

A COMPARATIVE STUDY OF YOGA AND STRUCTURED EXERCISES ON PAIN, MUSCLE PERFORMANCE, STRESS AND QUALITY OF LIFE IN PRIMARY DYSMENORRHEA

Shivani Ahuja¹, Ankit Yadav², Mansi Mittal³, Jeyanthi S.^{4*}

¹Masters of physiotherapy student, Physiotherapy department, Amarjyoti Institute of Physiotherapy, Karkardooma, Delhi, India

²Assistant Professor, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India

³Assistant Professor, Amarjyoti Institute of Physiotherapy, Karkardooma, Delhi, India.

⁴Professor, Sri Venkateshwaraa college of physiotherapy, Sri Venkateshwaraa Medical college hospital and research center, Ariyur, Puducherry, India.

Correspondence address: Jeyanthi S.

Email: jevkrishnan1999@gmail.com

ABSTRACT

Introduction: With a prevalence of 25 to 90% in India, primary dysmenorrhea is a frequent ailment among women of reproductive age. Management of primary dysmenorrhea is selected from multidisciplinary options, which mainly consist of pharmacological intervention, but other alternative methods like yoga and exercise are also available. However, none of the researchers have compared the effects of yoga and exercise in primary dysmenorrhea. **Aim:** To compare the efficacy of yoga and structured exercises on pain, stress, quality of life and muscle performance in primary dysmenorrhea. **Methods:** Forty participants were randomly divided into two groups: one for yoga and the other for structured exercises. A total of twelve sessions were conducted over a period of three weeks. The baseline assessment was conducted on the 3rd day of the menstrual cycle, while the post-test was conducted on the 3rd day of the next consecutive cycle. After data acquisition, the results were analyzed using repeated measures ANOVA. **Result:** Following the intervention, both groups demonstrated significant improvement ($p < 0.05$). But changes were not statistically significant between the two groups. **Conclusion:** Both yoga and exercise were effective in reducing pain and stress, as well as improving quality of life and muscle performance in primary dysmenorrhea.

Keywords: Muscle Performance, Primary Dysmenorrhea, Quality of Life, Structured Exercises, Yoga

INTRODUCTION

Dysmenorrhea is a widespread gynaecological disorder that affects 45 - 95 percent of women, with one out of five cases being extremely severe. The prevalence of primary dysmenorrhea in India is about 70.2% (Omidvar et al., 2015). This disorder is characterized by severe uterine discomfort that manifests as lower abdomen or pelvic pain throughout the menstrual cycle, which can even radiate to the thighs and back (Kulkarni and Deb, 2019). Primary dysmenorrhea generally affects women between the ages of 16-25 years. Menstrual pain begins 6 to 12 months after menarche, once the ovarian or uterine

cycle is regular. The onset of pain is just prior to menstruation, and the symptoms are self-limiting. Symptoms typically last for about 1-3 days during menstruation. It is characterized by dull pain, cramps or aches in suprapubic region that may or may not radiate to the abdomen, lower back, posterior thigh or upper leg, medial thigh (Kannan et al., 2015).

Women with primary dysmenorrhea had higher levels of inflammatory markers in their menstrual fluid, including vasopressin, prostaglandins (PGE2 and PGF2 α), and leukotrienes. Studies indicate that the levels of progesterone decrease during the premenstrual period, which thereby leads to an

CITE THIS AS: Ahuja, S., Yadav, A., Mittal, M., and S, J. (2025). A Comparative Study Of Yoga And Structured Exercises On Pain, Muscle Performance, Stress And Quality Of Life In Primary Dysmenorrhea. The Indonesian Journal of Public Health, 20(3), 526-537. <https://doi.org/10.20473/ijph.v20i3.2025.526-537>

©2025 IJPH. Open access under CC BY NC-SA. License doi: 10.20473/ijph.vl20i3.2025.526-537 Received 2 January 2025, received in revised form 17 November 2025, Accepted 21 November 2025, Published online: December 2025. Publisher by Universitas Airlangga

increase in the levels of prostaglandins, a vasoconstrictor and myometrial stimulant. Similarly, leukotrienes increase myometrial activity and sensitivity of the pain fibers (Kulkarni and Deb, 2019) This can result in nausea, vomiting, uterine cramping, backache, pain in the thighs, syncope and fainting (Padubidri and Daftary, 2014) Thereby, leading to stress, absence from school, poor academic performance, lost work time and harms daily activities performed by the individual (Shelke and Patil, 2019)

Poor posture is also one of the underlying causes of dysmenorrhea. Poor abdominal support and a hollow back can lead to increased strain on the pelvic organs and a potential impairment of circulation. Therefore, there is a widespread recognition of the role that the muscles of the abdominal wall play in maintaining good body posture and supporting the organs in the abdominal cavity (Hamer and Denniston, 1933) Menstrual pain and cramps occur because of increased uterine contractions during menstrual phase and the uterus is innervated by the sympathetic nervous system (Locke and Warren, 1999) Stress causes the sympathetic nervous system to become more active which can further lead to increased uterine muscle contractions and can further exacerbate pain intensity (Vaziri et al., 2015) One of the main causes of a poor quality of life is pain (Iacovides, Avidon and Baker, 2015) Studies report lower quality of life (QOL) in females who suffer with primary dysmenorrhea because of pain, general health condition, physical and social functioning. As the incidence of dysmenorrhea rises, the quality of life of females affected by it deteriorates (Barnard et al., 2003).

Yoga strengthens weak muscles and leads to the development of cognitive control over the body's autonomic processes. It teaches the skill of relaxation, which releases tension from the muscles and nerves and increases vitality (Nayak and Shankar, 2004) It is also considered as

the alternate treatment for improving flexibility, muscular strength, psychological well-being and can also cultivate a sense of calmness (Collins, 1998) Yoga's potential mental and physical health benefits have reduced the sympathetic nervous tone and thereby reduced the menstrual distress (Nag and Kodali, 2013). It is widely accepted that exercise tends to reduce the severity or frequency of the symptoms of dysmenorrhea (Saleh, Mowafy and Hameid, 2016). There are numerous ways to lessen pain or uterine contractions and soothe the discomfort of menstruation such as exercise-induced opiate release, particularly beta-endorphins, vasodilation, prostaglandin suppression, stress reduction, and mood enhancement. (Kannan et al., 2015).

The high prevalence and major effects of primary dysmenorrhea on pain, muscle performance, stress levels and quality of life are alarming. Hence, it is crucial to find a way to enhance the general well-being of women that has no side effects and also to find an effective non-pharmacological treatment.

The goal of this study is to investigate the efficacy of structured exercises and yoga on pain, muscle performance, stress, and quality of life in women with primary dysmenorrhea. We hypothesized that yoga and structured exercises do not affect pain, stress, quality of life and muscle performance in primary dysmenorrhea.

METHODS

Study design and Participants

A total of 40 female participants with primary dysmenorrhea were recruited in this experimental study after approval from the ethical review board. This study was registered at Clinical Trials Registry - India with the number: CTRI/2021/02/031538). The subjects were selected through convenience sampling from the Resident Welfare Association

(RWA), an institute, and the OPD of charitable trusts. Potential participants signed the consent form before screening. Individuals between the ages of 18 and 25 were eligible to participate in the study. WaLIDD (working ability, location, intensity and days of pain). Score was more than or equal to 1, only subjects with regular menstrual cycles (25 to 35 days), pain intensity of 4 or more in VAS (Visual Analog scale), subjects with only primary dysmenorrhea, ready to participate in the study voluntarily after giving informed consent on paper and had working knowledge of English. Participants were excluded from the study if subjects were not willing to participate, using any pain relief methods i.e., pharmacological or non-pharmacological during study period, had irregular menstrual cycles, history of regular exercises or yoga 3 days/week history of recent fracture, strain or sprain, history of any gynaecological disorders or secondary dysmenorrhea history of any musculoskeletal/ neurological problems like disc prolapse, etc (Shahr-jerdy, 2013; Saleh, 2016; Kulkarni and Deb, 2019).

After the eligibility criteria were met, the subjects were assigned to two experimental groups via randomization: group A with subjects performing yoga and group B with subjects performing structured exercises (stretching and strengthening). Before starting the intervention, a pre-test was conducted on the third day of the menstrual cycle. The pre-test involved assessing the levels of pain, muscle performance, stress, and quality of life. Following the pre-test, the interventional program was conducted via virtual sessions for both groups. The post-test was finally conducted on the 3rd day of the second consecutive menstrual cycle.

Sample size calculation and Randomization

G Power software was used to determine the sample size (Alpha error - 0.05, Effect size - 0.3, Power - 0.8, Number of measurements – 2, Number of groups –

2). The total sample size came out to be 40. These study subjects were divided equally into two groups. Convenience sampling was used to choose the research participants. After giving consent, the subjects were randomized into two groups via computer-generated randomization software.

Intervention

Participants in both the groups performed a total of twelve sessions of the interventional program each of 30 minutes, 4 times per week for 3 weeks. Participants in Group A (yoga) performed six asanas namely, Uttanpadasana, Uttanasana, Chakkichalanasana, Dhanurasana, Sasanakasana and Salabhasana. Each asana was performed for 5 minutes. Whereas, participants in group B performed structured exercises. It comprised of both strengthening and stretching exercises. Strengthening exercises included curl-ups, planks, pelvic bridging and prone on hands. Each position was held for 5 seconds and repeated 10 times except for planks which was repeated 12 times. Stretching exercises included bilateral knee-chest, and hamstring stretch. Every position was maintained for 30 seconds and then performed three times.

Outcome measures

Pain intensity was the primary outcome measure of the study, evaluated using the VAS scale (ICC – 0.97). It is a scale in which a line is drawn from 0 to 10, where 0 denotes "no pain at all" and 10 denotes "worst pain possible". Participants express their level of pain by pointing to the appropriate value on a 10-cm horizontal scale (Bijur, Silver and Gallagher, 2001).

The secondary outcome measures of the study were muscle performance, stress and quality of life. Muscle performance included muscle strength, flexibility, endurance and abdominal power. The strength of the transversus abdominis muscle was evaluated using a

Pressure Biofeedback unit (Stabilizer pressure biofeedback, Chattanooga, DJO, LLC), flexibility using the sit and reach test, abdominal endurance with the abdominal static endurance test, back endurance with Beiring- Sorensen test and abdominal power with the front power abdominal test, respectively. Stress was examined using 10 – 10-item perceived stress scale (PSS–10). It is a self-reported scale intended to address how stressful a person perceives certain circumstances in their life (reliability = 0.842). The 5-point Likert scale, which goes from 0 (never) to 4 (very often), is used to rate each item on the PSS-10. The range of total score is 0 to 40, with higher scores suggesting greater levels of perceived stress in an individual (Maroufizadeh et al., 2018).

Quality of life was assessed using the Short Form 36 questionnaire (SF–36). The SF-36 measures eight scales: bodily pain, physical functioning, general health, energy/fatigue, role limitation due to emotional problems, social functioning, role limitation due to emotional well-being, and physical problems (Lins and Carvalho, 2016). Reliability of this scale is > 0.75, and validity is 0.73 – 0.96 (Brazier et al., 1992).

Statistical Analysis

A Microsoft Excel sheet was used to compile the data, and descriptive statistics of SPSS version 21.0 were used for its

analysis. The statistical values were combined as mean + SD. Repeated measures ANOVA was used to analyze the efficacy of yoga and structured exercises on pain, stress, quality of life and muscle performance in primary dysmenorrhea and to compare between the two interventional groups. Statistical significance was fixed at 0.05.

Ethical Clearance

An ethical clearance certificate was obtained prior to the start of the study from the Institutional Ethics Review Board with letter number AJIRB-EC/07/2020.

RESULT

The intervention program was completed by 40 female participants (20 in each group), and 100% of the participants adhered to the 3-week intervention period. Participants were allocated randomly into each group. Furthermore, no negative impacts of yoga training or a structured exercise program were observed or reported. Participants aged 18 to 25 were included in the study. The mean ages, menstrual cycle durations, and bleeding durations of participants in both groups are listed in Table 1. It suggests that baseline characteristics of the participants in both groups included in the study were very similar.

Table 1. Demographic data of the participants, including the mean age, menstrual cycle duration and bleeding duration of both experimental groups.

GROUP	YOGA (GROUP A)	STRUCTURED EXERCISES (GROUP B)
Population (N = 40)	20	20
Age (years) (Mean ± SD)	21.5 ± 2.64	22.3 ± 2.05
Menstrual cycle duration (days) (Mean ± SD)	30.45 ± 2.79	29.75 ± 2.45
Bleeding duration (days) (Mean ± SD)	4.9 ± 1.11	4.95 ± 0.76

Pain intensity

Upon evaluating pain intensity levels using the visual analog scale, it was recorded that the mean difference in pain intensity in the yoga group was 2.4 ± 1.91 and in the structured exercise group was 1.96 ± 1.24 . The results indicate a significant reduction in pain over time ($p < 0.05$) in both groups; however, there was no statistically significant difference between the two interventional groups (Table 2).

Muscle performance

All the components of muscle performance [muscle strength, endurance (abdominal and back), abdominal power and flexibility] also showed significant improvement in both the groups with time ($p < 0.05$) but failed to achieve in between-

group and group * time interaction (Table 3).

Quality of life

All eight domains of quality of life demonstrated significant improvement over time ($p < 0.05$). However, there were no statistically significant differences between the two groups in any of their domains (Figures 1 and 2). The stress levels in participants showed a mean difference of $5.45 + 3.85$ in the group that performed yoga and $6.1 + 4.86$ in the group that performed structured exercises. All participants in both groups reported a significant reduction in stress levels over time, i.e. after three weeks of intervention; however, there were no statistically significant differences between the two groups (Table 4).

Table 2. Showing Mean $\pm$ SD and repeated measures ANOVA for pain intensity.

Outcome measure	Assessment	Group A Mean ± SD	Group B Mean ± SD	F value		Significance S – p<0.05 NS– p>0.05
Pain intensity (cm)	Pre test	6.34±1.89	6.74±2.14	Between group	0.358	0.553 ^{NS}
	Post test	4.52±2.66	4.78±2.33	Within time	36.381	0.000 ^S
				Time*group	0.066	0.799 ^{NS}

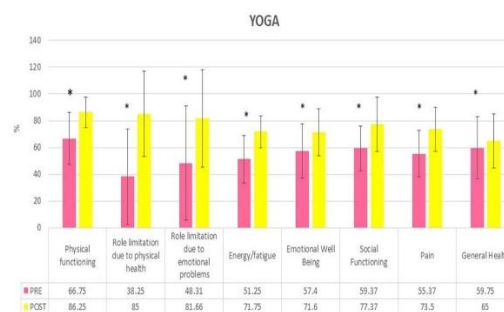
Table 3. Showing Mean $\pm$ SD and repeated measures ANOVA for muscle performance.

Outcome measure	Assessment	Group A (Mean ± SD)	Group B (Mean ± SD)	F value	Significance S - p<0.05 NS– p>0.05	
Muscle strength (mmHg)	Pre test	2.5± 1.10	2.65± 1.08	Between group	0.085	0.772 ^{NS}
	Post test	4.05± 1.19	4.25± 1.25	Within time	152.000	0.000 ^S
				Time*group	0.000	1.000 ^{NS}
Flexibility (cm)	Pre test	23.40± 9.75	21.56± 7.55	Between group	0.761	0.388 ^{NS}
	Post test	27.26± 7.89	24.64± 7.40	Within time	67.90	0.000 ^S
				Time*group	0.848	0.363 ^{NS}

Outcome measure	Assessment	Group A (Mean $\pm$ SD)	Group B (Mean $\pm$ SD)	F value	Significance S - $p < 0.05$ NS - $p > 0.05$
Back endurance (sec)	Pre test	31.8 $\pm$ 16.78	32.85 $\pm$ 23.12	Between group	0.071 0.791 ^{NS}
	Post test	43 $\pm$ 20.71	45.55 $\pm$ 26.69	Within time	39.100 0.000 ^S
				Time*group	0.154 0.697 ^{NS}
Abdominal endurance (grade)	Pre test	4.3 $\pm$ 0.73	4.4 $\pm$ 0.68	Between group	0.019 0.890 ^{NS}
	Post test	4.75 $\pm$ 0.44	4.7 $\pm$ 0.57	Within time	23.361 0.000 ^S
				Time*group	0.934 0.340 ^{NS}
Abdominal endurance (time)	Pre test	28.8 $\pm$ 10.68	33.1 $\pm$ 15.69	Between group	2.611 0.114 ^{NS}
	Post test	35.65 $\pm$ 12.22	47.95 $\pm$ 29.15	Within time	15.456 0.000 ^S
				Time*group	2.101 0.155 ^{NS}
Abdominal power (cm)	Pre test	136.75 $\pm$ 48.53	123.96 $\pm$ 35.95	Between group	1.406 0.243 ^{NS}
	Post test	167.88 $\pm$ 41.71	151.80 $\pm$ 35.60	Within time	48.035 0.000 ^S
				Time*group	0.149 0.701 ^{NS}

Table 4. Showing Mean $\pm$ SD and repeated measures ANOVA for stress

Outcome measure	Assessment	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	F value	Significance S - $p < 0.05$ NS - $p > 0.05$
Stress	Pre test	21.25 $\pm$ 5.91	21.55 $\pm$ 4.16	Between group	0.058 0.811 ^{NS}
	Post test	16.9 $\pm$ 5.01	15.95 $\pm$ 4.83	Within time	35.313 0.000 ^S
				Time*group	0.557 0.460 ^{NS}

**Figure 1.** Mean pre- and post-intervention scores of quality of life domains of yoga participants (n=40).

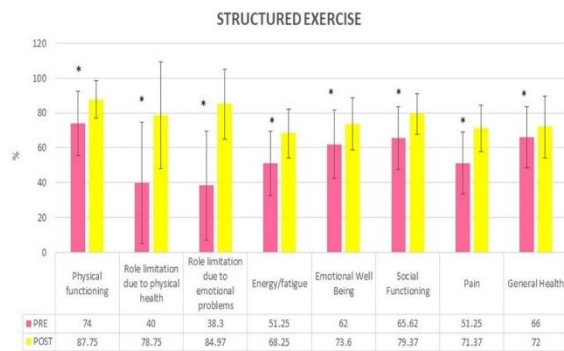


Figure 2. Mean pre- and post-intervention scores of quality of life domains of structured exercise participants (n=40).

DISCUSSION

Women with primary dysmenorrhea experience extreme pain, stress and therefore have a poor quality of life. Pain itself is debilitating in nature, and it can become really stressful for women to manage daily activities, especially for those who are working hard to make ends meet. Some women continue to lie in their beds, whereas others depend on pain-relieving medications to prevent hindrance in their jobs or studies (Saleh, Mowafy and Hameid 2016). Many studies have been conducted to design exercise protocols which can prevent women from this financial burden or the monthly expense of medications to manage primary dysmenorrhea. The present study aimed to compare the effects of yoga and structured exercises on pain, stress, quality of life, and muscle performance in primary dysmenorrhea.

Pain intensity

Participants in the current study who received yoga treatment reported a reduction in pain from 6.34 ± 1.89 cm to 4.52 ± 2.66 cm and those treated with structured exercises reported a reduction in pain from 6.74 ± 2.14 cm to 4.78 ± 2.33 cm. Results show a significant reduction in pain intensity in both groups. But when it came to lessening the severity of pain, none of the interventions outperformed the others. It is

believed that yoga helps reduce pain through the gate control mechanism, which involves the release of natural analgesics. It not only promotes relaxation but also reduces tension and fear. Awareness of breathing while an individual performs asanas can help reduce pain and promote relaxation (Rakhshae, 2011). Even exercise promotes pain reduction in a similar fashion to yoga. It enhances pelvic blood flow and the release of beta-endorphins, which further boosts the pain threshold or alleviates pain intensity. It improves mood and reduces mental pressure (Proctor and Farquhar, 2006). These could be the reasons which led to the reduction in pain in our study.

Rakhshae evaluated the efficacy of yoga therapy in females with primary dysmenorrhea. The results showed that compared to the control group, the experimental group's degree of pain severity and duration was significantly lower. This study suggested that yoga is a safe and effective method for managing primary dysmenorrhea, which supports the current results (Rakhshae, 2011). A study was conducted to compare the impact of strengthening and stretching exercises on managing the symptoms of primary dysmenorrhea. The exercise group's pain duration and intensity significantly decreased, according to the results. The author of this study suggests that this change occurred due to an increase in uterine blood circulation, which consequently led to a reduction in dysmenorrhea symptoms (Saleh, Mowafy, and Hameid 2016).

Muscle Performance

Participants' core strength, flexibility, endurance and muscle power of participants were examined before and after the intervention. All four components of muscle performance (core strength, flexibility, endurance and muscle power) reported significant improvement in muscle activity within both groups, but there were no significant differences between the two

groups. Yoga helps in improving strength and tone of weak musculature and results in development of conscious control over autonomic functions (Nayak and Shankar, 2004) Asanas selected in the present study work to strengthen core muscles, stretch the tight muscles and tone the nerves and organs of pelvis and abdomen (Iyengar, 2005) This improvement could have also occurred because both exercise and yoga poses help to improve the uterus's blood flow and metabolism which helps to effectively manage the symptoms of dysmenorrhea (Saleh, Mowafy and Hameid 2016).

A study examined the immediate effects of physiotherapy and yoga therapy in diminishing the symptoms of primary dysmenorrhea. Participants were divided into two groups, where Group A received physiotherapy along with K - K-taping and Group B received yoga therapy. Results revealed that yoga therapy and physiotherapy were equally beneficial in managing the symptoms of primary dysmenorrhea (Sharma and Gurprasad, 2019).

Stress

Yoga-treated ladies in the current study reported a reduction in stress from 21.25 ± 5.91 to 16.9 ± 5.01 and in the exercise group from 21.55 ± 4.16 to 15.95 ± 4.83 . The findings suggest a significant reduction in stress in both groups, with no significant differences observed between them. It is worth noting that regular exercise, as well as yoga, helps individuals achieve mental and physical health stability by downregulating the hypothalamic-pituitary-adrenal axis. It then reduces stress levels. By diminishing the activity of the sympathetic system, which is primarily responsible for pain and uterine muscle contraction (Mahvash et al., 2012), Sandhiya & Kokhila investigated the efficacy of yoga and stretching exercises in women with primary dysmenorrhea. Results showed that both groups experienced a reduction in pain intensity

and stress levels. However, contrary to our results, yoga was more effective than stretching exercises, unlike what was reported in the literature, where both groups equally benefited the participants and no intervention was found to be better than the other (Sandhiya and Kokhila, 2018). Another study was done to find out the effect of gym ball exercises and yoga asana on the subjects with primary dysmenorrhea. Researchers recruited thirty female subjects, who were randomly allocated to either the yoga group (Group A) or the gym ball exercise group (Group B). Women in group A were required to complete 60-second asanas with five repetitions per session, per day, for three days a week, over 12 weeks. Group B engaged in gym ball exercises 12 reps/sets with 10 seconds hold, three sets per day, three days per week, and 12 weeks. Menstrual distress using the Menstrual Distress Questionnaire and pain intensity using the VAS scale were analyzed after 12 weeks of intervention again. Results stated that Group B reported significantly less pain and menstrual distress in comparison to the yoga group after 12 weeks. This study states that using a gym ball not only helps improve the strength and flexibility of muscles but also focuses on enhancing stability, balance, and blood supply, which alleviates symptoms of primary dysmenorrhea (S et al., 2018).

Quality of life

Results from our study report a significant improvement ($p < 0.05$) in quality of life in both groups A and B; however, there were no significant differences between the two groups. All domains of the SF-36 reported significant improvement by the end of the 3 weeks. In this study, the quality of life in the participants may have improved because yoga coordinates inhalation and exhalation with different poses, which creates a 'relaxation response' in the neuroendocrine system. This response leads to improvement in metabolism, muscle tension and heart rate. It leads to overall

development of an individual, spiritually, mentally and physically (Vallath, 2010). Yoga and exercise, when done regularly, can help promote quality of life in an individual by releasing endorphins in the body, which lead to a reduction in pain intensity (Proctor and Farquhar, 2006; McGovern and Cheung, 2018). According to Yonglitthipagon et al., young females with primary dysmenorrhea who participated in the research found that 12 weeks of yoga improved their physical fitness and quality of life, while also helping to manage menstrual pain. (Yonglitthipagon et al., 2017) Onur et al. from their study suggest that a home-based exercise programme helped reduce pain intensity and led to an improvement in the quality of life of the participants. The exercise programme included aerobic training, stretching exercises and relaxation exercises (Onur et al., 2012).

Study limitations

This study is not without limitations. The study was conducted on a group of 18-to 25-year-old non-athletic girls. Long-term effects of yoga and exercise in women with primary dysmenorrhea were not seen with follow-up assessment. Assessment was done in multiple settings, and treatment was conducted virtually. The study involves the inclusion of women only from an urban setting.

Future research

A Study can be done with a bigger sample size. To determine whether adhering to a longer intervention yields different or better effects, further research should be conducted. Double blinded trial can be conducted. Another study involving women from rural areas or those participating in various sports could yield varying results. In this study, virtual sessions were conducted at the participant's home setting for the yoga and exercise group due to COVID-19 restrictions.

Future studies can be conducted in a single setting to minimize the impact of environmental factors.

CONCLUSIONS

The results of this research support both yoga and exercise as an alternative or complementary mode of management for primary dysmenorrhea, with or without medication. Both the interventions compared in this study are low-cost, easy-to-perform, non-time-consuming approaches that can be performed anywhere and do not necessarily require a professional setting. Furthermore, according to our study, both interventions delivered similar effects; therefore, women can select either one based on their condition, status, or interest.

REFERENCES

- Barnard, K., Frayne, S.M., Skinner, K.M. and Sullivan, L.M., 2003. Health status among women with menstrual symptoms. *Journal of Women's Health*, 12(9), pp.911–919.
<https://doi.org/10.1089/154099903770948140>
- Bijur, P.E., Silver, W. and Gallagher, E.J., 2001. Reliability of the visual analog scale for measurement of acute pain. *Academic emergency medicine: official journal of the Society for Academic Emergency Medicine*, 8(12), pp.1153–1157.
<https://doi.org/10.1111/j.1553-2712.2001.tb01132.x>
- Brazier, J.E., Harper, R., Jones, N.M.B., O'Cathain, A., Thomas, K.J., Usherwood, T. and Westlake, L., 1992. Validating the SF-36 health survey questionnaire: New outcome measure for primary care. *British Medical Journal*, 305(6846), pp.160–164.
<https://doi.org/10.1136/bmj.305.6846.160>

- Collins, C., 1998. Yoga: intuition, preventive medicine, and treatment. *Journal of obstetric, gynecologic, and neonatal nursing: JOGNN / NAACOG*, 27(5), pp.563–568. <https://doi.org/10.1111/j.1552-6909.1998.tb02623.x>
- Hamer, M.C. and Denniston, H.D., 1933. Dysmenorrhea and its relation to abdominal strength as tested by the wisconsin method. *Research Quarterly of the American Physical Education Association*, 4(1), pp.229–237. <https://doi.org/10.1080/23267402.1933.10761572>
- Iacovides, S., Avidon, I. and Baker, F.C., 2015. What we know about primary dysmenorrhea today: A critical review. *Human Reproduction Update*, 21(6), pp.762–778. <https://doi.org/10.1093/humupd/dm-v039>
- Iyengar, B.K.S., 2005. *Iyengar BKS The Illustrated Light On Yoga.pdf*.
- Kannan, P., Chapple, C.M., Miller, D., Claydon, L.S. and Baxter, G.D., 2015. Menstrual pain and quality of life in women with primary dysmenorrhea: Rationale, design, and interventions of a randomized controlled trial of effects of a treadmill-based exercise intervention. *Contemporary Clinical Trials*, 42, pp.81–89. <https://doi.org/10.1016/j.cct.2015.03.010>
- Kulkarni, A. and Deb, S., 2019. Dysmenorrhoea. *Obstetrics, Gynaecology and Reproductive Medicine*, 29(10), pp.286–291. <https://doi.org/10.1016/j.ogrm.2019.06.002>
- Lins, L. and Carvalho, F.M., 2016. SF-36 total score as a single measure of health-related quality of life: Scoping review. <https://doi.org/10.1177/2050312116671725>
- Locke, R.J. and Warren, M.P., 1999. What is the effect of exercise on primary dysmenorrhea? *Western Journal of Medicine*, 171(4), pp.264–265.
- Mahvash, N., Eidy, A., Mehdi, K., Zahra, M.T., Mani, M. and Shahla, H., 2012. The effect of physical activity on primary dysmenorrhea of female university students. *World Applied Sciences Journal*, 17(10), pp.1246–1252.
- Maroufizadeh, S., Foroudifard, F., Navid, B., Ezabadi, Z., Sobati, B. and Omani-Samani, R., 2018. The Perceived Stress Scale (PSS-10) in women experiencing infertility: A reliability and validity study. *Middle East Fertility Society Journal*, 23(4), pp.456–459. <https://doi.org/10.1016/j.mefs.2018.02.003>
- McGovern, C.E. and Cheung, C., 2018. Yoga and Quality of Life in Women with Primary Dysmenorrhea: A Systematic Review. *Journal of Midwifery and Women's Health*, 63(4), pp.470–482. <https://doi.org/10.1111/jmwh.12729>
- Nag, U. and Kodali, M., 2013. Meditation and Yoga As Alternative Therapy for Primary Dysmenorrhea Meditation and Yoga As Alternative Therapy for. *Int J Med Pharm Sci*, 03(March), pp.39–44.
- Nayak, N.N. and Shankar, K., 2004. Yoga: A therapeutic approach. *Physical Medicine and Rehabilitation Clinics of North America*, 15(4), pp.783–798. <https://doi.org/10.1016/j.pmr.2004.04.004>
- Omidvar, S., Bakouei, F., Amiri, F.N. and Begum, K., 2015. Primary Dysmenorrhea and Menstrual Symptoms in Indian Female Students: Prevalence, Impact and Management. *Global Journal of Health Science*, 8(8), p.135.

- <https://doi.org/10.5539/gjhs.v8n8p135>
- Onur, O., Gumus, I., Derbent, A., Kaygusuz, I., Simavli, S., Urun, E., Yildirim, M., Gok, K. and Cakirbay, H., 2012. Impact of home-based exercise on quality of life of women with primary dysmenorrhoea. *South African Journal of Obstetrics and Gynaecology*, 18(1), pp.15–18.
- Padubidri, V.G. and Daftary, S.N. eds., n.d. *Shaw's Textbook of Gynecology - 16th Edition*. 14th ed. Elsevier.
- Proctor, M. and Farquhar, C., 2006. Diagnosis and management of dysmenorrhoea. *British Medical Journal*, 332(7550), pp.1134–1138. <https://doi.org/10.1136/bmj.332.7550.1134>
- 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), pp.192–196. <https://doi.org/10.1016/j.jpog.2011.01.059>
- S, K.V., Padmanabhan, K., Sudhakar, S., Aravind, S., Praveen Kumar, C. and Monika, S., 2018. 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*, 5(2), p.118. https://doi.org/10.4103/cjhr.cjhr_93_17
- Saleh, H.S., Mowafy, H.E. and Hameid, A.A. abd E., 2016. Stretching or Core Strengthening Exercises for Managing Primary Dysmenorrhea. *Journal of Womens Health Care*, 05(01), pp.1–6. <https://doi.org/10.4172/2167-0420.1000295>
- Sandhiya, M. and Kokhila, K.B., 2018. An experimental study on stretching exercise versus yoga posture on young female adults with primary dysmenorrhea. *International journal of Pharmacy and biological sciences*, 8(2), pp.287–294.
- Shahr-jerdy, S., Hosseini, R.S. and Gh, M.E., 2013. Effects of stretching exercises on primary dysmenorrhea in adolescent girls. *Biomedical Human Kinetics*, 4, pp.127–132. <https://doi.org/10.2478/v10101-012-0024-y>
- Sharma, U. and Gurprasad, P., 2019. Immediate effects of Physiotherapy v/s Yoga therapy on Symptoms of Dysmenorrhea. *International Journal of Scientific Research in Science and Technology*, 6(4), pp.298–308. <https://doi.org/10.32628/IJSRST196440>
- Shelke, V.S.A. and Patil, Y.R., 2019. Study The Effect Of Asanas With Life Style Changes In The Management Of Primary Dysmenorrhea. *World Journal Of Pharmaceutical Research*, [online] 8(2), pp.749–760.
- Vallath, N., 2010. Perspectives on Yoga inputs in the management of chronic pain. *Indian Journal of Palliative Care*, 16(1), pp.1–7. <https://doi.org/10.4103/0973-1075.63127>
- Vaziri, F., Hoseini, A., Kamali, F., Abdali, K., Hadianfard, M. and Sayadi, M., 2015. 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*, 9(1), p.23.
- Yonglitthipagon, P., Muansiangsai, S., Wongkhumngern, W., Donpunha, W., Chanavirut, R., Siritarativat, W., Mato, L., Eungpinichpong, W. and Janyacharoen, 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), pp.840–846.
[https://doi.org/10.1016/j.jbmt.2017.
01.014](https://doi.org/10.1016/j.jbmt.2017.01.014)