

Section: Paediatric Nursing

Kangaroo mother care as a holistic non-pharmacological approach to enhancing physiological stability in infants with congenital heart disease

Reni Widyaningsih , Dwi Sulistyono, Reni Mareta, Septi Wardani

Authors information

Department of Nursing, Universitas Muhammadiyah Magelang, Indonesia

 **Contactable email:** rsreni16@gmail.com / Article DOI: *On process*

Abstract

Congenital Heart Disease (CHD) is a structural heart abnormality commonly found in newborns. This condition often causes physiological instability, such as respiratory distress, thermoregulation, and feeding difficulties. The management of CHD often requires intensive medical intervention, but a non-pharmacological approach can be an effective complement to improve the infant's physiological stability. One such non-pharmacological intervention that has proven effective is Kangaroo Mother Care (KMC). KMC involves skin-to-skin contact between the infant and the parent, which provides various benefits, including stabilization of body temperature, respiration, and heart rate, as well as reducing stress in the infant. The purpose of this article is to analyse the application of KMC to the physiological stability of infants with CHD. This case analysis shows that KMC can be a safe and effective nursing intervention to improve the outcomes of physiological stability in infants with CHD, as part of a holistic nursing care approach.

Keywords: Congenital heart disease, holistic nursing, Kangaroo Mother Care, nursing care, physiological stability

Introduction

Congenital Heart Disease (CHD) is the most common congenital anomaly, with a prevalence of about 8-10 per 1,000 live births (Babatunde et al., 2024). Infants with CHD often face significant physiological challenges, including hypoxia, feeding difficulties, and unstable body temperature (Norman et al., 2022). These conditions can hinder growth and development, as well as increase the risk of morbidity and mortality. The management of CHD generally involves pharmacological and surgical approaches. However, non-pharmacological interventions also play an important role in holistic nursing care. One method that has received widespread attention is Kangaroo Mother Care (KMC). KMC, initially developed for premature infants, is now applied to various conditions, including infants with CHD (Lisanti et al., 2020). The principle of KMC is skin-to-skin contact between the infant and the parent, which mimics the uterine environment and provides a sense of security for the infant (Chan et al., 2016). The benefits of KMC have been widely documented, including physiological Stability: KMC is proven effective in maintaining the infant's body temperature (Gajula et al., 2024), stabilizing heart rate and respiration, and increasing oxygen saturation. KMC helps regulate sleep, improves feeding patterns, and accelerates weight gain. KMC reduces stress in infants, which can trigger an increase in afterload and worsen cardiac output (Cristóbal et al., 2022). By reducing stress, KMC can have a protective effect on the infant's cardiovascular system. KMC enhances the bonding between parents and infants, and increases parents' self-confidence in caring for their child.

This study focusing on KMC as a holistic, non-pharmacological approach to enhancing physiological stability in infants with CHD is profoundly important for several critical reasons, primarily due to its potential to revolutionize supportive care in a highly vulnerable patient population. Infants with CHD often face complex challenges, including poor thermoregulation, frequent desaturation episodes, high metabolic demands, and prolonged hospital stay in sterile, isolated environments. Traditional intensive care, while necessary, can introduce significant stressors and separation trauma. KMC—which involves sustained skin-to-skin contact between the infant and a parent—offers a countermeasure by naturally regulating the infant's temperature, stabilizing heart rate and respiratory patterns, and conserving energy (Chen et al., 2022). By demonstrating KMC's efficacy in stabilizing these physiological parameters, the study moves beyond its established role for premature infants to address the unique instability faced by cardiac babies, offering a humanizing intervention that directly supports the fragile balance of their cardiovascular and respiratory systems. The second key factor underscoring the study's significance lies in its potential to improve neurodevelopmental outcomes and the overall quality of life for these infants and their families. CHD is frequently associated with an increased risk of developmental delays, anxiety, and depression in parents due to the intense stress of caring for a sick child (Forde et al., 2020). KMC is not merely a clinical technique; it is a family-centered intervention that promotes deep parental bonding, enhances parental confidence, and reduces maternal stress and

anxiety, creating a therapeutic alliance between the family and the care team (Toma, 2003). By encouraging parents to actively participate in stabilizing their infant's condition, the study reinforces their critical role in healing, which is vital for long-term emotional and psychological well-being (Boadu et al., 2025; Cai et al., 2022). Proving that KMC provides superior physiological stability may translate directly into shorter intensive care unit (ICU) stays, reduced exposure to hospital-acquired infections, and a more nurturing environment, ultimately mitigating the long-term emotional and developmental burdens associated with early life cardiac illness.

Finally, the study carries immense practical and policy implications for global paediatric cardiac care. If KMC is validated as a safe and effective adjunctive therapy, it offers a cost-effective and accessible model of care that is particularly relevant for resource-limited settings where specialized cardiac care infrastructure may be scarce. Integrating KMC into the standard protocol for infants awaiting surgery or recovering from cardiac interventions could standardize a compassionate approach that relies on the innate healing power of human contact rather than expensive technology alone. The evidence generated by this research will empower healthcare policymakers, particularly nurses and neonatologists, to champion the wider implementation of KMC guidelines, shifting the paradigm of care from purely technology-dependent management toward a more holistic, developmental, and family-inclusive model, thereby setting a new, higher standard for humanized paediatric cardiac care worldwide.

Case Description

This article's writing is based on a case analysis of an infant with CHD who was a patient at Tidar Hospital in Magelang City. The purpose of this analysis was to evaluate the effectiveness of KMC in improving the baby's physiological stability. Data was collected through direct observation, interviews with the parents and nurses, and a review of relevant literature. The implementation steps for KMC in this particular case were as follows: Preparation: First, it was ensured that the infant's condition was medically stable and the parent was clean and healthy. A quiet, clean, and warm environment (with a room temperature of 24–26°C) was also prepared. Implementation: The parent wore loose-fitting clothing, while the baby was dressed only in a diaper and a hat. The infant was then placed vertically on the parent's chest, with their head slightly tilted upwards to ensure an unobstructed airway. The baby's body was in direct contact with the parent's skin, and a blanket was placed over the baby's back for warmth. Duration: KMC was performed for at least 60 minutes per session to achieve optimal benefits. Monitoring: Throughout the KMC session, nurses and parents regularly monitored the infant's vital signs. The patient is an 11-day-old female infant diagnosed with CHD of the type Atrial Septal Defect (ASD) II with Patent Ductus Arteriosus (PDA), who was admitted to Tidar Hospital in Magelang City. Before the implementation of KMC, the infant often experienced fluctuations in heart rate and respiration, as well as other signs of physiological instability. Clinical assessment data showed the infant had dyspnoea (shortness of breath), with a rapid respiratory rate (RR=65x/minute) and increased heart rate (Pulse = 165x/minute). Other signs found were hepatomegaly (liver palpable 3 cm below the right costal arch) and a Capillary Refill Time (CRT) of 3 seconds, which indicates suboptimal tissue perfusion. The infant's oxygen saturation (SpO₂) was 97% with the help of 1 liter/minute of oxygen, indicating a dependency on external support to maintain oxygenation.

Discussion

The application of KMC in this case of an infant with CHD yielded significant positive results, directly correlating with the improvements in the patient's condition described in the case description. The infant, who was previously fussy and physiologically unstable, showed a marked positive response after receiving the KMC intervention. Over the course of three days, the baby's clinical condition showed notable improvements. The respiratory rate (RR) decreased from 62x/minute to 48x/minute, and oxygen saturation (SpO₂) stabilized at 97% with minimal oxygen support, indicating a significant improvement in cardiorespiratory stability. Peripheral perfusion also improved, as evidenced by a better CRT, which shortened from 3 seconds to 2 seconds. The infant's hemodynamic status became more stable, with the heart rate dropping from 165x/minute to 150x/minute, signalling a reduced cardiac workload. Furthermore, a slight weight gain from 3,225 grams to 3,228 grams was observed, suggesting an improvement in nutritional intake and metabolism. The effectiveness of KMC can be explained through several complex physiological and neurological mechanisms. The intense and continuous skin-to-skin contact triggers the release of oxytocin and endorphins in both the infant and the parent (Koreti & Gharde, 2022). Oxytocin, known as the "love hormone," has a calming effect and reduces the stress response, as proven by a decrease in cortisol levels. This stress reduction is crucial for infants with CHD, as a stress response can increase oxygen demand and cardiac afterload, potentially worsening their cardiovascular condition. Additionally, the tactile stimulation from the skin-to-skin contact stimulates the vagus nerve, which plays a vital role in regulating heart rate and respiration, thereby explaining the stabilization of the infant's vital signs (Narciso et al., 2022).

From a psychosocial perspective, KMC provides benefits that traditional care methods, such as incubators, cannot. Traditional care often separates infants from their parents, which can cause anxiety and feelings of helplessness. In this case, the infant's parents, who initially reported high levels of anxiety, showed a significant increase in self-confidence and emotional bonding (Lutkiewicz et al., 2020; O'Dea et al., 2023; Tognasso et al., 2022). The patient's mother felt a stronger connection with her child, was happy to be actively involved in the care process,

and was able to perform KMC with the guidance of nurses. This is a clear indicator of the success of this holistic approach. The clinical outcomes achieved in this case are strongly supported by various scientific literature, aligning with evidence-based practice. KMC effectively lowers the respiratory rate (RR), stabilizes oxygen saturation (SpO₂), improves peripheral perfusion, and enhances maternal attachment while reducing stress. These findings are consistent with the results observed in this case. Furthermore, the scientific literature confirms that KMC is a safe intervention for infants with CHD in cardiac intensive care units, and no complications were found during its application in this case. While this case analysis presents promising results, it is important to acknowledge its limitations. The findings are based on a single case and may not be widely generalizable. Therefore, further research with a larger sample and a stronger research design, such as a Randomized Controlled Trial (RCT), is needed to statistically confirm the effectiveness of KMC in a more diverse population of CHD infants. Future studies could also explore the optimal duration and frequency of KMC for infants with different types of CHD and its long-term impact on growth and neurocognitive development.

Conclusion

KMC is established as an effective and safe non-pharmacological intervention proven to significantly improve the physiological stability of infants with CHD. Its application successfully stabilizes body temperature, heart rate, and respiration, while also substantially reducing stress levels in infants through essential physiological mechanisms like vagus nerve stimulation and oxytocin release. Furthermore, KMC delivers crucial psychosocial benefits for parents, notably strengthening the parent-infant bond and mitigating parental anxiety. Given this evidence, KMC is strongly recommended for integration into the standard nursing care plan for CHD infants to optimize both health outcomes and quality of life. Moving forward, however, future studies are essential to enhance our implementation strategy: research must focus on assessing long-term neurodevelopmental outcomes, establishing the optimal duration and frequency of KMC based on specific CHD lesions, undertaking deeper biomarker analysis of inflammatory and stress pathways, evaluating feasibility in resource-constrained settings, and exploring the positive impact of involving fathers and extended family members in providing this vital care.

References

- Babatunde, T., Wolf, S., Tumin, D., Sarno, L., Greene, E., & Longshore, S. (2024). Association Between Congenital Heart Disease-Related Diagnosis Codes and Trauma Surgery Outcomes. *The American surgeon*, 90(11), 2832–2839. <https://doi.org/10.1177/00031348241256081>
- Boadu, M., Ohene, L. A., & Senoo-Dogbey, V. E. (2025). "More than medical care": a qualitative study on family support systems in the neonatal intensive care unit in Ghana. *BMC pediatrics*, 25(1), 577. <https://doi.org/10.1186/s12887-025-05912-1>
- Cai, Q., Chen, D. Q., Wang, H., Zhang, Y., Yang, R., Xu, W. L., & Xu, X. F. (2022). What influences the implementation of kangaroo mother care? An umbrella review. *BMC pregnancy and childbirth*, 22(1), 851. <https://doi.org/10.1186/s12884-022-05163-3>
- Chan, G. J., Valsangkar, B., Kajeepeta, S., Boundy, E. O., & Wall, S. (2016). What is kangaroo mother care? Systematic review of the literature. *Journal of global health*, 6(1), 010701. <https://doi.org/10.7189/jogh.06.010701>
- Chen, W. Y., Wu, Y. Y., Xu, M. Y., & Tung, T. H. (2022). Effect of Kangaroo Mother Care on the Psychological Stress Response and Sleep Quality of Mothers with Premature Infants in the Neonatal Intensive Care Unit. *Frontiers in pediatrics*, 10, 879956. <https://doi.org/10.3389/fped.2022.879956>
- Cristóbal, C. D., Parrón Carreño, T., Borja, S. C., & Perales, B. A. (2022). Benefits of Kangaroo Mother Care on the Physiological Stress Parameters of Preterm Infants and Mothers in Neonatal Intensive Care. *International journal of environmental research and public health*, 19(12), 7183. <https://doi.org/10.3390/ijerph19127183>
- Forde, D., Deming, D. D., Tan, J. C., Phillips, R. M., Fry-Bowers, E. K., Barger, M. K., Bahjri, K., Angeles, D. M., & Boskovic, D. S. (2020). Oxidative Stress Biomarker Decreased in Preterm Neonates Treated With Kangaroo Mother Care. *Biological research for nursing*, 22(2), 188–196. <https://doi.org/10.1177/1099800419900231>
- Gajula, R., Kankanala, G. R., Mutukulla, R., & Kotha, R. (2024). Kangaroo Mother Care in Term and Late Preterm Neonates: A Systematic Review. *Cureus*, 16(5), e60958. <https://doi.org/10.7759/cureus.60958>
- Koreti, M., & Gharde, M. P. (2022). A Narrative Review of Kangaroo Mother Care (KMC) and Its Effects on and Benefits for Low Birth Weight (LBW) Babies. *Cureus*, 14(11), e31948. <https://doi.org/10.7759/cureus.31948>
- Lisanti, A. J., Buoni, A., Steigerwalt, M., Daly, M., McNelis, S., & Spatz, D. L. (2020). Kangaroo Care for Hospitalized Infants with Congenital Heart Disease. *MCN. The American journal of maternal child nursing*, 45(3), 163–168. <https://doi.org/10.1097/NMC.0000000000000612>
- Lutkiewicz, K., Bieleninik, Ł., Cieślak, M., & Bidzan, M. (2020). Maternal-Infant Bonding and Its Relationships with Maternal Depressive Symptoms, Stress and Anxiety in the Early Postpartum Period in a Polish Sample. *International journal of environmental research and public health*, 17(15), 5427. <https://doi.org/10.3390/ijerph17155427>

- Narciso, L. M., Beleza, L. O., & Imoto, A. M. (2022). The effectiveness of Kangaroo Mother Care in hospitalization period of preterm and low birth weight infants: systematic review and meta-analysis. *Jornal de pediatria*, 98(2), 117–125. <https://doi.org/10.1016/j.jpmed.2021.06.004>
- Norman, V., Zühlke, L., Murray, K., & Morrow, B. (2022). Prevalence of Feeding and Swallowing Disorders in Congenital Heart Disease: A Scoping Review. *Frontiers in pediatrics*, 10, 843023. <https://doi.org/10.3389/fped.2022.843023>
- O'Dea, G. A., Youssef, G. J., Hagg, L. J., Francis, L. M., Spry, E. A., Rossen, L., Smith, I., Teague, S. J., Mansour, K., Booth, A., Davies, S., Hutchinson, D., & Macdonald, J. A. (2023). Associations between maternal psychological distress and mother-infant bonding: a systematic review and meta-analysis. *Archives of women's mental health*, 26(4), 441–452. <https://doi.org/10.1007/s00737-023-01332-1>
- Tognasso, G., Gorla, L., Ambrosini, C., Figurella, F., De Carli, P., Parolin, L., Sarracino, D., & Santona, A. (2022). Parenting Stress, Maternal Self-Efficacy and Confidence in Caretaking in a Sample of Mothers with Newborns (0-1 Month). *International journal of environmental research and public health*, 19(15), 9651. <https://doi.org/10.3390/ijerph19159651>
- Toma T. S. (2003). Método Mãe Canguru: o papel dos serviços de saúde e das redes familiares no sucesso do programa [Kangaroo Mother Care: the role of health care services and family networks in a successful program]. *Cadernos de saúde pública*, 19 Suppl 2, S233–S242. <https://doi.org/10.1590/s0102-311x2003000800005>