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Effectiveness of a Modified Pregnancy Support Belt in Reducing Back and Pelvic Pain in Pregnant Women: A Quasi-Experimental Study in South Jakarta

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ORIGINAL ARTICLES

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ABSTRACT

Lower back and pelvic pain are common complaints among pregnant women, particularly in the third trimester, due to physiological and hormonal changes. These discomforts significantly impact daily functioning and quality of life. To evaluate the effectiveness of a modified pregnancy support belt in reducing lower back and pelvic pain among pregnant women in the South Jakarta area. This quasi-experimental study involved 60 pregnant women in their third trimester, divided into two groups: an intervention group and a control group. The intervention group used the modified pregnancy support belt, while the control group used a standard pregnancy belt. Pain levels were measured before and after the intervention using the Visual Analogue Scale (VAS). Sociodemographic characteristics, including age, education, occupation, and parity, were also analyzed. Most respondents were aged 20-35 years, housewives, and high school graduates. The mean reduction in VAS scores was 3.1 (95% CI: 2.6-3.6) in the intervention group compared to 2.3 (95% CI: 1.5-3.1) in the control group. Back and pelvic pain were associated with a measurable decrease post-intervention (p < 0.05). The use of a modified pregnancy support belt demonstrated a greater reduction in lower back and pelvic pain compared to a standard belt. Supportive belts should be considered as a non-pharmacological intervention to enhance maternal comfort and wellbeing during pregnancy.

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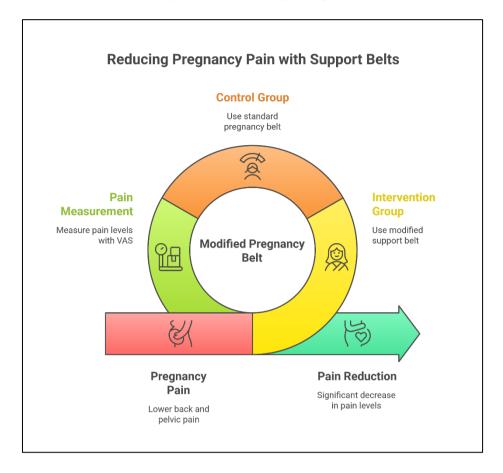


Quick Response Code

Key Messages:

- This study demonstrates that the use of pregnancy support belts, especially the Finest Pregnancy Belt, is effective in significantly reducing lower back and pelvic pain among pregnant women in their third trimester.
- Physiological changes, sedentary lifestyle, parity, and previous birth history are key contributors to back pain, highlighting the importance of personalized maternal care strategies.
- The intervention aligns with non-pharmacological approaches and offers a practical, low-risk solution to improve comfort and mobility during pregnancy.
- These findings support the integration of supportive devices into routine antenatal care programs, particularly for housewives and women with limited access to physical activity resources.

GRAPHICAL ABSTRACT



INTRODUCTION

Pregnancy related lumbopelvic pain (PRLP), which includes back and pelvic pain, is among the most common physical complaints during pregnancy, affecting women worldwide (1),(2). The prevalence of lower back pain has been reported to range from 50% to over 90%, particularly in the third trimester, and a considerable proportion experience moderate to severe pain that interferes with rest, mobility, and quality of life (3),(4). Such high prevalence demonstrates that PRLP is not a minor discomfort but a significant maternal health issue requiring targeted intervention.

Despite its impact, PRLP is often normalized as an inevitable consequence of pregnancy, resulting in under-diagnosis and under-treatment (5). Pain is primarily driven by physiological and biomechanical adaptations such as increased body weight, shift in the center of gravity, ligament laxity, and postural changes (6),(7). While pharmacological therapy is often limited due to safety concerns, non-pharmacological approaches such as physiotherapy, exercise, acupressure, and support devices have gained increasing attention (8).

Among these approaches, maternity support belts are considered practical, safe, and widely acceptable (9). Systematic reviews highlight that support belts can provide measurable reductions in back and pelvic pain, improve mobility, and enhance maternal well-being (10). However, conventional belt designs are often limited in scope, typically supporting only the pubic symphysis or anterior pelvis, while failing to adequately stabilize the lumbar and lower abdominal regions (11). This design gap may reduce overall effectiveness, especially in women with more widespread lumbopelvic discomfort.

To address these limitations, a modified pregnancy support belt has been developed, providing broader coverage of the lumbar, pelvic, and lower abdominal regions. This innovation seeks to optimize mechanical stabilization, reduce musculoskeletal strain, and improve maternal comfort during late pregnancy. Prior research has suggested that wider, ergonomically designed belts may outperform standard belts in pain management and daily function, but empirical evidence remains limited (12),(13).

Accordingly, this study was designed to test the effectiveness of a modified pregnancy support belt in reducing back and pelvic pain among pregnant women in South Jakarta, using a quasi-experimental design. The rationale is to generate robust empirical data that can validate the belt's efficacy, complementing existing literature and addressing current evidence gaps (14). The study hypothesizes that the modified belt will demonstrate superior pain reduction compared to conventional belts.

The findings of this research are expected to contribute to clinical practice by providing evidence-based recommendations for non-invasive pain management strategies in pregnancy (15). If effective, the modified belt could be integrated into maternal health programs as a low-cost, accessible intervention to reduce the burden of PRLP, enhance maternal quality of life, and guide future innovations in ergonomic maternity support tools.

METHODS

Study Design and Setting

This study employed a quasi-experimental research design with a pretest-posttest control group approach to assess the effectiveness of a modified pregnancy support belt in reducing lumbopelvic pain among pregnant women. The research was conducted over a period of 4 to 6 weeks in several Independent Midwife Practices (Tempat Praktik Mandiri Bidan, TPMB) located in the South Jakarta area, Indonesia. Participants were allocated into intervention and control groups using simple random allocation based on a computer-generated random sequence to minimize selection bias. The intervention group received the newly designed modified support belt, while the control group used conventional pregnancy belts available in the market.

Population and Sampling

The study population consisted of pregnant women in their second and third trimesters who reported experiencing waist and lower pelvic pain. Operational definitions were applied: "back pain" was defined as pain localized in the lumbar region persisting for more than one week with a minimum VAS score of 3, while "pelvic pain" referred to discomfort in the symphysis pubis, sacroiliac joints, or lower pelvis with a minimum VAS score of 3. Participants were recruited from eligible clients visiting selected TPMB clinics. Inclusion criteria included: (1) pregnant women in the second or third trimester, (2) experiencing lumbopelvic discomfort according to the operational definitions, (3) willing to participate voluntarily, and (4) able to understand instructions. Exclusion criteria included high-risk pregnancies, musculoskeletal disorders unrelated to pregnancy, or contraindications to using maternity belts. A session of physical assessment was conducted to confirm eligibility.

Sample size was determined using a priori power analysis (G*Power software, version 3.1). With an effect size of 0.7 based on previous studies, a power of 0.80, and α = 0.05, the minimum sample required was 52 participants. To account for potential dropouts, the final sample size was increased to 60 participants (30 in each group).

Tools and Materials

The primary tool used for pain assessment was the Visual Analogue Scale (VAS), a validated and widely used instrument to measure pain intensity on a scale from 0 (no pain) to 10 (worst pain imaginable). The intervention tool was the modified pregnancy support belt, designed to provide additional stabilization to the waist, pelvic, and lower abdominal areas. Participants in the control group were provided with conventional pregnancy belts commonly sold in the local market. To standardize usage, participants were instructed to wear their belts for at least 6–8 hours daily, including during routine household activities, but not during sleep. Compliance was monitored through daily logs and weekly phone reminders. Instructional materials such as video tutorials and written guidelines were provided to both groups to ensure correct use.

Data Collection Procedures

Prior to the intervention, ethical approval was secured, and written informed consent was

obtained from all participants. The research team provided a clear explanation regarding the study's purpose, procedure, benefits, and potential risks. Baseline data were collected using VAS to measure initial pain levels. Participants were not informed of the study's primary hypothesis (blinded to the expected superiority of the modified belt) to reduce expectation bias, although complete blinding of intervention allocation was not feasible due to the visible differences between belts. After eligibility screening and informed consent, participants were assigned to either the intervention or control group following the random allocation sequence.

The intervention group received a demonstration and a video tutorial on how to use the modified pregnancy support belt properly, while the control group received standard instructions for using conventional pregnancy belts. Both groups were instructed to follow the same usage protocol (6–8 hours per day for 14 consecutive days). Compliance was verified through participant self-reports and weekly monitoring calls by research assistants. At the end of the two-week intervention, posttest pain levels were reassessed using the VAS.

Data Analysis

All collected data were analyzed using IBM SPSS Statistics software version 26.0. Descriptive statistics were used to summarize demographic characteristics and pain scores. To compare the effectiveness of each intervention, a paired t-test was used to analyze within group changes in VAS scores from pretest to posttest. An independent t-test was used to compare post-intervention pain reduction between the intervention and control groups. Effect sizes (Cohen's d) and 95% confidence intervals were calculated to provide precision of estimates. Statistical significance was determined at a p-value < 0.05.

CODE OF HEALTH ETHICS

This study was conducted in accordance with ethical research standards. Approval for the study was obtained from the Health Research Ethics Committee of the Ministry of Health Polytechnic, Bandung, with reference number No.07/KEPK/EC/X/2023. All participants provided written informed consent prior to data collection, and participant confidentiality and rights were maintained throughout the study.

RESULTS

Descriptive Statistics

The study involved 60 pregnant women from several Independent Midwife Practices (TPMB) in South Jakarta. Participants were divided evenly into two groups: 30 in the intervention group (modified support belt) and 30 in the control group (standard belt). Table 1 presents the demographic and obstetric characteristics. The majority were aged 20–35 years (85.0%), in the third trimester (72.0%), without diabetes or hypertension (95.0%), and most were housewives (62.0%). Almost half of participants had at least a bachelor's degree (43.0%), and more than half were multigravida (57.0%).

Table 1. Characteristics of Respondents by Group (n = 60)

Variable	FINEST Belt (n=30)	Standard Belt (n=30)	Total (n=60)
	n (%)	n (%)	n (%)
Age			
<20 and >35 years	3 (10.0)	6 (20.0)	9 (15.0)
20-35 years	27 (90.0)	24 (80.0)	51 (85.0)
Trimester of Pregnancy			
Second Trimester	9 (30.0)	8 (26.7)	17 (28.0)
Third Trimester	21 (70.0)	22 (73.3)	43 (72.0)
Pregnancy Status			
Primigravida	11 (36.7)	15 (50.0)	26 (43.0)
Multigravida	19 (63.3)	15 (50.0)	34 (57.0)
Education Level			
Junior High School	2 (6.7)	3 (10.0)	5 (8.0)
Senior High School	16 (53.3)	11 (36.7)	27 (45.0)
Associate Degree (D3)	0 (0.0)	1 (3.3)	1 (2.0)

	FINEST Belt (n=30)	Standard Belt (n=30)	Total (n=60)
Variable	n (%)	n (%)	n (%)
Bachelor Degree (S1)	12 (40.0)	14 (46.7)	26 (43.0)
Master's Degree (S2)	0 (0.0)	1 (3.3)	1 (2.0)
Occupation			
Housewife	19 (63.3)	18 (60.0)	37 (62.0)
Private Employee	11 (36.7)	12 (40.0)	23 (38.0)
History of Diabetes Mellitus			
Yes	1 (3.3)	2 (6.7)	3 (5.0)
No	29 (96.7)	28 (93.3)	57 (95.0)
History of Hypertension	,		, ,
Yes	1 (3.3)	2 (6.7)	3 (5.0)
No	29 (96.7)	28 (93.3)	57 (95.0)
Birth History	,		, ,
Not yet given birth	11 (36.7)	15 (50.0)	26 (43.0)
Once (normal)	14 (46.7)	12 (40.0)	26 (43.0)
Cesarean section	5 (16.7)	3 (10.0)	8 (14.0)

Effectiveness Analysis of Pregnancy Belt Use

Pain intensity was measured using the Visual Analogue Scale (VAS) before and after the two-week intervention.

Table 2. Mean Pain Scores Before and After Pregnancy Belt Use

Pain Variable	Modified Belt	Standard Belt
Pretest (Mean ± SD)	3.93 ± 1.70	4.40 ± 1.92
Posttest (Mean ± SD)	0.53 ± 0.90	2.13 ± 2.56
Mean Reduction	3.40 (95% CI: 2.8 - 4.0)	2.27 (95% CI: 1.6 - 2.9)

As shown in Table 2, both groups experienced a reduction in pain after the intervention. However, the mean reduction was greater in the modified belt group (3.40 points) compared to the standard belt group (2.27 points). Importantly, only the modified belt group exceeded the minimal clinically important difference (MCID) of ≥ 2 points in nearly all participants, indicating clinically meaningful improvement. Figure 1 shows a comparison of the mean VAS pain scores before and after the use of pregnancy belts in both the FINEST group and the standard group. The FINEST belt group demonstrated a more significant reduction in pain scores compared to the standard group.

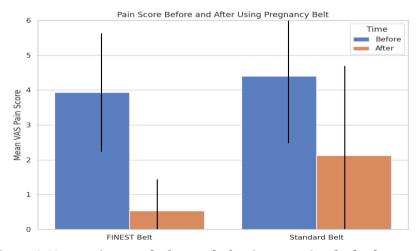


Figure 1. Mean pain score before and after intervention for both groups.

Figure 2 presents the individual changes in pain scores among respondents. The FINEST group shows a more consistent and steeper reduction in pain from before to after the intervention.

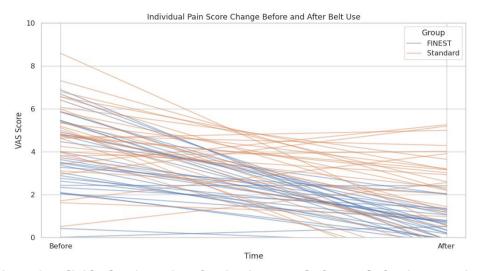


Figure 2. Individual trajectories of VAS pain scores before and after intervention.

As shown in Figure 3, the distribution of pain scores in the FINEST group after intervention is more concentrated at the lower end, indicating less variability compared to the standard group.

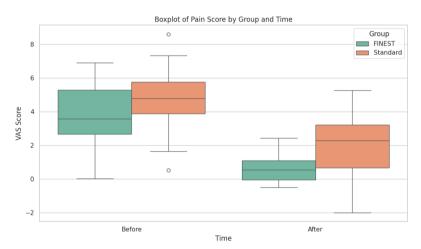


Figure 3. Distribution of pain scores by group and time (boxplot).

Table 3. Independent t-Test Comparing Pain Reduction Between Groups

Comparison	Mean Difference	95% CI	p-value
FINEST vs. Standard Belt	1.13	0.45 - 1.81	0.002

The independent t-test revealed a statistically significant difference in pain reduction between groups (mean difference = 1.13, 95% CI: 0.45-1.81, p = 0.002). This indicates that the modified pregnancy belt provided superior pain relief compared to the standard belt. Moreover, the majority of women in the modified belt group achieved a clinically meaningful reduction (≥ 2 -point decrease in VAS), while improvement in the control group was less consistent.

DISCUSSION

This study confirms that back and pelvic pain are frequent complaints among pregnant women, especially in the third trimester, consistent with prior reports indicating a prevalence of up to 70% (16). Hormonal fluctuations, increased uterine size, and postural adaptations significantly contribute to discomfort in this population (17). The current findings emphasize not only the high prevalence but also the severity of pregnancy-related lumbopelvic pain, which underscores the clinical importance of effective

and accessible non-pharmacological interventions.

The role of parity was reaffirmed, with multigravida women demonstrating higher susceptibility to back pain due to cumulative musculoskeletal strain across pregnancies (18). In line with existing literature, our results also suggest that vaginal delivery contributes to greater long-term musculoskeletal vulnerability compared to cesarean section, likely due to pelvic floor trauma and sacroiliac instability induced during vaginal birth (19). These findings reinforce the importance of strengthening pelvic stability through both rehabilitative exercise and supportive devices.

Educational attainment and occupational status influenced pain experience and coping strategies. Women with higher education are generally better informed and more proactive in seeking medical advice (20). However, in our study, a large proportion of respondents were housewives, who may be more exposed to physically demanding chores and less structured exercise routines. This finding highlights the intersection between socioeconomic factors and musculoskeletal health, emphasizing the need for tailored preventive strategies in domestic settings (21).

The intervention analysis demonstrated that although both belts reduced pain, the FINEST Belt provided significantly greater relief. This can be attributed to its broader anatomical coverage and enhanced biomechanical support, which stabilize not only the anterior pelvis but also the lower back and abdomen. By distributing mechanical loads more evenly, the FINEST Belt likely reduces localized strain on the lumbar and sacroiliac joints, thereby alleviating discomfort more effectively than conventional belts (22). Such design-specific benefits highlight the importance of innovation in ergonomic maternity supports.

Beyond biomechanical mechanisms, a potential placebo effect or behavioral change during the intervention cannot be ruled out. The use of any supportive device may enhance a sense of safety and encourage better posture or reduced activity intensity, indirectly contributing to pain reduction (23). Future trials should consider including a sham-belt group or blinding strategies to better isolate the true physiological benefits from psychological influences.

Generalizability remains a limitation of this study. The sample was drawn from an urban setting with relatively high educational backgrounds, which may not represent rural or lower-resource populations. Additionally, the intervention period was limited to two weeks, restricting the ability to evaluate long-term outcomes such as chronic pain reduction, mobility improvement, or prevention of disability (24). Broader multicenter studies with more heterogeneous samples and longer follow-up are needed to validate the present findings.

Finally, the results support the integration of maternity belts into routine maternal care as an accessible, non-pharmacological strategy to improve comfort and functionality during pregnancy. If adopted widely, the FINEST Belt could complement physiotherapy and exercise-based approaches, offering a practical solution especially in primary care and community midwifery services (25). These insights also open avenues for further research on combining ergonomic innovations with behavioral interventions to optimize maternal health outcomes.

CONCLUSION

This study concludes that lower back and pelvic pain are prevalent among pregnant women in their second and third trimesters, particularly among those aged 20–35 years, multigravida, with sedentary lifestyles, lower educational backgrounds, and predominantly working as housewives. These discomforts are primarily influenced by hormonal changes, postural adaptations, and weakened muscle support. The use of the modified pregnancy support belt was associated with greater reductions in back and pelvic pain compared with standard belts over a two-week period, as measured by the Visual Analogue Scale (VAS). The findings affirm the potential role of supportive maternity belts as a non-pharmacological intervention to enhance maternal comfort during pregnancy. However, further research with longer follow-up durations and more diverse populations is warranted to strengthen generalizability and assess long-term benefits.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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