

EFFECT OF KANGAROO MOTHER CARE ON OUTCOME IN PRETERM AND LOW BIRTH WEIGHT NEONATES

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ABSTRACT

BACKGROUND

The aim of the study is to study the effect of kangaroo mother care(KMC) on preterm and LBW neonates' vital parameters like temperature, respiratory rate, heart rate and oxygen saturation, establishment of breastfeeding and weight gain, morbidity and mortality, outcome in intramural and extramural neonates.

MATERIALS AND METHODS

Hospital-based prospective study, Katuri Medical College and Hospital, 300 newborns shifted to KMC ward. In our study group, female newborns were more than male newborns. Inborn were more than outborn, late preterm more than early preterm and term neonates. A significant increase in axillary temperature, increase in respiratory rate, decrease in heart rate and increase in oxygen saturation was seen in neonates. Higher proportion of neonates achieved transition from predominant expressed breast milk consumption to predominant direct breastfeeding during hospital stay.

RESULTS

The study showed significantly mean weight gain per day during in hospital KMC of 20 g/kg/day. Mean age when neonates started to gain weight was 8.5 days. Neonates were discharged early as they met our discharge criteria with mean age being 11.6 days. Morbidity of neonates requiring NICU admissions apart from LBW in our study were hyperbilirubinaemia (49.9%), sepsis (19.4%), respiratory illness (7.8%) and hypothermia (6.4%). During KMC stay, sepsis and NEC seen in 2 each, apnoea, PDA, jaundice in one each and maternal acceptance of KMC was good. During follow up, it was observed that all neonates were exclusively breastfed and the rate of weight gain (148 g/week) was satisfactory with an exception that only 8 requiring hospitalisation and only 1 death due to severe infection. The response of the family and/or the father was supportive.

CONCLUSION

KMC sustains improvement in LBW neonates' physiological parameters and accelerates growth pattern. Practice of KMC promote breastfeeding, shorten hospital stay without compromising survival, growth or development and would humanise the practice of neonatology. It is superior alternative to conventional method of care in institutions with limited resources. We recommend Kangaroo Mother Care for low birth weight infants, which is cost effective and easy to follow even in tertiary care hospitals. It is definitely feasible, acceptable to mothers and can be continued at home in the Indian setup.

KEYWORDS

Kangaroo Mother Care, Low Birth Weight Neonates, Humanise, Alternative.

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BACKGROUND

Of the estimated 4 million neonatal deaths, preterm and LBW babies represent more than a fifth. Therefore, the care of such infants become a burden for health and social systems everywhere.¹

In most countries, the use of incubators is standard for thermal care of LBW babies. However, "incubator care" is not widely available in developing countries, especially

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outside of large cities. Even in the limited cases where incubator care is available, the use of this method can be very challenging. LBW newborns and insufficient machines results in many babies sharing an incubator. This practice along with inadequate disinfection of incubators can lead to increased infection rates. Since, it largely excludes the participation of the mother, incubator care can also lead to decreased breastfeeding and maternal newborn bonding. Given the cost of incubators and the operational and programmatic challenges making incubator care available and accessible to the majority of families of LBW babies is simply not an option in most developing countries. Fortunately, there is an alternative approach for providing thermal care for and improving survival of LBW infants that is both effective and affordable - namely, Kangaroo Mother Care or KMC.²



KMC method was developed in the 1970s in Colombia by neonatologists Edgar Rey Samaria and Hector Martinez Gomez in response to overcrowded neonatal care units. This method includes three main components- 1) Skin-to-skin contact- a newborn baby is kept in a prone position between the mother's breasts several hours a day; 2) Exclusive on-demand breastfeeding; and 3) Early hospital discharge with appropriate follow-up.³

Aims and Objectives

Effect of KMC on-

- Vital parameters like temperature, respiratory rate, heart rate and oxygen saturation in preterm and low birth weight neonates.
- Establishment of breastfeeding and weight gain in preterm and low birth weight neonates.
- Morbidity and mortality in preterm and low birth weight neonates.

Outcome in intramural and extramural preterm and low birth weight neonates.

MATERIALS AND METHODS

Study Design- Hospital-based prospective study.

Source of Data- Preterm and low birth weight neonates admitted and attached to Katuri Medical College and Hospital between November 2014 to October 2016.

Inclusion Criteria

- Preterm neonates of gestational age between 28-37 weeks as per extended Ballard scoring system.
- Neonates having birth weight between 1000-2499 grams.

Exclusion Criteria

- Neonates with one minute Apgar <7.
- Neonates having any respiratory, cardiac and/or neurological dysfunction.
- Neonates who are haemodynamically unstable.
- Neonates with any major congenital anomalies.
- Neonates on IV fluids.

Preterm and LBW neonates born in Katuri Medical College and Hospital or referred from peripheral hospitals and admitted in NICU and shifted to postnatal ward after stabilisation who fulfils inclusion criteria was included in this study. This hospital-based prospective observational study included 300 neonates during study period of November 2014 to October 2016. Informed consent was obtained in parents willing to provide KMC in postnatal ward and at home and come for follow up. KMC was initiated as soon as the baby was shifted usually in the morning hours. The mothers provided skin to skin contact using a specially tailored "kangaroo bag" made of soft flannel cloth. 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. She provided kangaroo care on the reclining cot in the semi-upright position with the help

of pillows. Trained nursing assistance was provided whenever required.

Anthropometry- Babies were weighed naked on an electronic weighing scale immediately after birth, before KMC, 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 followup visit by using an infantometer. Head circumference was measured by standard methods at birth, on discharge and on each followup visit with a nonstretchable tape. All measurements were carried out by the clinician trained.

Feeding- All babies were exclusively breastfed and those unable to take direct breastfeeds were given expressed breast milk by nasogastric tube or using a pallada or sterile wati and spoon. Feeding practice were noted before KMC at discharge and at followup. Trained nursing assistance was provided whenever required. They were also supplemented with calcium (100 mg/kg/d), phosphorus (50 mg/kg/d) and multivitamin supplements.

Monitoring- Neonates vital parameters (temperature with clinical thermometer, respiratory rate and heart rate by clinical examination and oxygen saturation with pulse oximeter) were monitored twice a day till discharge. Babies were monitored for hypothermia, hypoglycaemia, apnoea, sepsis, feeding problem and other morbidities. Babies who developed a life-threatening event like convulsions, hypothermia, severe sepsis were considered as critically ill and were shifted back to NICU and withdrawn from the KMC group. Babies requiring phototherapy were also temporarily withdrawn from KMC group.

Discharge and Followup- Babies were discharged when they showed a weight gain of 10-15 g/d for three consecutive days were feeding well, maintaining temperature without assistance and the mother was confident of caring for her baby. Mother was advised about personal care, diet, benefits of the procedure for herself and was adequately supported with KMC pouch to carry newborn.

Statistical Methods

- Data was entered using MS Excel 2007.
- Data imported to SPSS 17.0 version software.
- Descriptive statistics was used to analyse nonparametric tests. Chi-square tests was used to assess significant difference between 2 groups and $p < 0.05$ was considered significant.
- Student's t-test was used to compare 2 groups of continuous data. $P < 0.05$ was considered significant and $p < 0.01$ was considered highly significant.

RESULTS

Male newborns were more than female newborns comprising of 157 and 143, respectively in the ratio of 52.3%

and 47.7%, respectively. In our study, inborn neonates were more than outborn. Among 202 inborn, majority were born in various places like CLW, followed by ECLW, SRLW and OT. Among 98 outborn, majority (90) were referred from various hospitals and 4 were home delivery.

In our study, majority of newborns born at late preterm and early preterm comprising of 172 (57.3%) and 116 (38.7%), respectively. Only small number of 12 (4%) newborns born at term.

In our study, the age of the mothers, majority of the mothers were in the age group of 21-25 years (54%). Nearly, 290 mothers of <30 years gave birth to the LBW babies against mothers of age 31 years. There is no significant difference between babies born to primi and multipara comprising of 146 and 154, respectively. Significant LBW and prematures are born to the mothers whose spacing is <25 months comprising of 122 and medical diseases and abortions are noted in 10 and 38, respectively.

In our study, the major contributory factors for LBW and prematures are PROM (182), maternal anaemia (182), PIH (106) and twins (55). Majority of babies are delivered through vaginal route, only 17 babies were delivered by CS. Of these, 282 babies were delivered spontaneously and 18 were induced.

In our study, the morbidity pattern of neonates requiring NICU admission before enrolling them for KMC care. All 300 babies were screened thoroughly before enrolling for KMC care. Nearly have 257 babies enrolled for KMC had hyperbilirubinaemia, 100 babies found to have sepsis, respiratory illness in 40, cardiovascular illness in 34, hypothermia in 33, metabolic in 14 and nervous system illness in 12.

In our study, there is significant increase in temperature after adapting KMC newborns mean axillary temperature before KMC was 36.75°C and after KMC is 36.98°C, raise by 0.23°C is found to be significant with P value of 0.00.

In our study, mean respiratory rate of neonates per min. was 35.12 after KMC care against 30.28 before KMC. Raise by 4.84 is found to be significant with P value of 0.01.

In the study, it was observed that there was decreased heart rate after KMC from 136.21 to 124.12. Decrease by 12.09 is found to be significant with P value of 0.00.

In the study, there is an increase of oxygen saturation from 98.41 to 99.55 increase by 1.14% is found to be significant with P value of 0.00.

Study showed that there is significant improvement in direct breastfeeding after KMC.

Study shows average weight gain during KMC stay was 21.94 g/kg/day in term, 20.58 g/kg/day in late preterm and 18.76 g/kg/day in early preterm. The average day when neonates started gaining weight irrespective of groups was 8.5 days.

Study shows average day of weight gain in preterm AGA were on 8.47 (SD 4.22) days, preterm SGA were on 8.9 (SD 4.58) days and term on 6.5 (SD 1.83) days.

Study shows average duration of KMC stay in term, late preterm and early preterm was 3.5, 5.5, 6 days, respectively. But, the average duration of hospital stay being 9.08 days

for term, 12.11 days for late preterm and 13.95 days for early preterm.

Of the 300 LBW babies were enrolled for KMC only, 7 babies were died of various causes. All the babies enrolled for KMC were advised to come for follow up to evaluate the health status of the newborns. Nearly, 250 mothers have brought their babies for follow up. Out of 250 who came for follow up, 241 babies were found to have good health. Only 9 babies had diseases as shown above. 8 babies who had come for follow up have above diseases were admitted and instituted appropriate treatment. Death was noted in only one child. 50 NB out of 300 didn't bring their children for follow up after giving sufficient advice. Study shows average weight growth velocity in preterm AGA was 119.1 g/week, preterm SGA was 126.4 g/week and term was 201.9, which was statistically significant with 'p' value of 0.001.

DISCUSSION

Kangaroo mother care has been proposed as an alternative method for caring low birth weight neonate. The method was first implemented by Roy and Martinez in 1979 at Maternal and Child Institute of Bogota, Colombia. In India, since its recommendation by WHO in 2003, its implementation is poor in spite of evidence favouring KMC as observed by Lawn et al.⁴

A hospital-based observational study was performed on LBW neonate fulfilling inclusion criteria and shifted to postnatal ward over a period of 2 years. Dhandekar et al had done retrospective cohort study, Veana et al was an observational study and all others were RCT's. Our study group contained 300 neonates were more as compared to study done by Dandekar RH et al,⁵ Ghavane et al,⁶ Gathwala G. et al⁷ and others. In the present study included inborn (67.3%) more than outborn. Demographic details of neonates of LBW mother showed that they were aged between 21-25 years. The health status of the mothers was studied in detail for giving birth to LBW babies showed that only 10 had medical diseases. The LBW babies born to both primipara and multipara were almost equal in number. Proper spacing in between two babies was observed in 20% of mothers. The following antenatal risk factors were noted in mothers of LBW births were PROM (31.9%), maternal anaemia (31.9%), PIH (18.6%), twins (9.6%), APH (5.9%) and others in decreasing order. Majority of the babies were born by vaginal delivery (94.3%), while others were delivered by CS and induced were 6% for various maternal reasons. Baseline characteristics of LBW babies at birth showed that the mean birth weight 1378.76 grams (SD 458 g), length 32.64 cm (SD 17 cm) and the head circumference 29.7 cm (SD 1.28 cm). Our study group constituted late preterm (57.3%), early preterm (38.7%) and term (4.0%). Various diseases requiring initial NICU admissions were apart from LBW in our study were hyperbilirubinaemia 49.9%, sepsis 19.4%, respiratory illness 7.8%, hypothermia in 6.4%, metabolic cause, central nervous system illness and abdominal illness forming the rest. The mean chronological age at which neonates were initiated KMC in our study was 5.50 (SD 1.8) in term, 6.61 (SD 3.86) in late preterm and

7.91 (SD 4.71) in late preterm. This was due to more morbidity seen in early preterm than in term.

In our study, it showed that the neonates' body temperature significantly increased, while they are placed in KMC. This is in accordance to study performed by Dandekar RH et al,⁵ Ghavane et al,⁶ Gathwala G. et al⁷ and many others. Babies in close contact with warm maternal skin and receives heat from mother's breast on each side and chest in front and rise in skin temperature is as a result of conductance of heat from mother to the infant. Placement of the infant underneath a blouse improved insulation and prevents heat loss during the maternal kangaroo care. Higher temperature in the skin-to-skin contact in the present and the earlier studies provide evidence that maternal body is an efficient heat source for the baby. Thermal control is very important for LBW neonates because of their great tendency towards hypothermia because of increased surface area and it thus contributes towards homeostasis. A significant increase in respiratory rate, decrease in heart rate and increase in oxygen saturation were seen in neonates receiving KMC in our study. In Acolet et al⁸ and Kadam et al⁹ found higher oxygen saturation and reduction in respiratory rates after KMC. Ventilation and perfusion are gravity dependent, so an upright position optimises respiratory function. Also, since the newborn was calm and comfortable in contact with its mother, which probably decreased the consumption of oxygen and increase in saturation, decreases in heart rate maybe associated with lower stress, calm experiences in relation to the hospital routine and calm sleep. In our study, though respiratory rate increased in contrast to Acholet et al⁸ and Kadam et al,⁹ it was towards normal. Further research would investigate the initiation of KMC in the hospital before stabilisation of vitals, which was not feasible in this study.

Present study recorded a higher proportion of neonates achieved transition from predominant expressed breast milk consumption to predominant direct breastfeeding during hospital kangaroo mother care. This was in accordance with Rao et al (98%)¹⁰ and Ramnathan et al (86%).¹¹ Also, all infants were on exclusive breastfeeding at follow up and were on regular supplements.

Neonates given KMC showed significantly mean weight gain per day during in-hospital KMC of 20 g/day and during followup. This is in accordance with observation made by Cattaneo et al (21.3 g),¹² K. Ramanathan et al (15.9 g),¹¹ Rao et al (23.9 g)¹⁰ and Gathwala et al (21.92 g).⁷ In our study, average day at weight gain in preterm AGA were on 8.47 (SD 4.2) days, preterm SGA were on 8.9 (SD 4.58) days and term on 6.5 (SD 1.8) days and average duration of KMC stay in term was 3.5 days, in late preterm was 5.5 days and early preterm was 6 days and the average duration of hospital stay being 9 days for term, 12 days for late preterm and 13.9 days for early preterm. Neonates were discharged early as they met our discharge criteria. This finding was similar to conclusion made by Cattaneo et al (13.4 days).¹² Though in K. Ramanathan et al¹¹ study, average day of hospital stay was 27.2 ± 7 days. This difference may be due to individual hospital discharge strategy. Early discharge,

decreases the overcrowding in the neonatal units, thereby reducing the chances of contracting hospital-acquired infections and also reduces the economic burden imposed on the family. Eventually, it would also reduce the overall burden on the health services. We could not confirm when the birth weight was regained as neonates were discharged earlier and only small number did not turn up for initial follow up. In present study, the babies receiving KMC had no hypothermia. This finding was similar to Kadam et al⁹ and Rao et al. Also, we found little incidence of sepsis (2+ 3/300) similar to the finding of Rao et al (4/103) and Syed Ali et al (4/58).¹³ The episodes of apnoea in <32 weeks babies in KMC group was significantly less (1/300). This finding is similar to the finding of Rao et al (4.3%) and Syed Ali et al (1.7%).¹³ Only 2 neonates developed NEC and jaundice and PDA were seen in one each, which is a common complication of preterms and it was managed as per protocol and were included in the present study as KMC had more supportive role even in them.

Most of neonates were observed on follow up date at High-Risk Newborn OPD. All mothers were continuing KMC even at home as they were feeling satisfactory about the care to their neonates and family too supported them at home. Our study recorded a higher proportion of exclusive breastfeeding during follow up among KMC infants. Charpak et al¹⁴ reported that the proportions of KMC mothers who breastfed up to 3 months exclusively were significantly higher on statistical analysis. Higher breastfeeding rates were also observed by Ramnathan et al.¹¹ These neonates showed average weight gain per week found to be 119.1 grams (33.51) preterm AGA, 126.4 g (45.28) preterm SGA and 201.9 grams (62.81) in term, which was statistically significant. The average weight gain velocity was 21.23 g/day, which was comparable with the studies done by Cattaneo et al (21.3 g),¹² K. Ramanathan et al (15.9 g),¹¹ Rao et al (23.9 g)¹⁰ and Gathwala et al (21.92 g).⁷ The increase in physical growth more rapidly maybe due to exclusive breastfeeding, temperature maintenance, physiologic stability and decreasing morbidities. Although, the rate of weight gain was satisfactory, 4 babies showed poor weight gain who were admitted and evaluated. Other morbidity observed during followup were severe infection in 3 requiring hospitalisation and ROP in one, which was managed by ophthalmology team.

One of the strengths of our study is the high follow-up rate among KMC infants comparable to other studies. 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. Home visit was not possible in the present study. However, the higher followup by KMC mothers suggests that early discharge with regular followup 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. 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. Few mothers during

hospital KMC stay were confident enough to serve as advocates for KMC and they were an important source of support for the newly-enrolled mothers. This study has demonstrated that KMC is feasible in the Indian household. 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. The limitations of our study are an observational study, sample being purposive and not a true representative of study population. As our study is confined to our hospital setting, the generalisation to community cannot be made.

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