PERINATAL JOURNAL

Original Article

Perinatal Journal 2024;32(3):186-191

The effect of kangaroo mother care on the vital signs of newborn babies in neonatal intensive care unit

Sema Tanrıverdi[1], Ebru Çetin[2], Seniha Kahraman[1]

[1]Manisa Celal Bayar University, Medical School Department of Pediatrics, Division of Neonatology, Manisa, Türkiye
[2]Manisa Celal Bayar University, Medical School Department of Pediatrics, Manisa, Türkiye

Abstract

Objective: Kangaroo mother care (KMC) is to ensures skin-to-skin contact between the mother and the baby by placing the newborn babies on the mother's chest in a prone, upright position. KMC is a suitable method for maintaining the body temperature of term or preterm babies, especially in neonatal intensive care units (NICU). The aim of this study is to compare the relationship between mother and infant body temperature during KMC applied to infants followed in NICU and to evaluate the vital signs of the infant during KMC.

Methods: Fifty six newborn babies who were followed up in the neonatal intensive care unit of our hospital and who were treated with kangaroo mother care (KMC) between December 2018 and December 2020, and who were respiratory and hemodynamically stable, were included in the study. During KMC, the constant ambient temperature (23ºC) and the body temperature of the mother and baby were measured, and baby's vital signs were recorded.

Results: Fifty six newborn babies were included in the study. The mean gestational age at delivery was 33.03±3.8 (26-40) weeks, and the mean birth weight was 2069.64±849.37 (640-4630). Thirty (53.5%) babies were boys, and 26 (46.5%) were girls. The mean duration of kangaroo mother care (KMC) was 24.30±28.82 (5-97). At the constant ambient temperature (23ºC) during KMC, the average body temperature of the baby before KMC was 36.42±0.36 (35.40-37.2) ºC, during KMC was 36.35±0.01 (35.40-37.2) ºC, and after KMC was 36.35±0.40 (35.40-37.40) ºC. There was no significant change in the body temperature of the baby before, during and after KMC (p>0.05).

Conclusion: Kangaroo mother care in the neonatal intensive care unit did not cause any change in the body temperature of the baby or the mother, and the vital signs of the baby remained stable at a constant ambient temperature.

Keywords: Neonatal intensive care, kangaroo mother care, body temperature, vital signs

Introduction

Kangaroo maternal care (KMC) is the provision of skin-to-skin contact between the mother and the baby by placing the newborn babies on the mother's chest in a prone, upright position.[1,2] KMC is a suitable method for maintaining the body temperature of term or preterm infants, especially in neonatal intensive care units (NICU). KMC was first introduced by Dr Edgar Rey Sanabria in 1978 in Bogota, Colombia, as an incubator alternative for low birth weight infants.[1] It is assumed that KMC improves newborn outcomes by maintaining the infant's temperature and other vital sign parameters through skin-to-skin contact and providing the benefits of breastfeeding.[1] KMC also increases the likelihood of exclusive breastfeeding for up to 4 months and reduces the risk of neonatal sepsis, hypothermia, hypoglycemia, and hospital readmission. In addition, infants receiving KMC had vital signs, increased head circumference, and lower pain scores. There is no evidence of harm related to KMC.[3] These effects of KMC are thought to be beneficial for all newborns, but it is more advantageous especially for preterm babies.[3] In meta-analyses, it was found that KMC reduces the risk of morbidity and mortality among preterm low birth weight infants.[4,5] It has been reported that KMC has positive results in cardiopulmonary stability.[6,7] It has been shown that KMC has important effects on the regulation

Correspondence: Sema Tanrıverdi, Manisa Celal Bayar University, Medical School Department of Pediatrics, Division of Neonatology, Manisa, Türkiye, **e-mail:** drsemarala@yahoo.com, **Received:** May 08, 2024 **Accepted:** August 22, 2024

How to cite this article: Tanrıverdi S, Çetin E, Kahraman S. The effect of kangaroo mother care on the vital signs of newborn babies in neonatal intensive care unit. Perinatal Journal 2024;32(3):186-191 DOI: 10.59215/prn.24.0323003

ORCID ID: S Tanrıverdi 0000-0002-5681-3647; E Çetin 0000-0003-0494-1249; S Kahraman 0000-0002-1498-259X

CETUS Publishing

of physiological changes in the newborn, such as respiratory rate, oxygenation, and maintaining body temperature; however, no significant effect on cardiac pulse was found.[3] In some studies, it has been reported that an increase in the baby's body temperature during KMC may cause apnea, bradycardia, and a decrease in oxygen saturation.[8-10] However, the direct beneficial effects of KMC on the infant's cardiopulmonary control remain unclear. The aim of this study is to compare the relationship between ambient temperature, mother and baby body temperature during kangaroo mother care applied to infants followed in NICU and to evaluate the vital signs of the baby during kangaroo mother care.

Methods

Respiratory and hemodynamically stable newborn infants who were followed up in the neonatal intensive care unit of our hospital and treated with kangaroo mothers between December 2018 and December 2020 were included in the study. Babies with congenital malformation, chromosomal disorders, congenital or perinatal infection of the central nervous system, grade 3 and higher intraventricular bleeding and diagnosed as hypoxic-ischemic encephalopathy were excluded from the study. Informed consent form was obtained from the mother of each infant. The study was approved by the Manisa Celal Bayar University Medicine Faculty of Medicine Ethics Committee.

During kangaroo maternal care (KMC), the baby was dressed only with a diaper for skin-to-skin contact. In line with the kangaroo care guidelines[2,11], the baby was placed on the mother's chest in the prone position to ensure skin-to-skin contact. A baby blanket and a hat were put on to keep the warmth. The mothers were placed in a stable, cushioned seat. Skin-to-skin KMC was performed for fifteen minutes. A pulse oximeter probe was placed on the baby's right wrist (Masimo Radical SET, Irvine, CA, USA). The baby's cardiac pulse, perfusion index and oxygen saturation were measured. Body temperature of mother and baby was measured from the axilla. The ambient temperature throughout the KMC was set at a constant 23 ºC. Before, during and after the KMC, body temperature and the baby's body temperature, heart rate, blood pressure, respiratory rate, perfusion index, oxygen saturation value were measured every 15 minutes for one hour and recorded for each baby and mother.

Kangaroo maternal care was performed during the mother's intensive care visit, that is, during the daytime between 13.00-14.00. Due to the intensive care system and care, the KMC duration was kept to 1 hour. No additional intervention, treatment, care or nutrition was applied to the babies during KMC.

The first hypothesis of our study is to show that kangaroo mother care causes a positive increase in the body temperature of the baby and the mother. The second hypothesis of our study is to show that kangaroo mother care causes a positive change in the vital signs of the baby (heart rate, respiratory rate, and oxygen saturation, perfusion index, blood pressure). Data were analyzed using SPSS version 21, independent t-test, Paired t-test, Chi-square test. P- Value less than 0.05 was considered as significant level.

Results

Fifty six newborn babies were included in the study. Mean week of delivery was 33.03±3.8 (26-40) weeks, mean birth weight was 2069.64±849.37 (640-4630) grams.Ten babies (18.1 %) were term and fourty six (81.9 %) were preterm. Thirty (53.5%) babies were male and 26 (46.5%) were female. The mean day of kangaroo maternal care (KMC) was 24.30±28.82 (5-97) days. There was no baby intubated during KMC, 52 (92.8%) of the babies were at room air (Table 1).

At ambient temperature (23ºC), which is constant during KMC, the mean body temperature of the mother before KMC is 36.45±0.44 (35.3-37.8) ºC, and the mean body temperature of the mother during KMC is 36.44±0.02 (35.3-37.5) ºC, mean body temperature of the mother after KMC was 36.47±0.38 (35.8-37.5) ºC. Body temperature was measured with a separate digital thermometer for each mother. The primary and secondary outcome variables of our study is to show that KMC causes a positive increase in the mother's body temperature during and after KMC. There was no significant change in the body temperature of the mother before, during and after KMC (p>0.05).

At the ambient temperature (23ºC), which is constant during KMC, the average body temperature of the baby before KMC is 36.42±0.36 (35.40-37.2) ºC, and the body temperature of the baby during KMC is 36.35±0.01 (35.40-37.2) ºC, mean body temperature of the baby after KMC was 36.35±0.40 (35.40-37.40) ºC. Body temperature was measured with a separate digital thermometer for each baby. There

was no significant change in the body temperature of the baby before, during and after KMC (p>0.05). No significant changes were observed in the baby's heart rate, respiratory rate, perfusion index, oxygene saturation and blood pressure values during KMC (p>0.05) (Table 2).

Table 1. Demographic, antenatal and clinical characteristics of babies

	Babies with KMC (n=56)
Gestational age (weeks)	33.03±3.8 (26-40)
Term (38-42wk) (n, %)	10 (%18.1)
Preterm (<37wk) (n, %)	46 (%81.9)
-Extremely preterm(<28wk) (n, %)	8 (%14.2)
-Very preterm (28-32 weeks) (n, %)	8 (%14.2)
-Middle preterm (32-34wk) (n, %)	11 (%19.6)
-Late preterm (34-37 weeks) (n, %)	19 (%33.9)
Birth weight (g)	2069.64±849.37 (640-4630)
Birth height (cm)	42.57±5.71 (28-52)
Birth head circumference (cm)	30.46±3.98 (19-36)
Gender (n, %)	
-Female	30 (%53.5)
-Male	26 (%46.5)
Type of birth (n, %)	
-C-section	48 (%85.7)
-Normal spontaneous delivery	8 (%14.3)
Maternal age	28.36±8.18 (19-47)
Number of maternal pregnancies, n	3 (1-6)
Number of maternal births, n	2 (0-6)
Kangroo day	24.30±28.82 (5-97)
Respiratory support during kangaroo, (n, %)	
-Room air	52 (%92.8)
-Noninvasive ventilation	4 (%7.2)
-Intubated, invasive ventilation	0 (%0)
Feeding during kangaroo, (n, %)	
-Total parenteral nutrition	12 (%21.4)
-Enteral nutrition	17 (%30.3)
-Oral nutrition	27 (%48.3)
Duration of hospitalization in neonatal intensive care unit (days)	31.08 ± 31.64 (7-107)

Table 2. Comparison of vital signs of infants before, during and after KMC

	KMC before	KMC during	KMC after	p
HR (min)	146.69±20.36 (101-197)	147.93±1.74 (96-210)	152.08±18.09 (104-196)	*0.545 **0.146 ***0.061
RR (min)	55.14 (48-70)	54.27±0.43 (48-68)	54.50 (42-68)	*0.167 **0.282 ***0.324
PI	1.10±0.84 (0.01-4.80)	1.01±0.84 (0.31-3.40)	1.10±0.74 (0.30-3.70)	*0.235 **0.242 ***0.712
$Sa0_2$	98.71±1.34 (95-100)	98.30±0.18 (90-100)	98.24±2.50 (90-100)	*0.314 **0.282 ***0.130
BP (sistolic) (mmHg)	80.11±11.39 (56-117)	77.24±3.32 (55-99)	76.68±12.89 (51-104)	*0.251 **0.213 ***0.176
BP (diastolic) (mmHg)	46.88±12.65 (28-80)	48.21±2.69 (29-76)	43.15±7.28 (29-68)	*0.251 **0.445 ***0.409
BP (mean) (mmHg)	57.77±10.51 (43-83)	57.68±6.64 (44-84)	55.06±9.21 (39-69)	*0.491 **0.213 ***0.328
Baby BT (ºC)	36.42±0.36 (35.40-37.2)	36.35±0.01 (35.40-37.2)	36.35±0.40 (35.40-37.40)	*0.156 **0.444 ***0.198
Mother BT (ºC)	36.45±0.44 (35.3-37.8)	36.44±0.02 (35.3-37.5)	36.47±0.38 (35.8-37.5)	*0.346 **0.448 ***0.619

(KMC: kangaroo mother care, HR: heart rate, RR: respiratory rate, PI: perfusion index, BP: blood pressure, BT: body temperature, * P value before KMC- during KMC, **: P value during KMC-after KMC, *** P value before KMC-after KMC)

Discussion

Kangaroo maternal care (KMC) is a practical alternative to incubator care through skin-to-skin contact for preterm infants. It is a natural, cost-effective application used to reduce mortality and morbidity in premature and low birth weight infants. A common complication of premature birth is the inability of these babies to regulate their own body temperature. KMC is an effective strategy to reduce this problem.[1,2,12] It is recommended by the World Health Organization for the care of babies with a birth weight of 2000 g or less. KMC is used in neonatal intensive care units to support mother-infant attachment, breastfeeding and infant growth.[12-15] It is thought that it improves the problems in the neonatal period by protecting the baby's temperature and other vital parameters through skin-to-skin contact in KMC, improves breastfeeding, and is beneficial for newborn babies, especially preterm babies.[1,6,7] It

has also been shown to reduce the risk of mortality in low birth weight infants.[4,5] It has also been shown that KMC initiated after birth in term babies is effective in preventing hypothermia.[16] In our study, 81.9% of the babies whom we underwent KMC in our neonatal intensive care unit were preterm babies and the average birth weight was 2069.64 g. The first hypothesis of our study is to show that kangaroo mother care causes a positive increase in the body temperature of the baby and the mother. The second hypothesis of our study is to show that kangaroo mother care causes a positive change in the vital signs of the baby (heart rate, respiratory rate, and oxygen saturation, perfusion index, blood pressure).

The effects of kangaroo care babies on the cardiopulmonary system remain unclear. While it has been shown to increase respiratory stability in some studies [13,17,18,19], it has been shown to worsen respiratory instability in some studies.[8-10] In randomized controlled studies, kangaroo care has been reported to improve cardiopulmonary stability through monitoring.[6,7] In our study, it was observed that there was no significant change in the body temperature of the mother and baby in the KMC performed in our neonatal intensive care unit, where the room temperature was 23 °C. No significant changes were observed in the baby's cardiac pulse, respiratory rate, perfusion index, and blood pressure values during KMC. The mechanisms for the therapeutic efficacy of KMC in stabilizing respiration and improving heart rate remain unclear.[20]

In a meta-analysis conducted in 2014, it was stated that KMC did not have a significant effect on the mean heart rate.[3] It has been reported that the respiratory rate is 3 breaths per minute slower than the traditional care, and the oxygen saturation is 0.9% higher.[3] It has been reported that the body temperature is 0.24 °C higher than the traditional method, and there is a 78% lower risk of hypothermia and a 23% lower risk of hyperthermia in these babies.[3] As a result of this meta-analysis, it is seen that the clinical effects of improvements in respiratory rate, oxygenation and body temperature in infants receiving KMC are important.[3] In another prospective observational study, it was found that KMC and body temperature in premature infants were significantly lower in basal heart rate variability without any change in oxygen saturation. It has been shown that skin-to-skin contact has a positive effect on neoantal parasympathetic activity.[21] In a study from Iran, it was reported that there were significant changes in physiological parameters.[heart rate, respiratory rate, and oxygen saturation) of infants during and after kangaroo care.[22]

In the study of Keshavarz et al., it was reported that body temperature was higher after KMC.[23] In the study of Jafari et al., there was no significant difference in body temperature after KMC applied to premature babies.[24] In the study of Basiri et al., low birth weight infants underwent KMC for less than 4 hours and for more than 4 hours, oxygen saturation was found to be significantly higher in the group with KMC for more than 4 hours, there was no significant difference between the two groups in terms of body temperature, and strategies to increase the duration of kangaroo maternal care were found to be significantly higher. consideration was emphasized. [25] In our study, it can be concluded that the short-term application of the kangaroo mother care period, such as 1 hour, did not cause any change in the body temperature of the mother and the baby and the vital signs of the baby.

In the study of Bisanalli et al., it was stated that KMC can also be applied in low birth weight infants receiving noninvasive or invasive respiratory support, and it was shown that the heart rate, respiratory rate, body temperature and oxygen saturation of infants remained stable during KMC.[26] In our study, 92.8% of our babies were in room air and 7.2% were on noninvasive ventilation support during KMC application.

Keeping the kangaroo mother care period short is a limitation of our study. Due to the treatment, care and nutrition practices of the babies in our neonatal intensive care unit and the functioning of the neonatal intensive care unit, the KMC duration in our study was kept to 1 hour.

Conclusion

As a result, kangaroo mother care applied in neonatal intensive care units, even for a short time, does not adversely affect the mother's body temperature, baby's body temperature, and other vital signs such as cardiac pulse, respiratory rate, perfusion index, blood pressure.

References

1. Charpak N, Ruiz JG, Zupan J, Cattaneo A, Figueroa Z, Tessier R, et al. Kangaroo mother care: 25 years after. Acta Paediatr. 2005;94(5):514-522.[PubMed][CrossRef]
2. DiMenna L. Considerations for implementation of a neonatal kangaroo care protocol. Neonatal Netw.2006;25(6):405-412.[PubMed][CrossRef]
3. Boundy EO, Dastjerdi R, Spiegelman D, Fawzi WW, Missmer SA, Lieberman E, Kajeepeta S, Wall S, Chan GJ. Kangaroo Mother Care and Neonatal Outcomes: A Meta-analysis. Pediatrics. 2016;137(1):20152238. [PubMed] [CrossRef]
4. Lawn JE, Mwansa-Kambafwile J, Horta BL, Barros FC, Cousens S. 'Kangaroo mother care' to prevent neonatal deaths due to preterm birth complications. Int J Epidemiol. 2010;39(Suppl 1):144-154. [PubMed][CrossRef]
5. Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database Syst Rev. 2011;16(3):CD002771.[CrossRef]
6. Moore ER, Anderson GC, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane Database Syst Rev. 2007;18(3):CD003519.[CrossRef]
7. Johnston CC-Y, Fernandes A, Inglis D, Streiner D, Zee R. Skin-to-skin care for procedural pain in neonates. Cochrane Database Syst Rev. 2014;1:CD008435 [CrossRef]
8. Fischer CB, Sontheimer D, Scheffer F, Bauer J, Linderkamp O. Cardiorespiratory stability of premature boys and girls during kangaroo care. Early Hum Dev.1998;52(2):145-153. [PubMed] [CrossRef]
9. Mori R, Khanna R, Pledge D, Nakayama T. Meta-analysis of physiological effects of skin-to-skin contact for newborns and mothers. Pediatr Int.2010;52(2):161-170. [PubMed][CrossRef]
10. Bohnborst B, Heyne T, Peter CS, Poets CF. Skin-to-skin (kangaroo) care, respiratory control, and thermoregulation. J Pediatr. 2001;138(2):193-197. [PubMed][CrossRef]
11. Nyqvist KH, Anderson GC, Bergman N, Cattaneo A, Charpak N, Davanzo R, et al. State of the art and recommendations. Kangaroo mother care: Application in a high-tech environment. Acta Paediatr. 2010;99(6)812-819. [PubMed][CrossRef]
12. Conde-Agudelo A, Belizan JM, Diaz-Rossello J. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database Syst Rev. 2011;16(3):CD002771. [CrossRef]
13. Ibe OE, Austin T, Sullivan K, Fabanwo O, Disu E, Costello AMD. A comparison of kangaroo mother care and conventional incubator care for thermal regulation of infants < 2000 g in Nigeria using continuous ambulatory temperature monitoring. Ann Trop Paediatr. 2004;24 (3):245-251. [PubMed][CrossRef]
14. Pattinson RC, Bergh AM, Malan AF, R. Prinsloo. Does kangaroo mother care save lives? J Trop Pediatr. 2006;52(6):438-44. [PubMed] [CrossRef]
15. World Health Organization Department of Reproductive Health and Research. Kangaroo Mother Care: A Practical Guide. Geneva, Switzerland: World Health Organization; 2003
16. Ramani M, Choe EA, Major M, Newton R, Mwenechanya M, Travers CP, Chomba E, Ambalavanan N, Carlo WA. Kangaroo mother care for the prevention of neonatal hypothermia: a randomised controlled trial in term neonates. Arch Dis Child. 2018 May;103(5):492-497. [PubMed][CrossRef]
17. Begum EA, Bonno M, Ohtani N, Yamashita S, Tanaka S, Yamamoto , et al. Cerebral oxygenation responses during kangaroo care in low birth weight infants. BMC Pediatr. 2008;8:51. [PubMed][CrossRef]
18. Ludington Hoe SM, Johnson MW, Morgan K, Lewis T, Gutman J, Wilson PD, et al. Neurophysiologic assessment of neonatal sleep organization: Preliminary results of a randomized, controlled trial of skin contact with preterm infants. Pediatrics 2006;117:909-923 [PubMed][CrossRef]
19. Mitchell AJ, Yates C, Williams K, Hall RW. Effects of daily kangaroo care on

cardiorespiratory parameters in preterm infants. J Neonatal Perinatal Med.2013;6(3):243-249. [PubMed][CrossRef]

20. Bloch-Salisbury E, Zuzarte I, Indic P, Bednarek F, Paydarfar D. Kangaroo care: cardio-respiratory relationships between the infant and caregiver. Early Hum Dev. 2014 Dec;90(12):843-50. [PubMed][CrossRef]
21. Butruille L, Blouin A, De Jonckheere J, Mur S, Margez T, Rakza T, Storme L. Impact of skin-to-skin contact on the autonomic nervous system in the preterm infant and his mother. Infant Behav Dev. 2017;49:83-86. [PubMed] [CrossRef]
22. Parsa P, Karimi S, Basiri B, Roshanaei G. The effect of kangaroo mother care on physiological parameters of premature infants in Hamadan City, Iran. Pan Afr Med J. 2018;30:89. [PubMed] [CrossRef]
23. Keshavarz M, Bolbol Haghighi N. Effects of kangaroo contact on some physiological parameters in term neonates and pain score in mothers with cesarean section. Koomesh. 2010;11(2):91-8.
24. Jafari M, Bayatmokhtari M, Kermansaravi F. The effect of kangaroo mother care on weight gain, stay length and controlling temperature of preterm neonates with low birth weight in neonatal intensive care units of selected hospitals in Mashhad. Medical-Surgical Nursing Journal. 2014;3(1):37-3218.
25. Basiri B, Shokouhi M, Heydari Farah S. The Effect of Kangaroo Mother Care (KMC) Duration on Physical Growth of Low Birth Weight Infants. Sci J Hamadan Univ Med Sci. 2014;21(1):8-15.
26. Bisanalli S, Nesargi S, Govindu RM, Pn Rao S. Kangaroo Mother Care in Hospitalized Low Birth-Weight Infants on Respiratory Support: A Feasibility and Safety Study. Adv Neonatal Care. 2019 Dec;19(6):21-25. [PubMed][CrossRef]