K, Bhavanani AB, Vijayalakshmi P, Surendiran A; Madanmohan. Effect of slow and fast pranayams on reaction time and cardiorespiratory variables. *Indian J Physiol Pharmacol.* 2005;**49**(3):313-8. [PubMed ID: 16440849].
- Roshi M. Yoga an Effective, Alternative and Cost Effective Approach Towards Management of Dysmenorrhea. *World Journal of Pharmaceutical Research.* 2017;1830-6. <https://doi.org/10.20959/wjpr20177-8967>.
- Ghorbani L, Ghasemi G. Effects of Eight Weeks Corrective Exercises on Lumbar Lordosis. *Journal of Research in Rehabilitation Sciences.* 2007;**3**(2). <https://doi.org/10.22122/jrrs.v3i2.88>.

24. Afrondeh R, Saidznozi R. [Comparison of the effect of traditional corrective exercise and pilates on lumbar lordosis abnormality of female students]. *Rehabilitation Med.* 2016. FA.
25. Lau C, Yu R, Woo J. Effects of a 12-Week Hatha Yoga Intervention on Cardiorespiratory Endurance, Muscular Strength and Endurance, and Flexibility in Hong Kong Chinese Adults: A Controlled Clinical Trial. *Evid Based Complement Alternat Med.* 2015;2015:958727. [PubMed ID: 26167196]. [PubMed Central ID: PMC4475706]. <https://doi.org/10.1155/2015/958727>.
26. Masoudi Sabet K, Ganji B, Dehghani M. [The effect of 8 weeks of yoga selected exercises on pain and functional disability in Women with non-specific chronic low back pain]. *J Res Sport Rehabilitation.* 2017;5(9):25-35. FA. <https://doi.org/10.22084/rst.2017.10510.1235>.
27. 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. [PubMed ID: 21514190]. <https://doi.org/10.1016/j.jpag.2011.01.059>.
28. Rani K, Tiwari S, Singh U, Singh I, Srivastava N. Yoga Nidra as a complementary treatment of anxiety and depressive symptoms in patients with menstrual disorder. *Int J Yoga.* 2012;5(1):52-6. [PubMed ID: 22346067]. [PubMed Central ID: PMC3276934]. <https://doi.org/10.4103/0973-6131.91715>.
29. Nag U. Effect of Yoga on Primary Dysmenorrhea and Stress in Medical Students. *IOSR Journal of Dental and Medical Sciences.* 2013;4(1):69-73. <https://doi.org/10.9790/0853-0416973>.
30. Sakuma Y, Sasaki-Otamaru A, Ishida S, Kanoya Y, Arakawa C, Mochizuki Y, et al. Effect of a home-based simple yoga program in child-care workers: a randomized controlled trial. *J Altern Complement Med.* 2012;18(8):769-76. [PubMed ID: 22808932]. <https://doi.org/10.1089/acm.2011.0080>.
31. Khalsa GDS, Stauth C. *Meditation as medicine: Activate the power of your natural healing force.* Simon and Schuster; 2011.
32. Birch KM, Reilly T. Manual handling performance: the effects of menstrual cycle phase. *Ergonomics.* 1999;42(10):1317-32. [PubMed ID: 10582502]. <https://doi.org/10.1080/001401399184974>.
33. Mannix LK. Menstrual-related pain conditions: dysmenorrhea and migraine. *J Womens Health (Larchmt).* 2008;17(5):879-91. [PubMed ID: 18537489]. <https://doi.org/10.1089/jwh.2007.0440>.
34. Nasir L, Bope ET. Management of pelvic pain from dysmenorrhea or endometriosis. *J Am Board Fam Pract.* 2004;17 Suppl:S43-7. [PubMed ID: 15575029]. https://doi.org/10.3122/jabfm.17.suppl_1.s43.
35. Reed BG, Carr BR. The Normal Menstrual Cycle and the Control of Ovulation. In: Feingold KR, Anawalt B, Blackman MR, Boyce A, Chrousos G, Corpas E, et al., editors. *Endotext.* South Dartmouth (MA): [Internet]; 2000.
36. Streeter CC, Gerbarg PL, Saper RB, Ciraulo DA, Brown RP. Effects of yoga on the autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. *Med Hypotheses.* 2012;78(5):571-9. [PubMed ID: 22365651]. <https://doi.org/10.1016/j.mehy.2012.01.021>.
37. Sprouse-Blum AS, Smith G, Sugai D, Parsa FD. Understanding endorphins and their importance in pain management. *Hawaii Med J.* 2010;69(3):70-1. [PubMed ID: 20397507]. [PubMed Central ID: PMC3104618].
38. Nidhi R, Padmalatha V, Nagarathna R, Amritanshu R. Effect of holistic yoga program on anxiety symptoms in adolescent girls with polycystic ovarian syndrome: A randomized control trial. *Int J Yoga.* 2012;5(2):112-7. [PubMed ID: 22869994]. [PubMed Central ID: PMC3410189]. <https://doi.org/10.4103/0973-6131.98223>.