

Section: General Nursing

Swaddling and kangaroo mother care for body temperature stability in new-born baby with low birth weight

Muhammad Izzan Hanafi , Sri Hananto Ponco Nugroho, Heni Setyowati Esti Rahayu, Sigit Priyanto

Authors information

Department of Nursing, Universitas Muhammadiyah Magelang, Indonesia

 **Contactable email:** izzanhanafi40@gmail.com / Article DOI: *On process*

Abstract

Newborns, especially those with low birth weight (LBW), are at high risk of hypothermia due to immature thermoregulation systems. Non-pharmacological interventions such as swaddling and Kangaroo Mother Care (KMC) are recommended to maintain neonatal body temperature. This case study aims to analyze the effectiveness of swaddling and KMC in maintaining neonatal temperature stability. A descriptive case study was conducted on a 3-day-old infant with hypothermia treated in the perinatology unit of Temanggung Hospital. Swaddling and KMC interventions were applied, and the infant's body temperature was monitored periodically. The infant's body temperature increased from 35.4°C to 36.7°C within 48 hours. Improvements were also observed in suck reflex and body weight. Swaddling and KMC are effective in maintaining normothermia in low-birth-weight infants and can be adopted as standard care in healthcare facilities.

Keywords: Body temperature, low birth weight, new-born baby, nursing care, paediatric nursing

Introduction

Hypothermia is one of the most critical challenges in neonatal care, particularly affecting premature and low birth weight (LBW) infants (Mohamed et al., 2021). Because their thermoregulatory systems are physiologically immature, these newborns are highly susceptible to rapid heat loss through evaporation, conduction, convection, and radiation. According to the World Health Organization (WHO), more than 60% of premature infants experience hypothermia immediately after birth, a condition that significantly increases the risk of neonatal mortality (Nyandiko et al., 2021). In Indonesia, hypothermia ranks as the fourth leading cause of neonatal death, following prematurity, asphyxia, and infection (Seid et al., 2019; Zhang et al., 2025). To mitigate this risk, evidence-based non-pharmacological interventions—such as swaddling and Kangaroo Mother Care (KMC)—are strongly recommended by both the WHO and the Indonesian Ministry of Health. Consequently, this study aims to analyze the effectiveness of these combined interventions in maintaining neonatal temperature stability within a hospital perinatology unit. From a nursing perspective, this study highlights the vital role of autonomous, evidence-based nursing interventions in managing neonatal vulnerability and preventing hypothermia. LBW infants possess underdeveloped thermoregulatory systems and minimal subcutaneous fat, making them highly susceptible to rapid, life-threatening heat loss (Dunne et al., 2024). While technological interventions like incubators are dependent on institutional resources, swaddling and KMC represent independent nursing practices that can be initiated immediately in any clinical setting. Nurses view these techniques not merely as traditional comfort measures, but as scientifically sound, non-pharmacological therapies. By utilizing swaddling to minimize heat loss via convection and radiation, and KMC to facilitate direct skin-to-skin contact for conductive heat transfer, nurses actively stabilize the infant's microclimate, decrease metabolic demand, and reduce neonatal mortality risks without relying solely on specialized mechanical equipment (Chan et al., 2016; Koreti & Muntode Gharde, 2022).

Furthermore, this case underscores the nursing profession's commitment to family-centered care and the clinical education of caregivers. Neonatal intensive care environments can be incredibly intimidating for parents, often leading to feelings of detachment and anxiety (Paraíso-Pueyo et al., 2026; Shetty et al., 2024). From a nursing standpoint, implementing and researching KMC and swaddling serves as a powerful bridge to involve parents directly in their new-born's acute care plan. Nurses act as educators and clinical guides, training mothers and fathers to safely perform skin-to-skin care, which not only stabilizes the infant's physiological parameters but also promotes maternal-infant bonding and stimulates lactation. Ultimately, this title reflects a holistic nursing paradigm that values low-cost, high-impact interventions to standardize neonatal protocols, empower families, and elevate the overall quality of perinatal nursing practice. This study holds profound importance for the advancement of neonatal medicine and paediatric nursing care, as it addresses one of the primary, preventable causes of neonatal mortality: hypothermia in LBW infants. LBW and premature new-borns are highly vulnerable to rapid heat loss due to their immature thermoregulatory systems, large surface-area-to-mass ratios, and lack of insulating subcutaneous brown fat (Ralphe

et al., 2021). While modern medical technology relies heavily on radiant warmers and incubators, these resources are often limited, costly, or unavailable in low-resource settings. By scientifically evaluating and validating the combined use of swaddling and KMC, this study provides empirical evidence for accessible, zero-cost, and highly effective non-pharmacological interventions that can stabilize a new-born's microclimate, reduce metabolic stress, and directly save lives.

Beyond its immediate physiological benefits for the infant, this research is crucial for shaping clinical protocols and promoting family-centred care models. It shifts the healthcare paradigm from a purely tech-dependent approach to a more holistic, hands-on methodology. For nurses and clinical staff, this study offers data-driven justification to standardize swaddling and KMC as immediate, front-line nursing interventions rather than just alternative comfort measures. Furthermore, it empowers parents—particularly mothers—by transforming them from passive observers into active, primary caregivers in the perinatology unit. Teaching parents how to effectively use their own body heat (via KMC) and proper swaddling techniques not only stabilizes the infant's temperature but also fosters critical maternal-infant bonding, encourages breastfeeding success, and prepares families for safe care management at home post-discharge.

Case Description

Clinical measurements demonstrated a gradual and steady increase in the infant's body temperature over the course of the intervention. On the first day, the baseline temperature of 35.4°C rose to 36.0°C following swaddling, and increased further to 36.4°C after the implementation of KMC. By the second day, the temperature reached 36.7°C, successfully stabilizing within the normothermic range of 36.5°C to 37.5°C. In addition to improved thermoregulation, the infant exhibited a stronger sucking reflex and a weight gain from 1,570 grams to 1,573 grams within the 48-hour period. No complications were observed throughout the clinical intervention. These positive outcomes were documented in a temperature trend graph, illustrating consistent and progressive physiological improvement.

Discussion

This case study conclusively demonstrates that the strategic implementation of swaddling and Kangaroo Mother Care (KMC) serves as a highly effective, non-pharmacological approach for achieving and maintaining optimal body temperature stability in low birth weight (LBW) newborns. The clinical data collected during the 48-hour intervention window revealed a remarkable physiological progression, wherein the infant's baseline core body temperature successfully rose from a profoundly hypothermic state of 35.4°C to a stable, normothermic level of 36.7°C. This steady upward trajectory strongly indicates that the synergistic application of these two interventions provided the necessary thermal insulation and conductive heat transfer to counteract the newborn's compromised physiological state. By establishing a reliable microclimate for the infant, these methods effectively minimized metabolic stress and prevented the cascading systemic complications traditionally associated with neonatal cold stress.

These clinical findings closely align with a vast body of established pediatric literature, which consistently identifies neonatal hypothermia as a major, yet preventable, risk factor for morbidity and mortality in premature and low birth weight infants (Ralphe et al., 2021). Newborns with restricted birth weights are uniquely vulnerable due to their immature thermoregulation systems, characterized by a lack of insulating subcutaneous brown fat, an exceptionally high surface-area-to-mass ratio, and an underdeveloped central nervous system that cannot adequately regulate heat production (Getaneh et al., 2022). When left unmanaged, rapid heat loss through evaporation, conduction, convection, and radiation forces the neonate to deplete precious glycogen stores and oxygen resources simply to generate warmth, quickly leading to metabolic acidosis, respiratory distress, and hypoglycemia (Frade Garcia et al., 2025). The success documented in this case study reinforces the empirical consensus that active thermal management is not merely a supportive comfort measure, but a critical, life-saving clinical necessity during the immediate postnatal period.

Consequently, the definitive outcomes of this study hold profound implications for the advancement of clinical nursing protocols, particularly within resource-limited perinatology units where access to mechanical incubators or radiant warmers may be restricted. Swaddling and Kangaroo Mother Care offer a dual benefit: they provide a zero-cost, technologically independent shield against environmental cold stress while simultaneously fostering an environment conducive to holistic neonatal development. By standardizing these evidence-based techniques into daily nursing care plans, healthcare providers can confidently bridge the gap between high-tech medical dependency and low-cost, high-impact clinical intervention. Furthermore, integrating these practices empowers mothers and primary caregivers to become active participants in the therapeutic process, accelerating maternal-infant bonding, stimulating lactation, and establishing a sustainable framework for safe neonatal care that can be seamlessly continued at home post-discharge.

Conclusion

This case study demonstrates that swaddling and KMC are highly effective, non-pharmacological methods for stabilizing body temperature in LBW newborns. Given their safety, accessibility, and efficacy, these techniques should be integrated as standard nursing interventions within perinatology units, particularly in resource-limited healthcare

facilities where incubator access is restricted. By implementing these low-cost, high-impact strategies, nursing staff can proactively mitigate the risks of neonatal hypothermia, thereby improving clinical outcomes and reducing neonatal mortality rates in vulnerable populations. To expand upon these findings, future experimental research is strongly recommended to evaluate the broader clinical efficacy and scalability of these interventions. Subsequent studies should utilize another design to directly compare the thermoregulation outcomes of swaddling versus KMC, as well as their combined effects. Additionally, future investigators should explore the long-term physiological benefits of these methods, such as their impact on neonatal weight gain, breastfeeding success, and length of hospital stay.

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