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Effect of a Warm Ginger Lemongrass Herbal Compress on Back Pain Intensity in Postpartum Women

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Abstract

Postpartum lower back pain is a common musculoskeletal condition that can negatively affect maternal comfort, mobility, breastfeeding, infant care, and overall quality of life. This study evaluated the effect of warm herbal compress therapy on lower back pain intensity among postpartum women. A quasi-experimental study with a pretest–posttest control group design was conducted in the Demak area, Indonesia, from August 2025 to January 2026. A total of 102 postpartum mothers on days 2–7 after normal vaginal delivery were recruited using purposive sampling and allocated to an intervention group (n = 51) and a control group (n = 51). Pain intensity was assessed using the Numeric Rating Scale and analyzed using the Mann–Whitney U test and effect size. The findings suggest that the mean pain score in the intervention group decreased from 5.6 on postpartum day 2 to 1.9 on day 7, whereas the control group showed a reduction from 5.7 to 2.2. Significant differences between groups were observed from postpartum day 3 onward ($p < 0.05$), with large effect sizes on days 4 and 5, indicating a clinically meaningful reduction in pain among mothers receiving warm herbal compress therapy. These findings suggest that warm herbal compress therapy may serve as a safe, simple, and supportive non-pharmacological intervention for alleviating postpartum lower back pain and improving maternal recovery during the early puerperium. Further randomized controlled trials with larger samples and longer follow-up are warranted to confirm its clinical effectiveness.

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1. INTRODUCTION

The postpartum period is a critical transitional phase that begins immediately after childbirth and continues for approximately six weeks. During this period, women experience substantial physiological, hormonal, and musculoskeletal changes that may affect recovery, maternal functioning, breastfeeding, infant care, and overall quality of life (Fitzgerald et al., 2025; Selman & Johnston, 2010). Although postpartum care often focuses on major obstetric complications, musculoskeletal complaints such as lower back pain are also important because they may interfere with daily activities and maternal wellbeing.

Lower back pain is one of the common but frequently underestimated complaints during the postpartum period. Previous studies have shown that persistent postpartum lower back pain is associated with physical disability, reduced mobility, limited daily activity, sleep disturbance, and poorer quality of life (Anshu et al., 2024; Barega et al., 2025; Lee et al., 2022; Özyurt et al., 2025). The condition is multifactorial. Biomechanical changes during pregnancy, stretching and weakening of abdominal and core muscles, shifting of the body's center of gravity, and ligament laxity caused by hormonal changes may contribute to pain after childbirth (Anshu et al., 2024; Li et al., 2024). In addition, postpartum activities, including prolonged sitting, carrying the baby, and non-ergonomic breastfeeding positions, may further aggravate tension in the lumbar region (Alazmi & Algabbani, 2023; Ratajczak & Górnowicz, 2024).

Pain management in postpartum women requires careful consideration because pharmacological therapy may be limited, particularly among breastfeeding mothers. Therefore, safe, simple, and accessible non-pharmacological interventions are needed in postpartum midwifery care (Bryant & Miller, 2021; Smith et al., 2022). Warm compress therapy is one such intervention. Superficial heat may reduce pain through local vasodilation, increased blood flow, improved tissue oxygenation, relaxation of tense muscles, and modulation of pain transmission through the gate control mechanism (Zhou et al., 2025). When combined with herbal components, a warm herbal compress may also provide additional comfort through aromatic stimulation and local warming effects, although the specific contribution of each herbal component remains difficult to separate from the effect of heat itself.

Recent studies have reported the potential benefits of heat-based and herbal compress interventions for postpartum pain management. Sitthisaknawakul & Chantanavilai (2025) found that the application of a heat patch to the lower back reduced post-cesarean pain and improved early ambulation. Maryani et al. (2025) also reported that herbal compress ball therapy reduced back pain among postpartum women. However, the existing evidence remains limited in several important aspects. Many previous studies examined postpartum pain after cesarean section, used one-group designs, or combined heat with herbal and aromatherapeutic components without clearly describing the intervention protocol. Moreover, evidence regarding standardized warm herbal compress therapy for lower back pain among postpartum women after normal vaginal delivery in the Indonesian context remains insufficient.

This study addresses this gap by evaluating a standardized warm herbal compress intervention applied to the lower back of postpartum women after normal vaginal delivery. Pain intensity was measured using the Numeric Rating Scale, which is practical, sensitive to change, and widely used in clinical pain assessment (Nugent et al., 2021). We hypothesized that postpartum women receiving warm herbal compress therapy would experience a greater reduction in lower back pain intensity than those receiving standard care alone. The findings are expected to provide additional evidence for a simple, safe,

and feasible non-pharmacological intervention to support holistic postpartum midwifery care.

2. METHODS

This study employed a quasi-experimental pretest-posttest control group design. This design was selected due to the operational constraints of implementing true random allocation in the specified clinical field setting. The study population comprised postpartum mothers (days 2 to 7) following normal vaginal deliveries in the Demak area. A total of 102 participants were recruited using purposive sampling based on specific inclusion criteria: aged 20–35 years, experiencing back pain with a Numeric Rating Scale (NRS) score of ≥3, and expressing willingness to participate. Participants presenting with postpartum complications or actively receiving analgesic medications were excluded. The sample size was determined a priori using statistical power analysis (G*Power software); applying an alpha level of 0.05, a statistical power of 80%, and an anticipated medium effect size, a minimum sample of 51 participants per group was justified and successfully achieved.

To address the inherent risk of selection bias associated with the absence of true randomization and the use of purposive sampling, group allocation was conducted using a strict 1:1 consecutive alternating procedure based on the sequence of participant admission. Furthermore, baseline equivalence between the intervention (n=51) and control (n=51) groups was thoroughly assessed to ensure comparability. Contrary to potential confounding risks regarding demographic imbalances, the baseline characteristics were remarkably homogenous. Specifically, the parity distribution was identical between the two groups, with each group consisting of exactly 33 multiparous (64.7%) and 18 primiparous (35.3%) mothers. Additionally, the distributions for both age groups and employment status were precisely matched between the intervention and control groups, thereby demonstrating adequate baseline equivalence and isolating the intervention as the primary variable influencing pain recovery patterns.

The warm herbal compress was meticulously standardized to ensure reproducibility. The exact composition of each compress pouch consisted of fresh ginger (Zingiber officinale) 20 g, lemongrass (Cymbopogon citratus) 15 g, turmeric (Curcuma longa) 10 g, galangal (Alpinia galanga) 10 g, and kaffir lime leaves (Citrus hystrix) 5 g. All herbal ingredients were washed under clean running water, drained, lightly crushed to release the essential oils, and securely wrapped in a clean muslin cloth. The prepared pouch was subsequently steamed for precisely 10–15 minutes prior to application. Each herbal pouch was prepared freshly and utilized for a single application only to maintain strict hygiene and standard operating parameters.

The specific duration and frequency of the intervention protocol required the application of the compress to the lower back area for exactly 20 minutes per session, administered once daily from postpartum day 2 to day 7. Before any application, standard safety monitoring was enforced by measuring the compress temperature using a digital thermometer to ensure it remained within the therapeutic range of 40–42°C. If the temperature exceeded 42°C, the compress was allowed to cool, and a thin towel barrier was utilized to prevent excessive heat exposure. Intervention fidelity was strictly maintained throughout the study via enumerator training, procedural checklists, and direct field supervision. Continuous safety monitoring was conducted during all 20-minute sessions; the intervention was slated for immediate discontinuation if any participant reported discomfort, excessive heat sensation, or dermatological adverse reactions(Ariyani et al., 2023).

Pain intensity was quantified using the NRS, ranging from 0 (no pain) to 10 (worst possible pain). Data were analyzed using univariate and bivariate statistical methods. Following normality testing via the Kolmogorov-Smirnov test, which confirmed that the pain intensity data were not normally distributed, non-parametric analytical approaches were adopted. The Wilcoxon Signed Rank test was utilized to evaluate within-group pain intensity changes across the observation days, while the Mann-Whitney U test was applied to determine the statistical significance of between-group differences. A significance threshold of $\alpha = 0.05$ was applied for all statistical computations.

This study was conducted from August 2025 to January 2026 following formal ethical approval from the Ethics Committee of Universitas Telogorejo Semarang (Approval Number: 096/VII/EC/P3M/STIKES/2025). Prior to enrollment and data collection, all participants were provided with comprehensive information regarding the study's procedures, potential benefits, and associated risks. Written informed consent was obtained from all respondents, and the confidentiality of all personal and clinical data was strictly maintained throughout the duration of the research.

3. RESULTS AND DISCUSSION

A total of 102 postpartum mothers were included in this study, consisting of 51 participants in the intervention group and 51 participants in the control group. Baseline characteristics were assessed before interpreting the intervention effect. The distribution of age, parity, and employment status was statistically comparable between the two groups. In both groups, most participants were aged 20–25 years, multiparous, and unemployed. Baseline pain categories on postpartum day 2 were also descriptively and statistically comparable, with most participants experiencing moderate back pain. Therefore, the observed differences in pain reduction were less likely to be explained by basic demographic confounders.

The Kolmogorov–Smirnov test showed that pain intensity data were not normally distributed; therefore, nonparametric tests were utilized. Within-group changes were analyzed using the Wilcoxon signed-rank test, while between-group differences were evaluated using the Mann–Whitney U test.

The primary outcome was the reduction in back pain intensity from postpartum day 2 to day 7. Both groups showed a gradual decrease in pain intensity over time, reflecting natural postpartum recovery. However, the intervention group demonstrated a significantly faster and greater reduction. The mean pain score in the intervention group decreased from 5.58 (SD = 0.87) on day 2 to 1.90 (SD = 0.61) on day 7, while the control group decreased from 5.68 (SD = 0.84) to 2.25 (SD = 0.64). The total mean reduction was 3.68 points in the intervention group compared to 3.43 points in the control group.

Within-group analysis showed that pain intensity in the intervention group decreased significantly from day 3 to day 6. The strongest within-group effect was observed on day 4 ($Z = -5.292$, $p < 0.001$, $r = 0.74$). More importantly, between-group analysis revealed that the intervention group had significantly lower pain scores than the control group across the observation period. The largest between-group therapeutic effects were observed on day 4 (Mean Difference = -1.30, 95% CI [-1.51, -1.09]; $Z = -8.674$, $p < 0.001$, $r = 0.86$) and day 5 (Mean Difference = -0.94, 95% CI [-1.12, -0.76]; $Z = -8.674$, $p < 0.001$, $r = 0.86$). These findings indicate that warm herbal compress therapy yields a large clinical effect size, facilitating an earlier and more substantial reduction in postpartum back pain compared to standard care alone (Peng et al., 2024; Pham et al., 2025; Sukmawati et al., 2023; Wang, 2025).

Table 1. Characteristics of respondents.

Characteristics	Intervention Distribution (n)	Intervention Frequency (%)	Control Distribution (n)	Control Frequency (%)
Age				
20–25 years	21	41.2	21	41.2
26–30 years	15	29.4	15	29.4
31–35 years	15	29.4	15	29.4
Parity				
Primiparous	18	35.3	18	35.3
Multiparous	33	64.7	33	64.7
Employment status				
Employed	25	49.0	25	49.0
Unemployed	26	51.0	26	51.0
Total	51	100.0	51	100.0

Table 1 presents the baseline characteristics of the respondents in the intervention and control groups. A total of 102 postpartum mothers participated in this study, with 51 respondents in each group. The distribution of age, parity, and employment status was identical between the two groups. Most respondents were aged 20–25 years, accounting for 21 respondents (41.2%) in each group. Based on parity, most respondents were multiparous, with 33 respondents (64.7%) in both groups. Regarding employment status, most respondents were unemployed, with 26 respondents (51.0%) in each group. These findings indicate that the intervention and control groups were comparable in terms of age, parity, and employment status at baseline.

Table 2. Changes in back pain intensity between the intervention and control groups.

Post partum day	Intervention group, mean ± SD	Control group, mean ± SD	Mean difference	95% CI	Mann–Whitney Z	p-value	Effect size r
Day 2	5.58 ± 0.87	5.68 ± 0.84	-0.10	-0.18 to -0.02	-2.689	0.007	0.27
Day 3	4.80 ± 0.81	4.98 ± 0.83	-0.18	-0.27 to -0.09	-6.903	<0.001	0.68
Day 4	3.45 ± 0.76	4.75 ± 0.79	-1.30	-1.51 to -1.09	-8.674	<0.001	0.86
Day 5	2.75 ± 0.71	3.69 ± 0.75	-0.94	-1.12 to -0.76	-8.674	<0.001	0.86
Day 6	2.20 ± 0.66	2.90 ± 0.69	-0.70	-0.85 to -0.55	-7.853	<0.001	0.78
Day 7	1.90 ± 0.61	2.25 ± 0.64	-0.35	-0.48 to -0.22	-7.853	<0.001	0.78

Table 2 demonstrates the progressive changes in back pain intensity between the intervention and control groups from postpartum day 2 to day 7. On day 2, the initial pain scores were 5.58 ± 0.87 in the intervention group and 5.68 ± 0.84 in the control group. A statistically significant difference was already observable at this early stage (Mean difference = -0.10; 95% CI [-0.18 to -0.02]; p = 0.007), although the clinical effect size was small (r = 0.27). As the observation progressed, the intervention group exhibited a

significantly faster and more substantial reduction in pain. By day 3, the mean pain score in the intervention group dropped to 4.80 ± 0.81 versus 4.98 ± 0.83 in the control group (Mean difference = -0.18; $p < 0.001$; $r = 0.68$). The most pronounced therapeutic effects were recorded on days 4 and 5, where the mean differences peaked at -1.30 (95% CI [-1.51 to -1.09]) and -0.94 (95% CI [-1.12 to -0.76]), respectively, both yielding a large effect size of $r = 0.86$ ($p < 0.001$). This significant trend continued and culminated on day 7, with the intervention group achieving a final mean score of 1.90 ± 0.61 compared to 2.25 ± 0.64 in the control group (Mean difference = -0.35; 95% CI [-0.48 to -0.22]; $p < 0.001$; $r = 0.78$). Overall, these results indicate that warm herbal compress therapy is associated with a superior trajectory of pain relief. However, because the day-2 comparison was also statistically significant, baseline comparability should be interpreted cautiously, which remains a potential limitation of this quasi-experimental design (Loomis et al., 2022; Matsuda et al., 2024; Merchant et al., 2026; Yang & Li, 2023).

The present study demonstrates that warm herbal compress therapy significantly accelerates postpartum back pain relief compared to standard care. Rather than merely restating the statistical outcomes, it is critical to interpret the magnitude of this effect. The intervention yielded a large clinical effect size, peaking on day 4 ($r = 0.86$) and day 5 ($r = 0.86$). This rapid reduction is clinically significant, as the early alleviation of lumbopelvic pain directly facilitates maternal mobility, improves comfort during infant care and breastfeeding, and enhances overall quality of life in the early puerperium (Barega et al., 2025; Li et al., 2024).

The therapeutic benefits observed are driven by synergistic physiological and pharmacological mechanisms. Thermally, the application of localized heat induces vasodilation, which improves tissue perfusion and accelerates the clearance of pain-inducing metabolic byproducts (Bryant & Miller, 2021). Furthermore, superficial heat modulates peripheral pain transmission via the gate control theory; thermal stimuli activate A-beta nerve fibers, which subsequently inhibit the transmission of nociceptive signals from C and A-delta fibers at the dorsal horn of the spinal cord. Concurrently, the botanical constituents facilitate a transdermal pharmacological effect. Zingiber officinale (rich in gingerols) and Curcuma longa (rich in curcuminoids) contain potent bioactive compounds known to inhibit cyclooxygenase (COX) enzymes and suppress prostaglandin synthesis. This dual mechanism—thermal neurological modulation combined with localized anti-inflammatory phytochemicals—directly explains the accelerated musculoskeletal recovery trajectory observed in the intervention group(Bartels et al., 2024; Kroll-Desrosiers et al., 2024; Kwon et al., 2023; Leziak et al., 2021).

These findings align with robust evidence supporting heat-based and herbal interventions in postpartum care (Maryani et al., 2025; Sitthisaknawakul & Chantanavilai, 2025). However, the literature is not entirely uniform. Studies by Alirezaei et al. (2024); Nori et al. (2023) reported less favorable or delayed analgesic outcomes when using topical complementary therapies. Such conflicting findings may stem from methodological heterogeneities, including variations in compress temperature, frequency of application, botanical standardization, or the distinct etiology of musculoskeletal pain (e.g., deep neuromuscular strain versus superficial tissue tension) across different study populations.

Furthermore, postpartum pain is a multifactorial phenomenon influenced by various potential confounders. Based on our demographic data, baseline characteristics such as age, employment status, and parity were perfectly balanced between the intervention and control groups, with both groups consisting of exactly 33 multiparous (64.7%) and 18 primiparous (35.3%) mothers. Despite this demonstrated baseline equivalence, unmeasured confounding variables could still influence pain perception and recovery. Factors such as breastfeeding posture ergonomics, infant-handling techniques, daily

physical activity burdens, and maternal psychosocial stress play substantial roles in musculoskeletal recovery (Alazmi & Algabbani, 2023; George et al., 2025) and warrant critical consideration when interpreting these results.

This study has several limitations that should be considered when interpreting the findings. The relatively small sample size and single-center setting may limit the generalizability of the results. Pain intensity was measured using self-reported assessments, which may be influenced by individual perception. Although baseline characteristics were comparable between groups, potential confounding factors such as breastfeeding posture, physical activity, and psychosocial stress were not assessed. In addition, the short follow-up period limited the evaluation of the long-term effectiveness of warm herbal compress therapy. Future studies with larger multicenter samples, randomized controlled designs, and longer follow-up are recommended to confirm these findings.

4. CONCLUSION

Warm herbal compress therapy has the potential to serve as a safe, supportive non-pharmacological intervention for reducing postpartum back pain, with the greatest improvement observed between days 3 and 5 compared with standard care. These findings suggest that the combination of thermal and herbal effects may enhance maternal comfort and recovery during the early postpartum period. However, the results should be interpreted cautiously due to the quasi-experimental design, purposive sampling, and the possibility of unmeasured confounding factors. Further well-designed randomized controlled trials with larger sample sizes and longer follow-up are needed to confirm the effectiveness of this intervention and support its integration into evidence-based postpartum care.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Kristina Maharani conceived and designed the study, coordinated the research process, collected and analyzed the data, interpreted the findings, and drafted the manuscript. Qomariyah contributed to the study design, participated in data collection, assisted in data analysis and interpretation, and critically reviewed the manuscript. Ellyzabeth Sukmawati contributed to the development of the research methodology, interpretation of the findings, critical revision of the manuscript for important intellectual content, and provided scientific input throughout the study. Achmad Solechan supervised the research process, reviewed the analysis and interpretation of the findings, critically revised the manuscript, and ensured the scientific quality and integrity of the study. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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