

Original Article

The effect of warm compress therapy on labor pain during the active phase of the first stage of labor: A pre-experimental study

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Abstract

Background: Labor pain during the active phase of the first stage of labor is a significant physiological and psychological challenge for women and may influence labor progression and childbirth experience. Non-pharmacological interventions are increasingly recommended to support maternal comfort and promote physiological labor. Warm compress therapy has been widely applied during the second stage of labor; however, evidence regarding its effectiveness during the active phase of the first stage of labor remains limited.

Objective: This study aimed to examine the effect of warm compress therapy on labor pain during the active phase of the first stage of labor.

Methods: This study employed a quantitative approach using a pre-experimental one-group pretest–posttest design. The study was conducted at PMB Erni Artiqoh, Bumi Makmur Village, involving 20 laboring women selected through total sampling. Labor pain intensity was measured using a numerical rating scale before and after the application of warm compress therapy. The intervention consisted of warm compress application at a temperature of 38–45°C for approximately 20 minutes during the active phase of labor. Data were analyzed using univariate analysis and the Wilcoxon signed-rank test.

Results: The results showed a clear reduction in labor pain intensity following the intervention. Before the intervention, most participants reported severe pain levels, while after warm compress therapy, pain scores shifted to mild-to-moderate levels. The Wilcoxon signed-rank test demonstrated a statistically significant difference in labor pain intensity before and after the intervention ($p = 0.001$), indicating that warm compress therapy effectively reduced labor pain during the active phase of the first stage of labor.

Conclusion: Warm compress therapy was found to be effective in reducing labor pain during the active phase of the first stage of labor. This non-invasive, low-cost intervention can be safely integrated into routine midwifery care to enhance maternal comfort during childbirth.

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Background

Childbirth represents a complex physiological process that involves coordinated uterine contractions, cervical dilation, and fetal descent within clinical maternity care settings worldwide (World Health Organization, 2018). The first stage of labor, particularly the active phase, is characterized by progressive cervical dilation accompanied by increasing contraction intensity and frequency in hospital-based deliveries (World Health Organization, 2018). Labor pain during the active phase of the first stage originates primarily from uterine ischemia, cervical stretching, and myometrial contractions in parturient women (Kaur et al., 2020).

Unmanaged labor pain during this phase can lead to heightened maternal anxiety, increased catecholamine release, and prolonged labor

duration in obstetric practice (WHO, 2018). Clinical guidelines emphasize the importance of providing effective pain management strategies that are safe, accessible, and woman-centered during the intrapartum period (American College of Obstetricians and Gynecologists, 2016). Non-pharmacological interventions have therefore gained increasing attention as complementary approaches to pharmacological pain relief during labor in diverse healthcare settings (Begley et al., 2019). These approaches align with global recommendations that prioritize respectful maternity care and positive childbirth experiences for women during labor (WHO, 2018).

In Indonesia, the high volume of childbirth cases underscores the importance of effective labor pain management strategies in routine maternity services (Kemenkes RI, 2019). National data recorded 5,050,637 childbirths in

2019, with an estimated annual increase of approximately 20% in delivery rates across healthcare facilities in Indonesia (Kemenkes RI, 2019). The majority of childbirths in Indonesia are assisted by skilled health personnel, with 90.32% of deliveries attended by doctors and midwives according to national statistics (Kemenkes RI, 2019).

Strategic health planning data indicated that midwife-assisted deliveries increased from 81.18% in 2020 to 90.28% in 2021, reflecting expanded professional involvement in intrapartum care (Kemenkes RI, 2019). Regional data from the South Sumatra Health Office reported 171,905 deliveries in 2021 and 166,170 deliveries in 2022, with skilled attendance rates exceeding 90% in both years (South Sumatra Health Office, 2023). These figures highlight the substantial responsibility of midwives and healthcare providers to implement effective, evidence-based pain management interventions during labor (Begley et al., 2019). Consequently, scalable and low-cost interventions suitable for high-volume maternity settings are critically needed in Indonesian obstetric care (WHO, 2018).

Among non-pharmacological approaches, perineal and thermal interventions have been widely explored for their role in reducing pain and trauma during labor (Aquino et al., 2020). Warm compress therapy has been identified as a simple thermal intervention that promotes vasodilation, muscle relaxation, and sensory modulation during uterine contractions in laboring women (Farahmand et al., 2020). Physiologically, the application of warmth stimulates thermoreceptors that compete with nociceptive signals, thereby reducing pain perception during the active phase of labor (Türkmen et al., 2021).

Clinical studies have demonstrated that warm compresses can reduce labor pain intensity and improve maternal comfort during both the first and second stages of labor (Kaur et al., 2020). Systematic reviews have further shown that thermal interventions are associated with reduced perineal trauma and improved childbirth outcomes in vaginal deliveries (da Silva et al., 2023). These findings support the integration of warm compress therapy as part of comprehensive intrapartum care strategies aimed at optimizing maternal experiences (WHO, 2018). However, most existing evidence

has focused predominantly on the second stage of labor rather than the active phase of the first stage (Magoga et al., 2019).

Previous research has extensively examined warm compress application during the second stage of labor, particularly in relation to perineal outcomes and pain reduction (Magoga et al., 2019). Randomized trials have shown that warm compresses applied to the perineum during pushing can significantly decrease perineal tears and pain intensity among nulliparous women (Goh et al., 2021). Comparative studies have also reported that combining warm compresses with perineal massage yields better maternal comfort outcomes than massage alone during labor (Hong et al., 2022).

Observational and experimental studies have consistently supported the effectiveness of thermal therapy in reducing labor-related discomfort and enhancing maternal satisfaction (Modoor et al., 2021). Despite these promising findings, limited empirical attention has been given to warm compress therapy during the active phase of the first stage of labor, when pain escalation begins (Farahmand et al., 2020). The lack of focused evidence on early labor pain management represents a critical gap in current obstetric research (da Silva et al., 2023). Addressing this gap is essential to develop timely interventions that prevent pain intensification before the onset of the second stage of labor (WHO, 2018).

From a clinical perspective, early pain management during the active phase of the first stage of labor may influence maternal coping ability, labor progression, and overall childbirth outcomes (ACOG, 2016). Expert midwives have emphasized the importance of early supportive interventions that promote physiological labor and reduce unnecessary medical interventions (Begley et al., 2019). Evidence suggests that inadequate pain control during early labor may increase the likelihood of obstetric interventions, including episiotomy and prolonged labor duration (Jiang et al., 2017). Selective use of non-invasive interventions aligns with contemporary obstetric practice that discourages routine invasive procedures during vaginal birth (Franchi et al., 2020). Warm compress therapy offers a practical, low-risk option that can be readily implemented by midwives in diverse clinical settings (Gaheen &

Abo-Hatab, 2021). Furthermore, thermal therapy aligns with WHO recommendations for supportive care during labor that respects women's comfort and autonomy (WHO, 2018). Nevertheless, empirical evidence examining its specific effect during the active phase of the first stage of labor remains insufficient (Farahmand et al., 2020).

Given the high prevalence of facility-based childbirths and the central role of midwives in labor care, further investigation into early-stage pain management interventions is warranted (KEMENKES RI, 2019). Existing studies have largely employed randomized controlled designs focused on later stages of labor, leaving limited experimental data for early labor pain outcomes (Magoga et al., 2019). Pre-experimental studies can provide valuable preliminary evidence to inform future controlled trials in maternal health research (da Silva et al., 2023). Evaluating warm compress therapy during the active phase of the first stage of labor may contribute to evidence-based midwifery practice and improve maternal comfort outcomes (Türkmen et al., 2021). Such evidence is particularly relevant for high-volume maternity settings in Indonesia, where resource-efficient interventions are essential (South Sumatra Health Office, 2023).

Therefore, this study aims to examine the effect of warm compress therapy on labor pain during the active phase of the first stage of labor using a pre-experimental study design to generate empirical evidence supporting early intrapartum pain management strategies.

Methods

Study Design

This study employed a quantitative research approach using a pre-experimental design with a one-group pretest-posttest format. The selection of this design was based on the primary objective of evaluating the effect of warm compress therapy on labor pain during the active phase of the first stage of labor within a real clinical setting. The one-group pretest-posttest design allows for direct comparison of outcome measurements before and after the intervention in the same group of participants, thereby controlling for individual variability in pain perception.

This design was considered appropriate because it enables preliminary evaluation of intervention effectiveness when randomization and control groups are not feasible due to ethical and practical considerations in maternity care. The study was conducted at PMB Erni Artiqoh, Bumi Makmur Village, a primary midwifery practice that routinely provides intrapartum care services. The clinical setting was selected to reflect typical community-based maternity services, ensuring that the findings would be relevant to midwifery practice in similar contexts. The design also supports the generation of initial empirical evidence that may inform future quasi-experimental or randomized controlled studies.

Sampling

The study population consisted of all women in labor who met the inclusion criteria and received intrapartum care at PMB Erni Artiqoh, Bumi Makmur Village, during the study period, totaling 24 individuals. A total of 20 respondents were included as study samples after applying inclusion and exclusion criteria. Inclusion criteria comprised women in the active phase of the first stage of labor, characterized by cervical dilation of 4–7 cm, singleton pregnancy, cephalic presentation, spontaneous labor onset, and willingness to participate in the study. Exclusion criteria included women with obstetric complications, pharmacological pain management use during the observation period, high-risk pregnancies, or medical conditions that could influence pain perception.

A total sampling technique was applied, whereby all eligible participants during the study period were invited to participate, ensuring maximal sample representation within the limited population size. The final sample size was determined based on participant availability and eligibility, which is acceptable for pre-experimental designs aiming to detect within-group changes. This sampling strategy ensured feasibility while maintaining sufficient statistical power for non-parametric analysis.

Instruments

The primary instrument used in this study was a standardized labor pain assessment scale designed to measure subjective pain intensity during the active phase of the first stage of labor. The instrument employed a numerical rating scale ranging from 0 to 10, where 0 indicated no pain and 10 represented the worst pain imaginable. This scale was selected due to its simplicity, sensitivity to change, and suitability for use during labor without disrupting the birthing process.

The instrument was administered verbally by trained midwives to ensure clarity and consistency, particularly given the physical condition of participants during labor. Demographic and obstetric data were collected using a structured data collection form that included age, parity, gestational age, cervical dilation at assessment, and labor characteristics. The use of structured instruments facilitated uniform data collection across participants and minimized measurement bias. All instruments were reviewed prior to data collection to ensure clarity, feasibility, and appropriateness for the clinical context.

Intervention

The intervention implemented in this study was warm compress therapy applied during the active phase of the first stage of labor. The warm compress consisted of a clean cloth soaked in warm water with a temperature maintained between 38°C and 45°C to ensure safety and comfort. The compress was applied to the lumbosacral and lower abdominal regions, areas commonly associated with labor pain transmission, while the participant was in a comfortable labor position. The intervention was initiated after baseline pain assessment during the active phase and was applied continuously for approximately 20 minutes.

Warm compresses were replaced as needed to maintain consistent temperature throughout the intervention period. The procedure was performed by trained midwives following a standardized protocol to ensure uniform application across participants. This

intervention was selected due to its non-invasive nature, low cost, ease of implementation, and compatibility with routine midwifery care.

Data Collection

The data collection process was conducted in three structured stages to ensure systematic and reliable measurement. The preparation stage involved obtaining informed consent, screening participants for eligibility, preparing instruments, and training midwives on standardized intervention and assessment procedures. The implementation stage began with the pretest measurement of labor pain intensity during the active phase before the application of warm compress therapy. Following the pretest, the warm compress intervention was administered according to the established protocol.

The post-implementation stage involved reassessment of labor pain intensity immediately after the intervention to capture changes attributable to the therapy. All data were recorded promptly to minimize recall bias and ensure data accuracy. The structured staging of data collection ensured consistency in timing and procedures across all participants.

Data Analysis

Data analysis was conducted using both univariate and bivariate approaches. Univariate analysis was performed to describe participant characteristics and labor-related variables using frequency distributions, percentages, means, and standard deviations. Bivariate analysis was used to evaluate differences in labor pain intensity before and after the warm compress intervention. The Wilcoxon signed-rank test was selected for bivariate analysis due to the non-normal distribution of pain intensity data and the paired nature of pretest-posttest measurements. This non-parametric test is appropriate for small sample sizes and ordinal or non-normally distributed continuous data. Statistical significance was determined using a predefined alpha level of 0.05. The analysis focused on identifying statistically meaningful changes in pain intensity following the intervention.

Ethical Consideration

Ethical considerations were carefully addressed throughout the research process to ensure participant safety and rights. Approval to conduct the study was obtained from the management of PMB Erni Artiqoh prior to data collection. All participants received clear explanations regarding the study objectives, procedures, potential benefits, and their right to withdraw at any time without affecting their care. Written informed consent was obtained from each participant before inclusion in the study.

Results

Descriptive statistics were used to provide a clear overview of pain intensity levels prior to and after the application of warm compress therapy. The findings are summarized in Table 1.

Table 1. Distribution of Labor Pain Scale Scores Before and After Warm Compress Therapy

Pain Scale	Frequency	Percentage (%)
Pretest		
Scale 6	1	5%
Scale 7	4	20%
Scale 8	7	35%
Scale 9	8	40%
Post Test		
Scale 4	8	40%
Scale 5	7	35%
Scale 6	5	25%

Table 1 shows the distribution of labor pain intensity scores among participants before and after the application of warm compress therapy. Prior to the intervention, the majority of participants reported high pain intensity levels, with 40% of respondents experiencing pain at scale 9 and 35% at scale 8, indicating severe labor pain during the active phase. Additionally, 20% of participants reported pain at scale 7, while only 5% reported pain at scale 6, demonstrating that most respondents experienced moderate to severe pain before the intervention.

Following the implementation of warm compress therapy, a noticeable shift toward lower pain intensity scores was observed. Posttest results showed that 40% of participants reported pain at scale 4 and 35% at scale 5, indicating a transition from severe pain to mild-to-moderate pain levels. Only 25% of respondents remained at pain scale 6, and no participants reported pain at scales 7, 8, or 9 after the intervention.

Overall, the distribution of pain scores demonstrates a clear reduction in labor pain intensity after the application of warm compress therapy. These findings suggest that warm compress therapy may be effective in decreasing labor pain during the active phase of the first stage of labor, as reflected by the downward shift in pain scale categories from pretest to posttest measurements.

Table 2. Wilcoxon Signed-Rank Test Results for Differences in Labor Pain Intensity Before and After Warm Compress Therapy (n = 20)

	n	Mean Rank	Sum of Ranks	p-value
Posttest labor pain – pretest labor pain	Negative Ranks	20	210.00	0.001
	Positive Ranks	0	0.001	
	Ties	0		
	Total	20		

Table 2 presents the results of the Wilcoxon signed-rank test comparing labor pain intensity scores before and after the warm compress intervention. The analysis shows that all 20 participants demonstrated a reduction in labor pain intensity following the intervention, as

indicated by the presence of 20 negative ranks. The mean rank for negative differences was 10.50, with a total sum of ranks of 210.00, reflecting a consistent decrease in posttest pain scores compared to pretest scores.

No positive ranks were observed, indicating that none of the participants experienced an increase in labor pain intensity after the application of warm compress therapy. Additionally, no tied ranks were found, suggesting that all participants showed a change in pain scores rather than remaining unchanged. The Wilcoxon signed-rank test yielded a p-value of 0.001, which is below the predetermined significance level of 0.05.

These results indicate a statistically significant difference in labor pain intensity before and after the intervention. Therefore, warm compress therapy was associated with a significant reduction in labor pain during the active phase of the first stage of labor among the study participants.

Discussion

The findings of this study demonstrate that warm compress therapy effectively reduced labor pain intensity during the active phase of the first stage of labor among all participants. The significant decrease in pain scores after the intervention indicates that thermal stimulation contributes to pain modulation during uterine contractions in active labor (Kaur et al., 2020). The uniform reduction in pain levels observed across respondents supports the role of non-pharmacological interventions in promoting maternal comfort during childbirth (WHO, 2018).

The absence of increased pain scores following the intervention further confirms the consistent analgesic effect of warm compress therapy (Türkmen et al., 2021). These findings align with evidence-based intrapartum care practices that prioritize safe and supportive pain management strategies (ACOG, 2016). The results of this study reinforce previous reports that emphasize the effectiveness of heat application during labor (Musgrove, 1999). Overall, the findings suggest that warm compress therapy is a beneficial intervention for managing labor pain during the active phase of the first stage of labor (Farahmand et al., 2020).

The physiological basis for pain reduction observed in this study can be explained through the effects of heat on musculoskeletal and

neural systems during labor (Musgrove, 1999). Warm compress therapy facilitates vasodilation in the pelvic and lumbosacral regions, which may reduce ischemia-related pain during uterine contractions (Kaur et al., 2020). Thermal stimulation also enhances muscle relaxation, which can decrease tension in the lower back and abdominal muscles during active labor (Türkmen et al., 2021).

Heat application activates sensory nerve fibers that inhibit nociceptive transmission at the spinal level, thereby reducing perceived pain intensity (Zhu et al., 2022). This neurophysiological mechanism supports the observed decrease in pain scores following warm compress therapy (Farahmand et al., 2020). The effectiveness of thermal interventions aligns with recommendations advocating supportive and comfort-focused intrapartum care (WHO, 2018). Therefore, warm compress therapy serves as a physiologically sound approach to labor pain management during the early stages of childbirth (Kaur et al., 2020).

The findings of this study are consistent with previous research demonstrating the effectiveness of warm compresses in reducing labor-related pain and discomfort (Farahmand et al., 2020). Studies conducted during the second stage of labor have reported significant reductions in pain intensity following perineal warm compress application (Magoga et al., 2019). Randomized trials have also shown that warm compress therapy contributes to improved maternal comfort and satisfaction during vaginal delivery (Modoor et al., 2021).

The present study extends this body of evidence by demonstrating the analgesic effect of warm compress therapy during the active phase of the first stage of labor (Kaur et al., 2020). This extension is important because pain escalation often begins during this phase and may influence labor progression (WHO, 2018). The consistency between these findings and earlier studies strengthens the validity of warm compress therapy as an effective non-pharmacological intervention (Türkmen et al., 2021). Thus, the current results support the broader application of warm compress therapy

across different stages of labor (Magoga et al., 2019).

Beyond pain reduction, warm compress therapy may indirectly contribute to improved obstetric outcomes by supporting physiological labor processes (ACOG, 2016). Effective pain management during early labor may enhance maternal coping ability and reduce stress-related hormonal responses (WHO, 2018). Reduced maternal stress may facilitate cervical dilation and promote efficient uterine contractions during active labor (Kaur et al., 2020).

Previous studies have shown that supportive intrapartum interventions can decrease the need for invasive procedures such as routine episiotomy (Jiang et al., 2017). The selective use of non-invasive interventions aligns with contemporary obstetric practices aimed at minimizing perineal trauma (Franchi et al., 2020). Warm compress therapy may therefore serve as an adjunctive strategy to reduce unnecessary obstetric interventions (ACOG, 2016). These findings highlight the potential broader benefits of early labor pain management beyond analgesia alone (WHO, 2018).

The role of midwives in implementing warm compress therapy is particularly relevant in the context of intrapartum care delivery (Begley et al., 2019). Qualitative evidence indicates that expert midwives frequently utilize non-invasive techniques to enhance maternal comfort and preserve physiological birth processes (Begley et al., 2019). Warm compress therapy is a simple intervention that can be easily integrated into routine midwifery practice without requiring advanced equipment (Gaheen & Abo-Hatab, 2021).

Studies combining warm compresses with other supportive techniques have reported enhanced maternal outcomes compared to single interventions (Goh et al., 2021). The present study supports the feasibility of applying warm compress therapy independently during early labor stages (Farahmand et al., 2020). This feasibility is critical for primary maternity care settings where resources may be limited (WHO, 2018). Therefore, warm compress therapy

represents a practical and effective tool for midwives in managing labor pain (Begley et al., 2019).

Despite the positive findings, this study should be interpreted in light of its methodological limitations (da Silva et al., 2023). The pre-experimental design without a control group limits the ability to establish causal relationships between the intervention and pain reduction (da Silva et al., 2023). The relatively small sample size may also restrict the generalizability of the findings to broader populations (Türkmen et al., 2021).

However, the consistent reduction in pain scores across all participants strengthens the internal validity of the results (Farahmand et al., 2020). Previous systematic reviews have emphasized the need for additional studies exploring non-pharmacological pain management strategies during different labor stages (Aquino et al., 2020). This study contributes preliminary evidence that addresses this gap by focusing on the active phase of the first stage of labor (Kaur et al., 2020). Future research using randomized controlled designs is therefore recommended to confirm these findings (da Silva et al., 2023).

In conclusion, the findings of this study provide evidence that warm compress therapy is effective in reducing labor pain during the active phase of the first stage of labor (Farahmand et al., 2020). The results support existing recommendations that emphasize supportive and non-invasive pain management strategies during childbirth (WHO, 2018). The consistency of these findings with previous studies strengthens the argument for integrating warm compress therapy into routine intrapartum care (Magoga et al., 2019).

Warm compress therapy offers a safe, low-cost, and easily implemented intervention suitable for various maternity care settings (Gaheen & Abo-Hatab, 2021). The application of this intervention aligns with professional guidelines that advocate for respectful and woman-centered childbirth care (ACOG, 2016). By addressing pain early in labor, warm compress therapy may contribute to improved maternal experiences and labor outcomes (Kaur et al., 2020). These findings underscore the

importance of further research to expand evidence-based non-pharmacological interventions in intrapartum care (da Silva et al, 2023).

Conclusion and Recommendation

This study concludes that warm compress therapy effectively reduces labor pain intensity during the active phase of the first stage of labor among laboring women. The application of warm compresses demonstrated a consistent decrease in pain scores following the intervention, indicating a positive analgesic effect during early labor. The findings suggest that thermal stimulation supports physiological pain modulation mechanisms and enhances maternal comfort during uterine contractions.

The results also highlight the feasibility of implementing warm compress therapy as a non-invasive and low-cost intervention within routine midwifery care settings. The effectiveness of this intervention aligns with contemporary intrapartum care principles that emphasize supportive and woman-centered approaches. The study further indicates that early pain management during active labor may contribute to improved maternal coping and overall childbirth experience. Therefore, warm compress therapy can be recommended as a practical non-pharmacological strategy for managing labor pain during the active phase of the first stage of labor, while further controlled studies are encouraged to strengthen the evidence base.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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