an idea health journal
ISSN (online): 2797-0604

Volume 6 No 4, Page 676-688
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OPEN ACCESS

Effect of an Integrated Complementary Childbirth Care Model on Neonatal Outcomes Care: A Quasi Experimental Study

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Article Info:
Received: 16 May, 2026
Revised: 28 July, 2026
Accepted: 02 August, 2026
Available online: 20 August 2026

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How to Cite:
Mutaharoh S, Astuti DP, Sumarni S. Effect of an Integrated Complementary Childbirth Care Model on Neonatal Outcomes Care: A Quasi Experimental Study. An Idea Health Journal.2026; 6(04): 676-688.
https://doi.org/10.53690/ihj.v6i04.821

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Abstract

Background: Neonatal outcomes are key indicators of the quality of childbirth services and newborn adaptation. Complementary childbirth approaches, including hypnobirthing relaxation techniques, murottal therapy, and rebozo techniques, have been shown to enhance maternal comfort and facilitate a physiological labor process. The present study analyzed the effect of a complementary childbirth service model on neonatal outcomes.

Methods: A quasi-experimental posttest-only control group design was employed, involving 60 women in labor (30 per group) recruited through purposive sampling without randomization. The intervention group received integrated complementary childbirth care, whereas the control group received standard care. Neonatal outcomes assessed included initial newborn assessment, APGAR score, blood glucose level within the first 24 hours after birth, and neonatal temperature status. Categorical outcomes were analyzed using Fisher's exact test, and the intervention effect was estimated using risk ratio (RR) with a 95% confidence interval (CI) ($\alpha = 0.05$).

Result: No significant differences were observed in initial newborn assessment, APGAR scores, or blood glucose levels between groups (all $p = 1.000$). However, neonatal vital signs differed significantly ($p = 0.005$), with the intervention group exhibiting a lower incidence of hypothermia (50.0% vs. 86.7%; RR = 0.58, 95% CI: 0.35).

Conclusion: The integrated complementary childbirth care model was associated with improved neonatal temperature regulation, specifically a reduced incidence of hypothermia. These findings should be interpreted with caution due to the purposive sampling, non-randomized allocation, and posttest-only study design.

Keywords: Rebozo, Complementary Therapy, Neonatal.

BACKGROUND

The neonatal period is the most dramatic phase of physiological change throughout the human lifespan. The respiratory and cardiovascular systems undergo immediate adaptation after birth, whereas other organ systems gradually adjust to extrauterine conditions (1). This neonatal transition requires coordinated physiological processes, including stabilization of breathing, circulation, temperature regulation, and metabolic adaptation, which determine early newborn well-being (2).

Initial assessment, including APGAR score, vital signs examination, and blood glucose measurement in newborns, is important for evaluating the neonatal transition from intrauterine to extrauterine life and determining the need for further interventions. The APGAR score remains the standard tool for assessing the newborn's condition immediately after birth and the response to resuscitation, although it is not a sole predictor of long-term outcomes (3). Among these parameters, body temperature, cardiovascular adaptation, respiratory status, and glucose regulation are particularly important because disturbances in the early neonatal period may indicate difficulties with the physiological transition (1, 2).

The process of neonatal adaptation is influenced not only by intrinsic newborn factors but also by maternal conditions during labor. Maternal stress, anxiety, and excessive pain may activate neuroendocrine responses involving increased catecholamine release, which can affect uterine activity, maternal hemodynamic responses, and placental circulation. However, the direct relationship between maternal psychological conditions and neonatal outcomes remains complex, and current evidence mainly supports improvements in maternal comfort rather than definitive neonatal benefits (4).

Non-pharmacological interventions during childbirth have been increasingly explored to improve maternal psychological and physical experiences (5). Hypnobirthing is a relaxation-based intervention that combines breathing techniques, visualization, and self-control strategies to reduce fear and perceived pain during labor. Previous studies have demonstrated its benefits in reducing labor anxiety, pain intensity, and improving maternal confidence during childbirth. Nevertheless, evidence regarding its direct effects on neonatal outcomes remains limited (5). Infants born to mothers who reported anxiety were more likely to experience delivery complications, require admission to neonatal care units, have lower APGAR scores, and experience longer hospital stays (6).

Murottal therapy, or listening to Qur'anic recitation during pregnancy or labor, has been investigated as a culturally appropriate relaxation intervention, particularly in Muslim communities. Previous studies have reported reductions in maternal anxiety and improvements in relaxation responses following murottal exposure. Although some studies have explored physiological changes associated with this intervention, evidence regarding its effects on immediate neonatal indicators remains limited and warrants further investigation (7, 8).

The rebozo technique is a traditional non-pharmacological approach involving rhythmic movements, pelvic mobilization, and relaxation using a cloth. Studies suggest that rebozo may improve maternal comfort, reduce labor pain, and support fetal positioning during labor (8, 9). However, as with other complementary approaches, available evidence has primarily focused on maternal outcomes, while the potential influence on neonatal adaptation remains unclear (9, 10).

Conceptually, an integrated complementary childbirth care model combining hypnobirthing, murottal therapy, and rebozo techniques may influence neonatal adaptation through indirect pathways. These interventions primarily target maternal psychological and physiological responses by promoting relaxation, reducing perceived stress and pain, and improving childbirth experiences. Such maternal benefits may contribute to a more physiological labor process; however, their direct effects on neonatal adaptation remain uncertain. Current evidence regarding complementary relaxation and childbirth interventions has demonstrated more consistent effects on maternal anxiety, fear, pain perception, and birth experience, while evidence supporting direct improvements in neonatal outcomes remains limited

and requires further investigation. Therefore, the proposed pathway between integrated complementary childbirth care and neonatal outcomes should be considered a theoretical framework rather than an established causal relationship (11).

Although evidence supports the positive effects of each intervention on maternal anxiety, pain, and childbirth experience, research evaluating the combined effects of hypnobirthing, murottal therapy, and rebozo techniques on immediate neonatal indicators remains limited. Most existing studies have focused on maternal outcomes or examined single interventions rather than an integrated care model. Furthermore, quantitative studies evaluating neonatal parameters such as initial newborn assessment, APGAR score, blood glucose levels, and vital signs using a quasi-experimental approach are still scarce.

Therefore, a research gap exists regarding whether an integrated complementary childbirth care model can influence early neonatal adaptation indicators. Evaluating this model in primary healthcare settings is important for generating evidence regarding its potential contribution to newborn care practices while maintaining an appropriate interpretation of the findings.

Based on this background, this study aimed to examine the effect of an integrated complementary childbirth care model consisting of hypnobirthing, murottal therapy, and rebozo techniques on early neonatal indicators, including initial newborn assessment, APGAR score, blood glucose levels, and neonatal vital signs. The findings are expected to provide preliminary evidence regarding the potential association between complementary childbirth care and neonatal adaptation, while contributing to the development of evidence-based maternity care in primary healthcare facilities.

METHODS

Study Design

A quantitative quasi-experimental design with a posttest-only control group was utilized. The study population comprised women in labor at the Klirong 2 Community Health Center, who were divided into intervention and control groups. Group allocation was based on clinical availability and eligibility criteria without randomization, introducing potential selection bias as a study limitation. The intervention group received a complementary childbirth care model, while the control group received standard maternity care in accordance with established procedures. The complementary care model included three standardized components: hypnobirthing relaxation techniques, murottal therapy, and rebozo techniques. Interventions were administered during the active phase of labor by healthcare providers trained and certified in complementary care. The independent variable was the complementary childbirth care model, and the dependent variables were neonatal outcomes, including initial newborn assessment, APGAR score, blood glucose levels within the first 24 hours, and neonatal vital signs. Outcome measurements were conducted post-delivery to compare differences between groups.

Participants /Sample

The research was conducted at Klirong 2 Community Health Center. The study population included all women in labor and their newborns who delivered at the health center in 2024, for a total of 334 deliveries.

The sample comprised intervention and control groups recruited from the same healthcare setting. Purposive sampling was employed based on predefined inclusion and exclusion criteria. Because recruitment was non-randomized, baseline characteristics were assessed to identify potential differences that could influence neonatal outcomes. Recruitment occurred from June to July 2025, resulting in 60 participants: 30 in the intervention group and 30 in the control group. The intervention group received the complementary childbirth care model, while the control group received standard childbirth care without complementary interventions.

Inclusion criteria were term pregnant women willing to participate with no history of preeclampsia, total placenta previa, or placental abruption. Exclusion criteria were mothers with acute intrapartum complications requiring immediate medical intervention, incomplete intervention procedures, refusal to participate, or newborns requiring advanced resuscitation after birth.

Intervention

The independent variable was the complementary childbirth care model consisting of hypnobirthing relaxation techniques, murottal therapy, and rebozo techniques. The intervention protocol was standardized as follows: hypnobirthing relaxation was provided through guided breathing and relaxation techniques during labor; murottal therapy was provided through Qur'anic recitation using an audio device during the relaxation period; and rebozo techniques were performed through gentle pelvic movement and positioning support during labor. All interventions were administered according to the same clinical protocol by trained providers. The dependent variables were neonatal outcomes, including initial newborn assessment, APGAR score, blood glucose level, and neonatal vital signs. The initial newborn assessment was evaluated based on the newborn's general clinical condition immediately after birth. APGAR scores were assessed at the first and fifth minutes after birth and categorized as normal (7–10) and abnormal (<7).

Blood glucose levels were measured within the first 24 hours after birth and categorized as normal or hypoglycemic based on standard neonatal clinical criteria. Neonatal vital signs included body temperature measurement. Temperature was categorized as normal (≥36.5°C) or hypothermia (<36.5°C) according to neonatal thermal care guidelines.

Data Collection

Data collection was conducted from June to July 2025 at Klirong 2 Community Health Center. Data were obtained directly from women in labor and newborns through observation, clinical examination, and documentation of measurement results using structured observation sheets. Prior to data collection, all participants received detailed explanations of the study objectives, procedures, benefits, and potential risks, and were subsequently asked to sign an informed consent form as evidence of their willingness to participate. Participants in the intervention group received the complementary childbirth care model consisting of hypnobirthing relaxation, murottal therapy, and rebozo techniques administered by certified healthcare providers. The timing, duration, and sequence of each intervention component were recorded to ensure intervention fidelity and consistency. The control group received standard maternity care in accordance with routine clinical procedures. Neonatal outcome data were collected immediately after birth and continued through 24 hours of life. The initial newborn assessment and APGAR score were evaluated after delivery. Blood glucose levels were measured within the first 24 hours using a calibrated glucose monitoring device. Neonatal temperature was measured using calibrated instruments according to standard clinical procedures. Additional maternal and neonatal characteristics, including maternal age, parity, gestational age, birth weight, newborn sex, and mode of delivery, were collected to describe baseline characteristics and assess comparability between groups. All collected data were reviewed for completeness and accuracy before statistical analysis.

Data Analysis

Data analysis was performed to summarize participant characteristics and neonatal outcomes. Data analysis was performed to summarize participant characteristics and neonatal outcomes. Categorical variables were presented as frequencies and percentages. Differences in neonatal outcomes between the intervention and control groups were analyzed using Fisher's exact test due to the presence of small cell frequencies. The effect size of the intervention was estimated using risk ratio (RR) with a

95% confidence interval (CI) to determine the magnitude of differences between groups. A significance level of $\alpha = 0.05$ was applied, and statistical significance was determined at $p < 0.05$.

Ethical Consideration

Based on the Ethical Clearance Certificate issued by the Health Research Ethics Committee of Universitas Muhammadiyah Gombong, this study was declared ethically approved under Protocol Number 21124000031 and Ethical Clearance Number 105.6/II.3.AU/F/KEPK/VI/2025. The study underwent an ethical review process and was determined to comply with health research ethical standards in accordance with the 2011 WHO 7 Standards, including social value, scientific validity, fair distribution of burdens and benefits, risk management, protection against inducement or exploitation, confidentiality and privacy, and informed consent, with reference to the 2016 CIOMS Guidelines. The ethical approval certificate was valid from June 18, 2025, to June 18, 2026.

RESULT AND DISCUSSION

RESULT

Demographic Characteristics of Participants

All distributed questionnaires were fully completed and returned, yielding a 100% response rate. (Table 1).

Table 1. Characteristics of Women in Labor (n=60)

No	Characteristics	Intervention Group		Control Group	
		N	%	N	%
1	Maternal age				
	< 20 years	0	0	2	6,67
	20-35 years	20	66,67	26	86,67
	>35 years	10	33,33	2	6,66
	Total	30	100	30	100
2	Parity				
	Primiparous	8	26,67	14	46,67
	Multiparous	20	66,67	16	53,33
	Grand multiparous	2	6,66	0	0
	Total	30	100	30	

Table 1 presents the maternal characteristics of participants in the intervention and control groups. The majority of mothers in both groups were within the reproductive age range of 20–35 years, accounting for 66.7% in the intervention group and 86.7% in the control group. In terms of parity, multiparous mothers constituted the largest proportion in both groups (66.7% in the intervention group and 53.3% in the control group). However, differences in maternal age distribution were observed, with a higher proportion of mothers aged >35 years in the intervention group compared with the control group.

Neonatal Outcome

Neonatal outcomes were analyzed to compare newborn conditions in the intervention and control groups. Outcomes assessed included initial newborn assessment, APGAR score, blood glucose within the first 24 hours, and neonatal temperature. Categorical differences were evaluated using Fisher's exact test, with results shown in Table 2.

Table 2. Neonatal Outcomes

Neonatal Outcomes	Intervention Group		Control Group		Total		p-Value	RR (95% CI)
	N	%	N	%	N	%		
Initial Assessment of Newborns								
Normal	30	100%	29	96.7%	59	98.3%	1.000	-
Abnormal	0	0%	1	3.3%	1	1.67%		
Total					60	100		
APGAR score								
Normal	30	100%	29	96.7%	59	98.3%	1.000	-
Abnormal	0	0%	1	3.3%	1	1.67%		
Total					60	100		
Blood Glucose Level (within first 24 hours)								
Normal	29	96.7%	29	96.7%	58	96.67%	1.000	-
Hypoglycemia	0	0%	1	3.3%	1	1.67%		
Hyperglycemia	1	3.3%	0	0%	1	1.67%		
Total					60	100		
Vital Signs								
Normal	15	50%	4	13.3%	19	31,67%	0.005	0.58 (0.35-0.96)
Hypothermia	15	50%	26	86.7%	41	68.3%		
Total					60	100		

Table 2 shows that all newborns in the intervention group had normal initial assessment results (100.0%), while one newborn in the control group (3.3%) was categorized as abnormal. Fisher's exact test indicated no statistically significant difference between the intervention and control groups (p=1.000). A similar trend was observed for APGAR scores: all newborns in the intervention group had normal scores (100.0%), compared with 29 newborns (96.7%) in the control group. This difference was also not statistically significant (p=1.000).

Within the first 24 hours after birth, most newborns in both groups exhibited normal blood glucose levels, with 29 newborns (96.7%) in each group. One newborn in the control group (3.3%) experienced hypoglycemia, and one newborn in the intervention group (3.3%) experienced hyperglycemia. Fisher's exact test indicated no significant difference in blood glucose status between the groups (p=1.000).

A significant difference in neonatal temperature status was found between the intervention and control groups (p=0.005). In the intervention group, 15 newborns (50.0%) had normal temperatures and 15 (50.0%) experienced hypothermia. In the control group, 4 newborns (13.3%) had normal temperatures, while 26 (86.7%) experienced hypothermia. The risk of hypothermia was lower in the intervention group compared to the control group (RR=0.58; 95% CI: 0.35–0.96). These results indicate that the integrated complementary childbirth care model was associated with a reduced incidence of neonatal hypothermia. However, these findings should be interpreted with caution because other neonatal thermal care practices and environmental factors may also affect newborn temperature regulation.

DISCUSSION

Initial Assessment of Newborns

Based on the findings of this study, all newborns in the intervention group had normal initial newborn assessment results (100.0%), while one newborn in the control group (3.3%) was categorized as abnormal. Fisher's exact test indicated no statistically significant difference between the intervention and control groups (p=1.000). These findings suggest that the integrated complementary childbirth care model, consisting of hypnobirthing relaxation techniques, murottal therapy, and rebozo techniques, was not associated with differences in initial newborn assessment outcomes compared with standard maternity care. The absence of significant differences suggests that the intervention did not adversely affect early neonatal adaptation; however, it does not provide sufficient evidence to conclude that the intervention directly improves neonatal adaptation.

The initial assessment of newborns is an essential component of neonatal transition evaluation from intrauterine to extrauterine life. This assessment focuses on respiratory effort, heart rate, muscle tone, reflex response, and skin color to determine whether the newborn requires immediate support or resuscitation. However, early neonatal adaptation is primarily influenced by fetal oxygenation, gestational age, maternal and obstetric conditions, and intrapartum complications rather than by maternal relaxation interventions alone (12).

The participants' relatively low-risk characteristics may explain the lack of significant differences in initial newborn assessments in this study. Most term newborns without major complications complete physiological adaptation after birth, resulting in similar neonatal conditions across groups. In addition, the integrated complementary childbirth care model may primarily influence maternal psychological comfort and childbirth experience rather than directly altering immediate neonatal physiological parameters. The World Health Organization emphasizes that positive childbirth care should support both the physical and psychological needs of women while maintaining evidence-based clinical practices for maternal and newborn safety (13, 14).

Although complementary approaches such as relaxation techniques, breathing exercises, and supportive care during labor may reduce maternal anxiety and improve childbirth experiences, the pathway linking maternal psychological conditions to neonatal outcomes remains complex. In this study, potential mediating factors such as maternal anxiety level, pain intensity, maternal stress response, labor duration, skin-to-skin contact, early initiation of breastfeeding, and immediate thermal care practices were not measured. Therefore, the interpretation that complementary childbirth interventions directly influence neonatal adaptation should be approached with caution. Previous systematic evidence indicates that relaxation interventions show stronger effects on maternal outcomes, while adequately powered studies are still needed to determine their effects on neonatal physiological outcomes (15, 16).

APGAR Score

The present study found that all newborns in the intervention group had normal APGAR scores (100.0%), whereas one newborn in the control group (3.3%) had an abnormal APGAR score. Fisher's exact test showed no statistically significant difference between the two groups (p=1.000). This finding suggests that the integrated complementary childbirth care model was not associated with measurable differences in APGAR scores compared with standard maternity care.

The APGAR score remains one of the most widely used clinical tools for evaluating newborn condition immediately after birth. It provides information regarding respiratory effort, heart rate, muscle tone, reflex response, and skin color during the early neonatal transition. However, APGAR score interpretation should be considered in the clinical context, as it is primarily designed to identify newborns requiring immediate assessment and resuscitation rather than to detect subtle effects of maternal interventions. A recent review of APGAR score validity highlighted that although APGAR

remains clinically valuable, it should not be considered a comprehensive indicator of neonatal health outcomes (17).

The lack of significant differences in APGAR scores in this study may be attributed to the high proportion of normal APGAR scores in both groups. In low-risk deliveries, most newborns achieve adequate physiological adaptation, resulting in limited variability and reduced statistical power to detect small intervention effects (18).This finding is consistent with recent evidence showing that relaxation interventions during pregnancy and labor have inconsistent effects on APGAR scores. Abera et al. (2024) reported that relaxation interventions may provide benefits for maternal mental health and certain birth outcomes; however, effects on newborn indicators, such as the APGAR score, remain inconsistent and require further investigation with larger sample sizes (4).

Acute obstetric and neonatal conditions, including fetal distress, impaired oxygenation, prematurity, prolonged labor, and intrapartum complications, more strongly influence the APGAR score. Therefore, the absence of APGAR differences between groups in this study should not be interpreted as evidence that the complementary childbirth care model improves neonatal vitality, but rather that the intervention did not negatively affect immediate neonatal condition (15, 16).

Blood Glucose Levels within the First 24 Hours

Regarding neonatal blood glucose levels within the first 24 hours after birth, most newborns in both groups were classified as having normal glucose levels: 29 (96.7%) in the intervention group and 29 (96.7%) in the control group. One newborn in the control group (3.3%) experienced hypoglycemia, while one newborn in the intervention group (3.3%) was categorized as having hyperglycemia. Fisher's exact test showed no statistically significant difference in blood glucose status between the intervention and control groups ($p=1.000$). These findings indicate that the integrated complementary childbirth care model was not associated with differences in neonatal blood glucose regulation during the first 24 hours of life.

Neonatal glucose regulation is an essential component of metabolic adaptation during the transition from intrauterine to extrauterine life. Immediately after birth, newborns experience a physiological decrease in glucose concentration due to the interruption of placental glucose supply, followed by gradual adaptation through glycogenolysis, gluconeogenesis, and hormonal regulation. Most healthy term newborns can maintain glucose homeostasis during this transitional period, and transient fluctuations in blood glucose levels may occur without indicating pathological conditions. Recent evidence highlights that neonatal hypoglycemia is a complex condition influenced by multiple factors, including gestational age, birth weight, maternal diabetes, perinatal stress, and metabolic adaptation capacity rather than by childbirth intervention alone (19).

The absence of a significant difference in blood glucose levels between groups in this study may be related to the relatively homogeneous characteristics of the newborns, particularly the predominance of term infants without major metabolic risk factors. The complementary childbirth care model applied in this study primarily focused on maternal relaxation and comfort during labor; therefore, its potential influence on neonatal glucose regulation is indirect. Although maternal stress reduction may theoretically affect fetal and neonatal physiology through neuroendocrine pathways, this study did not measure maternal stress hormones, anxiety levels, labor duration, feeding initiation, or other mediating variables. Therefore, the mechanism linking complementary childbirth care with neonatal glucose regulation remains uncertain (19).

Previous studies have shown that relaxation-based interventions during pregnancy and childbirth are more consistently associated with maternal psychological outcomes, such as reduced anxiety, improved coping, and an enhanced childbirth experience. In contrast, evidence regarding direct effects on neonatal metabolic outcomes remains limited. Therefore, the current findings should be interpreted as evidence that complementary childbirth care did not produce measurable differences in neonatal

blood glucose levels, rather than evidence that the intervention improves neonatal metabolic stability. Further studies with larger sample sizes and adjustment for important neonatal and maternal confounding factors are required to clarify this relationship (20, 21).

Neonatal temperature regulation is closely linked to glucose metabolism because maintaining body temperature requires increased energy expenditure. Hypothermia may increase glucose utilization through activation of non-shivering thermogenesis and may subsequently increase the risk of hypoglycemia, particularly among vulnerable newborns. However, although the present study identified a significant difference in neonatal vital signs, the relationship between hypothermia and glucose abnormalities was not specifically analyzed; therefore, this mechanism cannot be confirmed based on the current data. Adequate thermal care practices, including immediate drying, maintaining ambient temperature, skin-to-skin contact, and early initiation of breastfeeding, remain important components of neonatal care to support both thermal and metabolic stability (22).

Overall, the findings demonstrate that the integrated complementary childbirth care model was not associated with differences in neonatal blood glucose outcomes during the first 24 hours of life. Future research should include larger multicenter samples and evaluate potential confounding variables, such as birth weight, gestational age, maternal metabolic conditions, feeding practices, and neonatal thermal management, to better understand the factors influencing neonatal glucose adaptation.

Vital Signs

In this study, neonatal vital signs, particularly body temperature, showed a statistically significant difference between the intervention and control groups. Fifteen newborns (50.0%) in the intervention group had normal body temperature, compared with only four newborns (13.3%) in the control group. Conversely, hypothermia was observed in 15 newborns (50.0%) in the intervention group and 26 newborns (86.7%) in the control group. Fisher's exact test showed a significant difference between groups ($p=0.005$), with a risk ratio (RR) of 0.58 (95% CI: 0.35–0.96), indicating that newborns in the intervention group had a lower risk of hypothermia than those receiving standard care. However, this finding should be interpreted cautiously because multiple factors beyond the childbirth intervention itself influence neonatal temperature.

Neonatal temperature regulation is a critical component of physiological adaptation after birth. Newborns are vulnerable to heat loss due to a relatively large body surface area, limited subcutaneous fat stores, immature thermoregulatory mechanisms, and dependence on environmental conditions. Neonatal hypothermia is associated with increased risks of adverse outcomes, including hypoglycemia, respiratory instability, infection, prolonged hospitalization, and increased neonatal morbidity. Therefore, maintaining normal body temperature immediately after birth is an essential component of high-quality newborn care. The stability of newborn vital signs, especially body temperature, is crucial for neonatal adaptation. Neonatal hypothermia is associated with an increased risk of morbidity, including hypoglycemia, respiratory distress, and increased need for intensive care. The significant findings in the vital signs variable in this study suggest that complementary interventions provided to mothers (relaxation techniques, murottal therapy, and the rebozo technique) may contribute to a calmer and more efficient labor process, thereby facilitating timely initiation of newborn care practices that support thermal regulation, such as earlier skin-to-skin contact and reduced delays in immediate postpartum care. Recent literature emphasizes the strong association between neonatal hypothermia and adverse clinical outcomes, including increased odds of NICU admission, hypoglycemia, and longer hospital stays. Therefore, the reduction in the incidence of hypothermia in the intervention group is an important finding with implications for midwifery practice in primary care settings (23).

The significant difference in neonatal temperature observed in this study suggests that the integrated complementary childbirth care model may be associated with improved thermal outcomes;

however, a direct causal relationship cannot be established. The intervention components (hypnobirthing, murottal therapy, and rebozo techniques) primarily target maternal psychological comfort and labor experience rather than neonatal thermoregulation directly. The observed difference may also be influenced by other immediate newborn care practices, such as early skin-to-skin contact, early breastfeeding initiation, immediate drying, wrapping, ambient delivery room temperature, and timing of temperature measurement, which were not fully controlled in this study.

Immediate thermal care practices have been consistently identified as important determinants of neonatal temperature stability. Skin-to-skin contact between mother and newborn immediately after birth promotes heat transfer, reduces heat loss, supports cardiorespiratory stability, and facilitates early initiation of breastfeeding. Therefore, the lower incidence of hypothermia in the intervention group may reflect not only the possible contribution of maternal relaxation during labor but also differences in the implementation of immediate newborn care practices. Because these mediating factors were not measured, the mechanism underlying the observed association remains uncertain (24).

The high prevalence of hypothermia in both groups, particularly in the control group (86.7%), should also be considered as a quality of care issue rather than interpreted solely as an intervention effect. This finding suggests gaps in the implementation of thermal care, such as delayed drying, inadequate wrapping, limited skin-to-skin contact, inappropriate room temperature, or delayed initiation of breastfeeding. Therefore, strengthening evidence-based thermal care practices in delivery settings remains essential regardless of the type of childbirth approach provided. Recent studies have emphasized that prevention of neonatal hypothermia requires a comprehensive bundle approach, including maintaining delivery room temperature, immediate drying, appropriate clothing and wrapping, skin-to-skin contact, and early breastfeeding. Although complementary childbirth interventions may create a calmer maternal environment that could support better implementation of newborn care, the current study did not directly evaluate these care processes. Therefore, further studies are needed to investigate whether complementary childbirth models influence neonatal temperature by improving immediate newborn care practices (25).

Relaxation-based childbirth approaches, including hypnobirthing, have been reported to improve maternal psychological outcomes, reduce anxiety, and enhance maternal coping during labor. However, the relationship between improved maternal psychological status and neonatal temperature regulation remains indirect and requires further investigation. In the present study, maternal anxiety, stress hormone levels, labor duration, and immediate newborn care practices were not measured; therefore, the potential pathway between complementary childbirth care and neonatal thermoregulation remains hypothetical. Future research should incorporate these variables to clarify the mechanisms (26).

CONCLUSION

The integrated complementary childbirth care model, which included hypnobirthing, murottal therapy, and rebozo techniques, did not yield significant differences in initial newborn assessments, Apgar scores, or neonatal blood glucose levels compared with standard maternity care. However, the intervention was linked to a significantly lower risk of neonatal hypothermia (RR = 0.58; 95% CI: 0.35–0.96; $p = 0.005$), suggesting a potential protective effect on neonatal thermoregulation in the early postnatal period. Due to the quasi-experimental design, purposive sampling, and lack of control for confounding factors related to thermal care, these results should be interpreted with caution. Larger randomized controlled studies are recommended to confirm the effectiveness of this care model and to clarify the mechanisms behind its association with neonatal thermal outcomes.

ACKNOWLEDGEMENT

The authors sincerely thank the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia for financial support through the Beginner Lecturer Research Grant (Penelitian Dosen Pemula/PDP) program. We also thank Puskesmas Klirong 2, all study participants, and everyone who contributed to the success of this research.

AUTHOR'S CONTRIBUTION STATEMENT

Author 1 contributed to study conceptualization, supervised research implementation, drafted the initial manuscript, and participated in manuscript review and revision. Author 2 was responsible for data collection, intervention implementation, data entry, and preparation of the initial manuscript draft. Author 3 contributed to statistical analysis, research methodology development, data interpretation, and manuscript review and revision. All authors have read and approved the final version of the manuscript for publication.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The Authors acknowledge the use of AI-Assisted Technologies to support language improvement, improve clarity, and improve the overall readability and structure of the manuscript.

FUNDING

This research received funding support from the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia through the *Penelitian Dosen Pemula (PDP)* grant program.

DATA AVAILABILITY

The dataset generated and analyzed during the current study is available from the corresponding author upon request.

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