

Effect of kangaroo mother care in low-birth-weight babies in reference to breastfeeding in NICU at a tertiary care centre - An observational study



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Submission: 07-08-2024

Revision: 02-11-2024

Publication: 01-12-2024

ABSTRACT

Background: Kangaroo mother care (KMC) is described by the WHO as early, ongoing, and prolonged skin-to-skin contact between a mother and her preterm infants. **Aims and Objectives:** (1) The aim of the study was to study the effect of KMC in growth of newborn and (2) to study the effect of KMC in prevention of hypothermia, apnea, and requirement of prolonged hospital stay. **Materials and Methods:** In this prospective, hospital based, observational study, 241 neonates who were hospitalized to the neonatal intensive care unit in Gauhati Medical College and Hospital, Guwahati between April 2023 and March 2024 were assessed. Every potential mother was trained for KMC and given exclusive breastfeeds, and contrasted with a control/(conventional method of care) group of mothers. **Results:** The KMC babies had better breastfeeding rates as compared to the control group (76% vs. 53.8%). The weight gain (14.9 ± 4.7 vs. 10.5 ± 4.1 g/day), increase in length (0.97 ± 0.67 vs. 0.69 ± 0.63 cm/week), chest circumference (0.73 ± 0.35 vs. 0.49 ± 0.19 G/week), and head circumference (0.74 ± 0.52 vs. 0.50 ± 0.31 g/week), was also better in the KMC group. The incidence of apnea and hypothermia was significantly less in the KMC group, and the duration of stay in hospital was less in the KMC group than the control group (10 ± 5 vs. 16 ± 8 days). **Conclusions:** KMC improves breastfeeding rates, improves growth, reduces morbidities, and decreases duration of hospital stay.

Key words: Kangaroo mother care; Conventional method of care; Low birth weight; Breastfeeding; Hypothermia; Apnea

INTRODUCTION

Kangaroo mother care (KMC) is prolonged skin to skin contact between the caregiver (mother/father/family member) and the neonate, especially low birth weight (LBW) and preterm neonates. Components of KMC include “KMC position,” where the neonate is positioned in skin-to-skin contact in between the mother’s breast with neck in slight extension, “KMC nutrition,” that is exclusive breastfeeding, and “KMC discharge,” i.e., early discharge of neonate after fulfilling the unit discharge criteria, with

continuation of KMC at home and regular followup subsequently.¹

The idea of KMC was started in Bogota, Columbia in 1978 as an intervention to counter the lack of incubators/warmers, and separation of infant-mother dyad.² As per recent records, the prevalence of LBW and Preterm globally is 15.5% and 9.9% and in India is 18% and 13%.^{3,4}

And as it is a low cost, evidence-based method of providing warmth and support LBW and preterm neonates; hence,

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v15i12.68576

E-ISSN: 2091-0576

P-ISSN: 2467-9100

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it is practice for maximum duration of time possible is beneficial. KMC can be given to newborns for as little as 1 h, up to as long as 24 h a day.

In our setup, KMC is given in the KMC room for stable babies that are not on oxygen support, for at least 3 h at a stretch, or in the neonatal intensive care unit (NICU) for babies who are on oxygen support on nasal prongs or continuous positive airway pressure (CPAP) for the maximum duration of time possible. In this study, we study the benefits of KMC given to the LBW and preterm neonates admitted in our inborn unit, and compare it to a control group who received all similar treatment except KMC.

Aims and objectives

1. To study the effect of KMC in growth of newborn
2. To study the effect of KMC in prevention of hypothermia, apnea, and requirement of prolonged hospital stay.

MATERIALS AND METHODS

This study was conducted in NICU Inborn unit, in the Department of Pediatrics, Gauhati Medical College and Hospital as a prospective hospital-based observational study, over a period of 12 months, that is, from April 2023 to March 2024. Ethical Committee clearance was taken from the Gauhati Medical College ethics committee. GMCH is a tertiary care hospital with a state-of-the-art NICU that is well-equipped with features like CPAP and all-modern ventilatory equipments for the newborn, phototherapy equipment, exchange transfusion facilities, surfactant therapy at zero cost, and ROP screening facilities and facilities for screening of newborn hearing.

The NICU has a separate Inborn and Outborn unit, with a preterm unit, term unit, phototherapy unit, KMC unit, stepdown unit. Handwashing is taught to all attendants and Family Participatory Care is encouraged by the team.

Inclusion criteria

Neonates were considered eligible for inclusion in the study were:

- Birth weight <2000 g
- Gestational age <34 weeks
- Hemodynamically stable neonates, not on ionotropic support.

Exclusion criteria

The following criteria were excluded from the study:

- Hemodynamically unstable babies, on ionotrope support
- Neonates with gross congenital malformation
- Birth weight >2000 g.

Study procedure

A total of 260 newborn were selected randomly, and the babies whose mother/caregiver performed KMC were included in the KMC group, and those who did not receive KMC was included in the control/(Conventional method of care) group. The control group received all routine nursing care except KMC.

Total number of babies born in GMCH from April 2023 to March 2024 was 14,285. Out of these, 4367 (30.5%) had a birth weight of <2500 g. A sample size of 260 babies was selected from this group, who fulfilled the inclusion criteria. A proforma was designed for this study that included the baseline parameters of mother such as gravida, parity, age of the mother; gestational age, mode of delivery; and baseline parameters of newborn like birth weight, APGAR score, length and head circumference of newborn at birth, and compared the KMC group to the Control group at 2 months of postnatal age in parameters like increase in length, head circumference, chest circumference, weight, incidence of hypothermia, apnea, and duration of hospital stay. A written informed consent was taken from the mothers/caregivers and they were explained about the purpose of this study, in the local language. Out of the 260 babies, 162 were put in the KMC group and 98 were in the control group.

Mothers or caregivers of the KMC group gave KMC in the KMC chairs beside the baby's warmer or in the mothers bed in the KMC room. Mothers were asked to take bath every day, to wear clean clothes before coming for KMC, and explained about importance of handwashing. Clothes of the babies were removed and babies placed in between mothers breast in skin-to-skin contact, with hips and arms flexed and abducted to maintain frog-like position, with baby's neck in slight extension so that eye contact with mother is possible, and the airway is straight. KMC was given for a minimum of 1 h up to 16–18 h or as long as the mother or caregiver can provide KMC comfortably.

Mothers/caregivers that gave KMC was supported, trained, and informed about KMC by the nursing staff and on duty doctors. Mothers were encouraged to sing or talk to their babies that helped in the mother-baby bonding. Issues related to breastfeeding were also discussed during the KMC sessions.

The control group received routine neonatal care including maintenance of temperature, paladai/katori feeding of expressed breastmilk or formula milk, and oil massage. Data were recorded and entered into excel sheets. The departmental protocol of discharge from hospital was followed. The babies were followed up till 2 months of postnatal age. Out of the total 260 babies, 19 babies were

lost to follow-up, out of which 12 were from KMC group and seven were from control group.

Statistical analysis

The data were analyzed using SPSS version 24. Variables were analyzed with t-test, Chi-square test, and logistic regression. The statistical level of significance was set at 0.05.

RESULTS

In this study, 162 mothers performed KMC, and 98 were in the control group. Twelve babies in the KMC group and seven babies were lost to follow-up. Hence, in the end, 150 babies remained in the KMC group, and 91 babies in the control group.

Baseline neonatal characteristics were similar in both the KMC and control group as shown in Table 1, with no significant difference in both the groups. Similarly, baseline characteristics of mother were also similar, and the differences in between the KMC group and control group were non-significant (Table 2).

Table 1 shows the baseline neonatal characteristics of both the KMC group and the control group, including birth weight, sex of the baby, gestational age, length, head

circumference, and APGAR score. On comparing both the groups, there was no significant difference in the baseline characteristics of the KMC group and the control group.

Table 2 shows the baseline characteristics of the mother/caregiver, which were similar in both the KMC group and the control group ($P>0.05$), including the gravida, parity, age of mother, gestational age, and mode of delivery. It was also seen that fathers/grandparents of 39 babies came forward to give KMC to the babies, which was very encouraging to the family and the health-care team too.

Table 3 shows that exclusive breastfeeding was compared in both the groups, by dividing in weight groups of <1000 g, 1000–1500 g, and >1500 g. In the weight group of 1000–1500 g, exclusive breastfeeding was possible in 77.9% of babies, as compared to 51.2% of babies in the control group, with a significant difference ($P=0.003$).

Similarly, in the weight group of 1500–2000 g, 73% babies were exclusively breastfed in the KMC group, in comparison to 53.8% in the control group, with a significant difference ($P=0.02$) (Table 3).

Table 4 shows that KMC improves the weight gain (g/day) (14.9 ± 4.7 vs. 10.5 ± 4.1) ($P<0.001$), increase in length (cm/week) (0.97 ± 0.67 vs. 0.69 ± 0.63) ($P=0.012$), increase in head circumference (cm/week) (0.74 ± 0.52 vs. 0.50 ± 0.31) ($P=0.001$), increase in chest circumference (cm/week) (0.73 ± 0.35 vs. 0.49 ± 0.19) ($P<0.001$).

| Characteristics | KMC (n=150) | Control group (n=91) | P-value |
|------------------------|-------------|----------------------|---------|
| Birth weight | | | |
| <1000 g | 12 (8) | 9 (9.8) | 0.56 |
| 1000–1500 g | 86 (57.3) | 43 (47.2) | 0.14 |
| >1500 g | 52 (34.6) | 39 (42.8) | 0.20 |
| Sex: Male | 69 (46) | 45 (49.4) | 0.23 |
| Gestational age (week) | 32.34±2.4 | 32.61±2.3 | 0.38 |
| Length | 41.60±1.42 | 41.72±1.23 | 0.49 |
| Head circumference | 27.80±1.21 | 27.9±1.56 | 0.59 |
| APGAR at 5 min | 9.51±0.15 | 9.52±0.16 | 0.63 |

KMC: Kangaroo mother care

| Variables | KMC group | Control group | P-value |
|--------------------------------|-----------|---------------|---------|
| Gravida | 2.92±0.5 | 2.89±0.6 | 0.69 |
| Parity | 1.39±0.3 | 1.42±0.1 | 0.26 |
| Age | 27.1±4.25 | 27.3±4.19 | 0.72 |
| Gestational age (week) | 32.34±2.4 | 32.61±2.3 | 0.38 |
| Spontaneous vaginal delivery | 87 (59.3) | 53 (58.2) | 0.80 |
| Father/grandparents giving KMC | 39 (26) | | |

KMC: Kangaroo mother care

| Birth weight | KMC group | Control group | P-value |
|-------------------------------|-----------|---------------|---------|
| <1000 g | 9 (75) | 6 (66.6) | 0.6 |
| 1000–1500 g | 67 (77.9) | 22 (51.2) | 0.003 |
| >1500 g | 38 (73) | 21 (53.8) | 0.02 |
| Total exclusive breastfeeding | 114 (76) | 49 (53.8) | 0.001 |

KMC: Kangaroo mother care

| Variables | KMC group | Control group | P-value |
|---|-----------|---------------|---------|
| Weight gain (g/day) | 14.9±4.7 | 10.5±4.1 | <0.001 |
| Increase in length (cm/week) | 0.97±0.67 | 0.69±0.63 | 0.012 |
| Increase in head circumference (cm/week) | 0.74±0.52 | 0.50±0.31 | 0.001 |
| Increase in chest circumference (cm/week) | 0.73±0.35 | 0.49±0.19 | <0.001 |

KMC: Kangaroo mother care

Table 5: Effect of KMC on various morbidity outcome parameters

| Variables | KMC group | Control group | P-value |
|----------------------------------|-----------|---------------|---------|
| Hypothermia | 5 | 17 | 0.028 |
| Apnea | 1 | 9 | 0.014 |
| Duration of hospital stay (days) | 10±5 | 16±8 | <0.001 |

KMC: Kangaroo mother care

Table 5 shows that the morbidity outcomes were significantly more in the control group than the KMC group. Five babies in the KMC group suffered from hypothermia as compared to 17 babies in the control group ($P=0.028$), one suffered from apnea in KMC group versus nine in the control group ($P=0.014$).

Duration of hospital stay was significantly reduced in the KMC group ($P\leq 0.001$).

DISCUSSION

On comparing the babies receiving KMC, and the babies receiving routine care, this study found that breastfeeding rates are better in the KMC group than the control group (76% vs. 53.8%). This is similar to results found in other studies done by Suman et al., 2008⁵ and Gathwala et al., in 2010.⁶ In another study, by Tharashree et al., in 2018, in preterm babies, the breastfeeding rates in preterms receiving KMC was higher than those who did not receive KMC (62.5% vs. 37.5%).⁷ In a study by Boo and Jamli in 2007, it was reported that breastfeeding rates were higher at discharge in KMC group (29.7% vs. 14.5%).⁸

Regarding daily weight gain of newborns in the study population, weight gain (g/day) was more in the group receiving KMC as compared to the control group (14.9±4.7 vs. 10.5±4.1). This is comparable to results of other studies done by Suman et al., in 2008⁵ and Ramanathan et al.⁹ In a study by Mishra et al., in 2017, they found that weight gain was better when babies received KMC.¹⁰ In another study by Ramanathan et al., in 2001, newborn receiving KMC showed better weight gain after 1st week of life.⁹

In this study, weekly increase in length (0.97±0.67 vs. 0.69±0.63), head circumference (0.74±0.52 vs. 0.50±0.31), and chest circumference (0.73±0.35 vs. 0.49±0.19) was also higher in the KMC group than the control group. This is similar to other studies by Suman et al., in 2008⁵ and Gathwala et al., in 2010.⁶ Occurrence of hypothermia and apnea was significantly less in the KMC group than the control group in this study ($P=0.284$ and 0.014 respectively). In a similar study by Suman et al., in 2008, it

was found that there was less hypothermia in KMC group as compared to those that did not receive KMC (5.9% vs. 36.9%).⁵ In another study by Parmar et al., in 2009, it was found that there was no episode of apnea in KMC group.¹¹ In the study done by Mishra et al., in 2017, it was found that the hypothermia and apnea rates were lower in the KMC group.¹⁰

In this study, the duration of hospital stay was significantly less in the KMC group compared to the control group (10±5 vs. 16±8 days). This is similar to a study by Cattaneo et al., in 1998, where neonates on KMC were discharged earlier compared to those who did not (13.4 days vs. 16.3 days).¹² Similar result was shown by studies done by Ramanathan et al., in 2001, and Mishra et al., in 2017.^{9,10}

It is widely accepted that KMC is an effective method to increase the rates of breastfeeding, improve weight gain, decrease morbidities such as apnea, hypothermia, and also decreases the duration of hospital stay. In developing countries and low resource setups, it is a cost-effective way of care for newborn babies.

We had an adequate sample size and we followed up the cases till 2 months of postnatal age. We studied the outcomes in newborn that commonly affects our decision making in management of the neonates.

In this study, we could not study the long term effects or neurobehavioral outcomes of neonates receiving KMC, as follow-up for longer duration is required. Furthermore, additional studies need to be done for KMC in sick neonates.

Limitations of the study

One of the limitations of this study is that the study was done over a short span of time with a small sample size. Hence, further studies with a large sample size and followup for a longer period of time is needed.

CONCLUSION

KMC improves rates of breastfeeding and weight gain in neonates. KMC also decreases the incidence of morbidities such as apnea and hypothermia and also decreases the duration of hospital stay in LBW newborns.

ACKNOWLEDGMENT

We sincerely thank the parents and caregivers of the newborns involved in the study, for their invaluable support and involvement in the study. We also thank our nursing staff for their support throughout the study.

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DK- Study concept, design, study protocol, data collection, data analysis, manuscript writing, submission of article, manuscript editing, and revision; **SS-** Study concept, design, study protocol, data collection, data analysis, manuscript writing, submission of article, manuscript editing, and revision.

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Source of Support: Nil, **Conflicts of Interest:** None declared.