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Original Research Article

Early kangaroo mother care in healthy term and late preterm infants: a worthy intervention

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ABSTRACT

Background: Kangaroo mother care (KMC) is a well-established intervention for preterm and low birth weight infants; however, evidence regarding its benefits in healthy term and late preterm neonates remains limited. Early skin-to-skin contact may influence neonatal physiological stability and feeding outcomes even among clinically stable newborns. The objective is to evaluate the effects of early kangaroo mother care on thermal stability, breastfeeding effectiveness, hydration indicators and weight loss among healthy term and late preterm neonates.
Methods: This descriptive comparative study was conducted in the postnatal care wards of a tertiary care teaching hospital. A total of 100 mother–baby dyads fulfilling eligibility criteria were randomly allocated into KMC (intervention) group and a standard care group. Neonates in the intervention group received early KMC for a minimum of 30 minutes per day initiated within 24 hours of birth, while the control group received routine postnatal care. Neonatal rectal temperature, wet nappy counts, Infant Breastfeeding Assessment Tool (IBFAT) scores and body weight were recorded over the early postnatal period. Statistical analysis was performed using SPSS version 22.0, with $p<0.05$ considered statistically significant.
Results: Neonates receiving KMC demonstrated significantly higher post-intervention temperatures on day 1, 2 and 3 ($p<0.05$). Wet nappy counts were consistently higher in the KMC group across all observation days (day 1: $p=0.01$; day 2: $p=0.001$; day 3: $p<0.001$). Breastfeeding effectiveness was significantly better in the KMC group, with a higher proportion of effective feeders observed on day 1 ($p=0.04$) and day 2 ($p=0.001$). Although day-wise neonatal weights were comparable, cumulative percentage weight loss was significantly lower in the KMC group (4.51±2.80%) compared to standard care (6.37±2.45%) ($p<0.001$).
Conclusions: Early kangaroo mother care was associated with improved thermal stability, enhanced early breastfeeding effectiveness, better hydration indicators and reduced cumulative weight loss among healthy term and late preterm neonates. Early KMC represents a simple and clinically beneficial intervention that may be integrated into routine postnatal care.

Keywords: Kangaroo mother care, Skin-to-skin contact, Term neonates, Late preterm neonates, Breastfeeding effectiveness, Thermoregulation, Neonatal weight loss

INTRODUCTION

Kangaroo mother care (KMC) is often described as a "no-cost incubator," yet its value lies in restoring continuous mother–infant biology at the bedside. In an era where routine postnatal care can still separate a stable newborn from the mother for observation and procedures, early skin-to-skin contact offers a simple, physiologically rational strategy to support neonatal transition immediately after birth. KMC includes prolonged skin-to-skin contact, support for exclusive or near-exclusive breastfeeding and continuity of care after early discharge

in appropriate settings.[1] The practice evolved from early investigations into enhanced mother–baby contact soon after delivery and later became formalized as "kangaroo care," emphasizing early and sustained skin-to-skin placement on the mother's bare chest.[2] KMC is recognized as a human-centred care intervention that can improve neonatal stability and survival, with large trials demonstrating that even immediate initiation in low-birth-weight infants can improve outcomes when implemented safely.[3]

The biological plausibility of KMC is strong. Skin-to-skin contact supports thermoregulation, reduces stress responses, promotes calmer behavioural states and facilitates early feeding through proximity and frequent feeding cues.[4] Observational work on newborn behaviour shows that when placed skin-to-skin soon after birth, many infants demonstrate instinctive breast-seeking and early suckling that can support breastfeeding establishment.[2] These mechanisms explain why KMC has consistently shown benefits across domains such as physiologic stability, breastfeeding and neurodevelopment in vulnerable neonates, with long-term follow-up suggesting protective effects into later life.[5]

Although KMC has traditionally been emphasized for preterm and low-birth-weight babies, there is increasing interest in extending its routine use to healthy term and late preterm neonates, who constitute majority of births globally. Late preterm infants (34–36 weeks) are often managed like term infants, yet they remain physiologically immature and have higher risks of hypothermia, feeding difficulty and jaundice compared with full-term newborns.[6]

Emerging evidence indicates that KMC can prevent hypothermia, reduce procedural pain during vaccination and may improve bilirubin profiles when used as supportive care.[7-10] A recent systematic review focusing specifically on term and late-preterm neonates concluded that KMC is associated with potential advantages including better prevention of hypothermia, lower bilirubin levels and improved comfort during vaccination, while also highlighting the need for more consistent evidence and standardized protocols.[11]

Despite this growing literature, KMC is rarely implemented in routine postnatal wards for stable term and late preterm infants. The immediate postpartum period represents a critical window when thermal adaptation, stress regulation and breastfeeding initiation are established; therefore, evaluating early KMC as a standardized intervention may generate actionable evidence for improving routine newborn care without additional equipment or high costs. Against this background, the present study examines early kangaroo mother care in healthy term and late preterm infants as a potentially worthy intervention to strengthen physiologic stability and supportive neonatal outcomes in everyday clinical practice.

METHODS

Study design and setting

This descriptive comparative study was conducted in the Postnatal Care (PNC) wards of Kempegowda Institute of Medical Sciences (KIMS) Hospital and Research Centre, Bangalore, India, over a period of 18 months.

Study participants

The study population comprised healthy term and late preterm neonates delivered at KIMS Hospital and Research Centre and their mothers. Only mother–baby dyads fulfilling the eligibility criteria and providing written informed consent were included.

Eligibility criteria

Inclusion criteria

Healthy term neonates (gestational age ≥ 37 weeks) and late preterm neonates (gestational age 34–36 weeks). Neonates born at KIMS Hospital and Research Centre and shifted to the mother's side immediately after birth.

Exclusion criteria

Sick neonates requiring Neonatal Intensive Care Unit (NICU) admission at birth or those necessitating NICU transfer within the first 24 hours of life. Neonates born to mothers with severe maternal complications or comorbidities (e.g., severe postpartum hemorrhage, severe eclampsia, maternal ICU admission or other conditions) precluding safe provision of kangaroo mother care.

Sampling and group allocation

Eligible participants were enrolled following written informed consent from mothers willing to participate. Enrolled mother–baby dyads were allocated into either the test group (early KMC) or the control group (standard care) using a simple random sampling technique (lottery method). Each participant was assigned to a study group based on the lot drawn, ensuring unbiased allocation.

Intervention protocol

Test group (early kangaroo mother care): Mothers assigned to the test group were counselled regarding kangaroo mother care and encouraged to provide KMC for a minimum duration of 30 minutes per day. Early KMC was initiated within the first 24 hours of birth and continued daily throughout the hospital stay.

For KMC sessions, neonates were dressed in minimal clothing (diaper, cap and socks) and positioned upright against the mother's bare chest in the standardized kangaroo position. The infant was placed between the

mother's breasts in direct skin-to-skin contact, with the head turned to one side in a slightly extended position to maintain airway patency and facilitate visual interaction. The hips were flexed in a frog-like posture, and the arms were maintained in flexion. The dyad was covered with a shawl or blanket to ensure thermal comfort and privacy.

Control group (standard care): Neonates in the control group received routine postnatal ward care as per institutional protocol. This included appropriate clothing and swaddling, with breastfeeding provided on demand. No structured kangaroo mother care sessions were prescribed for this group.

Outcome measures

Breastfeeding effectiveness

Breastfeeding effectiveness was assessed using the Infant Breastfeeding Assessment Tool (IBFAT). The tool evaluates four domains: readiness to feed, rooting, latch-on and suckling. Each domain is scored from 0 to 3, yielding a total score ranging from 0 to 12.

Scores were interpreted as follows

10–12: Strong and effective breastfeeding; 6–9: Moderate breastfeeding effectiveness; may require support; 0–5: Poor breastfeeding effectiveness; intervention required

Thermal stability

Neonatal rectal temperature was measured using a calibrated digital rectal thermometer. Temperature recordings were obtained before and after KMC sessions in the test group. For the control group, temperature measurements were recorded at comparable time points.

Sample size estimation: The sample size was calculated based on the formula for comparison of proportions between two groups:

$$n = \frac{Z_{1-\alpha/2}^2[P_1(1-P_1) + P_2(1-P_2)]}{d^2}$$

Where: P_1= Proportion in the first group; P_2= Proportion in the second group; d= Population risk difference; $1-\alpha$= Desired confidence level

The following assumptions were applied:

P_1=0.86 (proportion achieving exclusive human milk feeding with early KMC) based on prior literature (Jayaraman et al); P_2=0.55 (proportion achieving exclusive human milk feeding with late/no KMC); $d = 0.31$ image (population risk difference); Confidence level = 95%; Power = 80%; and Margin of error = 5%.

The minimum required sample size was estimated as 43 participants per group. To account for potential attrition and enhance statistical robustness, the sample size was rounded to 50 participants per group. Accordingly, a total of 100 mother–baby dyads were included in the study.

Statistical analysis

Data were entered and analysed using Statistical Package for Social Sciences (SPSS) for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics

Continuous variables were summarized using mean and standard deviation (SD), while categorical variables were expressed as frequencies and percentages.

Inferential statistics

Continuous variables were compared between groups using the Independent Student's t-test or Mann–Whitney U test, depending on data distribution. Categorical variables were analysed using the Chi-square test. A p value <0.05 was considered statistically significant.

Ethical considerations

The study was conducted following approval from the Institutional Ethics Committee of KIMS Hospital and Research Centre. Written informed consent was obtained from all participating mothers. Confidentiality and anonymity of participant data were strictly maintained throughout the study.

RESULTS

Table 1 depicts the maternal and obstetric characteristics of the study participants in both groups. The mean maternal age was comparable between the standard care group (28.14±4.85 years) and the KMC group (27.18±3.91 years), with no statistically significant difference (p=0.41). With respect to obstetric status, primigravidae constituted 32.0% of participants in Group A and 34.0% in Group B, while multi-gravidae accounted for 68.0% and 66.0% of cases, respectively. This distribution was also statistically comparable between the two groups (p=0.83). These findings indicate that both groups were well matched in terms of maternal age and obstetric characteristics, minimizing the likelihood of confounding due to baseline maternal factors.

Table 2 compares gestational age and mode of delivery between the two study groups. The mean gestational age was slightly higher in the standard care group (37.72±1.05 weeks) compared to the KMC group (37.28±1.11 weeks) and this difference reached statistical significance (p=0.04). However, the absolute difference was small (<0.5 weeks) and is unlikely to be clinically meaningful. Regarding mode of delivery, lower segment

caesarean section (LSCS) was the most common mode in both groups, accounting for 60.0% of deliveries in group A and 68.0% in group B. Full-term vaginal deliveries constituted 36.0% and 30.0% of cases, while preterm vaginal deliveries were 4.0% and 2.0%. No, statistically significant difference observed (p=0.65), indicating similar obstetric management across both cohorts.

Table 3 presents the neonatal characteristics at birth in both study groups. The sex distribution was comparable, with male neonates constituting 48.0% in group A and 46.0% in group B and females being 52.0% and 54.0% of cases, respectively. This difference was not statistically significant (p=0.84). Assessment of APGAR scores showed that majority of neonates in both groups had satisfactory scores. At 1 minute, 98.0% of neonates in each group had an APGAR score ≥7, with no significant difference (p=1.00). At 5 minutes, all neonates in both groups achieved an APGAR score ≥7. Owing to the identical distribution of 5-minute APGAR scores in both groups, statistical comparison was not applicable. Overall, these findings indicate that the neonatal baseline condition at birth was similar in both groups, ensuring comparability for subsequent outcome assessment.

Table 4 compares parameters related to breastfeeding between the standard care and KMC groups. The mean time to initiation of breastfeeding was similar in both groups, being 106.50±39.31 minutes in Group A and 102.00±32.64 minutes in group B, with no statistically significant difference observed (p=0.87). The number of breastfeeds given prior to the interview was also comparable between the two groups, with a mean of 3.66±2.64 feeds in the standard care group and 3.00±2.81 feeds in the KMC group (p=0.13). Additionally, the average duration of individual feeds did not differ significantly between groups, measuring 10.68±2.97 minutes in group A and 11.02±2.70 minutes in group B (p=0.51). Overall, these findings indicate that breastfeeding initiation and feeding patterns were similar in both groups, suggesting that subsequent differences in neonatal outcomes are unlikely to be influenced by baseline breastfeeding practices.

Table 5 summarizes the neonatal physiological parameters on Day 1 in both study groups. The pre-intervention body temperature was comparable between the standard care group (99.04±0.49°F) and the KMC group (99.08±0.47°F), with no statistically significant difference (p=0.65). However, following the intervention, neonates in the KMC group demonstrated a significantly higher mean body temperature (99.43±0.35°F) compared to those receiving standard care (99.11±0.34°F) and this difference was statistically significant (p<0.001), indicating better thermoregulation with KMC. The mean neonatal weight on day 1 was similar in both groups (2.88±0.38 kg in Group A vs. 2.90±0.43 kg in Group B; p=0.77), confirming baseline comparability with respect to weight. In contrast, the mean wet nappy count was significantly higher in the KMC group (5.54±1.30) than in the standard care group (4.80±1.55), with this difference reaching statistical significance (p=0.01). Overall, these findings suggest that while baseline physiological parameters and weight were comparable on day 1, KMC was associated with improved thermoregulation and better urine output, reflecting enhanced early physiological stability and feeding adequacy.

Table 6 presents the comparison of neonatal parameters on day 2 between the standard care and KMC groups. The pre-intervention body temperature remained comparable between the two groups (99.13±0.45°F in Group A vs. 99.16±0.43°F in group B), with no statistically significant difference (p=0.71), but the post-intervention temperature was significantly higher in the KMC group (99.45±0.38°F) than the standard care group (99.24±0.35°F) with statistically significant difference (p=0.005), indicating improved thermoregulation with KMC on day 2. The mean neonatal weight on day 2 showed no significant difference between the groups (2.77±0.37 kg in group A vs. 2.81±0.43 kg in group B; p=0.62), suggesting similar weight trends at this stage. However, the mean wet nappy count was significantly higher in the KMC group (7.70±1.47) compared to the standard care group (6.46±1.54), with a significant difference (p=0.001).

Table 7 compares neonatal physiological parameters on Day 3 between the standard care and KMC groups. The pre-intervention body temperature was similar in both groups (99.09±0.38°F in group A and 99.14±0.39°F in group B), with no statistically significant difference observed (p=0.54). Following KMC, this group demonstrated a significantly higher post-intervention temperature (99.46±0.29°F) compared to the standard care group (99.25±0.29°F) and with statistically significant difference (p<0.001), indicating sustained improvement in thermoregulation with KMC on third postnatal day. The mean neonatal weight on day 3 did not differ significantly between the groups (2.72±0.37 kg in group A vs. 2.78±0.43 kg in group B; p=0.49), suggesting comparable weight trends at this time point. The mean wet nappy count was significantly higher in the KMC group (8.54±1.15) compared to the standard care group (7.22±1.63), with this difference being statistically significant (p<0.001).

Table 8 illustrates the infant breastfeeding assessment tool (IBFAT) scores on day 1 in the two study groups. A higher proportion of neonates in the KMC group were classified as effective feeders (26.0%) compared to the standard care group (14.0%), while poor feeding was more frequently observed in the standard care group (14.0%) than in the KMC group (2.0%). Most neonates in both groups were categorized as moderately effective feeders; however, the overall distribution of IBFAT scores differed significantly between the two groups. This difference was statistically significant (p=0.04), indicating that neonates receiving kangaroo mother care

demonstrated better early breastfeeding effectiveness on day 1 compared to those receiving standard care.

Table 9 presents the distribution of IBFAT scores on day 2 among neonates in the standard care and KMC groups. A markedly higher proportion of neonates in the KMC group were classified as effective feeders (76.0%) compared to the standard care group (42.0%). Conversely, moderately effective feeding was more common in the standard care group (58.0%) than in the KMC group (24.0%). This difference in the distribution of IBFAT scores between the two groups was statistically highly significant (p=0.001), indicating a substantial improvement in breastfeeding effectiveness among neonates receiving kangaroo mother care by the second postnatal day.

Table 1: Maternal and obstetric characteristics.

Variables	Group A (standard care) n=50	Group B (KMC) n=50	P value
Age (years), Mean±SD	28.14±4.85	27.18±3.91	0.41
Primigravida, N (%)	16 (32.0)	17 (34.0)	0.83
Multigravida, N (%)	34 (68.0)	33 (66.0)	

Data are expressed as mean±SD or n (%). KMC: Kangaroo Mother Care; SD: Standard deviation. p<0.05 was considered statistically significant. Maternal age (p=0.41) and obstetric status (p=0.83) were statistically comparable between the standard care (Group A) and KMC (Group B) groups, indicating well-matched baseline maternal characteristics.

Table 2: Gestational age and mode of delivery.

Variables	Category	Group A, N (%)	Group B, N (%)	P value
Gestational age (weeks)	Mean±SD	37.72±1.05	37.28±1.11	0.04
Mode of delivery	LSCS	30 (60.0)	34 (68.0)	0.65
	Full-term vaginal	18 (36.0)	15 (30.0)	
	Preterm vaginal	2 (4.0)	1 (2.0)	

Data are expressed as mean ± SD or n (%). Group A: Standard Care, Group B: KMC, Kangaroo Mother Care; LSCS: Lower segment caesarean section; SD: Standard deviation. p<0.05 was considered statistically significant. Mean gestational age was slightly higher in the standard care group than the KMC group (p=0.04), though the absolute difference (<0.5 weeks) was not clinically meaningful. Mode of delivery showed no significant difference between groups (p=0.65), with LSCS being the most common in both cohorts.

Table 3: Neonatal characteristics at birth.

Variables	Category	Group A, N (%)	Group B, N (%)	P value
Sex	Male	24 (48.0)	23 (46.0)	0.84
	Female	26 (52.0)	27 (54.0)	
APGAR at 1 min	≥7	49 (98.0)	49 (98.0)	1
APGAR at 5 min	≥7	50 (100)	50 (100)	-

Data are expressed as n (%). APGAR: Appearance, Pulse, Grimace, Activity, and Respiration; Group A: Standard Care, Group B: KMC, Kangaroo Mother Care. p<0.05 was considered statistically significant. Sex distribution (p=0.84) and 1-minute APGAR scores (p=1.00) were comparable between the standard care (Group A) and KMC (Group B) groups, while 5-minute APGAR scores were identical (100% ≥7 in both groups; statistical test not applicable), confirming similar baseline neonatal condition at birth.

Table 4: Breastfeeding related parameters.

Parameters	Group A (Mean±SD)	Group B (Mean±SD)	P value
Time to initiation of breastfeeding (min)	106.50±39.31	102.00±32.64	0.87
Number of feeds before interview	3.66±2.64	3.00±2.81	0.13
Duration of feeds (min)	10.68±2.97	11.02±2.70	0.51

Data are expressed as mean±SD. Group A: Standard Care, Group B: KMC, Kangaroo Mother Care; SD: Standard deviation. p < 0.05 was considered statistically significant. Time to breastfeeding initiation (p=0.87), number of breastfeeds prior to the interview (p=0.13), and average duration of individual feeds (p = 0.51) showed no significant differences between the standard care (Group A) and KMC (Group B) groups, indicating comparable baseline breastfeeding practices.

Table 5: Neonatal physiological parameters on day 1.

Parameters	Group A (Mean±SD)	Group B (Mean±SD)	P value
Pre-intervention temperature (°F)	99.04±0.49	99.08±0.47	0.65
Post-intervention temperature (°F)	99.11±0.34	99.43±0.35	<0.001*
Weight (kg)	2.88±0.38	2.90±0.43	0.77
Wet nappy count	4.80±1.55	5.54±1.30	0.01*

Data are expressed as mean±SD. Group A: Standard Care; Group B: KMC, Kangaroo Mother Care; SD: Standard deviation. p<0.05 was considered statistically significant. Baseline neonatal weight (p=0.77) and pre-intervention body temperature (p=0.65) were comparable between the KMC and standard care groups. Post-intervention body temperature (p<0.001) and wet nappy count (p=0.01) were significantly higher in the KMC group, reflecting improved thermoregulation and urine output on Day 1.

Table 6: Neonatal physiological parameters on day 2.

Parameters	Group A (Mean±SD)	Group B (Mean±SD)	P value
Pre-intervention temperature (°F)	99.13±0.45	99.16±0.43	0.71
Post-intervention temperature (°F)	99.24±0.35	99.45±0.38	0.005*
Weight (kg)	2.77±0.37	2.81±0.43	0.62
Wet nappy count	6.46±1.54	7.70±1.47	0.001*

Data are expressed as mean±SD. Group A: Standard Care, Group B: KMC, Kangaroo Mother Care; SD: Standard deviation. p < 0.05 was considered statistically significant. On Day 2, pre-intervention body temperature (p=0.71) and neonatal weight (p = 0.62) showed no significant differences between the standard care (Group A) and KMC (Group B) groups. Post-intervention body temperature (p=0.005) and wet nappy count (p=0.001) were significantly higher in the KMC group, indicating sustained thermoregulation and improved urine output.

Table 7: Neonatal physiological parameters on day 3.

Parameters	Group A (Mean±SD)	Group B (Mean±SD)	P value
Pre-intervention temperature (°F)	99.09±0.38	99.14±0.39	0.54
Post-intervention temperature (°F)	99.25±0.29	99.46±0.29	<0.001*
Weight (kg)	2.72±0.37	2.78±0.43	0.49
Wet nappy count	7.22±1.63	8.54±1.15	<0.001*

Data are expressed as mean±SD. Group A: Standard Care, Group B: KMC, Kangaroo Mother Care; SD: Standard deviation. p<0.05 was considered statistically significant. On Day 3, pre-intervention body temperature (p = 0.54) and neonatal weight (p=0.49) showed no significant differences between the standard care (Group A) and KMC (Group B) groups. Post-intervention body temperature (p<0.001) and wet nappy count (p<0.001) were significantly higher in the KMC group, demonstrating sustained thermoregulation and improved urine output.

Table 8: IBFAT scores on day 1.

Category	Group A, N (%)	Group B, N (%)	P value
Poor feeder	7 (14.0)	1 (2.0)	0.04*
Moderately effective feeder	35 (71.0)	36 (72.0)	
Effective feeder	7 (14.0)	13 (26.0)	

Data are expressed as n (%). IBFAT: Infant Breastfeeding Assessment Tool; Group A: Standard Care, Group B: KMC, Kangaroo Mother Care. p < 0.05 was considered statistically significant. On Day 1, the overall distribution of IBFAT scores differed significantly between groups (p=0.04), with a higher proportion of effective feeders (26.0% vs. 14.0%) and fewer poor feeders (2.0% vs. 14.0%) in the KMC group compared to the standard care group, indicating better early breastfeeding effectiveness.

Table 9: IBFAT scores on day 2.

Category	Group A, N (%)	Group B, N (%)	P value
Moderately effective feeder	29 (58.0)	12 (24.0)	0.001*
Effective feeder	21 (42.0)	38 (76.0)	

Data are expressed as n (%). IBFAT: Infant Breastfeeding Assessment Tool; Group A: Standard Care, Group B: KMC, Kangaroo Mother Care. p<0.05 was considered statistically significant. On Day 2, the distribution of IBFAT scores differed significantly between groups (p=0.001), with a markedly higher proportion of effective feeders (76.0% vs. 42.0%) and fewer moderately effective feeders (24.0% vs. 58.0%) in the KMC group compared to the standard care group, indicating substantially improved breastfeeding effectiveness.

Table 10: Comparison of the percentage of weight loss during hospital stay.

Parameters	Group A (standard care) n=50	Group B (KMC) n=50	P value
Percentage of weight loss (%)	6.37 ± 2.45	4.51 ± 2.80	<0.001

Data are expressed as mean±SD. KMC: kangaroo mother care; SD: standard deviation. p<0.05 was considered statistically significant. Cumulative percentage of weight loss during the hospital stay was significantly lower in the KMC Group (group B) compared to the standard care group (group A) (p<0.001), indicating better overall weight preservation despite comparable day-wise weights on days 1–3.

Table 10 shows the comparison of cumulative percentage of weight loss during the period of hospital stay between group A (standard care) and group B (Kangaroo mother care). The mean percentage of weight loss in group A was 6.37±2.45%, whereas in group B it was 4.51±2.80%. The difference in percentage of weight loss between the two groups was found to be statistically significant (p<0.001). Although no statistically significant difference was observed in the day-wise body weight measurements on day 1, 2 and 3, analysis of cumulative weight loss over the entire hospital stay demonstrated a significantly lower percentage of weight loss in neonates receiving kangaroo mother care compared to those receiving standard care.

DISCUSSION

The present study evaluated the effects of early Kangaroo Mother Care (KMC) on physiological stability, breastfeeding effectiveness and weight dynamics among healthy term and late preterm neonates. The findings demonstrate that even within a population traditionally considered low-risk, early implementation of KMC is associated with measurable clinical benefits, particularly in thermoregulation, early breastfeeding behaviour, hydration status and cumulative weight loss patterns.

Baseline maternal and neonatal characteristics were largely comparable between the study groups. Maternal age, parity distribution, neonatal sex and APGAR scores did not differ significantly, minimizing potential confounding influences. Although a statistically significant difference in gestational age was observed, the absolute difference was small and clinically negligible, particularly given that all included neonates were physiologically stable.

One of the observations in this study was the improvement in post-intervention body temperature among neonates receiving KMC. While pre-intervention temperatures were similar between groups, post-KMC temperatures were significantly higher across day 1 to 3. This finding is physiologically coherent with the established thermoregulatory advantages of skin-to-skin contact. KMC promotes thermal synchrony through conductive heat transfer and dynamic maternal thermoregulation, thereby supporting neonatal temperature stability.[4] Evidence from randomized trials and systematic reviews confirms that KMC effectively reduces hypothermia risk by improving peripheral perfusion and autonomic regulation.[7,11] The temperature differences observed in the present study suggest that KMC provides cumulative thermoregulatory benefits rather than transient effects.

Hydration and feeding adequacy, reflected by wet nappy counts, were significantly better in the KMC group throughout the observation period. Increased urine output is widely accepted as a surrogate indicator of effective milk intake. These findings align with established evidence that KMC improves neonatal behavioural organization and feeding readiness by reducing stress responses and promoting stable sleep–wake cycles.[12] Improved autonomic stability during KMC has also been shown to enhance feeding efficiency and reduce energy expenditure, which plausibly explains the improved hydration indicators observed in the intervention group.[13]

Breastfeeding effectiveness, assessed using IBFAT scores, was significantly higher among neonates receiving KMC during the early postnatal days. Enhanced readiness to feed, improved rooting and better latch-on behaviour were particularly evident on day 1 and 2. These findings are consistent with prior studies demonstrating that skin-to-skin contact facilitates early breastfeeding by improving neonatal reflex responses and state regulation.[2,14] KMC has been associated with improved maternal oxytocin release, which positively influences milk ejection and mother–infant interaction.[4] By day 5, both groups demonstrated similar breastfeeding effectiveness, suggesting that KMC primarily accelerates breastfeeding establishment rather than altering eventual feeding success. Similar temporal convergence patterns have been described in term and late preterm populations.[11,15] Although day-wise body weights did not differ significantly between groups, cumulative percentage weight loss was significantly lower among neonates receiving KMC. This observation is clinically relevant, as excessive early weight loss is frequently associated with feeding difficulties, dehydration and hyperbilirubinemia. Reduced weight loss during KMC can be explained by improved thermoregulation, decreased metabolic stress and enhanced feeding effectiveness.[16] Skin-to-skin contact minimizes cold stress and energy expenditure, allowing greater allocation of metabolic resources toward growth and physiological adaptation.[4] Contemporary neonatal studies similarly report improved weight trajectories and feeding efficiency with early KMC.[17]

The significance of these findings lies in their applicability to healthy term and late preterm neonates. Traditionally, KMC has been emphasized for preterm infants; however, emerging evidence increasingly supports its benefits in stable newborn populations. Recent systematic reviews indicate that KMC improves thermoregulation, reduces stress responses and enhances breastfeeding outcomes even in term and late preterm neonates.[11] The present study adds to this evolving body of evidence by demonstrating that early KMC can produce physiologically meaningful benefits without additional technological requirements.

The biological plausibility of the observed effects is well supported. KMC improves autonomic regulation, stabilizes cardiorespiratory parameters, reduces cortisol levels and enhances maternal–infant bonding.[12] These mechanisms collectively contribute to improved thermal stability, feeding behaviour and metabolic efficiency. The consistency of findings across multiple physiological domains shows that KMC functions as an active regulatory intervention rather than a passive caregiving practice.

Certain limitations were that the study was conducted at a single centre, with a small sample size, which limits generalizability. The KMC exposure was for a minimal duration, precluding evaluation of dose–response relationships. Long-term developmental outcomes were not assessed. Nevertheless, the internal consistency of physiological and feeding outcomes supports the validity of the conclusions.

Overall, the findings of the present study support early initiation of KMC as a beneficial intervention even among healthy term and late preterm neonates. The improvements observed in thermoregulation, hydration indicators, breastfeeding effectiveness and cumulative weight loss suggest that KMC can enhance early neonatal adaptation and stability. These results reinforce contemporary perspectives advocating broader integration of KMC into routine postnatal care practices.

CONCLUSION

Early skin-to-skin contact through Kangaroo Mother Care (KMC) provides meaningful physiological and functional advantages even among healthy term and late preterm neonates. The present study demonstrates that early KMC is associated with improved thermal stability, more effective early breastfeeding behaviour, better hydration indicators and reduced cumulative weight loss during the immediate postnatal period. These findings emphasize that early KMC is not simply a nurturing practice but a clinically relevant intervention that supports neonatal adaptation and feeding competence. Incorporating early KMC into routine postnatal care may represent a simple yet impactful strategy for optimizing newborn stability and early feeding outcomes.

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