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Effectiveness of Kinesio Taping and Proper Body Mechanics on Low Back Pain in Pregnancy

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ABSTRACT

Background: Low back pain (LBP) It is a frequent issue affecting the musculoskeletal system experienced by pregnant women, particularly during the third trimester. Physiological and biomechanical changes during pregnancy, including hormonal alterations, increased body weight, and shifts in the center of gravity, may contribute to the development of LBP. Non-pharmacological interventions such as Kinesio Taping (KT) and Proper Body Mechanics (PBM) have been widely used as safe approaches for pain management during pregnancy.
Objective: This study aimed to evaluate the impact of Kinesio Taping, Proper Body Mechanics, and their combination on pain intensity among pregnant women with low back pain.
Method: This study utilized a quasi-experimental design, employing a pre-test and post-test control group method. The sample consisted of 60 pregnant women in their third trimester with low back pain were assigned to three groups: KT (n=20), PBM (n=20), and a combination of KT and PBM (n=20). The KT intervention was administered according to a standardized application procedure, while PBM consisted of education and guided practice on proper posture and movement techniques during daily activities. Interventions were implemented over seven consecutive days. The Numeric Rating Scale (NRS) was employed to evaluate pain levels prior to the intervention and again on the eighth day post-treatment. Data analysis was conducted via one-way ANOVA, supplemented by Tukey's post hoc test for multiple comparisons
Result: Following the intervention, pain scores were lower in all groups; however, the group receiving the combined treatment showed the lowest average pain intensity (mean = 3.35) followed by the Kinesio Taping group (mean = 2.15) and the Proper Body Mechanics group (mean = 1.20). One-way ANOVA demonstrated a statistically significant difference among the intervention groups ($F = 16.927$; $p < 0.001$). Post Hoc Tukey analysis further confirmed significant differences between the intervention groups
Conclusion: The combination of Kinesio Taping and Proper Body Mechanics was more effective at reducing low back pain among pregnant women than either intervention alone. This intervention may be considered a safe non-pharmacological option for managing LBP during pregnancy.

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INTRODUCTION

As a physiological state, pregnancy involves various hormonal and physical transformations that work in concert to sustain fetal development, maturation and prepare the maternal body for childbirth. However, these changes often lead to musculoskeletal discomfort, particularly low back pain (LBP), which is among the most frequently reported ailments during pregnancy. The prevalence of LBP in pregnant women has been reported to exceed 50% globally and may reach 70–75%, particularly during the second and third trimesters (Salari et al., 2023; Zhou et al., 2023).

Pregnancy-related LBP is linked to hormonal changes, particularly elevated relaxin levels, which promote ligament laxity and reduce lumbopelvic stability. Uterine enlargement shifts the center of gravity anteriorly, increases lumbar lordosis, and increases mechanical stress on the spine and surrounding structures (Żurawski et al., 2024). Additional contributors include gestational weight gain, reduced core muscle strength, and poor posture during daily activities (Adinatesh et al., 2023).Low back pain during pregnancy can impair physical activity, sleep quality, and psychological well-being. Persistent pain can reduce mobility and interfere with daily functioning, underscoring the need for safe and effective management strategies (Fatmarizka et al., 2021; Daneau et al., 2025).

Given the limitations of pharmacological therapy during pregnancy, non-pharmacological approaches are commonly recommended. Kinesio Taping (KT) has been shown to reduce pain through neuromuscular facilitation and sensory modulation (Xue et al., 2021). Similarly, Proper Body Mechanics (PBM), which emphasizes appropriate posture and movement techniques, has been associated with reduced LBP intensity in pregnant women (Muhammad et al., 2023; Dewi & Kusumadewi, 2025). Although KT and PBM have independently demonstrated positive effects, previous studies have primarily evaluated these interventions separately. Evidence on the combined application of KT and PBM remains limited, particularly in Indonesian primary healthcare settings involving third-trimester pregnant women. This represents the novelty of the present study, which investigates the comparative and combined effects of KT and PBM in the working area of the Telaga Dewa Public Health Center, Bengkulu City.This study aimed to analyze the effects of Kinesio Taping, Proper Body Mechanics, and their combination on pain intensity among third-trimester pregnant women with low back pain. It was hypothesized that the combined intervention would provide greater pain reduction than either single intervention.

METHOD

Research Design

A quasi-experimental approach was used for this research using a pre-test and post-test control group approach. Three intervention groups were included: Kinesio Taping (KT), Proper Body Mechanics (PBM), and a combination of KT and PBM. The study was conducted within the jurisdiction of the Telaga Dewa Public Health Center in Bengkulu City, including affiliated independent midwifery practices.

Ethical Considerations

This research received ethical clearance from the Health Research Ethics Committee at Poltekkes Kemenkes Bengkulu under Ethical Approval Number KEPK.BKL/680/09/2025. The study was declared ethically appropriate according to WHO 2011 standards and CIOMS 2016 guidelines. Informed consent, documented in writing, was acquired from all individuals involved prior to the commencement of data collection. The participants were briefed on the aims of the study, the employed methodologies, confidentiality protocols, and their right to withdraw from the study at any time without facing any repercussions.

Participants

The analysis involved subjects who were pregnant females in their third trimester reporting instances of low back pain. Key characteristics observed to provide a comprehensive overview, the study accounted for several critical factors: maternal age, gestational duration, and body mass index (BMI), and daily physical activity level. All participants had physiological pregnancies without severe medical complications.

Population and Sampling Method

The participants for this study were recruited from pregnant women in their third trimester who were experiencing low back pain and resided within the Telaga Dewa Public Health Center's service area. Cluster random sampling was employed based on healthcare service sites. Three healthcare facilities were identified as clusters: one public health center and two independent midwifery practices. Participants within each cluster who met inclusion criteria were recruited and proportionally allocated into intervention groups. A total of 60 respondents were enrolled and evenly distributed across three groups (n = 20 each).

Sample Size, Power, and Precision

Sample size calculation was conducted using power analysis with an assumed effect size of 0.55, significance level (α) of 0.05, and statistical power of 0.90. The minimum sample size requirement was 45 participants. To enhance the study's statistical power and provide a buffer for potential participant dropouts, the final sample size was established at 60 individuals. No participants withdrew during the intervention period.

Instrumentation

We utilized the Numeric Rating Scale (NRS) to evaluate pain intensity, asking participants to rate their experience on a scale where 0 indicates no pain and 10 represents the maximum possible discomfort. The NRS is widely recognized as a valid and reliable instrument for measuring subjective pain intensity. Supporting variables included maternal BMI, obtained from the Maternal and Child Health (MCH) handbook, and physical activity level, measured using a pregnancy physical activity questionnaire. Previous studies have confirmed the NRS to have strong construct validity and high test–retest reliability in clinical and maternal populations.

Procedures and Time Frame

Participants in the KT group received Kinesio Taping using elastic therapeutic tape applied to the lumbar paravertebral region following a standardized operating procedure. Participants were positioned in slight lumbar flexion before tape application. An I-strip technique was used, with one strip applied along the left side of the spine from the coccyx toward the mid-back area and repeated on the right paravertebral side. The tape was applied with light tension (approximately 10–15% stretch) to provide support without restricting movement. The tape remained in place for seven days unless participants experienced discomfort, itching, skin irritation, or allergic reactions. Participant adherence and tape condition were monitored through video calls and home visits throughout the intervention period. Post-test measurements were performed on the eighth day after tape removal.

Control of Confounding Variables

Potential confounding variables including maternal age, gestational age, BMI, and physical activity level were assessed at baseline. Homogeneity testing was conducted to ensure comparability among groups prior to intervention implementation

Analysis Plan

Statistical processing was conducted using the SPSS software package. We began the analysis by utilizing descriptive statistics to provide a comprehensive overview of participant demographics and pain scores. To ensure the data met the requirements for further inferential testing, we verified normality through the Shapiro–Wilk test and confirmed the homogeneity of variance using Levene's test. To evaluate differences in pain reduction among groups over time, repeated measures analysis was considered appropriate due to the pre-test and post-test design. One-way ANOVA and Post Hoc Tukey HSD tests were additionally performed to identify differences between intervention groups. Statistical significance was established at $p < 0.05$ with a 95% confidence level.

Scope and Limitations

This study included only third-trimester pregnant women within a single primary healthcare service area, which may limit generalizability. The quasi-experimental design may introduce selection bias, and subjective pain reporting may be influenced by individual perception. Nevertheless, standardized procedures and validated instruments were implemented to strengthen methodological rigor.

Reporting Guideline Recommendation

The reporting structure may follow CONSORT extension guidelines for non-randomized intervention studies.

RESULTS AND DISCUSSION

Results

Table 1. Respondent Characteristics and Baseline Equality

Variabel	KT	PBM	Combination	p-value
Age (Years)				
Mean ± SD	27,20 ± 4,62	27,05 ± 4,50	29,75 ± 4,63	0,122
Min–Max	19–37	21-35	21–37	
BMI (kg/m²)				
Mean ± SD	20,4–30,0	21,6–27,5	21,3-30,0	
Min–Max	25,34 ± 2,45	24,81 ± 1,75	25,65 ± 2,30	0,477
Physical Activity				
Light n (%)	11 (55%)	11 (55%)	9 (45%)	0,592
Moderate n (%)	7 (35%)	9 (45%)	10 (50%)	
Heavy n (%)	2 (10%)	0 (0%)	1 (5%)	
Total	20 (100%)	20 (100%)	20 (100%)	

Baseline characteristics of respondents were comparable across intervention groups. Statistically significant differences regarding the age of participants were not detected, ensuring that this demographic factor remained consistent across the sample ($p = 0.122$), BMI ($p = 0.477$), or physical activity level ($p = 0.592$), indicating homogeneity among groups before intervention.

Table 2. Pre-test and Post-test NRS Scores

Group	Mean ± SD	Min–Max	Total n
NRS Pre-test			
KT	5.65 ± 1.84	2–9	20
PBM	5.65 ± 1.81	2-9	20
Combination	5.55 ± 2.61	2–9	20
NRS Post-test			
KT	2.90 ± 1.44	0–6	20
PBM	4.30 ± 1.75	1–7	20
Combination	1.60 ± 1.14	0–4	20

Table 2 shows Pre-intervention pain scores were relatively similar across groups, indicating comparable baseline conditions. Following the intervention, scores declined in every group, with the most pronounced decrease occurring in the combination group, followed by the KT and PBM groups.

Table 3. Shapiro-Wilk Normality Test

Group	Pre-test (p)	Post-test (p)	Interpretation
KT	0.336	0.596	Normal distribution
PBM	0.775	0.263	Normal distribution
Combination	0.426	0.085	Normal distribution

Table 3 Shapiro–Wilk analysis demonstrated that all pre-test and post-test NRS scores were normally distributed ($p > 0.05$), supporting the use of parametric statistical tests.

Table 4. Levene's Test for Homogeneity of Variances

Test of Homogeneity of Variances

PostTest_NRS	Levene Statistic	df1	df2	Sig. (p-value)
	2.659	2	57	.079

Table 4 Levene's test indicated homogeneity of variance across intervention groups ($p = 0.079$), confirming that the assumption for one-way ANOVA was satisfied.

Table 5. One-Way ANOVA of Post-test NRS Scores

Source	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Between Groups	72.933	2	36.467	16.927	<.000
Within Groups	122.800	57	2.154		
Total	195.733	59			

One-way ANOVA revealed significant differences in post-test pain scores among intervention groups ($F = 16.927$, $p < 0.001$). The effect size was large ($\eta^2 = 0.37$), suggesting that intervention type had a substantial influence on pain reduction.

Table 6. Changes in NRS Scores (Pre-test vs. Post-test)

Group	Pre-test Mean ± SD	Post-test Mean ± SD	Mean difference	Interpretation
KT	5.65 ± 1.84	2.90 ± 1.44	2.75	Decreased
PBM	5.65 ± 1.81	4.30 ± 1.75	1.35	Decreased
Combination	5.55 ± 2.61	1.60 ± 1.14	3.95	Decreased

Table 6 All intervention groups demonstrated reductions in NRS scores after treatment. The largest decrease was observed in the combination group

Table 7. Tukey HSD Post Hoc Analysis

Group Comparison	Mean Difference	Std. Error	Sig. (p-value)	95% Confidence Interval	
				Lower Bound	Uper Bound
KT vs PBM	-1.40	0.464	**0.011**	-2.52	-0.28
KT vs Combination	1.30	0.464	**0.019**	0.18	2.42
PBM vs Combination	2.70	0.464	**<0.000**	1.58	3.82

Table 7 Post Hoc Tukey HSD analysis demonstrated statistically significant differences were found among all groups. Significant differences were identified between KT and PBM ($p = 0.011$), KT and the combination intervention ($p = 0.019$), and PBM and the combination intervention ($p < 0.001$). The largest mean difference was observed between PBM and the combination group, indicating superior effectiveness of the combined intervention in reducing pain intensity.

Discussion

The current findings reveal that all three interventions Kinesio Taping (KT), Proper Body Mechanics (PBM), and the combination of both effectively reduced low back pain in pregnant women in the final trimester of pregnancy, with the combination intervention producing the most substantial effect. Participants were predominantly in the reproductive age range of 20–35 years, with comparable body mass index (BMI) and levels of physical activity across all groups, ensuring homogeneity in baseline physical and biomechanical characteristics. This similarity indicates that the observed reduction in pain intensity can largely be attributed to the interventions rather than demographic or lifestyle differences, supporting the internal validity of the study. The reproductive age group is particularly relevant because it coincides with heightened physical activity and increased mechanical demands on the lumbopelvic region, which are known contributors to low back pain during pregnancy (Dunn et al., 2019; Cherni et al., 2019; Devecchi et al., 2021; Sari et al., 2025). Hormonal factors, such as elevated relaxin levels, also affect ligamentous laxity and spinal stability, making targeted interventions like KT and PBM especially pertinent in this population.

Kinesio Taping proved effective in alleviating low back pain by providing light mechanical support to the lumbar region, enhancing proprioceptive input, and modulating pain through neurosensory mechanisms such as the gate control theory (Ningrum & Setiawan, 2024; Ghai et al., 2023; Demircioğlu & Genç, 2024). The tape also helps redistribute mechanical loads on superficial tissues and improve functional stability by promoting more efficient muscle activation patterns. Meta-analyses of randomized controlled trials have demonstrated that KT significantly reduces pain intensity and improves functional outcomes in pregnant women with low back pain, both in short- and medium-term applications (Xue et al., 2021; Vairagade et al., 2018). Meanwhile, PBM primarily functions through postural optimization, promoting correct alignment during sitting,

standing, sleeping, and lifting, thereby decreasing biomechanical stress on the lumbopelvic region (Conder et al., 2019; Roshko et al., 2024; Bagwell et al., 2024). PBM also improves neuromuscular control and postural stability, which are critical in counteracting the anterior shift of the center of mass and increased lumbar lordosis that occur during pregnancy. However, the effectiveness of PBM is influenced by adherence to recommended techniques during daily activities, explaining why pain reduction in the PBM-only group was smaller compared to KT or the combination intervention.

The combination of KT and PBM demonstrated the greatest reduction in pain, highlighting the synergistic effects of passive and active interventions. KT provides immediate mechanical and sensory support, reducing perceived pain and enabling participants to engage more effectively in active PBM exercises. PBM, in turn, facilitates neuromuscular adaptations, core strengthening, and the acquisition of correct movement patterns, ensuring longer-term postural correction and sustained reduction of mechanical stress on the lumbar spine (Ngudi Waluyo et al., 2023; Smrcina et al., 2022; Geneen et al., 2020). The multimodal approach not only addresses pain reduction but also enhances self-efficacy and confidence in movement, which are important factors for adherence to proper posture and prevention of recurrent low back pain (Joern et al., 2022). These results are consistent with previous research indicating that multimodal non-pharmacological interventions are superior to single interventions in managing low back pain, offering both immediate symptomatic relief and long-term functional benefits (Blanco-Giménez et al., 2024; Fatmarizka & Ulee Keumala, 2024).

In addition, the study underscores the clinical relevance of considering demographic and biomechanical factors such as age, BMI, and baseline activity level when implementing interventions for low back pain in pregnant women. Homogeneity in these characteristics allowed for a clearer interpretation of intervention effects. The findings also provide practical guidance for health professionals in primary care settings, suggesting that the integration of KT and PBM can be safely and effectively applied to reduce pain and improve functional outcomes during daily activities. Overall, the study supports the use of a multimodal approach that combines passive support and active postural training to optimize pain management, neuromuscular adaptation, and functional capacity among pregnant women with low back pain, offering a model for future research and clinical practice in maternal musculoskeletal care.

Several previous studies have reported findings that differ from the present study. While numerous studies have demonstrated positive effects of Kinesio Taping on pregnancy-related low back pain, some investigations reported limited or non-significant improvements compared with conventional care or exercise-based interventions. For instance, variations in tape application techniques, duration of intervention, participant characteristics, and outcome assessment methods may contribute to inconsistent findings across studies. Similarly, the effectiveness of Proper Body Mechanics interventions has shown variability, particularly when participant adherence to postural recommendations was low or when intervention periods were relatively short. Studies involving unsupervised implementation of posture education have sometimes reported minimal improvements in pain outcomes.

The discrepancies between previous findings and the present study may be explained by methodological and contextual differences. In the current study, interventions were implemented using standardized procedures, participant compliance was monitored through home visits and remote communication, and the combination intervention integrated both passive biomechanical support and active postural correction strategies. This multimodal approach may have enhanced treatment adherence and produced synergistic effects, resulting in greater pain reduction compared with studies evaluating single or less structured interventions. Additionally, differences in healthcare settings, particularly within Indonesian primary healthcare contexts, may influence participant engagement and intervention outcomes.

Implications

The study supports the integration of KT and PBM into routine antenatal care for pregnant women with low back pain, highlighting the practical utility of multimodal approaches in primary healthcare settings. This combination can enhance functional capacity, reduce discomfort, and potentially improve overall maternal well-being.

Research Contribution

This research provides empirical evidence demonstrating the enhanced efficacy of combined KT and PBM interventions over single modalities for managing pregnancy-related low back pain. The study contributes to the development of safe, practical, and evidence-based non-pharmacological strategies applicable in primary care and community health settings.

Limitations

The limitations of this study include its quasi-experimental design without full randomization, which may have introduced selection bias. In addition, the study was conducted within a single healthcare service area, which limits the generalizability of the findings. Pain assessment relied on self-reported NRS scores, which may be influenced by subjective perception. The intervention duration was short-term, so long-term effects were not assessed.

Suggestions

Future studies should employ randomized controlled designs, include larger and more diverse populations, and extend the follow-up period to assess long-term outcomes. Further research could explore combinations of KT and PBM with other non-pharmacological modalities to optimize pain management and functional improvements during pregnancy

CONCLUSION

This study concludes that Kinesio Taping (KT), Proper Body Mechanics (PBM), and the combination of both interventions significantly reduced low back pain intensity among third-trimester pregnant women. Consistent with the study hypothesis, the combined KT and PBM intervention demonstrated the most optimal pain reduction compared with single interventions. These findings support the theoretical rationale that integrating biomechanical support and postural education produces a synergistic effect in managing pregnancy-related low back pain. The results align with the objectives outlined in the Introduction and confirm that multimodal non-pharmacological strategies can serve as effective, safe, and practical approaches in primary maternal healthcare settings.

From an application perspective, the combined intervention may be incorporated into routine antenatal care programs, particularly for pregnant women experiencing musculoskeletal discomfort. Future research is recommended to employ fully randomized controlled designs, include larger and more heterogeneous populations, and evaluate the long-term effects of the interventions. Further studies may also explore combinations with other non-pharmacological modalities to enhance clinical effectiveness and evidence-based maternal care.

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AUTHOR CONTRIBUTION STATEMENT

AA conceptualized and planned the study. BB conducted data collection and intervention implementation. AA and BB performed data analysis, interpreted the results, and drafted the manuscript. Both authors reviewed and approved the final version of the manuscript.

AI DISCLOSURE STATEMENT

Artificial intelligence tools were utilized only to assist with language editing and manuscript preparation. The authors retain full responsibility for all analyses, interpretations, and scientific content.

CONFLICTS OF INTEREST

The authors affirm that no financial, institutional, or personal relationships exist that could be perceived as influencing the research, data interpretation, or publication of this work.

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