

Original Research Article

Kangaroo Mother Care (KMC): An Alternative to Conventional Method of Care for Low Birth Weight Babies

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ABSTRACT

Objectives: To compare the effects of kangaroo mother care (KMC) with conventional methods of care (CMC) on growth of low birth weight babies (<2000gm)

Materials and Methods: This prospective randomized controlled study was conducted in level 3 NICU of teaching institute in western Maharashtra. 120 neonates weighing <2000g were included in study. The subjects were randomized into two groups: the intervention group (KMC: 60) received kangaroo mother care, the control group (CMC: 60) received conventional care. Primary outcome measured was average weight gain per day, head circumference and length increments per week, hospital duration in days. Both cases and controls were followed up to 40 postconceptional wk in preterm and up to 2500gm weight in term SGA babies. They were also monitored for hypothermia, sepsis, apnea in <32wk babies and exclusive breast feeding rate at the end of study.

Results: The KMC babies had better weight gain per day (KMC 25.28gm vs CMC 14.216gm $p < 0.0001$). The weekly increments in head circumference (KMC: 0.75cm vs CMC: 0.49cm $p < 0.001$) and length (KMC: 0.99cm vs CMC 0.70cm $p < 0.001$). Statistically significant babies from CMC group were suffered from hypothermia, sepsis, apnea (in <32wk) as compared to KMC group. There was statistically significant decreased duration of hospital stay in KMC group (KMC: 12days vs CMC: 17days, $p < 0.001$). More KMC babies were exclusively breast feed at the end of study (95% vs 78.34%). KMC was acceptable and feasible to most mothers and families at hospital and at home also.

Conclusion: Kangaroo mother care (KMC) improves growth velocity, reduces morbidity, and decreases hospital stay in low birth weight babies. It is simple acceptable, affordable, feasible to mother in hospital as well as at home after discharge. We concluded that KMC is the best alternative for the conventional method of care.

Key words: Kangaroo mother care (KMC), Conventional methods of care (CMC), Low birth weight (LBW), Preterm.

INTRODUCTION

Low birth weight (LBW) is a major problem worldwide with an average incidence of 18% globally and 33% in developing countries. ^[1] It is a major contributor to neonatal and infant mortality and morbidity with about 30 % of neonatal mortality related to it in developing countries. ^[2]

Nearly one third of Indian neonates are low birth weight (LBW), weighing less than 2500gm at term., overall 70 percent of perinatal deaths, 85 percent of neonatal deaths and 50 percent of infant deaths occur among LBW babies. Amongst the causes of morbidity and mortality in these babies, the most dangerous are hypothermia, hypoglycemia and sepsis. Hence the LBW

infants require the utmost care at hospital setup and at home after stabilization. [3]

Traditionally, these infants born in hospital are kept in incubators/ radiant warmers/ warm room with open cots. Hospital neonatal intensive care of LBW babies is difficult in developing countries due to high cost, difficulty in maintenance and repairs of equipments, intermittent power supply, inadequate cleaning of instruments and shortage of skilled staff. Frequently and often unnecessarily incubators and radiant warmers separate babies from their mothers, depriving them of the necessary contact. [4]

Kangaroo Mother Care (KMC), first proposed in response to the shortages of staff and equipment in their hospital by Dr Hector Martinez & Dr Edgar Rey in Bogotá Columbia in 1978, was developed as a simple method of care for LBW infant. [5] They developed a health care technique for LBW infants which is effective and is equivalent to care given in neonatal care unit and this technique was named as kangaroo mother care. [6,7]

The term kangaroo care is derived from practical similarity to marsupial care-giving in which the infant is kept warm in the maternal pouch and close to the breasts for unlimited feeding. [8] The mother is used as “incubators” and as the main source of food and stimulation for LBW infants while they mature enough to face extra uterine life in similar condition as that born at term. The method is applied only after the LBW infants are stabilized. It provides an appropriate, affordable yet high quality care and can be implemented almost anywhere. [8-10]

The present study compared the efficacy of Kangaroo mother care with the conventional care for LBW babies in our institute which caters the most of population of the western Maharashtra.

MATERIALS AND METHODS

This prospective randomized controlled study is performed on 120 neonates delivered by vaginal

route/caesarean section with birth weight below 2000gm in a neonatal intensive care unit (NICU) of Rajarshree Chhatrapati Shahu Maharaj Government Medical College, Kolhapur Maharashtra during Sept 2009 to Aug 2011. Critically ill babies requiring ventilator support or inotropic support, babies with chromosomal and life threatening congenital anomalies or whose mother were critically ill, or unable to comply with the follow up schedule were excluded. Primary outcome variable is growth pattern, which will be measured by weight gain, length increment and increase in head circumference. Secondary measures included duration of hospitalization, feasibility and acceptability of KMC, risk of hypothermia, sepsis, apnea, with KMC compared to CMC.

The subjects are randomized into two groups: Kangaroo Mother Care (KMC) and Conventional Method Care (CMC). Randomizations are achieved by simple Randomization and allocation was concealed by sealed envelope technique.

KMC Group: Mothers in KMC group were explained in detail about KMC adoption in the presence of their family. KMC was initiated as soon as the baby was stable. The mothers provided skin to skin contact using specially tailored “Kangaroo bag” made of soft flannel cloth. Kangaroo bags were provided free of cost to all mothers. The mothers were encouraged to keep the baby in KMC as long as possible during the day and night with a minimum period of one to two hours at a time. When the baby was receiving intravenous fluids, mother provides kangaroo care seated in a comfortable chair placed close to the baby’s cradle. Once the baby was on full feeds, she provided kangaroo care on the reclining cot in the semi upright position with the help of pillows. The mothers were given a “KMC chart” to keep a record of the duration of kangaroo care provided. If the mother was unable to fill up the chart, a close family member did it.

CMC group: The babies assigned to CMC group were managed under either servo

controlled radiant warmers or in a cradle under hot lamps in NICU. The babies in postnatal wards were adequately clothed and bedded in with their mothers.

Anthropometry: Babies were weighed naked on an electronic weighing scale (Conweigh Electronic weighing scale - accuracy of ± 5 g) immediately after birth and subsequently daily one hour after feeds till discharge. The weighing machines were calibrated daily with 5 g standard weight. The length was measured at birth, on discharge and on each follow-up visit by using an infantometer. Head circumference (HC), was measured by standard methods at birth, on discharge and on each follow-up visit with a non-stretchable tape. All measurements were carried out by the same clinician.

Feeding: All babies were exclusively breastfed, and also received calcium (100 mg/kg/d), phosphorus (50 mg/kg/d) and multivitamin supplements. Babies unable to take direct breastfeeds were given expressed breast milk by orogastric tube or using a bondla or sterile wati and spoon under supervision.

Monitoring: Babies in both the groups were monitored for hypothermia, hypoglycemia, apnea, sepsis, feeding problem and other morbidities. Babies who developed a life threatening event like convulsions, hypothermia, and severe sepsis were considered as critically ill and were temporarily withdrawn from the KMC group. Babies requiring phototherapy were also temporarily withdrawn from KMC group.

To check acceptability of kangaroo mother care: Acceptability was defined as the positive attitude of the mothers and nurses towards KMC. Acceptability was assessed by a questionnaire incorporating Likert scale. Mothers' attitude towards KMC was assessed on day 3 and on day 7 after starting Kangaroo Care using a questionnaire, which contained 10 items in local language marathi. [7]

The questions were:

1. Do you feel comfortable when giving KMC care?
2. Does KMC bring you closer to your baby?
3. Will you advice KMC for other babies?
4. Do you feel kangaroo care hampers and interferes with your daily activities?
5. Do you think it is possible to practice KMC at home?
6. Will you continue to practice KMC at home?
7. Are you happy with the assignment?
8. Would you prefer incubator rather than KMC?
9. Are you confident in handling the baby?
10. Are you confident in looking after the baby at home?

Discharge and follow up: Babies were discharged when they showed a weight gain of 10-15 g/kg/d for three consecutive days, were feeding well, maintaining temperature without assistance and the mother was confident of caring for her baby. They were followed up weekly for anthropometry and compliance with KMC, in the high risk OPD till post-menstrual age of 40 weeks in preterm babies or till a weight of 2500 g was reached in term SGA babies. Mothers in the KMC group were interviewed on a pre-structured questionnaire to assess the acceptability and feasibility of KMC in the hospital and at home.

❖ *Statistical analysis:*

Quantitative data

- a. Normality was tested by the Shapiro-Wilk procedure.
- b. Means and SD were used to describe the data.
- c. Where normality was assured, Student's t test (unpaired) was used as a test of significance.
- d. Where normality was not assured, median was used to describe the data.
- e. Where normality was not assured, Mann Whitney U test was used as a test of significance.

Qualitative data

- a. Pearson's chi-square test is applied to test the relationship of categorised independent and dependent variables.

- b. If expected number in the cell was below 5 in a table, Fisher's Exact Test (Exact Two sided) was used.
- c. Odds ratios and their 95% Confidence intervals were calculated for all 2x2 tables
- d. If in a 2x2 table, any cell has '0' values, Odds ratios and their 95% Confidence intervals cannot be calculated.

Note

- a. A p value (significance) of < 0.05 is deemed statistically significant
- b. A significance of 0.000 should be read as p<0.0001 (Very Highly significant) as the software can detect significance up to 3 decimal points only
- c. Stata SE 12.0 was used to analyse data.

Ethics: The approval from the Institutional Ethics Committee was obtained prior to the study. A written informed consent was taken from the mothers after the babies were stable and ready for enrolment into the study.

RESULTS

The final study groups comprised of 60 KMC babies and 60 CMC babies. Their baseline characteristics are compared in

Table I. The mean birth weight and gestational age of the KMC group was lower than that of the CMC group.

Effect on growth: KMC babies achieved significantly better growth at the end of the study (Table II). For preterm babies, daily weight gain, length increment and head circumference increment were significantly higher in the KMC group (weight gain/day 25.28g vs 14.21g, length increment .95cm vs.0.7cm and head circumference increment 0.75cm vs 0.49 cm) than in the CMC group) at the end of follow-up (P <0.05).

Morbidities: A significantly higher number of babies in the CMC group suffered from hypothermia, nosocomial sepsis, compared to the KMC group. KMC significantly reduced the incidence of apnea in VLBW babies. More KMC babies were on exclusive breastfeeds at the end of the study (95% vs 78%). (Table II).

Hospital stay: Babies on KMC were discharged earlier than CMC babies due to better weight gain, decreased incidence of nosocomial sepsis, and hypothermia. (Table II)

Table I: Neonatal Baseline Characteristics

Variables	KMC(n=60)	CMC(n=60)	P
Weight at birth(g;mean±SD)	1677.16±201.26	1699±199.34	0.55
Weight at Enrolment(g;mean±SD)	1610.16±199.83	1627.33±204	0.64
Age at Enrolment(days;mean with 95%ci)	3 days	4 days	0.27
Gestational age (wk;mean±SD)	32.43±1.8	32.40±1.94	0.92
Male:female ratio	56:44	51:49	0.58
Birth weight group n (%)			0.701
<1500gm	17(28.13%)	13(21.67%)	
1500-1799gm	21(35.00%)	23(38.33%)	
1800-1999gm	22(36.67%)	24(40.00%)	
Gestational age group n (%)			0.93
28-30wk	01(1.67%)	01(1.67%)	
30-32wk	10(16.67%)	13(21.67%)	
32-34wk	32(53.33%)	28(46.67%)	
34-36wk	10(16.67%)	10(16.67%)	
>36wk	07(11.67%)	08(13.33%)	
Classification based on Lubchenco's chart n (%)			0.50
Preterm SGA	40(66.67%)	42(70.00%)	
Preterm AGA	13(21.67%)	10(16.67%)	
Term SGA	07(11.67%)	08(13.33%)	
Anthropometry			
Total length(cm;mean±SD)	44.14±2.19	44.23±2.35	0.82
Head circumference (cm;mean±SD)	29.60±1.68	29.72±1.86	0.67

Table II: Effect of KMC on Growth and Morbidity

	KMC(n=60)	CMC(n=60)	P
Weight gain per day(gm)	25.28cm	14.21cm	0.0001
Head circumference increment per week(cm)	0.75cm	0.45cm	0.0001
Length increment per week(cm)	0.99cm	0.70cm	0.001
Hospital duration(days)	12days	17days	<0.001
Hypothermia	3	20	0.001
Sepsis	2	14	0.001
Apnea(in<32wk)	3	18	0.0001
Exclusive breast feeding rate at 40 wk	95%	78.34%	95% C I

Table III: Responses of mothers on day 3 and Day 7 after KMC was commenced

Questions	Not at all	No	Not sure	Yes	Very much
1. Do you feel comfortable during the period of KMC?	-	-	-	04	56(60)
2. Does KMC bring you closer to your baby?	-	-	3(1)	8(6)	49(53)
3. Will you advise KMC for other babies?	-	-	-	8(4)	52(56)
4. Do you feel Kangaroo Care hampers and interferes with your daily activities?	48(50)	12(10)	-	-	-
5. Do you think it is possible to practice Kangaroo Care at home?	-	-	-	10(4)	50(56)
6. Will you continue to practice KMC at home?	-	-	4(1)	13(10)	43(49)
7. Are you happy with the assignment?	-	-	-	9(1)	51(59)
8. Would you prefer incubator rather than KMC?	60	-	-	-	-
9. Are you confident in handling the baby?	-	-	6(1)	10(5)	44(54)
10. Are you confident in looking after the baby at home?	-	-	3(1)	12(10)	45(49)

Acceptability and feasibility of KMC

KMC was acceptable and feasible to all mothers. Most of the mothers feel comfortable and confident about handling the babies. A majority of mothers expressed happiness (71.5%), practiced KMC easily (75.5%), without assistance (80.39 %) and felt that their baby preferred KMC (100%). The KMC babies received kangaroo care for a mean of 33.78 ± 15.12 days at 11.5 hours per day. A few mothers provided almost 24 hours at home.

DISCUSSION

The goal of nutritional management of the LBW infants is the achievement of postnatal growth at intra-uterine growth accretion rates. [11] We demonstrated a significantly higher daily weight gain in infants who received the KMC intervention. This beneficial effect was reflected in other growth parameters and is comparable with other studies. [12-15] The recommended weekly increment of 0.75 cm in head circumference was achieved only in the KMC group. [4] Head circumference has been emphasized to be one of the most important growth parameters in LBW babies. [7,16] being a reflection of the underlying brain growth. Kangaroo care by promoting exclusive breastfeeding, ensuring temperature maintenance, facilitating

physiologic stability and decreasing neonatal morbidities, could result in improved physical and cognitive growth. [17] However, the weight of preterm babies at 40 weeks postmenstrual age was lower than the average birth weight of normal full term Indian babies even in the KMC group and lower than that documented in other studies. [6]

Our study confirms previous findings of the definite protective effect of KMC against hypothermia, apnea and sepsis. However, we also observed a difference in the duration of hospitalization between the two groups; we observed that babies on kangaroo mother care are discharged earlier than babies with conventional method of care. In our unit, discharge criteria for low birth weight babies is weight gain of at least 10 g/kg/d for 3 consecutive days, irrespective of the actual weight or gestation of the baby.

In the present study, the mean duration of KMC provided was 11.45 hours per day. The shorter duration of skin-to-skin-contact in the present study in comparison to other studies [6,14,16] could be due to the promotion of the mother alone as the kangaroo care provider due to the institutional policies preventing the father and the relatives to be with the baby in the NICU or postnatal wards. The other studies

involved the father or other close relatives in kangaroo care. However, the average maximum duration per day of 15 hours achieved by the mothers in the KMC group and the success of a few mothers to provide almost 24 hours per day kangaroo care suggested that with further motivation, education and involvement of the family, 24 hours kangaroo care in the home settings is definitely feasible.

One of the strengths of our study is the high follow-up rate among KMC infants, comparable to other studies.^[6] The better follow-up rate in the KMC group could be due to the active involvement of the mother in the care of her LBW baby or the strong rapport between the KMC mother and the health personnel. The poor follow-up in the CMC group is a limitation of this study. Home visit was not possible in the present study. However, the higher follow-up by KMC mothers suggests that early discharge with regular follow-up of LBW infants is definitely feasible without compromising on the health of the baby. In the present study, maternal acceptance of KMC was good and concurred with other studies.^[8,13-15] All the mothers were able to practice KMC at home and no adverse events were reported. The response of the family and/or the father was supportive. All the mothers were confident enough to serve as advocates for KMC during hospital stay and they were an important source of support for the newly enrolled mothers. This study has demonstrated that KMC is feasible in our institute. However, KMC was initiated in the hospital under close supervision and guidance and only later continued at home. Further research should investigate the implementation of KMC after initiation in the community. We conclude that KMC improves growth in low birth weight infants and has a significant role in protecting the LBW infant from hypothermia, apnea and sepsis. We recommend Kangaroo care for low birth weight infants. It is definitely feasible, acceptable to mothers and can be continued

at home in the set up with scarcity of infrastructure.

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