Effectiveness of Antenatal Exercise on Reducing Back Pain In Pregnant Women In The Second and Third Trimesters.

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A R T I C L E   I N F O

A B S T R A C T

Background: The prevalence of back pain in pregnant women in the third trimester in 2019 globally based on a survey conducted in England and Scandinavia, there were 50% of pregnant women in the third trimester suffering from significant back pain, while in Indonesia the prevalence rate of back pain was 68% of pregnant women with moderate intensity and 32% of pregnant women experiencing back pain with mild intensity. The purpose of the study was to determine the effectiveness of antenatal exercise reducing back pain in pregnant women in the second and third trimesters at the Kampung Dalam Community Health Center, Solok Regency in 2025.

Methods: This research type is a Quasy Experiment with the One-Group Pretest – Posttest Design method, conducted from August 2024 to April 2025. The population is all pregnant women in the second and third trimesters at the Kampung Dalam Sub-Health Center. In a total of 16 people with a sampling technique of total sampling. The research instrument uses an observation sheet. Univariate and bivariate analysis using the dependent t-test statistical test.

Results: The results of the study showed that the average back pain before antenatal exercise in pregnant women in the second and third trimesters was 7.13, and the average back pain after antenatal exercise in pregnant women in the second and third trimesters was 4.94. The results of the dependent t-test statistical test showed that the p value = 0.000.

Conclusion: The conclusion of the study is that there is effectiveness of antenatal exercise in reducing back pain in pregnant women in the second and third trimesters at the Kampung Dalam Sub-Health Center in Solok Regency in 2025. It is recommended that health workers improve the quality of health services and educate mothers and families more so that they can be more enthusiastic and routine in doing antenatal exercise in order to provide comfort in the form of reducing back pain in pregnant women.

INTRODUCTION

Pregnancy is a natural physiological process that begins with fertilization, followed by implantation in the uterine wall, and ends with childbirth (Wadhwa, 2020). Although normal, pregnancy involves complex anatomical, physiological, biochemical, and psychological adaptations as the fetus grows. These changes affect multiple body systems, particularly the musculoskeletal system, and often lead to physical discomfort (Alfianti, 2024).

Globally, birth rates remain high. Data from World Population Review (August 19, 2024) indicate that India, China, Nigeria, Pakistan, and Indonesia have the highest daily birth rates, with Indonesia reaching

12,234 births per day. In Indonesia, the 2023 Health Profile recorded 4,907,227 pregnant women and 4,030,995 live births (89.5%). In West Sumatra Province, there were 114,770 pregnant women in 2023. At the district level, Solok Regency recorded 6,765 pregnant women in 2023 and 4,529 in 2024. In the Simpang Tanjung Nan IV Community Health Center area, 376 pregnant women were recorded in 2023 and 244 in 2024 (Solok Regency Health Data, 2023–2024). These figures highlight the substantial number of women potentially affected by pregnancy-related discomforts, including back pain.

Musculoskeletal changes are among the most common causes of discomfort during pregnancy. Progressive weight gain and uterine enlargement shift the center of gravity forward, resulting in postural adjustments such as increased lumbar lordosis, rounded shoulders, and altered gait. Hormonal changes also increase ligament laxity, particularly in the sacroiliac joints, reducing joint stability. As a result, many women experience lower back and pelvic pain, which may worsen with prolonged standing, bending, lifting, or fatigue (Davenport, 2019).

Back pain can occur throughout pregnancy and even persist postpartum. The incidence typically peaks between 24 and 28 weeks of gestation, when abdominal growth accelerates. Studies show that 45% of women report back pain during antenatal visits, increasing to 69% by week 28 (Siahaan, 2022). In the third trimester, approximately 50% of pregnant women in the UK and Scandinavia experience significant back pain. In Indonesia, 68% of pregnant women report moderate pain and 32% mild pain (Ministry of Health, 2020). In West Sumatra, 75.8% of women in the second and third trimesters experience moderate back pain (Riskesdas, 2018). These data confirm that back pain is a prevalent maternal health issue that should not be overlooked.

Non-pharmacological management, particularly antenatal exercise, is recommended to reduce pregnancy-related back pain. Antenatal strengthens and maintains the elasticity of abdominal, pelvic floor, and supporting muscles involved in childbirth (Nurlitawati, 2022). Improved core stability enhances spinal alignment, balance, and pelvic control, thereby reducing mechanical stress on ligaments and joints (Chandrasekharan, 2020). For low-risk pregnancies, light to moderate exercise—such as prenatal gymnastics, swimming, or light aerobics—performed at least three times per week is considered safe and beneficial (Fitriana, 2024).

Empirical studies support the effectiveness of antenatal exercise. Lilis (2019) found a significant relationship between antenatal exercise and reduced back pain in third-trimester pregnant women ($\rho = 0.000$; OR = 2.600), indicating that women who did not exercise were 2.6 times more likely to experience back pain. Similarly, Fitriani (2021) reported a significant reduction in back pain before and after exercise among pregnant women in North Aceh (p = 0.000).

Despite these benefits, participation in antenatal exercise programs remains low in some areas. A preliminary study conducted in January 2025 at the Simpang Tanjung Nan IV Community Health Center revealed that although weekly prenatal classes including pregnancy exercise were available at Pustu Kampung Dalam, attendance was inconsistent. A survey on September 9, 2024, identified 17 pregnant women in the second and third trimesters; 12 (75%) reported back pain with high intensity (scale 7–9) and had not undertaken any pain management strategies.

The high prevalence of back pain combined with low participation in antenatal exercise indicates a gap between available services and their utilization. Therefore, this study aims to examine the effectiveness of pregnancy exercise in reducing back pain among second- and third-trimester pregnant women at the Kampung Dalam Community Health Center in Solok Regency.

METHODS

This research is a quasi-experimental study. It is structured in such a way that the researcher can obtain answers to the research questions. In this study, the researcher used a One-Group Pretest-Posttest Design, which includes a pretest before and after the treatment. This research was conducted in August 2024 – April 2025 at the Kampung Dalam sub-health center, Solok Regency in 2025.

The sample in this study was all pregnant women in the second and third trimesters who were at the Kampung Dalam sub-health center (March 2025) totaling 16 people with the sampling technique used being total sampling. Pain intensity score before and after intervention (pregnancy exercise) consisting of numbers 0-10 using the NRS (Numeric Rating Scale). The research instrument uses an observation sheet. Univariate and bivariate analysis using the dependent t-test statistical test. Ethical principles were applied throughout the research. Respondents were informed about the research objectives, procedures, potential benefits, and their right to withdraw at any time without consequences. Written consent was obtained from all participants before data collection. Respondent anonimity and data confidentiality were strictly maintained, and all data were used solely for research purposes.

RESULTS
Characteristics Respondents
Characteristics respondents in Community Health Center Village Assistants in the Regency Solok, based on results study can seen on table as following:

Table 1 Frequency Distribution of Respondent Characteristics

Characteristics	F	%
1. Age		
- ≤ 20 year or ≥ 35 year	4	25
- Between 20 – 35 year	12	75
Amount	**16**	**100**
2. Education		
- Elementary School	7	43.75
- Junior High School	3	18.75
- Senior High School	3	18.75
- Diploma III / Bachelor's Degree	3	18.75
Amount	**16**	**100**

Based on table 1, it is known that of the 16 pregnant women in their second and third trimesters who were respondents in Kampung Dalam Sub-district Health Center, Solok Regency, there are 12 people Pregnant women (7.5 %) are in the age range between 20 – 35 years. There are 7 pregnant women (43.75 %) with an education level of Elementary School.

Univariate Analysis
        This univariate analysis aims to explain or describe the characteristics of each research variable so that the results can be known as following:
Average Level of Back Pain Before Antenatal Exercises

Variables	n	%	Mean	Elementary School	Min-Max Value
Back Pain	16	100	7.13	1.20416	6-9

Based on table 2, it can be seen that the average mean scale of back pain in pregnant women before the intervention (pregnancy exercise) was 7.13 and the standard deviation value of the scale of back pain in pregnant women before the intervention (pregnancy exercise) was 1.20416, and the lowest value of the scale of back pain in pregnant women before the intervention (pregnancy exercise) was 6 and the highest value was 9.

Average Level of Back Pain After Pregnancy Exercises

Variables	*n*	%	Mean	Elementary School	Min-Max Value
Back Pain	16	100	4.94	0.7719	4-6

Based on table 3 It can be seen that the average mean scale of back pain in pregnant women after the intervention (pregnancy exercise) was 4.94 and the standard deviation value of the scale of back pain in pregnant women after the intervention (pregnancy exercise) was 0.7719 , and the lowest value of the scale of back pain in pregnant women after the intervention (pregnancy exercise) was 4 and the highest value was 6.

Bivariate Analysis

Bivariate analysis was conducted to see the effectiveness of pregnancy exercises on back pain in pregnant women.

The effectiveness of pregnancy exercises in reducing back pain in pregnant women in the second and third trimesters

Back Pain	*Mean*	Elementary School	*Standard Error of the Mean*	*P p* value	*N*
Pain before intervention	7.13	1,20416	0.30104	0,000	16
Pain after intervention	4.94	0.7719	0.19298		

Based on table 4 it can be seen that the value of the statistical test results using the t-test dependent (paired t test) shows a p value of 0.00 0 because the p value is smaller than 0.05, so we can conclude that there is an effect of antenatal exercise on back pain in pregnant women in the second and third trimesters at the Kampung Dalam Auxiliary Health Center, Solok Regency. After being carried out pretest and posttest. If the statistical test shows a p value <0.05, it can be concluded that there is an effect antenatal exercise on back pain in pregnant women in the second and third trimesters, so Ho is rejected. If the p-value is > 0.05, then there is no difference in the effectiveness of antenatal exercise on back pain in pregnant women in the second and third trimesters, so Ho is not rejected.

DISCUSSION

Effectiveness of antenatal exercise on reducing back pain in pregnant women in the second and third trimesters.

The results presented in Table 4 demonstrate that the paired t-test analysis produced a p-value of 0.001, which is lower than the predetermined significance level of 0.05. Statistically, this indicates that there is a significant difference between back pain scores before (pretest) and after (posttest) the implementation of antenatal exercise among pregnant women in the second and third trimesters at the Kampung Dalam Community Health Center. Because the p-value is less than 0.05, the null hypothesis (Ho), which states that there is no effect of antenatal exercise on back pain, is rejected. Thus, it can be concluded that antenatal exercise has a significant effect in reducing back pain among pregnant women in this study population.

The paired t-test is an appropriate statistical method in this context because it compares two related measurements taken from the same group of respondents namely, the level of back pain before and after the intervention. By using this method, the study ensures that the observed changes are attributable to the intervention rather than differences between separate groups. The significant p-value of 0.001 indicates that the reduction in back pain after the antenatal exercise program is unlikely to have occurred by chance. Therefore, the findings provide strong empirical evidence supporting the effectiveness of antenatal exercise as a non-pharmacological intervention for managing lower back pain during pregnancy.

Physiologically, back pain during pregnancy is a common complaint, particularly in the second and third trimesters. This period is characterized by rapid fetal growth, enlargement of the uterus, and significant maternal weight gain. These changes shift the center of gravity forward, increasing lumbar lordosis and

placing additional strain on the lumbosacral region. Furthermore, hormonal changes especially the increased production of relaxin lead to ligament laxity and joint instability, which further contribute to musculoskeletal discomfort. As described by Hu et al. (2020), additional factors such as poor posture, repetitive physical activities, and a prior history of back pain may exacerbate symptoms. Therefore, interventions targeting muscular strength, flexibility, and posture correction are essential for alleviating discomfort.

Antenatal exercise plays a crucial role in addressing these physiological changes. According to Zein (2020), antenatal exercise strengthens and maintains the elasticity of the abdominal wall muscles, ligaments, and pelvic floor muscles. Stronger abdominal and core muscles provide better spinal support, thereby reducing mechanical stress on the lower back. Similarly, Oktavia (2024) emphasizes that antenatal exercise enhances core stability, balance, and overall musculoskeletal alignment. With improved stability, pregnant women are better able to maintain proper posture during daily activities, which in turn reduces strain on the lumbar spine. Carvalho (2017) also notes that exercises focusing on abdominal strengthening contribute directly to the reduction of back pain intensity.

The findings of this study are consistent with previous research. For example, Fatmarizka (2021), in a study conducted at the Lolo Community Health Center, found that before antenatal exercise, 65% of respondents experienced moderate back pain and 35% experienced mild pain. After participating in antenatal exercise twice weekly, all respondents (100%) reported only mild back pain. The statistical analysis using the Mann Whitney test yielded a p-value of $0.000 < 0.05$, indicating a significant difference before and after the intervention. These findings reinforce the conclusion that regular prenatal exercise effectively reduces back pain intensity among third-trimester pregnant women.

Similarly, Muawanah (2023) conducted research at Ciawi Regional Hospital and reported a paired sample t-test p-value of $0.002 < 0.05$. This result also indicated a significant reduction in back pain among third-trimester pregnant women after antenatal exercise. The consistency of findings across different settings strengthens the external validity of the current study. It suggests that antenatal exercise is broadly applicable and effective across various healthcare environments and populations.

In the present study, of the 16 respondents, 11 were in their third trimester and 5 were in their second trimester. Most participants initially experienced moderate to severe back pain. Interestingly, many of them perceived back pain as a normal and unavoidable part of pregnancy. This misconception often leads pregnant women to ignore symptoms rather than seek intervention. Although all respondents were aware of antenatal exercise and had previously participated, they did not perform the exercises regularly. Busy schedules, household responsibilities, and infrequent visits to the sub-health center contributed to irregular participation. As a result, the benefits of antenatal exercise were not fully experienced before the structured intervention in this study.

Adherence to the standard operating procedures (SOP) and direct guidance from midwives and researchers during the intervention period likely played a significant role in achieving positive outcomes. The exercise program consisted of 30-minute sessions conducted twice a week for two consecutive weeks, as recommended by Chen (2020). Structured scheduling, supervision, and clear instructions ensured that participants performed the movements correctly and consistently. This highlights the importance of supervision and motivation in improving compliance and maximizing the benefits of antenatal exercise.

Another contributing factor to the effectiveness of prenatal exercise is its simplicity and accessibility. The movements are generally light, easy to learn, and safe for pregnant women when performed correctly. Because the exercises are not overly strenuous, they can be integrated into daily routines without requiring special equipment. The combination of stretching, strengthening, and relaxation techniques not only improves muscle elasticity and physical fitness but also promotes psychological comfort. Salari et al. (2023) emphasize that improved muscle elasticity and fitness significantly contribute to reducing symptoms of lower back pain. In addition, regular exercise may stimulate endorphin release, which naturally alleviates pain and enhances mood.

Beyond pain reduction, antenatal exercise may also improve overall maternal well-being. Reduced back pain can enhance sleep quality, mobility, and the ability to perform daily tasks. This, in turn, may reduce stress and anxiety levels during pregnancy. Improved physical condition may also prepare women better for labor and delivery, as stronger pelvic floor and abdominal muscles facilitate the birthing process. Therefore, the benefits of antenatal exercise extend beyond mere pain management.

Despite the positive findings, certain limitations should be acknowledged. The sample size in this study was relatively small (16 respondents), which may limit generalizability. Additionally, the intervention

duration was only two weeks, so long-term effects were not assessed. Future research with larger sample sizes and longer follow-up periods would provide more comprehensive evidence regarding sustained benefits.

The statistical analysis demonstrating a p-value of 0.001 confirms that antenatal exercise significantly reduces back pain among pregnant women in the second and third trimesters at the Kampung Dalam Community Health Center. The findings are consistent with previous studies conducted in other healthcare settings, further supporting the effectiveness of antenatal exercise as a safe, practical, and non-pharmacological intervention. Regular and supervised implementation of prenatal exercise programs should therefore be encouraged as part of routine antenatal care to improve maternal comfort and quality of life during pregnancy.

CONCLUSION

The findings indicate a statistically significant difference in the effectiveness of antenatal exercises on reducing back pain among pregnant women in the second and third trimesters, with a ρ value of 0.000 ($p < 0.05$). This result demonstrates that antenatal exercise programs have a meaningful impact on decreasing the intensity of back pain experienced during mid to late pregnancy.

These results suggest that structured and regular antenatal exercises can serve as an effective non-pharmacological intervention for managing musculoskeletal discomfort associated with physiological and postural changes during pregnancy. As the second and third trimesters are characterized by increased uterine size, weight gain, and shifts in the center of gravity, back pain becomes more prevalent. Antenatal exercises focusing on stretching, strengthening of the abdominal and pelvic muscles, posture correction, and relaxation techniques—help improve muscle support, enhance flexibility, and reduce mechanical strain on the spine.

The extremely low ρ value (0.000) indicates a very strong level of statistical significance, reinforcing the reliability of the findings. This suggests that the observed reduction in back pain is unlikely to have occurred by chance. Therefore, healthcare providers, including midwives and obstetric professionals, should consider recommending regular antenatal exercise programs as part of routine antenatal care. Antenatal exercise is an effective, safe, and practical intervention for reducing back pain in pregnant women during the second and third trimesters. Implementing such programs more widely may improve maternal comfort, enhance quality of life, and potentially contribute to better overall pregnancy outcomes.

CONFLICTS OF INTEREST
No conflicts of interest were disclosed by the writers of this work

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