



THE EFFECT OF DAILY DURATION OF KANGAROO MOTHER CARE ON PHYSICAL GROWTH AND BREASTFEEDING IN LOW BIRTH WEIGHT/ PRETERM BABIES (LBW/PT) IN FIRST THREE MONTHS OF LIFE: A HOSPITAL BASED PROSPECTIVE STUDY.

Paediatric Medicine

Dr. GP Kaushal HOD, SAG, Associate Professor, Dept Of Pediatrics, Dr Baba Saheb Ambedkar Medical College And Hospital Rohini Sector 6 New Delhi – 110085

Dr Vineeta Wadhwa CMO, Assit. Professor, BSAMCH.

Dr Euden Bhutia Professor, BSAMCH.

Dr Tannu Kataria* Senior Resident, BSAMCH. *Corresponding Author

ABSTRACT

Aims: To assess the effect of daily duration of Kangaroo Mother Care (KMC) on growth parameters (weight, length, and head circumference), exclusive breastfeeding rates, hospital readmission rates, and morbidity patterns in low birth weight (LBW) and preterm infants during the first three months of life. **Methods:** A prospective hospital-based study included 155 LBW (<1800 grams) and/or preterm (<35 weeks) infants, who were enrolled at 10 days of age and followed for three months. Infants were divided into four groups based on how long they spent on KMC each day. Growth metrics were recorded during hospitalization, and the infants were monitored at a high-risk clinic and during vaccine visits. **Results:** Subjects in Group 4 (longer daily KMC duration) experienced the largest average daily weight gain (33.25 g) and weekly gains in length (1.13 cm) and head circumference (1.05 cm). Group 1 (the shortest KMC time) had the lowest gains across all criteria. The daily duration of KMC had significant effects on exclusive breastfeeding rates, readmission rates, and morbidity in LBW/preterm infants. **Conclusion:** Longer daily duration of kmc significantly improved physical growth parameters and exclusive breast feeding rates. Further it reduced morbidity and readmission rates in LBW/Preterm infants. Family involvement was critical for increasing KMC duration and its benefits. **Recommendations:** Larger multi-centric study with larger sample size is recommended for further establishment of positive impacts of KMC duration on physical growth and other benefits.

KEYWORDS

Kangaroo Mother Care (KMC), growth parameters, exclusive breastfeeding.

INTRODUCTION:

Kangaroo Mother Care (KMC) involves placing a diaper-clad infant on the naked chest of a caregiver in a nearly horizontal position. This holistic approach also includes exclusive breastfeeding and early discharge with regular follow-up.^{1,2} Dr. Edgar Rey developed the concept of KMC as a solution to overcrowding in postnatal wards in limited resources for low birth weight (LBW) neonates.³ During KMC, mothers provide warmth to LBW/PT neonates and offer multisensory stimulation as they adapt to life outside the womb.⁴ KMC serves as a cost-effective alternative to incubators/warmers and promotes maternal-infant bonding.⁵ The kangaroo position should be practiced as long as possible or for at least 2 hours each time.⁶ KMC has been found to reduce mortality by maintaining better thermoregulation, promoting early breastfeeding, reduced risk of nosocomial infection, apneic episodes and also in strengthening the bond between mother and infant. In spite of being an effective, convenient and feasible method for optimal care of LBW/PT babies, still it is not widely practiced.⁷ There is limited Indian data on the effects of daily KMC duration on health outcomes. The present study was conducted to evaluate physical growth parameters, exclusive breastfeeding rate and hospital readmission rate in LBW/PT neonates receiving KMC and to correlate these with daily duration of KMC in first three months of life.

METHODS:

Study Design And Setting:

This prospective cohort interventional study was conducted at a tertiary care centre from May 2021 to Feb 2022.

Participants: 155 low birth weight (<1800 grams) and/or Preterm babies (<35 weeks), whose mothers were willing to provide KMC and come for follow up as per the protocol were enrolled.

Objective: The objective of this study was to investigate the relationship between the daily duration of KMC and physical growth parameters (weight, length, and head circumference), as well as to explore the additional benefits of KMC on the rate of exclusive breastfeeding, readmission in LBW/PT babies during the first 3 months of life.

Methodology:

On the tenth day of life, participants were recruited for the study, provided that they were hemodynamically stable and that their mother or a family member with the ability to do KMC was willing for it. Those mothers who were not willing to come follow up, lived outside of Delhi, or had babies with an APGAR score of less than 7 at 1-minute,

chromosomal abnormalities, or life-threatening congenital abnormalities were excluded from the study. Various demographic features of the neonates, such as the mother's age, gestational age, birth weight, weight at the start of KMC, start date of KMC, daily duration of KMC and duration of hospital stay were recorded. All participants were monitored till 14 weeks of life. During birth hospitalization, weight of baby was recorded daily, and weekly measurements of length and head circumference were taken. After discharge, participants were followed up in high-risk clinic weekly until they reached one month of age, then at 6 weeks, 10 weeks, and 14 weeks during their scheduled vaccination visits.

The subjects were divided into four groups based on the daily duration of KMC:

- Group 1: less than 4 hours,
- Group 2: between 4-8 hours,
- Group 3: between 8-12 hours, and
- Group 4: more than 12 hours.

The distribution of subjects by group was 49, 56, 48, and 2 in groups 1, 2, 3, and 4, respectively.

When providing kangaroo care, mother was instructed to wear a front-open gown and be seated in an inclined position on a chair. Naked baby, except for a cap and diaper, was placed between the mother's breasts inside her clothing to ensure proper skin-to-skin contact. KMC was administered for a minimum of 2 hours at a time and could continue for as long as the mother and family members were able to provide. The mother/family members were trained to keep track of the daily duration of KMC (start time, finish time for each session were noted daily) in a note book and this continued at home after discharge. Mothers whose babies could be breastfed were advised to do so regularly on semi-demand basis while providing KMC and others were fed with expressed breast milk with orogastric tube (when admitted) or with paladai.

Statistical Analysis:

The data was entered in MS EXCEL spreadsheet. Quantitative variable was expressed in Mean $\pm$ s.d. whereas categorical variable has been expressed in frequency and percentage. The Normality of the continuous variable like (weight, length, head circumference) has been checked by applying Shapiro-Wilk test. The distribution of weight, length, head circumference among the duration of KMC has been checked by applying Kruskal Wallis Test. Pairwise comparisons has been done for detecting which group pairs significantly differ among

themselves. Box plot has been made for visualising. A p-value of less than 0.05 was considered statistically significant. All the analysis has been done by using IBM- Statistical Package for Social Sciences (SPSS) version 29.0.

RESULTS:

The average daily weight gain was maximum for subjects in group 4 (33.25 ± 0.35) and minimum for subjects in group 1 (19.72 ± 1.09) while intermediate for group 2 (24.27 ± 2.11) and 3 (31.31 ± 1.42) (**Figure 1**). Average weekly length gain was maximum for group 4 (1.12 ± 0.03) and minimum for group 1 (0.64 ± 0.06) (**Figure 2**). Average weekly HC increase was maximum for group 4 (1.04 ± 0.07) and minimum for subjects in group 1 (0.51 ± 0.03), followed by group 2 (0.73 ± 0.11), group 3 (0.92 ± 0.05) (p value 0.001) (**Figure 3**). There was no significant difference in average weight gain, length and head circumference when compared between group 3 and 4 (p value 0.581). Statistically significant result was found in readmission rates during the study period in groups 1, 2, 3 and 4 as 12.2%, 1.8%, 2.1% and 0% (p value 0.001) (**Figure 4**). Significant difference in exclusive breastfeeding rates were observed at 14 weeks among all four groups (81.6%, 94.6%, 97.9%, and 100%) (p value 0.021) (**Figure 5**). This study additionally observed that for increasing the daily duration of KMC, participation of family member is significant.

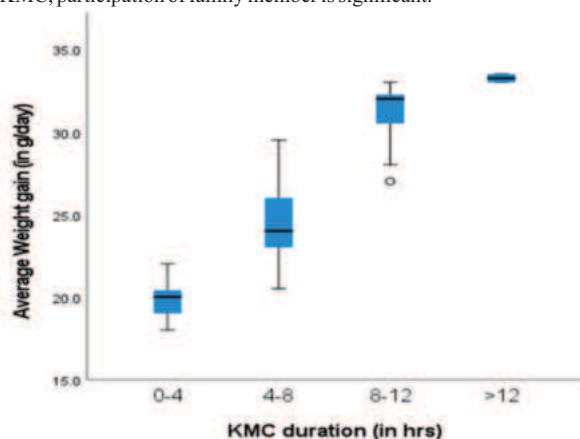


Figure 1: Effect of KMC duration on Average Weight gain (g/day)

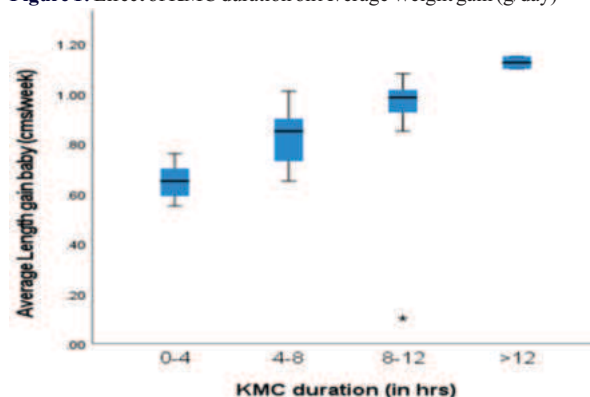


Figure 2: Effect of KMC Duration On Average Length Gain (cm/week)

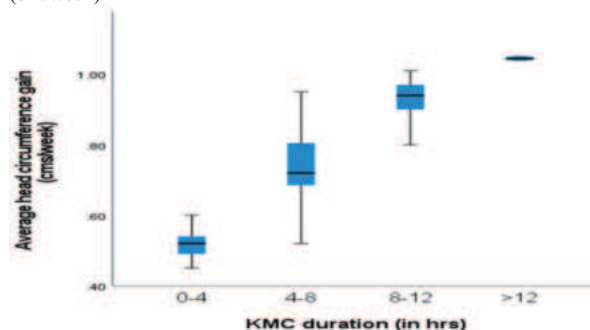


Figure 3: Effect of KMC duration on Average Head circumference (cm/week)

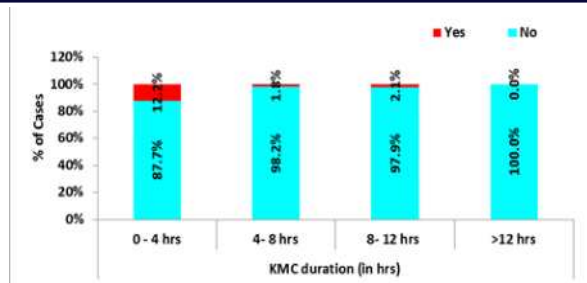


Figure 4: Comparison of distribution of readmissions across various KMC duration groups

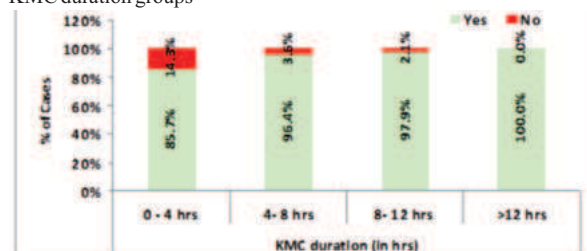


Figure 5: Comparison of distribution of patients according to presence of EBF across various KMC duration groups

DISCUSSION:

In the present study, 155 subjects across four groups were enrolled, focusing on the effects of Kangaroo Mother Care (KMC) on weight gain, length, and head circumference. The inter-group comparisons indicated significant differences in weight gain, length, and head circumference for Group 1 when compared to Groups 2, 3, and 4 ($p < 0.001$). Similarly, Group 2 showed significant differences compared to Groups 3 and 4 ($p < 0.001$). However, no significant differences were observed between Groups 3 and 4 for weight gain ($p = 0.581$), length gain ($p = 0.168$), and head circumference ($p = 0.200$) (**Table 1**).

Table 1: Comparison Of Mean Weight, Length And Head Circumference Between Different KMC Duration Groups

	Daily KMC duration (Hrs)	Mean $\pm$ SD	Min – Max	p value
Average weight gain	0 – 4	19.72 ± 1.09	18.0 - 22.0	0.001*
	4- 8	24.27 ± 2.11	20.5 - 29.5	
	8- 12	31.31 ± 1.42	27.0 - 33.0	
	>12	33.25 ± 0.35	33.0 - 33.5	
Average Length gain	0 – 4	0.64 ± 0.06	0.55 - 0.76	0.001*
	4- 8	0.82 ± 0.09	0.65 - 1.01	
	8- 12	0.96 ± 0.13	0.10 - 1.08	
	>12	1.12 ± 0.03	1.10 - 1.15	
Average HC	0 – 4	0.51 ± 0.03	0.45 - 0.60	0.001*
	4- 8	0.73 ± 0.10	0.52 - 0.95	
	8- 12	0.92 ± 0.05	0.80 - 1.01	
	>12	1.04 ± 0.07	1.04 - 1.05	

Other authors also observed benefits of KMC. Geeta Gathwala et al. (2010) reported a mean weight gain of 21.92 ± 1.44 grams in babies who received at least 6 hours of KMC daily, compared to 18.61 ± 1.28 grams in the control group ($p < 0.05$).⁸ Sharma D et al. (2016) also noted increased length gain in the KMC group.⁹ Nathalie Charpak et al. (2021) observed that increases in length and head circumference were duration-related, with significant growth in infants receiving over 6 hours of KMC per day, concluding that the growth effects of KMC are directly proportional to its duration.¹⁰

The study also revealed a significant reduction in readmission rates, with 6 patients in Group 1, 1 in Group 2, and 3 in Group 3, while no patients were readmitted in Group 4 ($p = 0.001$). Additionally, exclusive breastfeeding (EBF) rates were notably higher in infants who received longer durations of KMC ($p = 0.021$). Active involvement of family members was shown to significantly increase the daily duration of KMC ($p < 0.001$), which is consistent with findings from Emily R. Smith et al. (2017), who reported that caregiver involvement was beneficial in extending the duration of KMC.¹¹

CONCLUSION:

Our study revealed that the average daily duration of kangaroo mother care (KMC) significantly enhanced physical growth parameters and exclusive breast feeding rates. Further it significantly reduced morbidity and readmission rates in low birth weight/preterm infants during the first 3 months of life. The study additionally found the role of other family members in augmenting the daily duration of KMC.

Contributions:

TK: contributed to conception and design, data collection, analysis and interpretation; GPK: contributed to conception and design, analysis and interpretation; VW: contributed to conception and design, analysis; EB: contributed to conception and design, analysis. All authors drafted manuscript, critically revised manuscript, gave final approval and agree to be accountable for all aspects of work ensuring integrity and accuracy.

Funding: None;

Competing Interest: None

REFERENCES:

- 1) Charpak N, Ruiz JG, Zupan J, Cattaneo A, Figueroa Z, Tessier R, et al. Kangaroo Mother Care: 25 years after. *Acta Paediatr Oslo Nor* 1992. 2005 May;94(5):514–22.
- 2) Ruiz-Peláez JG, Charpak N, Cuervo LG. Kangaroo Mother Care, an example to follow from developing countries. *BMJ*. 2004 Nov 13;329(7475):1179–81.
- 3) Rey E, Martínez H. Manejo racional del niño prematuro. Bogotá, Colombia: Universidad Nacional, Curso de Medicina Fetal, 1983
- 4) Doyle LW. Kangaroo mother care. *Lancet*. 1997 Dec 13;350(9093):1721–2.)
- 5) Ibe OE, Austin T, Sullivan K, Fabanwo O, Disu E, Costello AM. 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;24:245-51. DOI: 10.1179/027249304225019082
- 6) Anderson GC. Skin-to-skin for breastfeeding difficulties post birth. Touch and massage therapy in early development. New Brunswick, NJ: Johnson & Johnson Pediatric Institute, LLC; 2004
- 7) Parmar VR, Kumar A, Kaur R, Parmar S, Kaur D, Basu S, et al. Experience with kangaroo mother care in a neonatal intensive care unit (NICU) in Chandigarh, India. *Indian J Pediatr* 2009;76:25-8.
- 8) Gathwala G, Singh B, Singh J. Effect of Kangaroo Mother Care on physical growth, breastfeeding and its acceptability. *Trop Doct*. 2010 Oct;40(4):199–202.
- 9) Sharma, D., Murki, S. & Pratap, O.T. The effect of kangaroo ward care in comparison with “intermediate intensive care” on the growth velocity in preterm infant with birth weight <1100 g: randomized control trial. *Eur J Pediatr* 175, 1317–1324 (2016).
- 10) Charpak N, Montealegre-Pomar A, Bohorquez A. Systematic review and meta-analysis suggest that the duration of Kangaroo mother care has a direct impact on neonatal growth. *Acta Paediatr*. 2021 Jan;110(1):45-59. doi: 10.1111/apa.15489. Epub 2020 Sep 17. PMID: 32683720.
- 11) Smith ER, Bergelson I, Constantian S, Valsangkar B, Chan GJ. Barriers and enablers of health system adoption of kangaroo mother care: a systematic review of caregiver perspectives. *BMC Pediatr*. 2017 Jan 25;17(1):35. doi: 10.1186/s12887-016-0769-5. PMID: 28122592; PMCID: PMC5267363.