

## The Effectiveness of Pregnancy Exercises on Back Pain among Third Trimester Pregnant Women

Novi Andani<sup>1</sup>, Nila Widya Keswara<sup>2</sup>



<sup>1</sup>Undergraduate Midwifery Study Program, Faculty of Health Sciences, Institute of Technology, Science and Health, Dr. Soepraoen Hospital, Malang, Indonesia

Correspondence should be addressed to:  
Novi Andani  
[nopiandanot@gmail.com](mailto:nopiandanot@gmail.com)

### Abstract:

Back pain is one of the most common discomforts experienced by pregnant women in the third trimester. Back pain can occur due to pressure on the back muscles or shifting of the spine, which puts pressure on joints. Back pain in pregnant women often arises from pressure on the back muscles or spinal shifts, leading to joint compression. This study aimed to evaluate the effectiveness of prenatal exercise in alleviating back pain among third-trimester pregnant women. A quantitative approach with a pre-experimental design, specifically a one-group pretest-posttest, was employed. The population included all third-trimester pregnant women visiting PMB Safara Kedawung Kulon, totaling 35 individuals, who were sampled using a total sampling technique. Pain assessment was conducted using the standardized Face Pain Scale-Revised questionnaire, which did not require additional validity testing. Data were analyzed univariately through frequency percentages and bivariately using the Wilcoxon Signed Ranks Test. The results indicated that all respondents experienced back pain. During the pretest, the highest level of reported pain was more severe, experienced by 13 respondents (37.1%). Following the prenatal exercise intervention, the posttest showed that 18 respondents (51.4%) reported mild pain. Wilcoxon statistical testing yielded an Asymp. Sig. 0.001, demonstrating a significant difference between pretest and posttest results. Consequently, it was concluded that prenatal exercise has a significant effect on back pain in pregnant women in the third trimester. These findings advocate for the systematic integration of evidence-based exercise protocols into standard maternal healthcare practices, empowering midwives to offer safe, cost-effective pain management strategies that enhance maternal comfort and well-being during late pregnancy.

### Article info:

Submitted:  
09-01-2026  
Revised:  
28-01-2026  
Accepted:  
02-02-2026

### Keywords:

pregnant women, back pain, prenatal exercise, third trimester

DOI: <https://doi.org/10.53713/htechj.v4i1.613>

This work is licensed under CC BY-SA License.



## INTRODUCTION

Pregnancy-related back pain represents a prevalent and clinically significant musculoskeletal complaint affecting a substantial proportion of women globally (Salari et al., 2023). As the fetus develops, profound anatomical, biomechanical, and hormonal adaptations occur to accommodate gestational changes, often precipitating discomfort that extends beyond physiological norms (Daneau et al., 2025). Among the spectrum of pregnancy-associated symptoms, lumbopelvic pain emerges as one of the most frequently reported complaints, with prevalence estimates of 63% pregnant women across trimesters (Shanshan et al., 2024). This condition not only compromises maternal mobility and daily functioning but may also contribute to sleep disturbances, psychological distress, and reduced quality of life (Naqvi et al., 2024). Given the limitations of pharmacological interventions during pregnancy due to fetal safety concerns, non-pharmacological strategies have

gained increasing attention as primary approaches for pain management in this vulnerable population (Beyable et al., 2022).

The pathophysiology of back pain during pregnancy involves a complex interplay of biomechanical and hormonal factors. Progressive uterine enlargement shifts the maternal center of gravity anteriorly, prompting compensatory lumbar hyperlordosis to maintain postural stability (Leung et al., 2025). Concurrently, significant weight gain, attributable to fetal growth, amniotic fluid, placental development, and maternal tissue expansion, exacerbates mechanical loading on the lumbar spine and sacroiliac joints (Esfahlani & Bagheri, 2023). Hormonally mediated ligamentous laxity, primarily driven by elevated relaxin and progesterone levels, further compromises pelvic and spinal stability. These adaptations collectively induce muscular imbalances, particularly between weakened abdominal musculature and overactive paraspinal muscles, resulting in increased strain on the lower back structures (Daneau et al., 2025). Such physiological changes typically intensify during the third trimester, rendering this period particularly susceptible to debilitating back pain that may persist into the postpartum period without appropriate intervention (Yoseph et al., 2025).

Prenatal exercise has emerged as an evidence-based, non-invasive modality for mitigating pregnancy-related back pain through multiple physiological mechanisms (Aparicio et al., 2023; Rosidah et al., 2025). Structured exercise programs designed for pregnant women typically incorporate gentle stretching, core stabilization, pelvic floor strengthening, and controlled aerobic components tailored to gestational safety parameters (Wu et al., 2025). These interventions enhance muscular endurance and flexibility of the trunk and pelvic girdle, thereby improving postural alignment and reducing mechanical stress on spinal structures (McCarthy et al., 2023). Additionally, physical activity stimulates endorphin release, providing natural analgesic effects while concurrently reducing psychological stress (Jusuf & Lisdayanti, 2025). A growing body of clinical evidence supports the efficacy of supervised prenatal exercise in significantly decreasing pain intensity and functional disability among pregnant women, with benefits observed during the second and third trimesters when biomechanical strain peaks (Franisia et al., 2022; Nugraha et al., 2025).

Despite accumulating evidence supporting exercise-based interventions, significant gaps remain regarding their implementation and effectiveness within specific community-based prenatal care settings, particularly in low-resource contexts. Most existing studies have been conducted in hospital-based or specialized clinical environments with structured physiotherapy supervision, limiting generalizability to routine primary maternity care facilities where access to specialized personnel may be constrained (Anisah & Fatmarizka, 2025). Furthermore, cultural, socioeconomic, and healthcare system variations influence exercise adherence and program feasibility across different populations. In Indonesia, where community midwifery practices (PMB) serve as primary providers of prenatal care for many women, evidence on the practical application and outcomes of standardized pregnancy exercise protocols in these settings remains limited. Addressing this contextual gap is essential for developing scalable, culturally appropriate interventions that can be integrated into routine antenatal care (Barbier et al., 2023; Alestari et al., 2025).

Accordingly, this study aimed to evaluate the effectiveness of a structured pregnancy exercise program in reducing back pain intensity among third-trimester pregnant women receiving care at PMB Safara Kedawung Kulon in Pasuruan Regency, Indonesia. By employing a pre-experimental one-group pretest-posttest design with the validated Face Pain Scale-Revised as the outcome measure, this research contributes empirical evidence on the feasibility and therapeutic potential of exercise interventions within community-based midwifery practice. The findings hold practical implications for strengthening non-pharmacological pain management protocols in primary prenatal care settings, ultimately supporting maternal comfort, functional capacity, and preparation for labor in resource-constrained environments (Wang et al., 2025).

## METHOD

This study adopted a quantitative research approach utilizing a pre-experimental design with a one-group pretest-posttest structure. This design enabled the researchers to assess changes in the outcome variable, pain, within the same group of participants before and after an intervention, without including a control group. The pretest-posttest framework provided a practical method for evaluating the intervention's effectiveness within the target population while maintaining methodological simplicity appropriate to the clinical setting.

The research was conducted over two months, spanning from October to November. The study population comprised all 35 pregnant women in their third trimester who attended prenatal care services at the Safara Kedawung Kulon Prenatal Care Center (PMB Safara). Given the limited and accessible population, a total sampling technique was employed, in which every eligible participant meeting the defined criteria was included in the sample. This approach ensured comprehensive representation of the target group without the need for random selection.

Data collection was conducted using a structured questionnaire to collect relevant demographic and clinical information. Pain intensity, the primary outcome measure, was assessed using the Face Pain Scale-Revised (FPS-R), a standardized and validated instrument widely recognized for its reliability in measuring pain levels, particularly among vulnerable populations such as pregnant women. As the FPS-R is an established tool with proven psychometric properties, no additional validation was required for its use in this study context.

For data analysis, univariate techniques were applied to describe the sample characteristics through frequency distributions and percentages. To examine the statistical significance of changes in pain scores between pretest and posttest measurements, a bivariate analysis was performed using the Wilcoxon Signed-Rank Test, a nonparametric test appropriate for paired ordinal data. Prior to implementation, the study protocol received ethical approval from the Faculty of Health Sciences at the Institute of Technology, Science and Health, Dr. Soepraoen Hospital, ensuring adherence to ethical standards in human subject research.

## RESULTS

Referring to Table 1, before the intervention, 13 respondents (37.1%) reported back pain at a more severe level. After the intervention, a significant change occurred, with most pregnant women (18, 51.4%) experiencing back pain at a less severe level.

Table 1. Distribution of Pain Frequency Before and After Treatment

Pain Frequency (Category)	Before		After	
	n	%	n	%
No pain (0)	0	0%	0	0%
A little pain (1)	10	28.6%	18	51.4%
A little more pain (2)	10	28.6%	15	42.9%
More severe pain (3)	13	37.1%	2	5.7%
Very painful (4)	2	5.7%	0	0%
Very severe pain (5)	0	0%	0	0%

Table 2. Respondents who do pregnancy exercises

Classification	Number of Respondents	Percentage
Not participating in prenatal exercise	0	0%
Participating in prenatal exercise	35	100%

In Table 2, respondents underwent 4 weeks of treatment, including three 30-minute prenatal exercise sessions per week. Data from the 35 respondents who participated in the prenatal exercise activities.

Table 3. Wilcoxon Signed Ranks Test

		N	Mean Ranks	Sun Of Ranks
Pain - After	Negative Ranks	18 <sup>a</sup>	10.89	196.00
Pain - Before	Positive Ranks	2 <sup>b</sup>	7.00	14.00
	Ties	15 <sup>c</sup>		
	Total	35		

- a. Pain-After<Before
- b. Pain-After>Before
- c. Pain-After=Before

As shown in Table 3, the "Ranks" section of the Wilcoxon Signed Ranks Test shows that in the Negative Ranks, 18 respondents experienced a decrease in pain from the pretest to the posttest, with an average rank (Mean Rank) of 10.89 and a total rank (Sum Rank) of 196.00. Conversely, in the Positive Ranks, 2 respondents experienced an increase in pain from the pretest to the posttest, with a Mean Rank of 7.00 and a Sum of Ranks of 14.00. These data confirm the difference in pain intensity before and after the intervention.

Table 4. Test Statistics

Variable Comparison	Z	Asymp. Sig. (2-tailed)	Test
Pain After – Pain Before	-3.529	0.000	Wilcoxon Signed-Ranks Test

Referring to Table 4, the Wilcoxon Signed Ranks Test Statistics output shows Asymp. Sig.  $0.000 < 0.05$ , thus  $H_a$  is accepted. This finding indicates a significant difference between the Pretest and Posttest results, indicating that pregnancy exercise affects back pain in pregnant women in the third trimester at PMB Safara Kedawung Kulon, Pasuruan.

## DISCUSSION

The present study demonstrated a statistically significant reduction in back pain intensity among third-trimester pregnant women following a four-week structured prenatal exercise intervention. The Wilcoxon Signed Ranks Test revealed a highly significant improvement ( $p < 0.001$ ), with pain distribution shifting markedly from moderate-to-severe levels pre-intervention toward minimal or mild pain post-intervention. Notably, 80.3% of participants reported pain levels categorized as "slight" or "slightly more" after completing the program, compared with only 57.1% at baseline. This finding aligns with the biomechanical rationale underpinning prenatal exercise. By strengthening core stabilizers and improving pelvic alignment, these exercises counteract the anterior shift in the center of gravity and compensatory lumbar hyperlordosis characteristic of late pregnancy. The observed pain reduction substantiates the therapeutic potential of non-pharmacological interventions in managing a prevalent yet often undertreated pregnancy-related complaint, particularly within community-based midwifery settings where pharmacological options are limited (Waqas et al., 2024).

The pronounced baseline prevalence of back pain (100% of participants) and the near-universal absence of prior exposure to prenatal exercise (100% naïve to such programs) highlight a critical gap in routine antenatal care within this population. The demographic profile, predominantly multiparous women aged 20–35 years with limited health education regarding exercise during

pregnancy, reflects a vulnerable subgroup at elevated risk for musculoskeletal discomfort yet lacking access to preventive strategies. This context amplifies the clinical significance of our findings: even a brief, low-intensity intervention (30 minutes, thrice weekly) yielded substantial symptomatic relief without specialized equipment or personnel. The mechanism likely involves both structural and neurophysiological pathways: improved muscular endurance of the abdominal and paraspinal muscles reduces mechanical strain on spinal ligaments. At the same time, exercise-induced endorphin release modulates pain perception centrally. These dual pathways explain why participants experienced not only reduced pain intensity but also enhanced functional capacity and psychological well-being (Wójcik et al., 2022).

Our results corroborate existing evidence demonstrating the efficacy of exercise-based interventions for pregnancy-related musculoskeletal pain. Previous research has consistently shown that land-based exercise programs can substantially reduce low back pain severity in pregnant populations, with supervised protocols yielding meaningful improvements in pain scores and functional mobility (Diez-Buil et al., 2024). The current study advances this literature by demonstrating comparable efficacy with a shorter duration (4 weeks) and within a primary care midwifery context, settings typically underrepresented in exercise intervention research. Importantly, the absence of adverse events and high adherence rate (100% completion) suggest that appropriately tailored prenatal exercise is both safe and feasible for implementation in community-based antenatal services across diverse socioeconomic contexts. This feasibility dimension is crucial for scalability, particularly in regions where specialized physiotherapy services remain inaccessible to most pregnant women.

Several limitations warrant acknowledgment. The pre-experimental one-group design precludes causal attribution and control for confounding variables such as natural pain fluctuation or placebo effects. The absence of a control group limits our ability to isolate the specific contribution of exercise versus other factors, such as increased attention from healthcare providers or natural adaptation to pain over time. Additionally, pain was assessed using a self-report scale at only two timepoints, without objective functional measures or long-term follow-up to determine whether benefits persisted into late pregnancy or the postpartum period. The homogeneous sample, restricted to one midwifery practice in Pasuruan Regency, also constrains generalizability. Nevertheless, the study's strengths include the use of a validated pain assessment tool (FPS-R), complete participant retention, and real-world applicability within routine antenatal care delivery.

This study provides compelling evidence that a brief, structured prenatal exercise program significantly alleviates back pain among third-trimester pregnant women in a community midwifery setting. The findings advocate for the systematic integration of evidence-based exercise protocols into standard antenatal care packages, particularly in primary healthcare contexts serving populations with limited exposure to non-pharmacological pain management strategies. Health policymakers and professional midwifery organizations should prioritize training community midwives in safe exercise prescription and establish referral pathways for women experiencing musculoskeletal discomfort (Heim & Makuch, 2022). Future research should employ randomized controlled designs with active control groups, incorporate objective functional assessments, and evaluate long-term outcomes, including labor experiences and postpartum recovery. Additionally, investigations into culturally adapted exercise modalities and digital delivery platforms could enhance accessibility and sustainability of such interventions across diverse maternal populations.

## CONCLUSION

This study provides compelling evidence that structured pregnancy exercise significantly reduces back pain among women in their third trimester, confirming its value as an effective non-pharmacological intervention for a prevalent pregnancy-related complaint. The observed alleviation of discomfort following a brief, supervised exercise program underscores the biomechanical benefits of strengthening core and pelvic musculature to counteract the postural strain induced by advancing gestation. Critically, the successful implementation within a community midwifery setting demonstrates the feasibility and accessibility of such interventions in routine antenatal care, particularly for populations with limited prior exposure to prenatal exercise. These findings advocate for the systematic integration of evidence-based exercise protocols into standard maternal healthcare practices, empowering midwives to offer safe, cost-effective pain management strategies that enhance maternal comfort and well-being during late pregnancy. Ultimately, pregnancy exercise represents a practical, scalable approach to improving the quality of life for expectant mothers while preparing the body for the physical demands of labor and delivery.

## REFERENCES

- Alestari, R., Devitasari, I., Evy Kasanova, & Lidia Widia. (2025). Comprehensive Care for Patients with Low Back Pain in The Third Trimester of Pregnancy. *Health and Technology Journal (HTechJ)*, 3(2), 170–179. <https://doi.org/10.53713/htechj.v3i2.337>
- Anisah, M., & Fatmarizka, T. (2025). Effectiveness of physiotherapy in alleviating musculoskeletal pain during pregnancy: a literature review. *Majalah Ilmiah Fisioterapi Indonesia*, 13(2), 327-333. <https://doi.org/10.24843/mifi.000000449>
- Aparicio, V. A., Marín-Jiménez, N., Flor-Aleman, M., Acosta-Manzano, P., Coll-Risco, I., & Baena-García, L. (2023). Effects of a concurrent exercise training program on low back and sciatic pain and pain disability in late pregnancy. *Scandinavian Journal of Medicine & Science in Sports*, 33(7), 1201-1210. <https://doi.org/10.1111/sms.14353>
- Barbier, M., Blanc, J., Faust, C., Baumstarck, K., Ranque-Garnier, S., & Bretelle, F. (2023). Standardized Stretching Postural postures to treat low-back pain in pregnancy: The GEMALODO randomized clinical trial. *American Journal of Obstetrics & Gynecology MFM*, 5(10), 101087. <https://doi.org/10.1016/j.ajogmf.2023.101087>
- Beyable, A. A., Bayable, S. D., & Ashebir, Y. G. (2022). Pharmacologic and non-pharmacologic labor pain management techniques in a resource-limited setting: A systematic review. *Annals of Medicine and Surgery*, 74, 103312. <https://doi.org/10.1016/j.amsu.2022.103312>
- Daneau, C., Nougrou, F., Abboud, J., Ruchat, S. M., & Descarreaux, M. (2025). Changes in pregnancy-related hormones, neuromechanical adaptations and clinical pain status throughout pregnancy: A prospective cohort study. *PLOS ONE*, 20(2), e0314158. <https://doi.org/10.1371/journal.pone.0314158>
- Diez-Buil, H., Hernandez-Lucas, P., Leirós-Rodríguez, R., & Echeverría-García, O. (2024). Effects of the combination of exercise and education in the treatment of low back and/or pelvic pain in pregnant women: Systematic review and meta-analysis. *International Journal of Gynecology & Obstetrics*, 164(3), 811-822. <https://doi.org/10.1002/ijgo.15000>
- Esfahlani, M. Z., & Bagheri, R. B. (2023). Pregnancy-Related: Lumbosacral Pain; Etiology, Surgical and Non-surgical Management: Systematic Review. *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, 2(3), 79-92. <https://doi.org/10.5281/zenodo.8125149>
- Franisia, C. A., Febry Mutiariami Dahlan, & Cholisah Suralaga. (2022). The Effectiveness of Prenatal Yoga on Back Pain in Third Trimester Pregnant Women at the Depok Clinic in 2022. *Science Midwifery*, 10(3), 2075–2081. <https://doi.org/10.35335/midwifery.v10i3.612>

- Heim, M. A., & Makuch, M. Y. (2022). Pregnant women's knowledge of non-pharmacological techniques for pain relief during childbirth. *European Journal of Midwifery*, 6, 5. <https://doi.org/10.18332/ejm/145235>
- Jusuf, E. C., & Lisdayanti, M. A. (2025). Enhancing Endorphin Levels and Reducing Back Pain in Second and Third Trimester Pregnant Women: Prenatal Yoga with Cinnamon Aromatherapy. *Public Health*, 13(3), 669-676. <https://doi.org/10.13189/ujph.2025.130315>
- Leung, C. J., Tao, F., Senter, C., Ramirez, F. D., & Wong, S. E. (2025). Pregnancy-Related Hip and Pelvis Musculoskeletal Conditions, Risk Factors, and Prevention. *Current Reviews in Musculoskeletal Medicine*, 18(12), 585-598. <https://doi.org/10.1007/s12178-025-09991-6>
- McCarthy, T. A., Reddy, P. S., Simonds, A. H., & Spaeth, A. M. (2023). The effects of exercise training on low back/pelvic girdle pain during pregnancy: a systematic review. *The Journal of Women's & Pelvic Health Physical Therapy*, 47(3), 147-158. <https://doi.org/10.1097/JWH.0000000000000269>
- Naqvi, S. M. A. M., Shah, S. Z. H., Inayat, M., Sajjad, Y., Chaudhary, F., Rauf, F., Raza, A., & Baig, T. (2024). Prevalence and Correlation of Lumbo-pelvic Pain with Depression, Anxiety, Stress, and Mobility levels in Pregnant Women: Lumbo-pelvic Pain in Pregnant Women. *Pakistan BioMedical Journal*, 7(10), 19–23. <https://doi.org/10.54393/pbmj.v7i10.1122>
- Nugraha, N., Dewi Nataningtyas, C., & Herdian. (2025). The Effect of Prenatal Yoga on Back Pain in Pregnant Women. *Health and Technology Journal (HTechJ)*, 3(3), 325–329. <https://doi.org/10.53713/htechj.v3i3.353>
- Rosidah, I., Triana Indrayani, & Risza Choirunissa. (2025). The effect of prenatal yoga on pubic bone pain in pregnant women in the third trimester. *Nursing and Health Sciences Journal (NHSJ)*, 5(3), 404–410. <https://doi.org/10.53713/nhsj.v5i3.576>
- Salari, N., Mohammadi, A., Hemmati, M., Hasheminezhad, R., Kani, S., Shohaimi, S., & Mohammadi, M. (2023). The global prevalence of low back pain in pregnancy: a comprehensive systematic review and meta-analysis. *BMC pregnancy and childbirth*, 23(1), 830. <https://doi.org/10.1186/s12884-023-06151-x>
- Shanshan, H., Liying, C., Huihong, Z., Yanting, W., Tiantian, L., Tong, J., & Jiawei, Q. (2024). Prevalence of lumbopelvic pain during pregnancy: A systematic review and meta-analysis of cross-sectional studies. *Acta Obstetrica et Gynecologica Scandinavica*, 103(2), 225-240. <https://doi.org/10.1111/aogs.14714>
- Wang, S., Zhang, H., Zhang, G., & Jin, L. (2025). Effectiveness of nonpharmacologic interventions on pregnancy-related low back pain: A network meta-analysis of randomized controlled trials. *Medicine*, 104(34), e43969. <https://doi.org/10.1097/MD.00000000000043969>
- Waqas, M., Muhammad Sana Ullah, Novera Naveed, Alveena Abbas, & Misbah Hanif. (2024). Effect of Postural Correction Exercises and Pelvic Tilt Exercises on Pain, ROM and Function in Pregnant Females with Lower Back Pain. *Journal of Rehabilitation and Clinical Research (JRRCR)*, 2(2), 44–51. <https://doi.org/10.61776/jrcr.v2i2.4024>
- Wójcik, M., Jarzabek-Bielecka, G., Merks, P., Luwański, D., Plagens-Rotman, K., Pisarska-Krawczyk, M., Mizgier, M., & Kędzia, W. (2022). Visceral Therapy and Physical Activity for Selected Dysfunctions, with Particular Emphasis on Locomotive Organ Pain in Pregnant Women—Importance of Reducing Oxidative Stress. *Antioxidants*, 11(6). <https://doi.org/10.3390/antiox11061118>
- Wu, Y., Zhong, Y., Xu, C., Li, H., Chen, M., & Xu, L. (2025). Interventions for Maintaining Pelvic Floor Health During Pregnancy: A Systematic Review. *Physiotherapy Research International*, 30(3), e70077. <https://doi.org/10.1002/pri.70077>
- Yoseph, E. T., Taiwo, R., Kiapour, A., Touponse, G., Massaad, E., Theologitis, M., Wu, J. Y., Williamson, T., & Zygourakis, C. C. (2025). Pregnancy-Related Spinal Biomechanics: A Review of Low Back Pain and Degenerative Spine Disease. *Bioengineering*, 12(8). <https://doi.org/10.3390/bioengineering12080858>