Letter to Editor

Weight gain pattern in low birth weight infants during first year after kangaroo mother care: a prospective study

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Abstract

Introduction: Low birth weight infants (LBWI) constitute a worldwide problem with high neonatal and infant mortality and morbidity. Millions of newborn death could be avoided if more resources were invested in proven, low cost interventions designed to address newborn's needs. Kangaroo Mother Care (KMC) is one such low cost and proven method of care of low birth weight babies but has not yet been widely used in India. In this method the infant is placed between mother's breasts in direct skin-to-skin contact, gives exclusive breast feeding and are discharged home early. It is particularly useful for care of stable LBW infants below 2000g. **Objective:** This prospective follow-up study was undertaken and had proved the beneficial effects of KMC to the LBW babies to study "Weight gain in Low Birth Weight infants during first year after Kangaroo Mother Care. **Results:** KMC reduced mortality, improved breastfeeding rates; KMC for 24 hours was possible with regular intensive counseling of mothers and other family members. The early discharge policy for low birth weight babies was possible and beneficial to achieve intrauterine growth accretion through regular follow-up and monitoring of babies. **Conclusion:** In low resources setting in developing world like India KMC-reduces mortality, improves breast feeding rate & help in early discharge of low birth weight babies.

Keywords: Kangaroo Mother Care, Pre-term babies, Infant Mortality, Low birth weight infants, Growth and development

Introduction

The method in which baby is kept in mother's total skin to skin contact is known as Kangaroo Mother Care (KMC). This full of humanity technique comes at a much lower cost for the adequate care of the babies who are born with a low birth weight. Exclusive breast feeding which is the best diet for a new born and a stronger bonding between mother and child are the other advantages of this technique [1].

Around 20 million infants with low birth weight are born all over the world every year and such infants pose a burden on health, social and economic systems in all the regions (World health report: WHO 2003). There is always an expectation that newborns will lose weight unto 7% during the first 72 hours and later on it gets stabilized. However, there is a loss of 3-5% of weight within first 3-5 days but they start regaining weight by the 10th day [2]. Infants who are preterm are allowed to lose 5-15% of their weight during first 6 days due to their underdeveloped skin and kidneys and more time is required by such infants to regain their weight. In 1970s, KMC was developed in Columbia but it is still not widely practiced in many of the low income nations.

Kangaroo position is the main feature of this technique in which skin to skin contact between the ventral surface of mother and ventral surface of baby is there.

Mother holds the baby in between her breasts under her clothes vertically for 24 hr per day with the substitution of father when mother is under unavoidable circumstances. Exclusive breast feeding and early discharge from hospital with KMC continuing at home under close follow up are the other important components of this technique [3].

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Lawn et al concluded that there was a significantly lower risk of neonatal mortality and significant morbidity especially due to infection when KMC was started within the first week of neonatal life when compare to the standard care of hospitals [4]. Many other studies have concluded that those low birth weight (LBW) babies are best candidates for KMC who are stable but the babies who are unstable can also be given KMC irrespective of their situation [5,6].

Subjects and Methods

This study was undertaken from October 2005 to January 2007 in babies who were receiving KMC in "Shishu Ghar" which is a major referral centre for deliveries with possible complications along with a tertiary level neonatal intensive care unit (NICU) and Ambulatory kangaroo mother care center.

Study Design: Prospective follow up study

Inclusion criteria: All babies who were born with birth weight ≤ 1800grams.

Exclusion criteria:

- Babies who were born outside and admitted in NICU.
- Mothers who were not willing to participate and come for regular follow up.
- Babies who required transfer to other hospitals.
- Mothers planning to shift somewhere else in near future.
- Babies with chromosomal and life threatening congenital anomalies.
- Mothers left due to medical advice
- Multiple pregnancy

Methods: All eligible babies weighing ≤ 1800 g were enrolled for Kangaroo mother care. At the time of enrollment, detailed history was recorded on a pre-designed proforma. Gestational age was determined by performing New Ballard's scoring, within 24 hours of life. All neonates with birth weight ≤ 1800 g and ≤ 34 weeks gestation were admitted in NICU and were given partial parenteral nutrition. Once babies were stable on vital parameters Kangaroo Mother Care and breastfeeding were initiated, first the trophic feeds with expressed breast milk and later the expressed breast milk were slowly increased to full feeds. All mothers and their family members were encouraged to keep their babies in KMC for 24 hours.

Anthropometric assessment

Babies were weighed naked on an electronic weighing scale (Conweigh, Zeal medical, Electronic weighing scale - accuracy of + 5 g) immediately after birth and daily till discharge. The weighing machines were calibrated daily with 5 g standard weight.

The mothers provided skin to skin contact using "kangaroo bag" made of soft flannel cloth. Babies were well dressed with front open shirt, cap, and preferably soak proof diaper or cotton in a polydrip sheet and socks before placing in kangaroo bag. All mothers were encouraged to provide KMC 24 hours in day, during one to one and group counseling, during the hospital stay as well as during follow up at every visit.

All other members of the family were also encouraged to keep the baby in KMC. Mothers were encouraged to give breastfeeding in the kangaroo position so that baby can maintain temperature while feeding.

The parents who provided KMC for approximately 20-24 hrs were grouped as continuous KMC and despite individual and group counseling due to personal problems like nuclear family, somemothers could provide KMC for <12 hrs were grouped as inadequate KMC.

For discussion purpose we have grouped in to two groups –

- Inadequate KMC:KMC for <12 hrs
- Continuous KMC : KMC for ≥12 hrs

The relatives were encouraged to provide KMC when the mothers needed sometime for personal reasons. If relatives were not available for giving KMC, the babies were kept well wrapped in thick clothes and kept away from open windows or fan, and KMC restarted as soon as mothers were available.

Stable babies were defined as babies who were hemodynamically stable without the need for inotropic support, without any respiratory distress, with no apnea or seizures and had no significant illnesses with or without IV fluids.

For stable NICU babies who were receiving intravenous fluids, mothers provided kangaroo care by sitting 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 either in NICU or in the postnatal wards. There were two separate rooms with two cots in NICU for kangaroo mothers.

Discharge and follow up

Babies were discharged when they met the following criteria:-

- Weight gain for two or three consecutive days.
- Successfully breastfeeding or wati-spoon feeding.
- Maintaining temperature in KMC.
- No evidence of illness.
- Mothers confident of caring for her baby.
- Assurance of follow-up.
- Successful "In hospital adaptation" of mother and other kangaroo care provider.

Babies were followed up at the kangaroo ambulatory center called "Shishu Ghar" situated away from NICU. Before discharge from NICU relatives were asked to visit "Shishughar" for familiarizing with the follow-up centre.

Statistical Analysis- All data were recorded on a pre-designed proforma, tabulated and the results were analyzed statistically by SPSS statistical software (version 11.5).

Tests of significance used:

- Pearson's Chi-square test: was used to test the association of columns and rows in tabular data, in case of qualitative, categorical data.
- ANOVA: was used for the changes noted in the same variable with time, within patients in place of T- test with identical output.
- P- value of < 0.05 was considered as "significant" and < 0.01 as "highly significant"

Results

There were 3865 deliveries during the study period, 289 (7.4%) babies were ≤1800 g. One hundred and thirteen (39.1%) babies were not enrolled and not meeting the inclusion criteria because of various reasons like, 30 (10.3%) babies died in NICU before enrollment, 13 (4.4%) babies were discharged against medical advice, 2 (0.6%) babies required transfer to other department or hospital, 16 (5.5%) mothers refused for enrollment as they were planning to go to native place after delivery and did not agree to come for continuous follow-up. There were 52 (17.9%) mothers with multiple gestations.

Basal anthropometric parameters at birth preterm in both the groupsi.e. inadequate KMC and Continuous KMC were comparable (Table 1).

In present study with inadequate KMC at some (75%) point of time families did provide KMC for 24 hours. In inadequate KMC group, intrauterine accretion rate of 15 gm / kg was observed at 169 instances. In continuous KMC groups intrauterine accretion rate of 15 gm / kg was noted with 227 instances.

Table-1: Mean birth weight of enrolled babies at birth

KMC group (Pre term)	Weight (mean ±SD)	KMC group (Term)	Weight (mean ±SD)
Inadequate KMC (n=46)	1419.10±253.41	Inadequate KMC (n=10)	1645.40±65.34
Continuous KMC (n=69)	1412.74±247.88	Continuous KMC (n=20)	1608.40±148.58
Total n = 115 (100%)	1416.56±250.14	Total n= 30 (100%)	1620.73±126.90

Table-2: Mean weight at stopping KMC

Weight of baby at birth	Weight at stopping KMC (mean ±SD)
≤ 1500 (n=75)	2128.93±154.58
1501-1800 (n=70)	2233.93±181.97
Total (n=145)	2179.62±175.83

There was no statistically significant difference in basal anthropometric parameters at birth in term Small for Gestational Age (SGA) in both KMC groups (Table 1). The mean weight at the time of stopping KMC for whole cohort was 2179.62±175.83g (Table 2).

Table-3: Net weight gain (Preterm and Term SGA)

KMC group	Preterm (n=115)			Term SGA (n=30)	
	Birth weight (mean ±SD)	CDOB (mean ±SD)	Difference	Birth weight (mean ±SD)	At. 2.5 kg Difference
Inadequate KMC n=46	1419.10±253.41	2216.49±382.72	797.39	1645.40±65.34	854.6
Continuous KMC n=69	1412.74±247.88	2269.54±445.70	856.8	1608.40±148.58	891.6
P	0.32	0.35	0.41	0.24	0.43

All babies irrespective of gestational age and birth weight on reaching Corrected date of Birth (CDOB) had comparable anthropometric parameters but slightly higher in continuous KMC group. Smaller and lesser gestational age babies gained more weight during KMC when the basal weights were comparable.There was higher weight gain with continuous KMC as compared with Inadequate KMC both in preterm and term babies but did not reach statistical significance. In full term SGA increment in weight was comparable in both KMC groups but slightly higher value was observed in continuous KMC (Table 3).

Table-4: Increment in weight upto 1 year

Parameters	Wt (g/day)
Up to CDOB	18.16
CDOB to 3 months	22.66
3-6 months	13.51
6-9 months	14.00
9-12 months	13.59

Increment in weight up to CDOB, first 3 months, 3-6 months, 6-9 months and 9-12 months was reported to be 18.16g/d, 22.66g/day, 13.51g/day, 14.00g/day and 13.59g/day respectively (Table 4).

Table-5: Weight upto 12 months of corrected age in both the groups

Age (month)	Wt for age (% of expected average wt for corrected age)	
	Inadequate KMC (n=56)	Continuous KMC (n=89)
CDOB (n=145)	103.45	105.67
3 month (n=145)	86.47	86.99
6 month (n=145)	89.88	91.95
9month (n=106)	99.18	99.18
12 month (n=57)	101.04	104.19

Even inadequate KMC did reveal comparable weight gain with continuous KMC (Table 5).

Discussion

An alternative to the standard care offered by most of the hospitals for care of babies born with low birth weight is KMC which was first of all implemented in 1979 at Maternal and Child Institute of Bogota, Colombia by Roy and Martinez. Skin to skin contact, exclusive breast feed and rapid discharge from the hospital is the major components of KMC [7]. Very few hospitals in India have adopted this wonderful technique to take care of the babies born with low birth weight. There is a generally a weight loss of the neonates to the tune of 5-15% during the first few days of life because of the loss of extra cellular fluid. Such weight loss occurs during the first 4-6 days of life and after that the baby starts regaining the weight reaching

the birth weight within 14-21 days of life [8]. KMC is an effective way to provide warmth, nutrition, protection from infection, stimulation, and safety and love.KMC can be used as hospital intervention and continued at home under close supervision until infants reach the post-conceptional age of 40 weeks. Mothers are used as "incubators" and are the main source of warmth and nutrition for the baby. Preterm low birth weight baby does require warmth and nutrition for 24 hours a day for its optimal growth [9]. Though studies in KMC are scanty, but recent studies did reveal the benefits of KMC in terms of morbidity and mortality. The present study was planned from October 2005 to January 2007 to study the weight gain in LBW babies during their first year of life who received KMC.

KMC intervention and exclusive breastfeeding in present study helped babies regaining their birth weight earlier than babies who received parental nutrition and formula feedings. Continuous KMC babies regained birth weight 2 days earlier than inadequate KMC. In the present study the weight gain in continuous KMC group was 17.3g/dand 22.2g/d among preterm and term group respectively (average of both 18.16 g/d) which was comparable with the various other studies by Charpak et al (1997) (1994) 20g/day [10] and 19g/day; Cattaneo et al (1998) 21.3g/day.[11]

KMC is definitely an effective technique with low cost and requirement of less trained staff along with added advantages of increased bonding between mother and baby and training of mother in handling the baby but still there is an issue of privacy of mothers. Since the Indian culture is conservative, so there is an issue of mothers and staff nurses accepting skin to skin contact with the naked baby and mother even if there are so many benefits from this technique [5].

Conclusion

The present study concluded that KMC is a useful, cheap and effective method to achieve early weight gain in babies born with low birth weight with no need of highly trained staff. Exclusive breast feeding, strong bonding between mother and baby along with practice of mother for handling of small baby are the other advantages of this technique. Still more future studies with a larger sample size are required in this field to validate the results of this present study so that this technique can be implemented in remote places worldwide where sophisticated and costly machines cannot be installed. I am thankful to all co-authors to guide me during the study process and helping me in manuscript preparation.

Contribution to existing knowledge: In low resources setting in developing world like India KMC intervention and exclusive breastfeeding in present study helped babies regaining their birth weight earlier than babies who received parentalnutrition and formula feedings. Continuous KMC babies regained birth weight 2 days earlier than inadequate KMC.

Abbreviations

LBWI: Low birth weight infants

KMC: Kangaroo Mother Care

NICU: Neonatal intensive care unit

CMC: conventional methods of care

CDOB: corrected date of birth

BERA: Brainstem Evoked Response Audiometry at discharge

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