MEDISAINS
Jurnal Ilmiah Ilmu - Ilmu Kesehatan

Original Article

Effect of integrated non-pharmacological therapy on second-stage labor duration and neonatal Apgar scores

Rosmiarti [1]✉, Riska Marlin [2], Yuli Bahriah [3]

[1] *Diploma III in Midwifery, Faculty of Vocational Studies, Universitas Muhammadiyah Ahmad Dahlan Palembang, Palembang, South Sumatra, Indonesia*
[2] *Bachelor of Midwifery, Faculty of Health Sciences, Universitas Muhammadiyah Ahmad Dahlan Palembang, Palembang, South Sumatra, Indonesia*
[3] *Midwifery Study Program, Budi Mulia Sriwijaya Institute of Health Sciences, Palembang, South Sumatra, Indonesia*

ARTICLE INFORMATION

Received: December 26, 2026
Revised: April 23, 2026
Accepted: April 30, 2026

KEYWORDS

Labor Duration; Apgar Score; Non-Pharmacological Therapy; Second Stage of Labor; Complementary Therapy; Midwifery Care

CORRESPONDENCE

Phone: +62 811-7193-159

E-mail: rosmiartiasmar74@gmail.com

A B S T R A C T

Background: Childbirth is a physiological process influenced by maternal physical and psychological conditions. A prolonged second stage of labor is associated with increased risks of maternal fatigue, birth canal trauma, and impaired neonatal adaptation. However, evidence regarding structured integrated non-pharmacological interventions during labor remains limited.

Purpose: This study aimed to evaluate the effect of an integrated non-pharmacological intervention on second-stage labor duration and neonatal Apgar scores.

Methods: A quasi-experimental study was conducted from January to June 2025 among 60 women with term singleton pregnancies (intervention, n = 30; control, n = 30). Participants were allocated consecutively into two groups. The intervention consisted of Qur'anic recitation, cold compress application, and effleurage massage. The primary outcome was second-stage labor duration, and secondary outcomes were Apgar scores at 1 and 5 minutes after birth. Data were analyzed using independent t-tests and regression analysis, with a significance level of $p < 0.05$.

Results: The intervention group had a significantly shorter second-stage labor duration than the control group (mean difference = −14.4 minutes; 95% CI: −19.2 to −9.6; $p < 0.001$). Neonates in the intervention group had significantly higher Apgar scores at 1 minute (mean difference = 0.8; 95% CI: 0.41 to 1.19; p = 0.002) and 5 minutes (mean difference = 0.6; 95% CI: 0.32 to 0.88; p = 0.001).

Conclusions: An integrated non-pharmacological intervention was associated with shorter second-stage labor duration and higher early neonatal Apgar scores. This multimodal approach may provide a feasible, low-cost supportive strategy for intrapartum care in low-resource settings. Further randomized controlled trials are warranted to confirm these findings.

INTRODUCTION

Childbirth is a physiological process that is strongly influenced by maternal physical and psychological conditions. Nevertheless, labor complications remain a major contributor to adverse maternal and neonatal outcomes worldwide. Globally, approximately 295,000 maternal deaths and 2.4 million neonatal deaths occur annually, many of which are associated with intrapartum complications such as prolonged labor, maternal exhaustion, and fetal hypoxia.[25]

The second stage of labor is particularly critical, as prolonged duration has been associated with increased risks of maternal fatigue, perineal trauma, postpartum hemorrhage, operative delivery, and impaired fetal oxygenation that may negatively affect neonatal adaptation after birth.[1,8] Previous studies have reported that prolonged second-stage labor occurs in approximately 10–20% of vaginal deliveries.[1] Therefore, strategies that optimize labor progress while maintaining maternal comfort and fetal well-being are clinically important.

Non-pharmacological interventions during labor have increasingly been recommended as supportive care approaches to reduce pain, anxiety, and physiological

https://doi.org/10.30595/medisains.v24i1.29409
©(2026) by the Medisains Journal. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered. More information is available at Attribution-NonCommercial 4.0 International.

stress. Methods such as massage therapy, auditory relaxation, and cold compress application may reduce catecholamine release, improve uterine contraction efficiency, enhance uteroplacental perfusion, and stimulate endogenous oxytocin secretion.[4–7] These mechanisms may contribute not only to improved maternal comfort but also to more efficient labor progression.

Recent studies have shown that individual non-pharmacological modalities, including audio therapy, massage, and emotional support, can improve maternal comfort and labor experience.[9–13] However, most previous studies evaluated these interventions as isolated modalities rather than as an integrated therapeutic package. In addition, evidence remains limited regarding standardized multimodal protocols and their effects on both maternal labor outcomes and neonatal conditions.[5,21]

To date, few studies have specifically examined whether combining spiritual, sensory, and tactile interventions may synergistically shorten second-stage labor duration while simultaneously improving neonatal Apgar scores. This represents an important research gap, particularly in culturally relevant maternity settings.[22]

Therefore, this study introduces a structured, integrated non-pharmacological therapy model comprising Qur'anic recitation, cold compress application, and effleurage massage. The novelty of this study lies in the use of a standardized multimodal protocol and the simultaneous evaluation of maternal (second-stage labor duration) and neonatal (Apgar score) outcomes. This study aimed to determine the effectiveness of the integrated therapy on second-stage labor duration and neonatal Apgar scores.

METHOD

Study Design

This study employed a quasi-experimental design with two comparison groups.

Setting and Participants

The study was conducted at Mitra Ananda Maternity Clinic, Palembang, Indonesia, from January to June 2025. The clinic provides routine intrapartum care for low-risk pregnancies and does not routinely use pharmacological labor analgesia.

The study population consisted of women admitted for labor during the study period. Sample size was calculated using an a priori power analysis to compare two independent means. Assuming a large effect size (Cohen's d = 0.80), a two-sided significance level of 0.05, and statistical power of 80%. A total of 60 eligible participants were enrolled and equally allocated into the intervention group (n = 30) and the control group (n = 30).

Inclusion criteria were: term singleton pregnancy (37–42 weeks of gestation), cephalic fetal presentation, spontaneous onset of labor, and absence of obstetric complications at admission. Exclusion criteria included indication for operative delivery, high-risk pregnancy conditions, use of pharmacological analgesia during labor, and fetal distress prior to the second stage of labor.

Participants were recruited consecutively upon admission using a consecutive sampling technique. No participants were excluded after enrollment, and no loss to follow-up occurred.

Intervention Procedure

The intervention consisted of a structured integrated non-pharmacological therapy model comprising three components: 1) Qur'anic recitation therapy: recorded recitation of Surah Ar-Rahman played continuously for approximately 20–30 minutes using a portable audio device at a comfortable listening volume; 2) Cold compress therapy: a clean towel soaked in water at 15–20°C applied to the lumbosacral area for 10–15 minutes; 3) Effleurage massage: rhythmic circular massage performed on the lower back and sacral region for approximately 15 minutes during uterine contractions

The intervention was initiated during the active phase of labor (≥4 cm cervical dilatation) and could be repeated at maternal comfort until the completion of the second stage of labor. All procedures were delivered by trained midwives using a standardized intervention protocol. Intervention fidelity was monitored using a structured checklist that documented the timing, duration, and completion of each component.

Participants in the control group received standard intrapartum care, including routine maternal and fetal monitoring, emotional support, and maternal positioning assistance during labor, without the structured integrated therapy protocol.

Outcomes and Measurements

The primary outcome was the duration of the second stage of labor, defined as the time interval (minutes) between complete cervical dilatation (10 cm) and delivery of the neonate. Duration data were obtained from partographs recorded by trained midwives in accordance with institutional standards. Secondary outcomes included neonatal Apgar scores at 1 and 5 minutes after birth, assessed by certified midwives using standardized clinical procedures. Parity was predefined as a subgroup variable. Potential confounders, including maternal age, gestational age, and birth weight, were recorded at baseline and included in the analysis.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Normality was assessed using the Shapiro–Wilk test. Continuous variables were presented as mean ± standard deviation and compared using independent t-tests, with mean differences and 95% confidence intervals (CI) reported. Categorical variables

were analyzed using the Chi-square test or Fisher's exact test, as appropriate.

Ethical Considerations

This study received ethical approval from the Research Ethics Committee of Muhammadiyah Palembang (No. 000011/KEP-IKesT Muhammadiyah Palembang/2024). Written informed consent was obtained from all participants prior to enrollment.

RESULTS

Baseline Characteristics

Participants in both groups had similar baseline characteristics. The mean maternal age ranged from 27 to 29 years, with approximately half of the participants being primiparous. Mean gestational age was around 39 weeks, and mean birth weight was approximately 3,100–3,200 g. The distribution of neonatal sex was also comparable between groups. Overall, baseline maternal and neonatal characteristics were comparable between the intervention and control groups, with no statistically significant differences observed (Table 1).

Table 1. Baseline Maternal and Neonatal Characteristics

Characteristics	Intervention	Control	*p-value*
Maternal age (years)	28.6 ± 4.2	27.8 ± 3.9	0.421
Primiparous, n (%)	14 (46.7)	15 (50.0)	0.795
Gestational age (weeks)	39.2 ± 1.0	39.0 ± 1.1	0.508
Birth weight (g)	3160 ± 310	3090 ± 330	0.372
Neonatal sex (male), n (%)	14 (46.7)	15 (50.0)	0.802

Treatment Effects on Second-Stage Labor Duration and Neonatal Apgar Scores

The intervention significantly reduced the duration of the second stage of labor compared with the control group, with a mean difference of −14.4 minutes (95% CI: −19.2 to −9.6; p < 0.001). Neonatal outcomes were also improved in the intervention group. Apgar scores were significantly higher at both the 1st minute (mean difference: 0.8; 95% CI: 0.41 to 1.19; p = 0.002) and the 5th minute (mean difference: 0.6; 95% CI: 0.32 to 0.88; p = 0.001) (Table 2).

Table 2. Effects of Integrated Non-Pharmacological Therapy on Labor Duration and Neonatal Apgar Scores

Variables	Intervention	Control	Mean Difference (95% CI)	*p-value*
Second-stage labor duration (minutes)	31.8 ± 8.1	46.2 ± 10.5	−14.4 (−19.2 to −9.6)	<0.001
Apgar score (1st minute)	8.2 ± 0.7	7.4 ± 0.8	0.8 (0.41 to 1.19)	0.002
Apgar score (5th minute)	9.3 ± 0.5	8.7 ± 0.6	0.6 (0.32 to 0.88)	0.001

DISCUSSION

This study found that integrated non-pharmacological therapy was associated with shorter second-stage labor duration and higher early neonatal Apgar scores compared with standard care. These findings indicate potential clinical benefits of a structured supportive labor intervention, while acknowledging the methodological limitations inherent to the quasi-experimental design.

A key strength of this study lies in the use of a standardized multimodal protocol that combines spiritual (Qur'anic recitation), tactile (effleurage massage), and thermal (cold compress) interventions within a single coordinated framework. Previous studies have generally evaluated these modalities separately or in less structured forms.[4,5,9-12] By integrating these components into a single protocol, the present study expands the current evidence on the potential value of combining multiple supportive strategies during labor.

Importantly, this study simultaneously evaluated maternal and neonatal outcomes, namely second-stage labor duration and neonatal Apgar scores. Most previous studies on non-pharmacological labor interventions have focused primarily on maternal pain perception, anxiety reduction, or labor satisfaction, with less attention to objective labor progression and immediate neonatal adaptation.[5,21] Therefore, the present findings suggest that integrated supportive therapy may provide broader benefits beyond maternal comfort alone. The combined use of spiritual relaxation, tactile stimulation, and thermal comfort may generate synergistic physiological and psychological effects that are less likely to be achieved through single interventions alone.

Several biological mechanisms may explain these findings. Maternal anxiety and pain during labor can increase catecholamine secretion, which may inhibit uterine contractility, reduce uteroplacental perfusion, and prolong labor.[6] Relaxation-based interventions such as auditory spiritual recitation and massage may reduce sympathetic activation, promote emotional calmness, and enhance endogenous oxytocin release, thereby improving contraction efficiency and facilitating labor progression.[6,22] Effleurage massage may also reduce pain perception through neurosensory mechanisms, whereas cold compresses may provide additional analgesic and comfort effects.[4,5]

The shorter duration of the second stage observed in this study may also contribute to improved neonatal condition at birth. Prolonged second-stage labor has been associated with maternal exhaustion, operative delivery, and compromised fetal oxygenation, which may adversely affect neonatal adaptation.[1,8] More effective labor progression may reduce intrapartum stress and hypoxic exposure, thereby supporting higher Apgar scores in the early postnatal period.[2,3] Nevertheless, neonatal outcomes are multifactorial and may also be influenced by other obstetric and neonatal factors.

These findings are consistent with previous reports indicating that supportive and non-pharmacological interventions during labor may improve maternal and neonatal outcomes.[7,11,14,15] Comparative studies have also shown beneficial effects of both pharmacological and non-

pharmacological approaches on labor progress and childbirth experience.[16] However, unlike most previous studies that evaluated single interventions, the present study examined a structured integrated multimodal approach, highlighting its potential added value.

From a practical perspective, this intervention may be particularly relevant in low-resource maternity settings where access to pharmacological analgesia is limited.[24,26] The components of the therapy are low-cost, non-invasive, relatively easy to implement, and compatible with routine midwifery care. Integration of evidence-based supportive interventions into standard intrapartum services may strengthen respectful and woman-centered childbirth care.[20,23]

This study has several strengths, including the use of a predefined standardized intervention protocol, objective clinical outcome measurements based on routine records, and simultaneous assessment of maternal and neonatal outcomes. However, several limitations should be considered. First, the quasi-experimental non-randomized design limits causal inference and may introduce selection bias. Second, blinding of participants and care providers was not feasible, which may increase the risk of performance bias, although outcome data were derived from standardized documentation. Third, the single-center setting and relatively small sample size may limit generalizability to other populations or healthcare systems. Finally, because the intervention was delivered as a multimodal package, the relative contribution of each individual component could not be determined.

Future randomized controlled multicenter studies with larger sample sizes are warranted to confirm these findings, improve external validity, and strengthen causal interpretation. Further research should also evaluate which intervention components are most effective and whether similar benefits are sustained across different clinical and cultural settings.

CONCLUSIONS AND RECOMMENDATION

Integrated non-pharmacological therapy was associated with a shorter second-stage labor duration and higher early neonatal Apgar scores compared with standard care. These findings suggest the potential value of a structured multimodal supportive approach combining spiritual, tactile, and thermal components during labor.

Clinically, this intervention may represent a feasible, low-cost, and non-invasive supportive strategy for low-risk intrapartum settings, particularly where access to pharmacological analgesia is limited. Its integration into routine midwifery services may support evidence-based and woman-centered childbirth care. However, due to the quasi-experimental design, causal relationships cannot be definitively established. Further randomized controlled trials involving larger and more diverse populations are needed to confirm these findings and strengthen the evidence base.

REFERENCES

1. Li Y, Liu X, Wei F, et al. Association between second-stage duration of labor and maternal and neonatal outcomes. *BMC Pregnancy Childbirth.* 2022;22:371. https://doi.org/10.1186/s12884-022-04871-0
2. Cnattingius S, Johansson S, Razaz N. Apgar score and risk of neonatal death among preterm infants. *N Engl J Med.* 2020;383(1):49-57. https://doi.org/10.1056/NEJMoa1915075
3. Yang C, Chen X, Zu S, He F. Retrospective analysis of risk factors for low 1-minute Apgar scores in term neonates. *Braz J Med Biol Res.* 2019;52(12):e9093. https://doi.org/10.1590/1414-431X20199093
4. Smith CA, Levett KM, Collins CT, Armour M, Dahlen HG. Massage for pain management in labour. *Cochrane Database Syst Rev.* 2018;3(3):CD009290. https://doi.org/10.1002/14651858.CD009290.pub3
5. Nori W, Plooij C, Kurniati A, et al. Non-pharmacological pain management in labor: a systematic review. *J Clin Med.* 2023;12(23):7203. https://doi.org/10.3390/jcm12237203
6. Buckley S, Uvnäs-Moberg K, Pajalic Z, et al. Maternal and newborn plasma oxytocin levels during physiological childbirth. *BMC Pregnancy Childbirth.* 2023;23:137. https://doi.org/10.1186/s12884-022-05221-w
7. Bohren MA, Hofmeyr GJ, Sakala C, Fukuzawa RK, Cuthbert A. Continuous support for women during childbirth. *Cochrane Database Syst Rev.* 2017;7(7):CD003766. https://doi.org/10.1002/14651858.CD003766.pub5
8. Laughon SK, Berghella V, Reddy UM, et al. Neonatal and maternal outcomes with prolonged second stage of labor. *Obstet Gynecol.* 2014;124(1):57-67. https://doi.org/10.1097/AOG.0000000000000278
9. Mahalan N, Smitha MV. Effect of audio-visual therapy on pain and anxiety in labor: a randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol X.* 2023;20:100240. https://doi.org/10.1016/j.eurox.2023.100240
10. Zhu R, Pan Q, Cao X. Comparisons of nonpharmaceutical analgesia and pharmaceutical analgesia in labor. *Immun Inflamm Dis.* 2023;11:e869. https://doi.org/10.1002/iid3.869
11. Feng Y, Zhu F, Zhang J, et al. Efficacy of different strategies for reducing labor pain: a Bayesian analysis. *Medicine (Baltimore).* 2024;103(20):e37594. https://doi.org/10.1097/MD.0000000000037594
12. Silva CBO, Rodrigues KMD, Zoldan C, Nomura RMY, Araújo Júnior E, Peixoto AB. Nonpharmacological methods to reduce pain during active labor in a real-life setting. *Rev Bras Ginecol Obstet.* 2023;45(1):3-10. https://doi.org/10.1055/s-0042-1759629
13. Navarro-Prado S, Sánchez-Ojeda MA, Marmolejo-Martín J, et al. Cultural influence on the expression of labour-associated pain. *BMC Pregnancy Childbirth.* 2022;22:836. https://doi.org/10.1186/s12884-022-05173-1
14. Lemos A, Amorim MMR, Dornelas de Andrade A, et al.

Pushing/bearing down methods for the second stage of labour. *Cochrane Database Syst Rev.* 2017;3(3):CD009124. https://doi.org/10.1002/14651858.CD009124.pub3
15. Fraser DM, Cooper MA. Evidence-based midwifery practice and maternal outcomes. *Midwifery.* 2020;85:102683. https://doi.org/10.1016/j.midw.2020.102683
16. Czech I, Fuchs P, Fuchs A, et al. Pharmacological and non-pharmacological methods of labour pain relief. *Int J Environ Res Public Health.* 2018;15(12):2792. https://doi.org/10.3390/ijerph15122792
17. Yee LM, Sandoval G, Bailit J, et al. Maternal and neonatal outcomes with early compared with delayed pushing. *Obstet Gynecol.* 2016;128(5):1039-1047. https://doi.org/10.1097/AOG.0000000000001683
18. Montfort E, Nallet C, Cot S, et al. Active second-stage duration under 15 minutes and maternal-neonatal outcomes. *Am J Obstet Gynecol.* 2025;233(2):247.e1-247.e10. https://doi.org/10.1016/j.ajog.2025.12.040
19. Zhang J, Landy HJ, Branch DW, et al. Contemporary patterns of spontaneous labor. *Obstet Gynecol.* 2010;116(6):1281-1287. https://doi.org/10.1097/AOG.0b013e3181fdef6e
20. Bohren MA, Vogel JP, Hunter EC, et al. The mistreatment of women during childbirth in health facilities globally. *PLoS Med.* 2015;12(6):e1001847. https://doi.org/10.1371/journal.pmed.1001847
21. Elgzar WT, Mabrouk M, Izett-Kerr R, et al. Utilization of non-pharmacological labor pain relief methods. *Reprod Health.* 2024;21:108. https://doi.org/10.1186/s12978-023-01737-2
22. Rosmiarti, Ria G, Maya A, Jamalluddin SB. Murotal Al-Quran therapy on decreasing labor pain and anxiety. *Enferm Clin.* 2020;30(suppl 5):110-114. https://doi.org/10.1016/j.enfcli.2019.11.034
23. Tannous AM, Warffuel J, Van Backle AS, et al. An evidence-based approach to vaginal birth. *O&G Open.* 2024;1(3):24. https://doi.org/10.1097/OG9.0000000000000024
24. McCauley M, Actis Danna V, Mrema D, et al. Healthcare providers' knowledge and attitudes regarding pain relief in labor. *BMC Pregnancy Childbirth.* 2018;18:444. https://doi.org/10.1186/s12884-018-2076-7
25. World Health Organization. *Managing Complications in Pregnancy and Childbirth: A Guide for Midwives and Doctors*. WHO; 2017. https://apps.who.int/iris/handle/10665/255760
26. World Health Organization. *WHO Recommendations: Intrapartum Care for a Positive Childbirth Experience.* WHO; 2018.