

Reducing Pain in the First Stage of Labour Using Counter-Pressure Therapy in the Indonesian Hospital

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Received: 18 Mar. 2025; Accepted: 24 Feb. 2026

Abstract- Inadequately managed labor pain can negatively impact the birthing process. Potential adverse effects of labor pain include stress, fatigue, impaired breathing patterns, inhibited oxytocin production, psychological distress, and an increased risk of medical interventions. Counter-pressure is a safe nursing intervention used to alleviate labor pain. This study aimed to determine the effect of counter-pressure on intrapartum maternal pain. A pre-experimental, one-group pretest-posttest design was utilized, focusing on first-stage intrapartum maternal pain within a hospital setting. The study participants included mothers in labor at the obstetrics department of Roemani Hospital, Semarang, Indonesia. A total of 20 participants were selected through purposive sampling. Data were collected using a numerical rating scale (NRS) and laboratory analysis of blood specimens. Results indicated that counter-pressure was effective in significantly reducing intrapartum maternal pain ($P=0.0001$). Following counter-pressure treatment, participants experienced a mean reduction of 2.4 points on the pain scale. The findings also demonstrated that counter-pressure does not adversely affect the inflammatory process or labor contractions. Sacral counter-pressure proved effective in alleviating pain during the first stage of labor. Nurses in obstetric units are encouraged to implement this intervention as a pain management strategy for intrapartum patients.

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Acta Med Iran 2026;64(7):422-427.

<https://doi.org/10.18502/acta.v64i7.22417>

Keywords: Labour pain; Pain management; Counter-pressure; Nurse

Introduction

Labor pain is a nearly universal experience for women during childbirth. During labor, strong and repetitive uterine contractions induce pain in the mother (1,2), which is typically localized in the lower abdomen and back (3). Although labor pain is a physiological aspect of the birthing experience, inadequately managed pain can pose significant risks to the labor process. Potential adverse outcomes include maternal stress, fatigue, hyperventilation or impaired breathing patterns, inhibition of oxytocin secretion, psychological distress, and an increased rate of medical interventions. Furthermore, severe pain during childbirth is recognized as a contributing factor to the development of post-traumatic stress disorder (PTSD) (4,5).

Because labor pain is inevitable, mothers must endure this discomfort throughout the birthing process (6,7). Consequently, effective pain management strategies are essential. As primary caregivers in hospital settings, nurses play a critical role in providing appropriate interventions to manage labor pain (8,9).

In American and European clinical practices, pharmacological analgesia is the standard approach for managing labor pain (10,11). Similarly, drug therapy is widely utilized across Asian countries. However, labor pain can also be effectively managed using non-pharmacological approaches (12). These alternative therapies include waterbirth, massage therapy, self-hypnosis, acupressure, and counter-pressure (13-16).

Counter-pressure is a safe nursing intervention designed to alleviate labor pain (9,17). This technique

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involves applying steady pressure to the patient's sacrum. Pressure and stimulation applied to the sacrum can relieve muscle tension and promote relaxation, thereby reducing pain perception (9,18). Ideally, pain reduction should be achieved without disrupting the physiological progression of labor (3,10,19).

An undesirable side effect of certain pain relief therapies is the suppression of uterine contractions. Adequate contractions are critical during labor to facilitate fetal descent and delivery. Therefore, the core principle of labor pain management is to reduce pain intensity while preserving uterine contractility (20,21). To date, existing research has primarily focused on labor pain reduction, often neglecting the potential impact of pain relief interventions on uterine activity (22). Thus, it is crucial to evaluate uterine contraction markers during pain management. Key biochemical indicators of labor progression and contractions include oxytocin, prostaglandins, estrogen, progesterone, and interleukin-1 beta (IL-1 β) (16). This study aims to evaluate the effectiveness of counter-pressure therapy in reducing labor pain among intrapartum mothers in a hospital setting while monitoring its impact on uterine activity.

Materials and Methods

Study design

This study employed a pre-experimental research design using a pretest-posttest approach without a control group. The study focused on first-stage intrapartum maternal pain in a hospital setting. Pain, as well as indicators of uterine contractions and inflammation, were measured.

Research subjects

The study subjects were mothers undergoing labor at the obstetric service of Roemani Hospital, Semarang, Indonesia. The inclusion criteria were primiparity, singleton pregnancy, productive age (25-35 years), absence of family accompaniment, and willingness to participate in the study. A total of 20 subjects were included in this study. The sampling technique used was purposive sampling.

Research instruments

Pain was assessed using a Numeric Rating Scale (NRS), which measures pain intensity on a scale ranging from 1 to 10. The pain scale was categorized into three levels: mild pain (1-3), moderate pain (4-6), and severe pain (7-10). Uterine contractions were assessed biochemically using interleukin-1 beta (IL-1 β) and

prostaglandin-endoperoxide synthase 2 (PTGS2) as indicators. Inflammation was also evaluated biochemically using the biomarker profile indicators tumor necrosis factor alpha (TNF- α) and nitric oxide synthase 2 (NOS2).

Intervention

Counter-pressure was administered by applying manual pressure to the sacral region (regiosacralis). The procedure was performed by a nurse using their hands without any mechanical devices. The therapy was administered three times, with each application lasting for 1 minute, separated by a 2-minute rest phase.

Validity and reliability

The Numeric Rating Scale (NRS) used for pain assessment is a standardized clinical tool routinely used in hospital settings, establishing its validity and reliability for measuring patient pain. The biomarker levels (IL-1 β , PTGS2, TNF- α , and NOS2) were determined through laboratory analysis of blood specimens, conducted by certified laboratory technicians using standardized and calibrated equipment.

Data analysis

The reduction in maternal pain was determined by analyzing the difference in mean pain scores before and after the application of counter-pressure. The statistical analysis of labor pain scores was performed using the Wilcoxon signed-rank test via SPSS software version [IBM SPSS software, version 20 (IBM Corporation, Armonk, NY, USA)]. Additionally, biomarker indicators were subjected to descriptive analysis to evaluate uterine contractions and inflammatory status.

This study was reviewed and approved by the Health Research Ethics Committee, Faculty of Nursing, Sultan Agung Islamic University, Semarang, Indonesia (No. 085/A.1-KEPK/FIK-SA/I/2023). All participants in this study took part voluntarily. The researchers explained the study objectives and the interventions to be carried out to the patients when treatment began. Patients were given the freedom to participate as research subjects. After patients agreed to participate as research subjects, they signed the informed consent form. The researchers did not include patient identities in reports or publication manuscripts to maintain the confidentiality of patient data. The data were collected solely for academic research purposes.

Results

This study enrolled 20 intrapartum mothers who met the specified inclusion criteria. Data collection was conducted between March 1 and March 30, 2023, in the obstetrics ward at Roemani Hospital, Semarang, Indonesia. The mean age of the subjects was 27.6($\pm$ 4.51) years (range: 21-36 years). Based on the 95% Confidence Interval (CI), the estimated age range for the hospitalized intrapartum mothers was 25.49-29.71 years.

Statistical analysis indicated a significant difference in the mean intrapartum pain scale before and after the counter-pressure intervention ($P=0.0001<0.05$). Following the counter-pressure intervention, subjects experienced a mean reduction of 2.4 points in their pain scale. Thus, it can be concluded that counter-pressure is effective in reducing intrapartum maternal pain.

Prior to the intervention, subjects reported severe pain, with a mean score of 7.4($\pm$ 1.1) (range: 6-10). The 95% CI suggested that the pain scores for hospitalized intrapartum mothers were within the range of 6.89-7.91. Post-intervention, pain levels decreased to a moderate range, with a mean of 5($\pm$ 1.08) (range: 4-8) (Table 1).

This study also evaluated inflammatory responses and uterine contractions, which are integral to the physiological process of labor. Because mechanical

pressure applied to the craniosacral region during counter-pressure might trigger an inflammatory response, these parameters were monitored as controls to determine whether the pain-relief intervention affected these physiological processes. Inflammatory markers, specifically TNF α and NOS2 levels, were measured, alongside labor contraction indicators, IL-1 β and PTGS2.

The results demonstrated a mean TNF α level of 110.5($\pm$ 18.56) pg/ml and a mean NOS2 level of 122.78($\pm$ 45.1) pg/ml, reflecting the physiological inflammatory response during childbirth. Additionally, mean levels for IL-1 β were 54.06($\pm$ 74.63) pg/ml, and mean PTGS2 levels were 31.18($\pm$ 20.1) ng/ml, confirming active uterine contractions during the labor process (Table 2).

The administration of counter-pressure to intrapartum mothers was shown to reduce pain without significantly altering inflammatory status. There was no significant correlation between the reduction in pain scores and levels of either TNF α ($P=0.414>0.05$) or NOS2 ($P=0.983>0.05$) (Table 3).

Furthermore, the findings indicate that counter-pressure did not adversely affect uterine contractions, allowing the physiological process of labor to proceed normally. Analysis revealed no significant correlation between the reduction in pain scores and levels of either IL-1 β ($P=0.368>0.05$) or PTGS2 ($P=0.981>0.05$) (Table 3).

Table 1. Difference in mean pain scale before and after being given counter-pressure

Indicators	Mean	CI 95%	P
Pain scale before counter-pressure	7.4($\pm$ 1.1)	6.89-7.92	0.0001 ^a
Pain scale after counter-pressure	5($\pm$ 1.08)	4.5-5.51	

^a Wilcoxon t-test

Table 2. Levels of inflammatory biomarkers and intrapartum maternal uterine contractions after being given counter-pressure measures

Indicators	Mean	CI 95%
TNF α	110.5($\pm$ 18.56)	101.82-119.19
NOS2	122.79($\pm$ 45.11)	101.68-143.9
IL-1 β	54.06($\pm$ 74.64)	19.14-88.99
PTGS2	31.19($\pm$ 20.11)	21.78-40.59

Table 3. Relationship between reduction in pain scale with levels of inflammatory biomarkers and intrapartum maternal uterine contractions after being given counter-pressure measures

Indicators	Correlation coefficient	P
Relationship between pain reduction and TNF α levels	0.193	0.414 ^b
The relationship between pain reduction and NOS2 levels	0.005	0.983 ^b
Relationship between pain reduction and IL-1 β levels	-0.213	0.368 ^c
Relationship between pain reduction and PTGS2 levels	0.006	0.981 ^b

^b Pearson Product Moment

^c Spearman Rank

Discussion

Labor pain is a physiological response to intense uterine contractions during cervical dilation, facilitating the expulsion of the fetus. The intensity of this pain is subjective and varies significantly, influenced by factors such as maternal age, ethnicity, previous obstetric history, environment, and administered analgesia (1). In the current study, the mean age of the subjects was 27.6($\pm$ 4.51) years (range: 21-36 years). Given that this age range falls within the optimal reproductive category (i.e., >20 and <35 years), the participants were physically and psychologically mature enough to undergo labor, thereby minimizing potential bias associated with age-related variations in pain perception.

The results indicate that intrapartum labor pain in the study population was in the moderate-to-severe category. This finding is consistent with studies conducted in Brazil and Northern Italy, which reported mean labor pain scales of 7.5 and 7.75, respectively (19,20). A mean pain scale of approximately 7.5 is considered a standard experience for mothers undergoing natural childbirth (27).

Pain sensations during the first stage of labor are transmitted via the thoracic (T10-T12) and upper lumbar sympathetic nerves. These afferent nerve fibers originate in the uterine corpus and cervix. Sensory impulses from the uterus are transmitted through synapses in the posterior horn of the spinal cord at the T10-T12 and L1 levels (23-25). According to the Gate Control Theory, pain perception is mediated by sensory pathways; the transmission of painful stimuli to the brain can be regulated by the "closing" or "opening" of specific neural gates. Cervical dilation and uterine distension, particularly in the lower uterine segment, are the primary triggers for these sensory pain impulses (26,27).

This study investigated the application of counter-pressure to mitigate intrapartum pain. Excessive labor pain can induce hemodynamic disturbances, potentially compromising the well-being of both the mother and the fetus (28-30). Regiosacral counter-pressure is a non-pharmacological analgesic modality based on the Gate Control Theory. By applying pressure to the regiosacral region, sensory input is modulated, effectively inhibiting the perception of pain along the nerve pathways originating from the soft tissues (3,8,31,32).

Our analysis revealed a significant reduction in the mean intrapartum pain scale following the counter-pressure intervention ($P=0.0001<0.05$), with a mean decrease of 2.4 points. These findings suggest that regiosacral counter-pressure is an effective technique for

reducing maternal labor pain. However, it is imperative to ensure that such analgesic interventions do not interfere with the natural birth process or cause adverse effects, such as tissue damage or localized inflammation resulting from the applied pressure.

Inflammation is a natural physiological response to tissue injury, which may result from incisions, punctures, or excessive mechanical pressure (29). During counter-pressure procedures, patients may request firmer or increased pressure, raising concerns regarding potential tissue trauma. This study evaluated the potential for inflammation resulting from regiosacral counter-pressure. Our objective was to demonstrate that this pain-relief method reduces pain intensity while minimizing systemic or local side effects, thereby establishing the safety of the pressure applied to the regiosacral area (33,34).

Biomarkers, including IL-1 β , PTGS2, TNF- α , and NOS2, were measured to assess inflammatory status and uterine activity. The results demonstrated mean levels of 110.5($\pm$ 18.56) pg/mL for TNF- α and 122.78($\pm$ 45.1) pg/mL for NOS2. These findings suggest that the application of regiosacral counter-pressure does not trigger an inflammatory response. Uterine contractions during the intrapartum period are essential for the dilation of the lower uterine segment and the eventual expulsion of the fetus. The measured levels of IL-1 β (mean: 54.06 $\pm$ 74.63 pg/mL) and PTGS2 (mean: 31.18 $\pm$ 20.1 ng/mL) confirm that mothers who received the counter-pressure intervention continued to experience normal uterine contractions, indicating that the analgesic method did not impede the physiological progress of labor.

Counter-pressure applied to the sacral region has been proven effective in reducing maternal pain during the first stage of labor. This intervention alleviates pain without affecting the physiological process of labor. Nurses in obstetric wards are expected to be able to apply counter-pressure techniques to manage intrapartum maternal pain

Acknowledgements

The researcher would like to express sincere gratitude to the intrapartum mothers who volunteered to participate in this study. The researcher also extends appreciation to all those who contributed to the completion of this research.

References

1. Karimi L, Mahdavian M, Makvandi S. A systematic

- review and meta-analysis of the effect of acupressure on relieving the labor pain. *Iran J Nurs Midwifery Res* 2020;25:455-62.
2. Dastjerd F, Erfanian Arghavanian F, Sazegarnia A, Akhlaghi F, Esmaily H, Kordi M. Effect of infrared belt and hot water bag on labor pain intensity among primiparous: a randomized controlled trial. *BMC Pregnancy Childbirth* 2023;23:405.
3. Hibatulloh QN. The effectivity of acupressure therapy to relieve labor pain during the active phase of the first stage. *Indones Midwifery Health Sci J* 2022;6:96-110.
4. Altınayak SÖ, Özkan H. The effects of conventional, warm and cold acupressure on the pain perceptions and beta-endorphin plasma levels of primiparous women in labor: a randomized controlled trial. *Explore (NY)* 2022;18:545-50.
5. Lagadec N, Steinecker M, Kapassi A, Magnier AM, Chastang J, Robert S, et al. Factors influencing the quality of life of pregnant women: a systematic review. *BMC Pregnancy Childbirth* 2018;18:1-14.
6. Azza A, Triharini M. A cultural nursing care model to prevent preeclampsia in the provision of basic services in Eastern Indonesia 2023;5293.
7. Nursalam N, Triharini M, Azza A, Chanif C, Wahyuni D, Machmudah M, et al. The relationship between spiritual quality and self-adaptation in cancer patients receiving chemotherapy 2023;54:261-6.
8. Solt Kirca A, Kanza Gul D. Effects of acupressure and shower applied in the delivery on the intensity of labor pain and postpartum comfort. *Eur J Obstet Gynecol Reprod Biol* 2022;273:98-104.
9. Gunadi A, Adnan N, Cahyawati FE, Listyaningrum TH, Sumaryani S. Trend of non-pharmacological therapy for first phase of active labor pain: a pilot study. *J Epidemiol Kesehat Indones* 2022;6.
10. Sharpe EE, Rollins MD. Beyond the epidural: alternatives to neuraxial labor analgesia. *Best Pract Res Clin Anaesthesiol* 2022;36:37-51.
11. Fan HSL, Wong JYH, Fong DYT, Lok KYW, Tarrant M. Association between intrapartum factors and the time to breastfeeding initiation. *Breastfeed Med* 2020;15:394-400.
12. Pawestri P, Machmudah M, Rejeki S, Pranata S, Ayu Nur Fitria S, Laila Fitri M, et al. Difference effectiveness of progressive muscle relaxation therapy and endorphin massage therapy towards reducing menstrual pain intensity in adolescents. *J Res Health* 2023;13:247-54.
13. Sharkawy HM. Effects of repetitive transcranial magnetic stimulation on pain thresholds in patients with chronic low back pain. *Case Med Res* 2017;85:2497-503.
14. Negara NWWP, Stang, Ansariad, Salamah AU, Seweng A, Nur R, et al. Effect of varash oil to decrease menstrual pain in primary dysmenorrhea of senior high school student at Palu City. *Gac Sanit* 2021;35:S145-7.
15. Rejeki S, Pratama FY, Ernawati E, Yanto A, Soesanto E, Pranata S. Abdominal stretching as a therapy for dysmenorrhea. *Open Access Maced J Med Sci* 2021;9:180-3.
16. Rejeki S, Solichan A, Machmudah, Safitri DNRP, Poddar S. The profile of interleukin-6, PGE2, and menstrual pain levels through the counterpressure regiosacralis therapy. *Eur J Mol Clin Med* 2020;7:122-8.
17. Astuti HP, Astuti AW, Agustin D, Awaliyah HF, Winarti GR, Jaya VO. Narrative review: pengaruh terapi massage counterpressure terhadap pengurangan nyeri dalam persalinan. *J Cakrawala Promkes* 2021;3:50-60.
18. Huang KY, Chang CH, Yu KC, Hsu CH. Assessment of quality of life and activities of daily living among elderly patients with hypertension and impaired physical mobility in home health care by antihypertensive drugs plus acupuncture. *Medicine (Baltimore)* 2022;101:e29077.
19. Lu C, Coxhead A. Specialized vocabulary across languages: the case of traditional Chinese medicine. *Stud Second Lang Learn Teach* 2023;13:179-217.
20. Abdi F, Amjadi MA, Zaheri F, Rahnemaei FA. Role of vitamin D and calcium in the relief of primary dysmenorrhea: a systematic review. *Obstet Gynecol Sci* 2021;64:13-26.
21. Sousa L de, Gomes-Sponholz FA, Nakano AMS. Transcutaneous electrical nerve stimulation for the relief of post-partum uterine contraction pain during breast-feeding: a randomized clinical trial 2014;40:1317-23.
22. Apriyani, Sagita D, Ningsih RPS. Pengaruh pemberian minuman air kunyit (Curcuma longa) terhadap skala nyeri dismenore pada remaja putri di Desa Sukasari. *Nusant Hasana J* 2022;2:146-54.
23. Özgen M, Gemiköz M, Atik Z, Armağan O, Mutlu F. Complex regional pain syndrome in hand-wrist injuries. *Agri* 2021;33:23-7.
24. Smart KM, Ferraro MC, Wand BM, O'Connell NE. Physiotherapy for pain and disability in adults with complex regional pain syndrome (CRPS) types I and II. *Cochrane Database Syst Rev* 2022;2022:CD010853.
25. Chu XL, Song XZ, Li Q, Li YR, He F, Gu XS, et al. Basic mechanisms of peripheral nerve injury and treatment via electrical stimulation. *Neural Regen Res* 2022;17:2185-93.
26. Enders J, Elliott D, Wright DE. Emerging nonpharmacologic interventions to treat diabetic peripheral neuropathy. *Antioxid Redox Signal*. 2023;38:989-1000.
27. Santuzzi CH, Azevedo H de, Neto F, Guilherme J, Pires P, Luiz W, et al. High-frequency transcutaneous electrical nerve stimulation reduces pain and cardio-respiratory

- parameters in an animal model of acute pain: participation of peripheral serotonin 2013;29:630-8.
28. Mohammadzadeh F, Noghabi ES, Noori R, Ahmadi SA, Azarang M, Noghabi AD. Comparing the effect of acupressure at the Spleen-10 (Xuehai) acupoint and vitamin E on primary dysmenorrhea. *Med Acupunct* 2022;34:325-30.
 29. Yeh CH, Chien LC, Huang LC, Suen LKP. Auricular point acupressure for chronic pain. *Holist Nurs Pract* 2014;28:184-94.
 30. Kafei-Atrian M, Mirbagher-Ajorpaz N, Sarvieh M, Sadat Z, Asghari-Jafarabadi M, Solhi M. The effect of acupressure at third liver point on the anxiety level in patients with primary dysmenorrhea. *Iran J Nurs Midwifery Res* 2016;21:142-6.
 31. Sorour AS, Ayoub AS, Abd El Aziz EM. Effectiveness of acupressure versus isometric exercise on pain, stiffness, and physical function in knee osteoarthritis female patients. *J Adv Res* 2014;5:193-200.
 32. Yeh CH, Kawi J, Ni A, Christo P. Evaluating auricular point acupressure for chronic low back pain self-management using technology: a feasibility study. *Pain Manag Nurs* 2021;23:301-10.
 33. Liu X, Wang X, Ma H, Zhang W. Mechanisms underlying acupuncture therapy in chronic kidney disease: a narrative overview of preclinical studies and clinical trials. *Front Nephrol* 2022;2:1006506.
 34. Church D, Stapleton P, Vasudevan A, O'Keefe T. Clinical EFT as an evidence-based practice for the treatment of psychological and physiological conditions: a systematic review. *Front Psychol* 2022;13:951451.