

Effectiveness of Yoga Exercise in Reducing Dysmenorrhea Pain Among Adolescent Girls at SMA Islam Al Azhar 14 Semarang

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Abstract: Background: Dysmenorrhea is a reproductive health problem commonly experienced by adolescent girls and can interfere with daily activities. One non-pharmacological approach that can be taken to reduce dysmenorrhea pain is yoga. Objective: This study aims to determine the effectiveness of yoga exercises in reducing dysmenorrhea pain in adolescent girls at Al Azhar 14 Islamic High School in Semarang. Method: This study used a pre-experimental design with a one-group pretest–posttest approach. The study sample consisted of 45 female students in grade XI who experienced primary dysmenorrhea, selected using purposive sampling. Pain levels were measured before and after the intervention using the Visual Analog Scale (VAS). The yoga exercise intervention was given once a week for two months (8 weeks). The data were analyzed using the Paired Sample T-Test after meeting the Shapiro–Wilk normality test. Results: The average dysmenorrhea pain score before yoga exercise was 5.58 ± 1.865 , while after yoga exercise it decreased to 3.93 ± 1.321 . The results of the Paired Sample T-Test showed a p-value of 0.001 ($p < 0.05$), which means that there was a significant difference between the pain levels before and after the intervention. Conclusion: Yoga exercises are effective in reducing dysmenorrhea pain in adolescent girls. Yoga exercises can be recommended as an alternative non-pharmacological therapy for treating dysmenorrhea in adolescents.

Keywords: dysmenorrhea; non-pharmacological therapy; teenage girls; yoga exercises

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Introduction

Dysmenorrhea is one of the most common reproductive health problems experienced by adolescent girls and may substantially interfere with their daily activities. It typically develops approximately 6–12 months after the onset of menarche, when ovulatory menstrual cycles become established. During this period, many adolescent girls experience menstrual pain of varying intensity, which may adversely affect their quality of life. The pain is primarily attributed to excessive uterine contractions induced by elevated prostaglandin production within the endometrium. In Indonesia, the prevalence of dysmenorrhea among adolescent girls remains considerably high, with an estimated rate of 64.25%, encompassing both primary and secondary dysmenorrhea.

The menstrual cycle in adolescent girls is often characterized by physiological immaturity, resulting in irregular hormonal fluctuations that may give rise to both physical and emotional symptoms, one of the most common being dysmenorrhea. Menstrual pain is typically localized in the lower abdomen and may be accompanied by nausea, diarrhea, dizziness, or even syncope in more severe cases. Pain occurring at the onset of menstruation can substantially impair adolescents' ability to perform daily activities, both at school and at home. If left inadequately managed, dysmenorrhea may negatively affect adolescents' physical, psychological, and social well-being.

Management of dysmenorrhea generally involves two principal approaches: pharmacological and non-pharmacological interventions. Pharmacological treatment commonly includes the administration of analgesics or non-steroidal anti-inflammatory drugs (NSAIDs) to alleviate menstrual pain. However, some adolescents are reluctant to use these medications because of concerns regarding adverse effects, contraindications, or prolonged medication use. Consequently, non-pharmacological interventions have gained increasing attention as safer and more natural alternatives for pain management.

Among the available non-pharmacological interventions, yoga has been consistently recognized as an effective strategy for reducing the severity of dysmenorrhea. Yoga is a mind–body practice that integrates physical postures, controlled breathing techniques, and meditation to promote both physical and psychological well-being.

Regular yoga practice has been shown to relieve muscle tension, enhance pelvic blood circulation, and stimulate the release of endorphins, the body's endogenous analgesics, thereby reducing the perception of menstrual pain. Furthermore, yoga contributes to stress reduction, an important factor known to trigger or exacerbate menstrual pain, making it a comprehensive and holistic intervention for the management of dysmenorrhea among adolescents.

Previous studies have consistently demonstrated that yoga exercise exerts a beneficial effect in alleviating dysmenorrhea among adolescent girls. A growing body of evidence indicates that regular yoga practice can significantly reduce the intensity of menstrual pain experienced by women, with both immediate and sustained therapeutic benefits. These findings support the use of yoga as a promising non-pharmacological intervention, particularly for adolescents who frequently experience dysmenorrhea and seek safe, accessible, and holistic approaches to pain management.

In Indonesia, yoga has increasingly gained recognition as an effective complementary therapy for menstrual pain; however, its implementation remains limited to certain regions and educational settings. Therefore, this study was conducted to evaluate the effectiveness of yoga exercise in reducing dysmenorrheal pain among adolescent girls at SMA Islam Al Azhar 14 Semarang. Specifically, this study aims to provide empirical evidence regarding the effectiveness of yoga as a non-pharmacological intervention for the management of primary menstrual pain in adolescents.

The findings of this study are expected to contribute to the growing body of knowledge on evidence-based dysmenorrhea management and to provide practical recommendations for schools and healthcare institutions to incorporate yoga into adolescent reproductive health promotion programs. Furthermore, this study may serve as a valuable reference for future research involving broader populations, diverse settings, and more comprehensive research designs to further strengthen the evidence regarding the effectiveness of yoga in managing dysmenorrhea among adolescent girls.

Method

This study employed a quasi-experimental design using a one-group pretest–posttest approach. In this design, no control group was included. Participants underwent two sequential assessments of menstrual pain intensity: the first (pretest) was conducted before the yoga intervention to establish baseline pain levels, and the second (posttest) was performed after completion of the yoga intervention to evaluate changes in menstrual pain intensity attributable to the intervention.

The study population comprised the entire group of interest to be investigated. In this study, the population consisted of all 71 eleventh-grade female students at SMA Islam Al Azhar 14 Semarang who had experienced menarche. The study sample represented the accessible portion of the target population that met the eligibility criteria and was enrolled in the study.

The primary outcome, menstrual pain intensity, was measured using the Visual Analogue Scale (VAS). Participants' demographic and menstrual characteristics, including age, age at menarche, menstrual duration, and regularity of physical exercise, were collected using an observation form and a validated menstrual characteristics questionnaire.

Data were collected through in-person questionnaire administration and structured interviews with participants who met the eligibility criteria. Before data collection, all participants received a comprehensive explanation of the study objectives and procedures and provided written informed consent prior to completing the study questionnaires.

Data were analyzed using IBM SPSS Statistics through the following analytical procedures, univariate analysis was performed to describe the participants' characteristics and the frequency distributions of stress levels, menstrual cycle regularity, and dysmenorrhea. The results are presented as frequency distribution tables and percentages, bivariate (correlational) analysis was conducted to examine the relationships between stress levels and menstrual cycle regularity, as well as between stress levels and dysmenorrhea, the normality of the continuous variables was assessed using the Shapiro–Wilk test, as the study included fewer than 50 participants, statistical test results were reported as p-values, with a p-value of < 0.05 considered to indicate statistical significance.

Results and Discussion

Dysmenorrhea is primarily caused by excessive uterine muscle contractions during menstruation. Throughout the menstrual cycle, the endometrial lining that is no longer required undergoes shedding and is expelled with menstrual blood. To facilitate this process, the uterus contracts. These contractions are stimulated by increased prostaglandin production, which induces intense uterine muscle contractions. Elevated prostaglandin levels also

reduce uterine blood flow, resulting in ischemia and pain that is commonly perceived in the lower abdomen, lower back, and thighs.

Prostaglandin production increases substantially during menstruation, thereby enhancing uterine contractility and exacerbating menstrual pain. In addition, fluctuations in estrogen and progesterone levels influence prostaglandin synthesis. Estrogen promotes the proliferation and thickening of the endometrial lining, whereas the decline in progesterone levels at the onset of menstruation triggers endometrial shedding. The relative increase in estrogen levels prior to menstruation may further stimulate prostaglandin production, thereby contributing to the development of menstrual cramps and dysmenorrhea.

Psychological factors, particularly stress, also play a significant role in the pathophysiology of dysmenorrhea. Stress increases cortisol secretion, which may disrupt hormonal homeostasis and indirectly enhance prostaglandin production, thereby aggravating menstrual pain. Furthermore, anxiety and emotional tension may increase pain sensitivity, making adolescents more susceptible to experiencing dysmenorrhea with greater intensity more sensitive to pain, thereby exacerbating the symptoms of dysmenorrhea.

As a non-pharmacological intervention, yoga exercise has been shown to be an effective approach for alleviating dysmenorrhea pain. Yoga postures help relieve muscle tension associated with excessive uterine contractions, while controlled breathing techniques promote relaxation and reduce psychological stress. In addition, yoga stimulates the release of endorphins, the body's endogenous analgesics, which contribute to pain modulation and significantly reduce the intensity of menstrual pain. Through the combined effects of physical relaxation, hormonal regulation, and stress reduction, yoga may improve overall well-being and serve as a safe and effective complementary therapy for managing dysmenorrhea among adolescent girls.

Yang and Kim (2016) reported a significant reduction in menstrual cramps among undergraduate students with primary dysmenorrhea after a 12-week yoga program. Their single-blind randomized controlled trial included 40 participants, with 20 assigned to the yoga group and 20 to the control group. The intervention was delivered for 60 minutes once a week for 12 weeks. These findings support the present study, although the present study used a one-group pretest–posttest design and involved 45 adolescent girls.

Mohamed et al. (2024) compared rocking, stretching, and Kegel exercises for primary dysmenorrhea among university female students. Their quasi-experimental study included 369 students, and all three exercise approaches produced significant reductions in pain intensity, with Kegel exercise showing the strongest effect. This differs from the present study because the current intervention focused specifically on yoga and used a one-group pretest–posttest design.

Hashemi et al. (2022) also found that an eight-week water-yoga program significantly reduced pain intensity and pain duration among girls with primary dysmenorrhea. Their clinical trial included 40 female students aged 18–26 years who were assigned to intervention and control groups. The present study differs in the intervention setting, participant characteristics, and study design, but the findings provide additional support for yoga-based exercise as a non-pharmacological approach to dysmenorrhea management.

The primary differences between the present study and previous studies are related to sample characteristics and analytical approaches. This study involved a larger sample size and applied a more robust statistical analysis through the Paired Samples t-Test following normality assessment, thereby strengthening the reliability of the findings. Previous studies that incorporated control or comparison groups provided broader insights into the effectiveness of yoga exercise by allowing comparisons between intervention groups and groups without intervention. Such designs contribute to a more comprehensive understanding of the effectiveness of yoga compared with other therapeutic approaches for managing dysmenorrhea.

To determine whether yoga exercise influenced changes in menstrual pain intensity, the researchers employed the Paired Samples t-Test to compare pain scores among adolescent girls before and after participating in yoga exercise therapy. All 45 participants experienced a reduction in pain intensity, with a p-value of 0.001 ($p < 0.05$), indicating that the null hypothesis (H_0) was rejected and the alternative hypothesis (H_a) was accepted. These findings demonstrate that yoga exercise had a statistically significant effect on menstrual pain intensity before and after the intervention.

Pain is a subjective experience, as only individuals experiencing pain can accurately describe its severity. This subjectivity may influence variations in reported pain intensity scores among participants. Pain can be triggered by physical stimuli, including thermal, mechanical, and electrical stimuli, as well as chemical mediators. Following tissue injury caused by disruption of tissue continuity, the body releases inflammatory mediators such as histamine, bradykinin, serotonin, and prostaglandins, which contribute to pain perception. During menstruation, the shedding of endometrial cells stimulates prostaglandin release, resulting in endometrial muscle contractions and constriction of surrounding blood vessels. This vasoconstriction reduces oxygen supply to the endometrial tissue, leading to ischemia and ultimately causing menstrual pain (Iacovides et al., 2015).

Yoga exercise may alleviate menstrual pain by relaxing uterine muscles experiencing spasms and reduced oxygen supply due to increased prostaglandin levels. This relaxation promotes vasodilation, thereby improving previously restricted blood flow and reducing pain intensity. In addition, yoga may help regulate pain perception by promoting relaxation responses, allowing the body to recover more effectively. Regular yoga movements also improve blood circulation, which may contribute to the reduction of menstrual pain symptoms (Carolyn et al., 2022).

The findings of this study are consistent with those reported by Hadiani and Ferina (2021), who investigated the effect of yoga exercise on menstrual pain reduction among female students at SMPN 40 Bandung. Their study involved 30 participants and demonstrated that yoga exercise significantly reduced menstrual pain among adolescent girls, with a statistically significant p-value of 0.000. Based on theoretical analysis and empirical findings, it can be concluded that yoga exercise is an effective non-pharmacological intervention for reducing menstrual pain (dysmenorrhea). Therefore, yoga exercise may be considered a safe and practical complementary approach for managing dysmenorrhea among adolescent girls.

Table 1. Participants' Characteristics by Age

Age Characteristics	Frequency (n)	Percentage (%)
16 years	17	37,6
17 years	21	46,7
18 years	7	15,6
Total	45	100

Based on Table 1, the age characteristics of the participants showed that 17 participants (37.8%) were 16 years old, 21 participants (46.7%) were 17 years old, and 5 participants (15.6%) were 18 years old. As shown in Table 2, the age at menarche among the participants varied. Most participants experienced menarche at 13 years of age (17; 37.8%), followed by before 12 years (13; 28.9%), at 12 years (10; 22.2%), and at 14 years (5; 11.1%).

Table 2. Participants' Characteristics by Age at Menarche

Age at Menarche (years)	Frequency (n)	Percentage (%)
< 12 Tahun	13	28,9
12 Tahun	10	22,2
13 Tahun	17	37,8
14 Tahun	5	11,1
Total	45	100

Table 3. Menstrual Duration Distribution

Menstrual Duration	Frekuensi (n)	Percentage (%)
5 days	29	64,4
6 days	4	8,9
7 days	11	24,4
8 days	1	2,2
Total	45	100

As shown in Table 3, the participants' menstrual duration varied. The majority of participants reported a menstrual duration of 5 days (29; 64.4%), followed by 7 days (11; 24.4%), 6 days (4; 8.9%), and 8 days (1; 2.2%).

Table 4. Frequency Distribution of Participants by Exercise Frequency

Exercise	Frekuensi (n)	Percentage (%)
No Exercise	6	13,3
Once per Week	11	24,4
Twice per Week	19	42,2
Three Times per Week	9	20,0
Total	45	100

As shown in Table 4, the participants' exercise frequency varied. Most participants engaged in exercise twice per week (19; 42.2%), followed by once per week (11; 24.4%), three times per week (9; 20.0%), while 6 participants (13.3%) reported no regular exercise.

Table 5. Distribution of Baseline Dysmenorrhea Pain Scores

Pain Category	Frekuensi (n)	Percentage (%)
No Pain = 0 mm	0	0
Mild Pain = 1-29 mm	1	2,2
Moderate Pain = 3-54 mm	22	48,8
Severe Pain = 55-74 mm	15	33,3
Very Severe Pain = >75 mm	7	15,5
Total	45	100

As shown in Table 5, the distribution of dysmenorrhea pain scores at baseline (pretest) indicated that no participants reported no pain (0 mm). Only one participant (2.2%) reported mild pain (1–29 mm), whereas moderate pain (30–54 mm) was the most common category, reported by 22 participants (48.8%). In addition, 15 participants (33.3%) experienced severe pain (55–74 mm), and 7 participants (15.5%) reported very severe pain (≥75 mm).

Table 6. Distribution of Posttest Dysmenorrhea Pain Scores

Pain Category	Frekuensi (n)	Percentage (%)
No Pain = 0 mm	0	0
Mild Pain = 1-29 mm	1	2,2
Moderate Pain = 3-54 mm	22	48,8
Severe Pain = 55-74 mm	15	33,3
Very Severe Pain = >75 mm	7	15,5
Total	45	100

As shown in Table 6, the distribution of dysmenorrhea pain scores following the intervention indicated that no participants reported no pain (0 mm). Moderate pain (30–54 mm) was the most frequently reported category, affecting 22 participants (48.8%), followed by mild pain (1–29 mm) in 1 participant (2.2%) and severe pain (55–74 mm) in 15 participants (33.3%). No participants reported very severe pain (≥75 mm).

Table 7. Descriptive Statistical Analysis

Group	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	45	2	10	5,58	1,865
Post-test	45	1	6	3,93	1,321

As presented in Table 7, the descriptive statistics summarize the participants' dysmenorrhea pain scores at two assessment points: pre-intervention (pretest) and post-intervention (posttest). The mean pain score decreased from 5.58 at pretest to 3.93 at posttest, representing a mean reduction of 1.65 points following the yoga intervention.

Table 8. Normality Test

Group	df (n)	Sig (p-value)
Pre-test	45	0,186
Post-test	45	0,012

As presented in Table 8, the Shapiro–Wilk normality test showed that the pre-intervention (pretest) data had a p-value of 0.186, indicating a normal distribution ($p > 0.05$). In contrast, the post-intervention (posttest) data yielded a p-value of 0.012, indicating that the data were not normally distributed ($p < 0.05$).

Table 9. Hypothesis Testing

Pre-test (Mean ± SD)	Post-test (Mean ± SD)	p
5,58 ± 1,865	3,93 ± 1,321	0,001

As presented in Table 9, the hypothesis test yielded a p-value of 0.001, indicating a statistically significant difference ($p < 0.05$). Therefore, the alternative hypothesis (H_1) was accepted, and the null hypothesis (H_0) was rejected. These findings demonstrate that the yoga intervention was effective in reducing dysmenorrhea pain among adolescent girls. The observed significance level ($p < 0.001$) provides strong evidence that yoga exercise significantly reduced the intensity of dysmenorrhea pain following the intervention.

Conclusion

Based on the findings of this study, the majority of female adolescents in grade XI at SMA Islam Al Azhar 14 Semarang were 17 years old, with a mean age at menarche of 13 years and an average menstrual duration of 5 days. Prior to the yoga intervention, the mean dysmenorrhea pain score was 5.58, which decreased to 3.93 after the intervention. Statistical analysis revealed a p-value of 0.001 ($p < 0.05$), indicating that yoga exercise was effective in reducing dysmenorrhea pain among adolescent girls.

Declaration of Generative AI

The authors declare that this manuscript was independently written without the use of generative AI or automated content-generation tools.

Authors' Contribution

All authors contributed equally to all research phases, from study design and data analysis to manuscript preparation and approval of the final version.

Conflict of Interests Statement

The authors declare no conflicts of interest regarding the research, authorship, or publication of this article.

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Data Availability

The dataset used during the current study is available from the corresponding author upon reasonable request.

Informed Consent

Written informed consent was obtained from all participants prior to their inclusion in the study.

References

- Abdelrahman, A. Y., El-Kosery, S. M., Abbassy, A. H., & Botla, A. M. (2024). Effect of aquatic exercise versus aerobic exercise on primary dysmenorrhea and quality of life in adolescent females: A randomized controlled trial. *Physiotherapy Research International*, 29(3), e2095. <https://doi.org/10.1002/pri.2095>
- Burnett, M., & Lemyre, M. (2017). No. 345—Primary dysmenorrhea consensus guideline. *Journal of Obstetrics and Gynaecology Canada*, 39(7), 585–595. <https://doi.org/10.1016/j.jogc.2016.12.023>
- Carolyn, B. T., Maesari, I., & Hisni, D. (2022). Yoga exercise on reduction of menstrual pain among adolescent girls. *Nursing and Health Sciences Journal*, 2(1), 29–33. <https://doi.org/10.53713/nhs.v2i2.86>
- Carroquino-Garcia, P., Jiménez-Rejano, J. J., Medrano-Sanchez, E., De La Casa-Almeida, M., Diaz-Mohedo, E., & Suarez-Serrano, C. (2019). Therapeutic exercise in the treatment of primary dysmenorrhea: A systematic review and meta-analysis. *Physical Therapy*, 99(10), 1371–1380. <https://doi.org/10.1093/ptj/pzz101>
- Chhikara, A., Jain, M., Vats, S., Kashoo, F. Z., Chahal, A., Guliyas, S., Vajrjala, K. R., Sidiq, M., & Rai, R. H. (2023). Role of yoga in minimizing stress and anxiety in women experiencing dysmenorrhea. *Journal of Lifestyle Medicine*, 13(2), 90–96. <https://doi.org/10.15280/jlm.2023.13.2.90>
- De Sanctis, V., Soliman, A., Bernasconi, S., Bianchin, L., Bona, G., Bozzola, M., Buzi, F., De Sanctis, C., Tonini, G., Rigon, F., & Perissinotto, E. (2015). Primary dysmenorrhea in adolescents: Prevalence, impact and recent knowledge. *Pediatric Endocrinology Reviews*, 13(2), 512–520.

- Fernández-Martínez, E., Onieva-Zafra, M. D., & Parra-Fernández, M. L. (2019). The impact of dysmenorrhea on quality of life among Spanish female university students. *International Journal of Environmental Research and Public Health*, 16(5), 713. <https://doi.org/10.3390/ijerph16050713>
- Ferries-Rowe, E., Corey, E., & Archer, J. S. (2020). Primary dysmenorrhea: Diagnosis and therapy. *Obstetrics & Gynecology*, 136(5), 1047–1058. <https://doi.org/10.1097/AOG.0000000000004096>
- Gravdahl, O. F., Svenningsen, R., Majak, P., & Majak, G. B. (2025). Menstrual-related symptoms as red flags for school absenteeism among Norwegian adolescents (MINA): A cross-sectional study. *Acta Obstetrica et Gynecologica Scandinavica*, 104(4), 746–754. <https://doi.org/10.1111/aogs.15062>
- Hadianti, D. N., & Ferina, F. (2021). Yoga gymnastics reduces dysmenorrhea in adolescents. *Jurnal Riset Kesehatan Poltekkes Depkes Bandung*, 13(1), 239–245. <https://doi.org/10.34011/juriskesbdg.v13i1.1910>
- Handayani, S. G., Ayubi, N., Komaini, A., Lesmana, H. S., Kusnanik, N. W., Herawati, L., Ardha, M. A. Al, Nurhasan, Kafrawi, F. R., Putri, D. R. S., Kusuma, D. A., & Putra, A. Y. (2023). N-3 polyunsaturated fatty acids (PUFAs) and physical exercise have the potential to reduce pain intensity in women with primary dysmenorrhea: Systematic review. *Retos*, 48, 106–112. <https://doi.org/10.47197/retos.v48.96629>
- Hashemi, N., Babakhani, F., & Sheikhhoseini, R. (2022). The effect of water yoga exercises on the intensity and pain duration in girls with primary dysmenorrhea. *Women's Health Bulletin*, 9(2), 61–69. <https://doi.org/10.30476/whb.2022.92560.1144.1>
- Hu, Z., Tang, L., Chen, L., Kaminga, A. C., & Xu, H. (2020). Prevalence and risk factors associated with primary dysmenorrhea among Chinese female university students: A cross-sectional study. *Journal of Pediatric and Adolescent Gynecology*, 33(1), 15–22. <https://doi.org/10.1016/j.jpag.2019.09.004>
- Iacovides, S., Avidon, I., & Baker, F. C. (2015). What we know about primary dysmenorrhea today: A critical review. *Human Reproduction Update*, 21(6), 762–778. <https://doi.org/10.1093/humupd/dmv039>
- Kim, S. D. (2019). Yoga for menstrual pain in primary dysmenorrhea: A meta-analysis of randomized controlled trials. *Complementary Therapies in Clinical Practice*, 36, 94–99. <https://doi.org/10.1016/j.ctcp.2019.06.006>
- Kirca, N., & Celik, A. S. (2023). The effect of yoga on pain level in primary dysmenorrhea. *Health Care for Women International*, 44(5), 601–620. <https://doi.org/10.1080/07399332.2021.1958818>
- Matthewman, G., Lee, A., Kaur, J. G., & Daley, A. J. (2018). Physical activity for primary dysmenorrhea: A systematic review and meta-analysis of randomized controlled trials. *American Journal of Obstetrics and Gynecology*, 219(3), 255.e1–255.e20. <https://doi.org/10.1016/j.ajog.2018.04.001>
- McGovern, C. E., & Cheung, C. (2018). Yoga and quality of life in women with primary dysmenorrhea: A systematic review. *Journal of Midwifery & Women's Health*, 63(4), 470–482. <https://doi.org/10.1111/jmwh.12729>
- Mohamed, H. A., Habib, F. M., Gamal, R. A., & Abu Setta, S. (2024). Comparison between the effect of rocking, stretching, and Kegel exercises on pain intensity of primary dysmenorrhea among university female students. *Egyptian Journal of Health Care*, 15(2), 735–752. <https://doi.org/10.21608/ejhc.2024.356777>
- Rakhshae, Z. (2011). 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*, 24(4), 192–196. <https://doi.org/10.1016/j.jpag.2011.01.059>
- Sharma, S., Ali, K., Narula, H., Malhotra, N., Rai, R. H., Bansal, N., Balasubramanian, K., Kalra, S., Sanjeevi, R. R., & Chahal, A. (2023). Exercise therapy and electrotherapy as an intervention for primary dysmenorrhea: A systematic review and meta-analysis. *Journal of Lifestyle Medicine*, 13(1), 16–26. <https://doi.org/10.15280/jlm.2023.13.1.16>
- Sultan, C., Gaspari, L., & Paris, F. (2012). Adolescent dysmenorrhea. *Endocrine Development*, 22, 171–180. <https://doi.org/10.1159/000331775>
- Söderman, L., Edlund, M., & Marions, L. (2019). Prevalence and impact of dysmenorrhea in Swedish adolescents. *Acta Obstetrica et Gynecologica Scandinavica*, 98(2), 215–221. <https://doi.org/10.1111/aogs.13480>
- Tsai, I.-C., Hsu, C.-W., Chang, C.-H., Lei, W.-T., Tseng, P.-T., & Chang, K.-V. (2024). Comparative effectiveness of different exercises for reducing pain intensity in primary dysmenorrhea: A systematic review and network meta-analysis of randomized controlled trials. *Sports Medicine - Open*, 10(1), 63. <https://doi.org/10.1186/s40798-024-00718-4>
- Utarini, G. A. E., Dewi, N. L. P. S., Erawati, N. L. P. S., & Ningtyas, L. A. W. (2025). Effectiveness of yoga in reducing menstrual pain intensity among adolescents: A comparative study before and after intervention. *Jurnal Ilmiah Kebidanan (The Journal of Midwifery)*, 13(1), 81–88.
- Xiang, Y., Li, Q., Lu, Z., Yu, Z., Ma, G., Liu, S., & Li, Y. (2025). Efficacy and safety of therapeutic exercise for primary dysmenorrhea: A systematic review and meta-analysis. *Frontiers in Medicine*, 12, 1540557. <https://doi.org/10.3389/fmed.2025.1540557>

- Yang, N.-Y., & Kim, S.-D. (2016). Effects of a yoga program on menstrual cramps and menstrual distress in undergraduate students with primary dysmenorrhea: A single-blind, randomized controlled trial. *Journal of Alternative and Complementary Medicine*, 22(9), 732–738. <https://doi.org/10.1089/acm.2016.0058>
- Yonglitthipagon, P., Muansiangsai, S., Wongkhumngern, W., Donpunha, W., Chanavirut, R., Siritaratiwat, W., Mato, L., Eungpinichpong, W., & Janyachaoen, T. (2017). Effect of yoga on the menstrual pain, physical fitness, and quality of life of young women with primary dysmenorrhea. *Journal of Bodywork and Movement Therapies*, 21(4), 840–846. <https://doi.org/10.1016/j.jbmt.2017.01.014>
- Zheng, Q., Huang, G., Cao, W., & Zhao, Y. (2024). Comparative effectiveness of exercise interventions for primary dysmenorrhea: A systematic review and network meta-analysis. *BMC Women's Health*, 24(1), 610. <https://doi.org/10.1186/s12905-024-03453-w>