



The Effectiveness of Kangaroo Mother Care on Thermoregulation Stabilization in Low Birth Weight Infants

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ABSTRACT

Introduction: Low birth weight (LBW) infants are at high risk of hypothermia due to immature thermoregulation mechanisms. Kangaroo Mother Care (KMC), characterized by continuous skin-to-skin contact, is recommended as a simple and cost-effective intervention to maintain thermal stability. This study aimed to determine the effectiveness of KMC in stabilizing body temperature among LBW infants in a perinatology ward. Methods: A quasi-experimental study with a one-group pretest–posttest design was conducted from December 2022 to January 2023 in the Perinatology Room of Tangerang Hospital, Tangerang City. A total of 40 LBW infants were recruited using total sampling. Body temperature was measured using a digital thermometer before and after KMC implementation. Data were analyzed using a paired t-test with a significance level of $p < 0,05$. Results: Prior to KMC, 87,5% of infants experienced hypothermia, while only 12,5% had normal body temperature. After KMC intervention, 100% of infants achieved normal temperature ranges (36,5°C–37,3°C). Statistical analysis showed a significant difference in mean body temperature before and after KMC ($p = 0,001$), indicating that KMC effectively improved thermoregulation in LBW infants. Conclusion: Kangaroo Mother Care significantly enhances thermal stability in low birth weight infants and can be implemented as a safe, non-invasive, and low-cost intervention in perinatology settings. Integrating KMC into standard neonatal care protocols may contribute to reducing hypothermia-related complications and improving neonatal outcomes.

Keywords: Low Birth Weight, Kanguru Methods, Thermoregulation, Body temperature

1. INTRODUCTION

Weight is a sign that shows how healthy a newborn baby is. The average weight of a full-term baby (gestational age 37 to 41 weeks) is 3200 grams (Devaguru, Gada, Potpalle, Dinesh Eshwar, & Purwar, 2023). In general, babies who are born with low birth weight or who are very heavy (3800 grams or more) are more likely to have health issues. By the late 1960s, it was widely believed that low birth weight does not always mean a baby was born too early. Not all low birth weight infants with a

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birth weight below 2500 grams are born prematurely (Herwanto, Hudiyanto, & Muhammad, 2024). Some LBW babies who weigh 2500 grams or more at birth aren't born at term. Low birth weight can happen for several reasons, like having too little amniotic fluid during pregnancy, carrying more than one baby, bleeding before delivery, and problems during pregnancy such as high blood pressure-related issues or the amniotic sac breaking too early (Putri et al., 2025). The consequences can include meconium aspiration syndrome, which causes breathing difficulties in infants, symptomatic hypoglycemia, particularly in males, hyaline membrane disease due to incomplete or insufficient pulmonary surfactant leading to alveolar collapse, neonatal asphyxia, and hyperbilirubinemia (Olicker, Raffay, & Ryan, 2021).

Globally, LBW prevalence ranges between 15–20%, with higher rates in low- and middle-income countries (Pudasainee-Kapri, 2025). In Indonesia, LBW continues to contribute substantially to neonatal complications. However, beyond epidemiological statistics, the critical issue is not merely prevalence but effective thermoregulation management in routine clinical settings (Hossain et al., 2025). Data The 2021 Indonesian Health Profile data shows that despite a decline in the prevalence of LBW from 3.4% in 2019 to 2.5% in 2021, LBW remains the leading cause of neonatal mortality, contributing to 34.5% of total newborn deaths (Kalsum, Susanti, & Bidan, 2025).

Kangaroo Mother Care (KMC), characterized by continuous skin-to-skin contact between mother and infant, is recommended by the World Health Organization as standard care for stable LBW infants (Pratomo & Zainita, 2021). Mechanistically, KMC facilitates conductive heat transfer, reduces heat loss, enhances autonomic stability, and promotes physiological homeostasis. Although systematic reviews and meta-analyses confirm KMC benefits, implementation fidelity varies across healthcare facilities (Cristóbal Cañadas, Parrón Carreño, Sánchez Borja, & Bonillo Perales, 2022). LBW infants who receive *skin to skin contact* (SSC) have lower average respiratory and pain levels, as well as higher oxygen saturation, temperature, and head circumference growth (Ningtyas, 2025).

The role of nurses in treating LBW babies according to theory is to stabilize their temperature, keep them warm, keep their airways clean and open, and immediately assess their condition, especially their vital signs (Sari, Dewi, & Rusmeni, 2025). Providing care to keep the baby warm using an incubator or Kangaroo Mother Care (KMC). This allows continuous skin-to-skin contact between the baby and the mother, enabling the baby to receive warmth (at the mother's temperature) through the process of conduction (Bear & Mellor, 2017).

Despite the well-established benefits of Kangaroo Mother Care (KMC) in improving neonatal outcomes, most existing studies primarily focus on mortality reduction and general physiological stabilization in controlled or large-scale settings (Margaretta, 2023). Limited evidence is available regarding the quantitative effect of short-duration KMC sessions on thermoregulation stabilization in routine perinatology ward settings, particularly in Indonesian clinical contexts.

Therefore, this study aims to address this gap by evaluating the effectiveness of a standardized 60-minute KMC intervention in stabilizing body temperature among low birth weight (LBW) infants. The main contribution of this study lies in providing empirical clinical evidence on immediate thermoregulatory response following KMC implementation in a real-world hospital setting, thereby supporting the integration of structured KMC protocols into routine neonatal nursing care, especially in resource-limited environments.

2. METHODS

This study is an experimental study using a quasi-experimental approach. This design uses a one-group pretest-posttest design. This study was conducted from December 4, 2022, to January 9, 2023, in the Perinatology Room of Tangerang Hospital. This study involved 40 samples using total sampling with the following inclusion criteria: 1). LBW infants undergoing treatment with a nasogastric tube (NGT) and infusion, 2). LBW infants aged > 6 hours, 3). Infants in incubators and under light therapy, 4) Clinically stable. Exclusion criteria were infants with invasive devices (CPAP, ventilator, monitor). KMC was administered for 60 minutes per session, once daily, under supervision. Infants were

positioned upright against the mother's chest with continuous skin-to-skin contact. Standard operating procedures were followed to ensure reproducibility. Axillary temperature was measured using a calibrated digital thermometer (accuracy $\pm 0.1^{\circ}\text{C}$). Calibration was verified weekly against a reference clinical thermometer. Measurements were taken immediately before and after each KMC session. Instruments used in this study included: a digital thermometer for axillary temperature measurement; standard operating procedures for KMC (Kangaroo Mother Care); and observation sheets for recording body temperature measurements before and after KMC. Statistical analysis was performed using the T-test with SPSS version 25. Researchers received *ethical approvals* from the Ethics Committee of Tangerang Hospital Number: 445/003-KEP-RSUTNG.

3. RESULTS

Tabel 1. Charateristic Responden (n=40)

Charateristic	Frekuensi (n)	Persentase (%)
Baby's age		
• 1 Day	19	47,5
• 2 Day	9	22,5
• 3 Day	5	12,5
• 4 Day	6	15
• 5 Day	1	2,5
Gender		
• Boy	19	47,5
• Girl	21	52,5

Source: Primery data, 2022

Based on [Table 1](#). shows that most KMC was performed on infants aged 2 days (19 infants, 47,5%), 3 days (5 infants, 12,5%), 4 days (6 infants, 15%), and 5 days (1 infant, 2,5%). Based on gender, more than half were male, namely 21 respondents (52,5%), and a small portion or less than half were female, namely 19 respondents (47,5%).

Tabel 2. Charateristic Responden (n=40)

Charateristic	Frekuensi (n)	Persentase (%)
Temperature before KMC		
• Hipotermi	35	87,5
• Normal	5	12,5
Temperature after KMC		
• Normal	40	100

Source: Primery data, 2022

Based on [Table 2](#), it is known that the body temperature of 35 infants before undergoing Kangaroo Care at Bhakti Asih Hospital in Tangerang City was hypothermic ($35,9^{\circ}\text{C} - 36,4^{\circ}\text{C}$), and 5 infants had normal temperatures ($36,5^{\circ}\text{C}$). After receiving Kangaroo Care at Bhakti Asih Hospital in Tangerang City, 40 infants had normal body temperatures ($36,5^{\circ}\text{C} - 37,3^{\circ}\text{C}$).

Tabel 3. Body Temperature Differences in Low Birth Weight Infants Before and After Kangaroo Care Treatment (n=40)

		Paired Samples Test							
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Temperature before								
	KMC - Temperature after KMC	- .5306	.1925	.0321	-.5957	-.4654	- 16.540	40	.001

Based on [Table 3](#) data, it is known that Mean temperature increased by 0.53°C (95% CI –0.59 to –0.46; $p < 0.001$), so it can be concluded that there is a difference in the body temperature of low birth weight babies before and after kangaroo care in the Perinatology Room. Although the 100% normalization rate appears clinically striking, interpretation should consider the absence of a control group.

4. DISCUSSION

This study demonstrated significant improvement in thermoregulation following 60-minute KMC sessions. The observed increase in temperature can be explained by conductive heat transfer during continuous skin-to-skin contact between the mother and infant.

Kangaroo care is a technique recommended by the WHO (2016) to maintain the temperature of low birth weight babies ([Bear & Mellor, 2017](#)). According to the WHO, kangaroo care consists of continuous skin-to-skin contact between mother and baby, more frequent breastfeeding, and earlier discharge from the hospital. Kangaroo Care (KC) was initiated on the baby's first day of life because the baby was born healthy, and there were no medical indications other than LBW, so KC was immediately implemented ([Mehta, 2025](#)). However, for premature infants or those requiring postnatal care, parents need to wait approximately 3-7 days after the infant's condition stabilizes. Thus, the researchers concluded that infants aged 1 day were more likely to receive KMC because infants born healthy and well were immediately placed in KMC after being reunited with their mothers ([Campbell-Yeo, Disher, Benoit, & Johnston, 2017](#)).

The results of the study show that kangaroo mother care (KMC) has a significant effect on increasing the body temperature of low birth weight (LBW) infants. The underlying mechanism for this is skin-to-skin contact, which allows heat transfer by conduction from the mother's body to the infant, thereby reducing the risk of hypothermia ([Beiranvand, Valizadeh, Hosseinabadi, & Pournia, 2018](#)). These findings are consistent with the study by [Putri et al \(2025\)](#), which reported that KMI reduced the incidence of hypothermia by up to 40% in LBW and premature infants. Thus, this simple intervention has been proven effective as a temperature stabilization strategy in the perinatal ward. In addition to maintaining body temperature, KMI also plays a role in improving the infant's physiological regulation ([Muhamad & Rahmadhena, 2022](#)). Skin-to-skin contact has been shown to stabilize respiratory rate, heart rate, and improve oxygen saturation. A recent meta-analysis by [La Rosa et al \(2024\)](#) confirmed that infants who received SSC had better physiological homeostasis compared to infants who were only treated with an incubator. This reinforces the view that SSC is not merely a thermoregulatory intervention, but also contributes to the stability of the infant's organ systems.

In addition to physiological benefits, KMC also contributes to maternal–infant bonding through increased oxytocin release. Oxytocin plays a role in reducing stress in mothers, increasing milk production, and providing a calming effect on babies ([Walter, Abele, & Plappert, 2021](#)). According to [Koreti & Muntode Gharde \(2022\)](#), KMC increases the success of early breastfeeding initiation and the continuation of exclusive breastfeeding. This is important because adequate nutrition is a major factor

in the successful growth and development of LBW babies. From a healthcare perspective, the implementation of KMC supports family-centered care, which places mothers as an important part of baby care. Research by [Narciso et al \(2022\)](#) shows that family involvement in the care of premature babies accelerates clinical recovery and reduces the length of hospital stays. This means that the implementation of KMC is not only beneficial for babies but also reduces the psychological and financial burden on families.

In a global context, the WHO (2019) recommends KMC as the gold standard in the care of LBW infants in health facilities with limited resources ([Tumukunde et al., 2024](#)). Scientific evidence shows that KMC significantly reduces neonatal mortality, especially in developing countries. A study by [Sivanandan & Sankar \(2023\)](#) in India reported a 25% reduction in neonatal mortality in the group receiving KMC compared to conventional care. This research also highlights the relevance of implementing KMC in Indonesia, where the prevalence of LBW remains quite high. Data from the 2018 Riskesdas survey shows an LBW rate of 6.2% with variations across regions. Implementing KMC could be an effective strategy to reduce clinical complications while improving national health indicators, particularly in reducing infant mortality rates ([Kemenkes RI, 2020](#)).

However, the implementation of KMC requires healthcare workers to be prepared to provide education and assistance to mothers. Implementation challenges such as maternal fatigue, ward space constraints, and staff training require consideration for scaling KMC protocols. Therefore, the integration of KMC into standard neonatal care protocols is essential, with the support of hospital policies and ongoing training for healthcare workers. With these scientific justifications, it can be concluded that KMC is an effective, inexpensive, and easy-to-apply intervention in improving thermoregulation and the health of LBW infants ([Gong, He, & Zhang, 2025](#)).

The large effect size observed suggests strong thermal responsiveness; however, causal inference remains limited due to the absence of comparison with incubator-only care. Temperature normalization may also reflect concurrent clinical stabilization. Unlike broader literature discussing mortality reduction, this study focused solely on thermoregulation and did not measure morbidity or mortality outcomes. Therefore, extrapolation beyond temperature stabilization should be avoided.

The findings of this study are consistent with previous research demonstrating the effectiveness of KMC in improving thermoregulation among LBW infants. A systematic review by [Sivanandan and Sankar \(2023\)](#) reported that KMC significantly reduces hypothermia incidence compared to conventional care. Similarly, [Tumukunde et al. \(2024\)](#) found that early initiation of KMC contributes to improved thermal stability and survival outcomes.

However, unlike these large-scale randomized trials, the present study specifically highlights the short-term thermoregulatory response following a single 60-minute KMC session, providing practical insights for daily clinical implementation. The observed mean increase of 0.53°C indicates a rapid physiological adaptation, which is particularly relevant for settings where prolonged KMC may not always be feasible.

Nevertheless, the absence of a control group limits direct comparison with incubator-based care, which remains the standard intervention in many neonatal units. Previous studies have shown that while incubators provide controlled thermal environments, they lack the additional physiological and psychological benefits associated with skin-to-skin contact. Therefore, future studies employing randomized controlled designs are needed to establish comparative effectiveness. These findings reinforce the role of KMC not only as an alternative but as a complementary intervention to conventional thermal management, particularly in low-resource settings where access to advanced neonatal equipment is limited.

CONCLUSION

Kangaroo Mother Care helped LBW infants stay warmer and regulate their body temperature better in this perinatology ward. While the findings support existing global evidence rather than offering new

theoretical insights, they provide crucial local implementation data that supports the structured integration of KMC into neonatal care protocols.

To help more people, future studies should include more participants and cover different types of healthcare environments. This will make the findings more useful for a wider range of situations. In real life, healthcare workers need to include kangaroo care as part of usual treatment for babies who are born too small and teach parents how to use this method on their own at home, so they can keep caring for their baby even after they go home from the hospital.

Acknowledgements

The author would like to express his gratitude to all parties who have facilitated this research. The authors utilized language editing tools to improve clarity and readability. All content was critically reviewed and validated by the authors to ensure scientific accuracy and originality. The authors take full responsibility for the integrity, originality, and final content of the published article

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