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Comparative study of the effects of lumbo-pelvic exercises and yoga on menstrual low back pain among female university students with primary dysmenorrhea

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Abstract

Background: Menstrual low back pain is a common complaint experienced by women during menstruation, often associated with dysmenorrhea. Non-pharmacological interventions such as exercise are recommended to reduce pain. Lumbo-pelvic exercises and yoga are both known to be effective, but their comparative effectiveness remains unclear. **Objective:** To compare the effects of lumbo-pelvic exercises and yoga on menstrual low back pain among female university students with primary dysmenorrhea. **Methods:** This non-randomized experimental study employed a two-group pretest–posttest design involving 20 female university students with primary dysmenorrhea. Participants were divided into Lumbo-Pelvic Exercise (n=10) and Yoga (n=10) groups through purposive sampling. Interventions were given for six weeks, five sessions per week. Pain intensity was measured using the Visual Analog Scale (VAS). Data were analyzed using the Shapiro–Wilk test, Levene's test, paired t-test, and Welch's t-test. **Results:** Mean VAS scores decreased from 7.29 ± 0.68 to 3.53 ± 0.81 in the Lumbo-Pelvic Exercise group and from 7.39 ± 0.51 to 4.30 ± 0.66 in the Yoga group. Both interventions significantly reduced pain ($p<0.05$), with a greater reduction observed in the Lumbo-Pelvic Exercise group ($p=0.025$; Cohen's $d=1.19$). **Conclusion:** Both exercises effectively reduced menstrual low back pain, but lumbo-pelvic exercises demonstrated superior short-term effects. These findings suggest that targeted core and pelvic stabilization exercises may be prioritized in managing menstrual low back pain. However, due to the small sample size and short intervention duration, further studies with randomized designs and larger samples are warranted.

Introduction

Menstruation is a normal physiological process that occurs in every woman of reproductive age, characterized by the shedding of the endometrial lining due to the absence of fertilization (Sánchez, 2012). Although it is a natural process, menstruation often causes complaints that can interfere with daily activities. One of the most common problems experienced is dysmenorrhea, which is menstrual pain characterized by abdominal cramps and pelvic pain directly related to the menstrual cycle (Patel et al., 2019).

In addition to lower abdominal pain, dysmenorrhea is often accompanied by complaints of lower back pain (menstrual low back pain). Approximately 40–50% of women report experiencing lower back pain during the menstrual phase (days 1 to 6) (Shakeri et al., 2013). This condition reduces comfort, productivity, and impacts the quality of life of women, including in academic, work, and social activities.

Management strategies for dysmenorrhea and menstrual low back pain can be pharmacological or non-pharmacological. Pharmacological therapies, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and oral contraceptives, are effective but have side effects, including nausea, intermenstrual bleeding, and sensory disturbances, which limit their long-term use (Kannan & Claydon, 2014). Therefore, non-pharmacological approaches are increasingly recommended. Physical exercise is one of the non-

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pharmacological interventions that has been proven to be safe, easily accessible, and effective in reducing menstrual pain (Saleh & Mowafy, 2016). Two forms of exercise that have been widely studied are lumbo-pelvic exercises and yoga. Lumbo-pelvic exercises focus on strengthening core muscles and pelvic stability, which can reduce muscle tension and enhance lumbar stabilization. Meanwhile, yoga combines stretching, breathing, and relaxation exercises that help decrease pain intensity, improve blood flow, and provide a calming effect (Chen, 2018).

Menstrual low back pain in primary dysmenorrhea occurs due to increased prostaglandin levels that cause uterine contractions and referred pain to the lumbosacral region. Muscle tension and reduced pelvic blood flow also contribute to the pain mechanism (Iacovides et al., 2015). Understanding this pathophysiology supports the use of physical exercise interventions such as lumbo-pelvic strengthening and yoga relaxation to improve blood circulation and reduce pain perception.

Given the high prevalence of menstrual low back pain and its negative impacts, effective interventions are needed to alleviate these complaints. To date, both lumbo-pelvic exercises and yoga are known to be beneficial, but research comparing their effectiveness remains limited.

Therefore, this study was conducted to determine the difference in the effects of lumbo-pelvic exercises and yoga on menstrual low back pain

Methods

This study used a quantitative experimental design with a two-group pretest–posttest approach. The study participants were female students from the Faculty of Health Sciences at Universitas Respati Yogyakarta who experienced lower back pain during menstruation. A total of 20 respondents were selected through purposive sampling and divided into two intervention groups: the Lumbo-Pelvic Exercise (LPE) group and the Yoga group, with 10 respondents in each group. Inclusion criteria included female students aged 18–23 years with regular menstrual cycles and primary dysmenorrhea confirmed through self-reported menstrual history without underlying pelvic pathology. Exclusion criteria included secondary dysmenorrhea, hormonal medication use, or musculoskeletal injury. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta (Approval No: 5877/B.1/KEPK-FKUMS/IX/2025). Pain intensity was measured on the first and second days of menstruation before and after six weeks of intervention

The interventions were administered over a period of six weeks, with a frequency of five sessions per week. Each session consisted of 10 repetitions × 3 sets, with a 60-second rest between sets. The LPE program focused on strengthening core muscles and stabilizing the pelvis, while the Yoga program consisted of a combination of stretching, breathing, and relaxation exercises aimed at reducing menstrual pain. The Lumbo-Pelvic Exercise program consisted of pelvic tilt, bridge, and abdominal curl exercises, each performed for 10 repetitions × 3 sets. The Yoga program included cat-cow pose, cobra pose, child's pose, and deep breathing sequences aimed at relaxation and flexibility.

The instruments used included the Visual Analog Scale (VAS) to measure the intensity of menstrual lower back pain. Measurements were taken before (pretest) and after (posttest) the intervention.

Data analysis was performed using the Shapiro–Wilk test for normality and Levene's test for homogeneity. Within-group differences were analyzed using the paired t-test or the Wilcoxon signed-rank test, depending on the data distribution, while between-group differences were analyzed using the independent t-test or the Mann–Whitney U test. All analyses were performed using SPSS version 25.0 with a significance level set at $p<0.05$.

Result

The reduction in VAS scores represents the effectiveness of the intervention in decreasing menstrual low back pain. The Lumbo-Pelvic Exercise group showed a higher mean reduction (3.76 ± 0.78) compared to the Yoga group (3.09 ± 0.15), indicating a potentially greater effect of the Lumbo-Pelvic Exercise on pain reduction.

Table 1
Mean pre-test, post-test, and reduction in VAS scores.

Intervention	Mean Pre-test	Mean Post-test	Mean Reduction
Lumbo-Pelvic Exercise	7.29	3.53	3.76 ± 0.78
Yoga	7.39	4.30	3.09 ± 0.15

VAS: Visual Analog Scale (0 = no pain, 10 = worst pain)

Normality Test

In this study, the normality test was carried out using post-test scores from the comparison group and experimental class. For samples totalling <50, the normality test used is the Shapiro-Wilk test (Faradiba, 2020). The following are the results of the normality test using SPSS 25.0 in Table 2.

Table 2
Normality test using Shapiro-Wilk.

Treatment Group	n	*p*	Conclusion
Lumbo-Pelvic Exercise	10	0.738	Normally distributed
Yoga	10	0.120	Normally distributed

Both groups were found to be normally distributed according to the Shapiro–Wilk test, with p-values of 0.738 for the Lumbo-Pelvic Exercise group and 0.120 for the Yoga group. A p-value greater than 0.05 indicates that the null hypothesis of the normality test—stating that the data are normally distributed—cannot be rejected. This suggests that the distribution of VAS reduction scores in both groups does not significantly deviate from a normal distribution. Consequently, the data meet one of the key assumptions required for parametric statistical tests, which assume normally distributed variables when comparing means between groups. However, because the homogeneity test indicated unequal variances between groups, an adjusted parametric test, Welch's t-test, was used for between-group comparisons instead of the standard independent t-test

Homogeneity Test

Homogeneity testing is used to determine whether the variances of two or more groups are equal, which is a key assumption in parametric tests such as the independent t-test (Nuryadi et al., 2017; Basuki, 2015). If this assumption is not met, the results of standard parametric tests may be biased, so alternative methods such as Welch's t-test should be employed.

In this study, Levene's test was used to assess the homogeneity of variances of post-test VAS reduction scores between the Lumbo-Pelvic Exercise and Yoga groups.

Table 3
Homogeneity test.

Test	F-value	*p*	Conclusion
Levene's Test	25.67	0.000	Variances are unequal

The p-value obtained from Levene's test was 0.000, which is less than 0.05**,** indicating that the variances of the two groups were significantly different. Therefore, the assumption of homogeneity of variance was not met.

Because the data were not homogeneous, a standard independent t-test could not be used for comparing the groups. Instead, Welch's t-test which adjusts for unequal variances was used to determine whether there was a statistically significant difference in mean VAS reduction scores between the two groups.

Between Group Comparison

The Welch's t-test is an adaptation of the independent t-test that is specifically designed to compare the means of two groups when the assumption of equal variances is violated. This makes it an appropriate choice for this study, as the homogeneity test indicated unequal variances between the Lumbo-Pelvic Exercise and Yoga groups. The comparison between the two intervention groups is presented in Table 4.

Table 4
Comparison between the two intervention groups

Comparison	t	*p*	Cohen's d
Lumbo-Pelvic Exercise vs Yoga	2.65	0.025	1.19 (large)

The results of the Welch's t-test showed a t-value of 2.65 and a p-value of 0.025, which is less than the conventional alpha level of 0.05. This indicates that there is a statistically significant difference in the mean reduction of VAS scores between the two groups. In other words, participants in the Lumbo-Pelvic Exercise group experienced a greater decrease in menstrual low back pain compared to those in the Yoga group.

Additionally, the effect size, measured using Cohen's d, was 1.19, which is classified as large. A large effect size not only supports the statistical significance but also indicates that the observed difference is clinically meaningful, suggesting that the Lumbo-Pelvic Exercise has a substantial impact on pain reduction

Both Lumbo-Pelvic Exercise and Yoga were effective in reducing menstrual low back pain, as evidenced by the decrease in VAS scores within each group. However, the Lumbo-Pelvic Exercise group demonstrated a greater mean reduction (3.76 ± 0.78) compared to the Yoga group (3.09 ± 0.15), indicating superior effectiveness in alleviating pain. The statistically significant difference between the two groups ($p = 0.025$), together with a large effect size (Cohen's $d = 1.19$), further supports the conclusion that Lumbo-Pelvic Exercise may be the preferred intervention for managing menstrual low back pain. This finding aligns with the theoretical understanding that targeted lumbo-pelvic exercises enhance core stability, pelvic alignment, and muscular support, all of which are critical factors in reducing pain associated with menstrual low back discomfort. In contrast, while Yoga provides benefits such as increased flexibility and relaxation, its effect on core stabilization may be less direct, which could explain the comparatively smaller reduction in VAS scores observed in this group.

Discussion

The present study aimed to compare the effectiveness of Lumbo Pelvic Exercises (LPE) and Yoga in reducing menstrual low back pain among female university students. The results indicated that both interventions significantly decreased VAS scores, demonstrating their effectiveness in alleviating menstrual low back discomfort. However, the Lumbo-Pelvic Exercise group showed a greater reduction in pain (mean reduction 3.76 ± 0.78) compared to the Yoga group (3.09 ± 0.15). The difference between groups was statistically significant ($p = 0.025$) and supported by a large effect size (Cohen's $d = 1.19$), indicating that LPE is more effective than Yoga in reducing menstrual low back pain.

The findings are consistent with the theoretical basis of Lumbo-Pelvic Exercises. LPE focuses on strengthening core muscles, improving pelvic stability, and enhancing lumbosacral alignment, which collectively reduce mechanical stress and muscular tension in the lower back. By enhancing the function of the deep abdominal, lumbar, and pelvic muscles, LPE can stabilize the lumbopelvic region during menstrual cycles, thereby reducing pain perception (Saleh & Mowafy, 2016; Chen, 2018). This mechanism likely explains the larger reduction in VAS scores observed in the LPE group compared to Yoga.

Yoga, while also effective, demonstrated a smaller reduction in pain scores. The benefits of Yoga are primarily related to flexibility, relaxation, stress reduction, and improved circulation, which can indirectly alleviate pain. Yoga practices such as deep breathing, gentle stretching, and mindfulness contribute to decreased muscle tension and enhanced psychological coping, reducing the subjective experience of pain. However, because Yoga does not specifically target core stabilization or pelvic musculature as directly as LPE, the reduction in menstrual low back pain may be less pronounced (Chen, 2018; Patel et al., 2019).

The significant difference between LPE and Yoga highlights the importance of intervention specificity. While general physical activity and relaxation techniques can contribute to pain reduction, exercises that specifically target the musculoskeletal structures involved in lower back support appear to have a superior effect in managing menstrual low back pain. This suggests that when designing non-pharmacological interventions for dysmenorrhea-related low back pain, the inclusion of core and pelvic focused exercises should be prioritized for optimal outcomes.

Furthermore, this study has practical implications for clinical and educational settings. Female students experiencing menstrual low back pain can benefit from structured exercise programs that enhance core strength and pelvic stability, potentially reducing reliance on pharmacological interventions such as NSAIDs, which may have side effects with long-term use (Kannan & Claydon, 2014). Implementing LPE routines in campus health programs or physiotherapy guidance may contribute to improved quality of life, reduced absenteeism, and increased productivity during menstruation.

Despite the promising results, several limitations should be noted. The study involved a relatively small sample size (n = 20), which may limit generalizability. The intervention duration was six weeks, and longer-term effects of both LPE and Yoga were not assessed. Additionally, the study relied on self-reported VAS scores for pain measurement, which may be influenced by subjective factors and reporting bias. Future research could incorporate objective functional assessments, larger sample sizes, and longer follow-up periods to strengthen the evidence base and evaluate sustained effects of these interventions.

However, due to the small sample size, non-random sampling method, and short intervention period covering only one menstrual cycle, the findings should be interpreted cautiously. Future studies should include larger populations, randomized designs, and long-term follow-up to confirm the effectiveness of these interventions across multiple menstrual cycles.

In conclusion, both Lumbo-Pelvic Exercises and Yoga are effective non-pharmacological interventions for reducing menstrual low back pain, with LPE demonstrated greater short-term effectiveness within one menstrual cycle; however, further studies are required to validate these findings over longer durations and larger samples. The findings support the integration of targeted core and pelvic stabilization exercises into health promotion and physiotherapy programs aimed at managing menstrual-related low back discomfort in young women.

Authors' Contribution

Study Design: GA, MMI; Data Collection: MMI, ZM; Statistical Analysis: GA, ZM; Manuscript Preparation: GA, ZM; Funds Collection: RM, BA.

Ethical Approval

The study was approved by Health Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta (Approval No: 5877/B.1/KEPK-FKUMS/IX/2025) and it was carried out in accordance with the Code of Ethics of the World Medical Association also known as a declaration of Helsinki.

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Conflict of Interest

The authors hereby declare that there was no conflict of interest in conducting this research.

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