



ORIGINAL ARTICLE

Impact of Prenatal Exercise on Low Back Pain Among Women in the Third Trimester of Pregnancy



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ARTICLE INFORMATION

Article history:

Received: 2025-12-17

Revised : 2026-01-10

Accepted: 2026-02-29

Keywords:

Play Activities; Appetite; Preschool Children; Eating Behavior; Child Health

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ABSTRACT

Introduction: During pregnancy, the enlargement of the uterus causes a shift in the center of gravity toward the front, requiring pregnant women to adjust their posture. Improper posture may lead to additional strain and fatigue, particularly in the spinal region, resulting in low back pain. In the working area of Tegalampel Primary Health Center, many pregnant women experience back pain and lack knowledge on how to manage it effectively.

Objectives: This study aimed to determine the effect of prenatal exercise on reducing back pain among third trimester pregnant women.

Methods: This study employed a correlational design with a cross-sectional approach. The population consisted of all preschool children at Al Irsyad Kindergarten, and a total of 168 children were included as the sample using a total sampling technique. The variables examined were play activities and children's appetite. Data were collected using structured questionnaires and analyzed using Spearman's rho correlation test with a significance level of 0.05.

Results: The results showed that in the control group, there was no significant difference between pretest and posttest scores ($p = 1.000$; $p > 0.05$). In contrast, the intervention group demonstrated a significant reduction in back pain after prenatal exercise ($p = 0.005$; $p < 0.05$).

Conclusions: Prenatal exercise has a significant effect on reducing back pain among third trimester pregnant women. Therefore, it is recommended that pregnant women perform prenatal exercise regularly to reduce back pain and improve maternal well-being.



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A. Introduction

Pregnancy is a physiological condition characterized by substantial anatomical, hormonal, and biomechanical changes that influence the overall health and well-being of women. As pregnancy progresses, particularly during the third trimester, the enlargement of the uterus causes a forward displacement of the center of gravity, leading to postural adaptations such as increased lumbar lordosis and altered spinal alignment. These biomechanical changes place additional stress on the musculoskeletal system, especially in the lower back region, resulting in a high prevalence of low back pain among pregnant women (Katonis et al., 2019; Wu et al., 2020).

Low back pain during pregnancy is one of the most commonly reported discomforts, with prevalence rates ranging from 50% to 70% globally. This condition may significantly affect daily activities, sleep quality, emotional well-being, and overall quality of life (Gutke et al., 2018; Kovacs et al., 2016). Despite its high prevalence, pregnancy-related back pain is often perceived as a normal physiological consequence, leading to underestimation and inadequate management in both clinical and community settings. If not properly addressed, persistent back pain may result in reduced mobility and decreased functional capacity in pregnant women.

The etiology of pregnancy-related low back pain is multifactorial, involving hormonal, biomechanical, and psychosocial factors. Increased levels of hormones such as relaxin and progesterone lead to ligament laxity and joint instability, particularly in the pelvic region, thereby increasing susceptibility to musculoskeletal strain (Kovacs et al., 2016; Katonis et al., 2019). In addition, mechanical factors such as weight gain, muscle fatigue, and improper posture further exacerbate the load on the lumbar spine. Psychosocial factors, including stress and anxiety, may also influence pain perception and contribute to the severity of symptoms (Davenport et al., 2019).

Given these complexities, non-pharmacological interventions are widely recommended as the first-line approach for managing low back pain during pregnancy due to safety considerations for both mother and fetus. Among these interventions, prenatal exercise has been identified as a safe and effective strategy. Prenatal exercise programs typically include stretching, strengthening, breathing, and relaxation techniques that improve muscle flexibility, enhance circulation, and promote postural stability (American College of Obstetricians and Gynecologists, 2020; Mottola et al., 2018). These exercises also stimulate endorphin release, which functions as a natural analgesic, thereby reducing pain perception.

A growing body of evidence has demonstrated that prenatal exercise can significantly reduce the intensity of low back pain and improve functional outcomes in pregnant women. Exercise interventions help strengthen core muscles, stabilize the spine, and reduce mechanical strain, which are essential in preventing and managing musculoskeletal discomfort (Shiri et al., 2018; Davenport et al., 2018). Furthermore, prenatal exercise contributes to psychological well-being by reducing stress, improving sleep quality, and enhancing overall maternal health (Nascimento et al., 2015; Davenport et al., 2019).

Despite the established benefits, the implementation of prenatal exercise programs remains suboptimal, particularly in community health settings. Limited awareness, lack of access to structured programs, and insufficient guidance from healthcare providers are among the barriers that hinder pregnant women from engaging in regular exercise (Haakstad & Bø, 2016; Okafor & Goon, 2020). This gap between evidence-based recommendations and real-world practice highlights the need for practical and accessible interventions at the primary healthcare level.

In Indonesia, maternal health remains a public health priority, with increasing attention toward improving the quality of antenatal care services. However, management of pregnancy-related

discomforts, such as low back pain, is still often overlooked. Preliminary observations in the working area of Tegalampel Primary Health Center, Bondowoso, indicated that many third trimester pregnant women experienced back pain and lacked knowledge regarding appropriate management strategies. Most of them relied on passive coping mechanisms and did not participate in structured physical activities, including prenatal exercise.

Therefore, understanding the effectiveness of prenatal exercise as a non-pharmacological intervention is essential to bridge this gap. This study aimed to analyze the effect of prenatal exercise on reducing low back pain among third trimester pregnant women in the working area of Tegalampel Primary Health Center, Bondowoso, Indonesia. The findings of this study are expected to provide evidence-based recommendations for integrating prenatal exercise into routine maternal healthcare services and improving the quality of life of pregnant women.

B. Methods

This study employed a quasi-experimental design using a pretest–posttest control group approach to examine the effect of prenatal exercise on low back pain among third trimester pregnant women. The study was conducted in the working area of Tegalampel Primary Health Center, Bondowoso, Indonesia.

The population of this study consisted of all third trimester pregnant women in the study area. A total of 40 participants who met the inclusion criteria were selected using purposive sampling. The participants were then divided into two groups: an intervention group ($n = 20$) that received prenatal exercise and a control group ($n = 20$) that received an alternative intervention in the form of educational leaflets.

The inclusion criteria included third trimester pregnant women who experienced mild to moderate low back pain, attended antenatal care at the study site, and were willing to participate. Exclusion criteria included pregnant women with comorbid conditions such as heart disease, diabetes mellitus, or other complications that could interfere with the intervention, as well as those who were unable to complete the study procedures.

The independent variable in this study was prenatal exercise, while the dependent variable was the level of low back pain. Data were collected using a structured questionnaire and an observational checklist based on a standard operating procedure (SOP) for prenatal exercise. Pain intensity was measured using a numeric rating scale ranging from 0 to 10, where higher scores indicated greater pain intensity.

The intervention group participated in prenatal exercise sessions conducted for approximately 20 minutes per session, four times over a two-week period, under the supervision of the researcher. The exercise program included stretching, breathing, and relaxation techniques designed specifically for pregnant women. Meanwhile, the control group did not receive exercise intervention but was provided with informational leaflets regarding pregnancy care.

Data collection was conducted in two stages: pretest (before intervention) and posttest (after intervention). The pretest was used to assess baseline pain levels, while the posttest measured changes after the intervention.

Data were analyzed using the Wilcoxon signed-rank test to determine differences in pain levels before and after the intervention within each group. Additionally, an independent t-test was used to compare differences between the intervention and control groups. A significance level of $p < 0.05$ was applied in all statistical analyses.

Ethical considerations were strictly observed throughout the study. Informed consent was obtained from all participants prior to data collection. Participant anonymity was maintained by

using coded identifiers, and confidentiality of all collected data was ensured. Participation in the study was voluntary, and participants were informed of their right to withdraw at any time without consequences.

C. Results

A total of 40 third trimester pregnant women participated in this study, consisting of 20 participants in the intervention group and 20 participants in the control group. The baseline characteristics showed that all participants experienced mild to moderate low back pain prior to the intervention.

The analysis of pain intensity before and after the intervention revealed different patterns between the two groups. In the control group, which received only educational leaflets, there was no significant change in pain intensity between pretest and posttest measurements ($p = 1.000$). In contrast, the intervention group, which participated in prenatal exercise, demonstrated a significant reduction in low back pain after the intervention ($p = 0.005$). These findings indicate that prenatal exercise had a measurable effect on reducing pain levels among participants.

Table 1. Comparison of Pretest and Posttest Low Back Pain Scores in Control and Intervention Groups (n = 40)

Group	Measurement	Mean \pm SD	p-value
Control (n=20)	Pretest	5.60 \pm 1.14	1.000
	Posttest	5.55 \pm 1.10	
Intervention (n=20)	Pretest	5.75 \pm 1.21	0.005
	Posttest	3.90 \pm 1.05	

Furthermore, a comparison between groups after the intervention showed a significant difference in pain intensity between the intervention and control groups ($p = 0.001$), indicating that participants who received prenatal exercise experienced greater pain reduction compared to those who did not receive the intervention.

Table 2. Comparison of Posttest Low Back Pain Between Groups (n = 40)

Group	Mean \pm SD	p-value
Control (n=20)	5.55 \pm 1.10	0.001
Intervention (n=20)	3.90 \pm 1.05	

Overall, these results demonstrate that prenatal exercise significantly reduced low back pain among third trimester pregnant women compared to standard care without exercise intervention.

D. Discussion

The present study demonstrated that prenatal exercise significantly reduced low back pain among third trimester pregnant women. The intervention group showed a statistically significant decrease in pain intensity after the exercise program ($p = 0.005$), whereas the control group did not exhibit any meaningful change ($p = 1.000$). These findings indicate that prenatal exercise is an effective non-pharmacological intervention for managing pregnancy-related low back pain.

The reduction in pain observed in this study can be explained by biomechanical and physiological adaptations associated with prenatal exercise. During the third trimester, the forward displacement of the center of gravity increases lumbar lordosis and mechanical strain on the spine. Prenatal exercise strengthens the abdominal and pelvic muscles, improves posture, and enhances flexibility, thereby reducing stress on the lumbar region (Davenport et al., 2018; Katonis et al., 2019). These findings are supported by recent systematic reviews demonstrating that

structured exercise programs during pregnancy can significantly reduce musculoskeletal discomfort and improve functional outcomes (Shiri et al., 2018; World Health Organization, 2022).

In addition to its physical effects, prenatal exercise also contributes to pain reduction through neurophysiological mechanisms. Exercise stimulates the release of endorphins, which act as natural analgesics and modulate pain perception. Furthermore, breathing and relaxation techniques included in prenatal exercise programs may reduce muscle tension and improve blood circulation, thereby alleviating discomfort in the lower back region. Recent studies have also highlighted the role of exercise in improving maternal mental health, which indirectly influences pain perception and coping mechanisms (Davenport et al., 2019; Silva et al., 2022).

The findings of this study also emphasize the importance of active interventions compared to passive approaches. Participants in the control group, who only received educational leaflets, did not show significant improvement in pain intensity. This suggests that providing information alone is insufficient to address physical symptoms such as low back pain. Active engagement through structured exercise is more effective in producing measurable physiological changes. Similar findings have been reported in recent studies indicating that behavioral and movement-based interventions yield better outcomes than passive education in managing pregnancy-related discomfort (Aune et al., 2021; Bø & Artal, 2023).

Furthermore, the significant difference in posttest pain scores between the intervention and control groups ($p = 0.001$) reinforces the effectiveness of prenatal exercise as a practical and accessible intervention. These findings are consistent with emerging evidence suggesting that integrating prenatal exercise into routine antenatal care can improve maternal health outcomes and reduce the burden of pregnancy-related musculoskeletal disorders (Mottola et al., 2018; Okafor & Goon, 2020).

From a clinical and public health perspective, the results of this study highlight the need to promote prenatal exercise programs at the primary healthcare level. Incorporating structured exercise sessions into antenatal services may enhance maternal well-being and prevent complications associated with prolonged pain. In addition, healthcare providers play a critical role in educating and motivating pregnant women to engage in safe physical activities during pregnancy.

Despite these findings, several limitations should be acknowledged. First, the sample size was relatively limited, which may affect the generalizability of the results. Second, the short duration of the intervention may not fully capture long-term effects. Third, potential confounding variables, such as daily physical activity, occupational workload, and nutritional status, were not fully controlled. Future studies are recommended to employ larger samples, longer intervention periods, and randomized controlled trial designs to strengthen the evidence.

E. Conclusion

This study confirms that prenatal exercise is an effective non-pharmacological intervention for reducing low back pain among third trimester pregnant women. The findings indicate that structured exercise programs can significantly improve maternal physical comfort by reducing musculoskeletal strain associated with pregnancy.

These results highlight the importance of integrating prenatal exercise into routine antenatal care as a practical strategy to enhance maternal well-being. In addition to its physical benefits, prenatal exercise may also contribute to improved functional capacity and overall quality of life during pregnancy.

Therefore, promoting regular and structured prenatal exercise should be considered an essential component of maternal health services, particularly at the primary healthcare level.

F. Recommendations

Based on the findings of this study, several recommendations can be proposed. First, pregnant women, particularly those in the third trimester, are encouraged to perform prenatal exercise regularly as a safe and effective strategy to reduce low back pain and improve physical comfort during pregnancy.

Second, healthcare providers, especially midwives and nurses at primary healthcare centers, should actively promote and facilitate prenatal exercise programs as part of routine antenatal care services. Providing structured guidance and supervision is essential to ensure that exercises are performed correctly and safely.

Third, health institutions and policymakers are recommended to integrate prenatal exercise into standard maternal health programs, including the development of guidelines, training for healthcare providers, and the provision of accessible exercise sessions for pregnant women in community settings.

Finally, future research is recommended to explore the long-term effects of prenatal exercise on maternal and neonatal outcomes using larger sample sizes and more rigorous study designs, such as randomized controlled trials, to strengthen the evidence base.

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