Effect of Kangaroo Mother Care on Feeding, Morbidity and Neuro Development of Low Birth Weight Neonates

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ABSTRACT

Objectives: Kangaroo Mother Care (KMC) was developed for caring of low birth weight (LBW) babies in developing countries. Study was done with the objective to evaluate the effect of Kangaroo Mother Care (KMC) on feeding, neurodevelopment, morbidity and problems associated with KMC on low birth weight (LBW) neonates.

Material and Methods: Prospective follow-up cohort study was carried out at Neonatal Intensive Care Unit (NICU) at tertiary level hospital from January 2015 to December 2016 and details of neonates were recorded on prestuctured proforma.

Results: Mean duration of KMC during the hospital stay was 9.3 ± 4.6days (5.7±2.4 hours/day). 72.2% Neonates were on breast milk at enrolment in the study which increased to 91.5% neonates at the time of discharge, with practise of KMC of 19.3% neonates were able to achieve exclusive breast feeding at discharge (p 0.01). Mean days for shift from katori spoon feeding to direct breastfeeding - 3.15 ± 2.44 days. Neuro-development was better in neonates who received KMC at home as compare to those who did not receive at home (p 0.04). Most common problem encountered during the practise of KMC was Shyness(26.2%) followed by pain at suture line (4.5%).

Conclusion: KMC helps to achieve smooth and early transition to direct breastfeeding, increases the exclusively breastfeeding rate, better neuro development and reduces the morbidities in LBW neonates.

Keywords: KMC, Feeding, Neuro-Development, Morbidity

INTRODUCTION

Kangaroo Mother Care (KMC)[1-3] is a special way of caring of low birth weight (LBW) babies carried out by skin-to-skin contact with the mother. It was developed by Dr. Edgar Ray Sanbaria and Dr. Martinezin Bogota, Colombia in 1978 as an alternative to inadequate and insufficient incubator care in developing countries but now considered as the most feasible, readily available, and preferred intervention for decreasing neonatal morbidity and mortality in developed and developing countries.[1,4]

Key features of KMC are[1,5]: Early, continuous and prolonged skin-to-skin contact, Exclusive breastfeeding and early discharge. It fosters infant health and wellbeing by promoting effective thermal control, breastfeeding, growth and neuro-development, physiological stability, infection prevention, and infant-mother bonding; there by decreasing duration of hospital stay. It is also used as effective transport modality and analgesic for mild procedural pain.[1,6-8] Present study was undertaken to evaluate the effect of KMC on growth, neurodevelopment, breastfeeding, procedural pain, reduction of morbidity and problems encountered during the practise of KMC.

MATERIAL AND METHODS

Prospective follow up cohort study was carried out in Neonatal Intensive Care Unit (NICU) of Civil Hospital, Ahmedabad from 1 January 2015 to 31 December 2016. Hemodynamically stable, intramural delivered babies with birth weight less than 2500 gm who were admitted in NICU were included in the study. Exclusion criteria: a) Unstable Neonates or critically ill neonates (b) Unwell mother and family members who were not ready to provide KMC, (c) Major malformation to baby, (d) LBW neonates brought to NICU from postnatal ward. KMC was provided in designed KMC chair or at fowler bed after counselling to KMC provider. Age at enrolment in the study, daily session and duration of each session, duration of KMC during the hospital stay and total duration of KMC were recorded in the pre-structured proforma. Neonate's axillary temperature and blood glucose were monitored. Neonates were also monitored for apnoea, sepsis or any other problem during the hospital stay.

All neonates were given breast milk by infant feeding tube(RTF) or katori spoon (KSF) or direct breastfeeding according to gestational age, birth weight, day of life and associated morbidities. Breast milk or top milk given to the neonate depending upon availability of breast milk. Days of transition of mode of feeding recorded in the chart. Neonates fulfilling the discharge criteria were discharged from the hospital. At the time of discharge, KMC provider were asked about the problems encountered during practising KMC, and were reinforced to continue providing KMC at home.

Enrolled neonates were followed up till 6 months of age. Neonates were divided into 2 groups. Group X: Received KMC at home, Group Y: Not received KMC at home. At 6 month of age – neonate development assessment by INFANIB[9-11] and exclusively breast feeding, top feed or mixed feeding (breast feeding + top feeding) were obtained in both groups.

STATISTICAL ANALYSIS

Statistical Analysis was done by Student 't' test and ANOVA (taking 5% level of significance), 2 tests for proportion(taking 5% level of significance) and Chi square test. Statistical Analysis done by graphpad calculator version 3.

RESULTS

There were 10622 intramural deliveries during the 2 year

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period, out of which 3274 neonates were LBW from which 576 neonates were enrolled. Out of 576 neonates, 154 neonates come for follow up visits out of which 96 had continued KMC at home for 6 months while other had stopped KMC before the completion of 6 months.

In study group 52% were female neonates, mean birth weight was 1511 grams, mean gestational age was 32.27 week and almost 90% neonates were preterm neonates. Mean age of enrolment, duration of hospitalization, duration of KMC during hospitalization were 5.8 days, 11.77 days and 9.28 days respectively. Mean hours of KMC were 5.7 ± 2.34 hours/day. Characteristics of the study group were shown in table-1.

At initiation of KMC 7% (41) neonates were Nil by mouth (NBM), 41% (241) neonates were on infant tube feeding and no neonates on infant tube feeding or NBM at the time of discharge. 37% (215) were on katori spoon feeding which reduced to 12.8% (74) on discharge. 15% (87) neonates were on breastfeeding at initiation of KMC which increased to 87.2% (502) at the time of discharge. Mean days for shift from NBM to Full infant tube feeding - 2.6 ± 1.94 days, mean days for shift from infant tube Feeding to Full Katori Spoon Feeding - 3.8 ± 2.76 days and mean days for shift from katori spoon feeding to direct breastfeeding - 3.15 ± 2.44 days. 72.2% (416) Neonates were on breast milk at enrolment in the study which increased to 91.5% (527) neonates at the time of discharge. With practise of KMC of Mean hours of 5.7 ± 2.34 19.3% (111) neonates were able to achieve exclusive breast feeding at discharge, which is statistically significant (p 0.01). Effect of KMC on associated morbidities are described in table-2.

Most common problem encountered during the practise of KMC was Shyness for providing KMC which was observed in 26.2% (151) KMC provider, other problems were pain at suture line (4.5%), soiling by the baby (4.1%), uncomfortable (2.4%) and regurgitation of feed (1.3%).

At discharge in Group A 18.8% (18) were on mix feed or top feed which decreased to 10.5% (10) neonates at 6 months of follow up; while group B 20.7% (12) were on top or mix feed which reduced to only 13.7%(8) at 6 month of follow up. But difference is not statistically significant (p 0.57). At 6 month follow up 25% Neonates in Group X have transient and abnormal INFANIB as compare to 38% neonates in Group Y with p value < 0.05; suggests effect KMC on maturation of brain (Details summarize in table-3).

DISCUSSION

During study period 10,622 neonates were delivered at the institute; 5.4% were enrolled for the study, which consisted of 17.6% of LBW neonates delivered at the institute during the study period. Mean birth weight (1511 gm) of present study was comparable with Udani et al[12] (1625 gm) and Ramnathan et al[13] (1467 gm). 81% neonates were Preterm AGA, followed by 10% full term SGA, 8% preterm SGA and 1% preterm LGA in present study. There were no extreme preterm (<28 week) in the study. Mean Gestational age was 33.27 ± 2.62 week.

Mean age of enrolment of neonates was 5.8 days as they were enrolled after once they were hemodynamically stable. 20.5% neonates were enrolled within 72 hours of birth while 2 neonates were enrolled after 14 days of life as they require prolong ventilator and CPAP therapy. Age of enrolment were comparable with Udani et al[12] (5 days), but significantly lower than Ramnathan et al[13] and higher than Rao et al[14] (3.7 days) and Chrapak et al[4] (4 days). Mean duration of hospital stay of

Birth Weight in gram (n=576)		Distribution of LBW (n=576)		Gestational Age (n=576)	
< 1000	12	Preterm AGA	466	< 28 week	0
1000 – 1499	237	Preterm SGA	45	28 – 30 week	5
1500 – 1999	286	Preterm LGA	4	30 – 32 week	113
2000 – 2499	41	Full term SGA	61	32 – 34 week	281
Mean	1511 ± 287			34 – 36 week	91
				36 – 37 week	26
				> 37 week	61
				Mean	33.27 ± 2.62
(AGA – Appropriate for gestational age, SGA – Small for gestational age, LGA – Large for gestational Age)					

Table-1: Baseline characteristics of Study Group

Morbidity	Before initiation of KMC (n=576)	After initiation of KMC (n=576)	Morbidities developed during KMC which were not present before (n=576)
Hypothermia	16 (2.7%)	3 (0.52%)	2 (0.34%)
Hypoglycaemia	24 (4.2%)	5 (0.86%)	3 (0.52%)
Sepsis	107 (18.6%)	1 (0.17%)	1 (0.18%)
Apnoea	14 (2.4%)	0	0

Table-2: Effect of KMC on Morbidities

Development according to INFANIB	Group A No of Neonates (n=96)	Group B No of neonates (n=58)
Normal INFANIB score	72	42
Transient and abnormal INFANIB	24	16
% Neonate having transient and abnormal INFANIB	25%	38%

Table-3: Effect of KMC Neuro development of neonates at 6 month of age

enrolled neonate was 11.77 ± 4.8 days. Mean days of KMC during hospitalization were comparable to Udani et al.[12] Most of the studies had a mean duration of hospitalization between 8 – 13 days in KMC group. Udani et al[12], Ramanathan et al[13], Rao et al[14], Gamit et al[15] and Bambharoliya et al[16] were Randomized control trial (RCT) with conventional care group. As compared to other RCT; in our study mean birth weight was lower but duration of hospital stay is comparable with other studies.

KMC causes breast milk production is stimulated by skin to skin contact, also decreases infant crying. In a calm baby, food can be properly absorbed in the stomach, so the baby grows faster. KMC helps in development of infant's oral-motor competence with repeated rooting, repeated swallowing, frequent and long sucking bursts, and hence help in early initiation of breastfeeding.[17-19] In present study days required to achieve direct breastfeeding is comparable to the randomized control trial of Suman Rao et al[14] (Mean Values: Birth weight – 1683 gm, duration of hospitalization – 12.7 days, days for direct breastfeeding – 3.76 days) which proves the efficacy of KMC to achieve earlier and better breastfeeding rate in present study, however there is no study to compare the effect of KMC on days required to shift from NBM to RTF and RTF to KSF. But in Gamit et al[15] study (mean duration of hospitalization – 9.59 days) 67.3% (198) neonates achieved exclusive breast feeding at the time of discharge while in present study 12.5% (72) neonates were able to achieve exclusive breast feeding rate at discharge. There was no statistically significant difference noted in feeding status of X and Y group at the time of follow up but exclusively breast fed rate in X group (89.5%) was comparable to Gavhane et al[20] (85.9%), but higher than Bambharoliya et al[16] (82.4%) and lower than Udani et al[12] (95%).

KMC practice helps in maintaining respiratory rates and heart rate within clinically acceptable range and prevents apnoea.[21,22] KMC reduces the incidence of hypoglycaemia during and after the hospital discharge by providing thermal regulation and uninterrupted breastfeeding also maintains glycaemic control of newborn.[23] Practice of KMC reduces the incidence of nosocomial infections due to enhanced stratum corneum barrier function due to an increase in hydration and decrease in transepidermal water loss.[24]

After starting the practise of KMC, morbidities significantly reduced in the study population. Morbidities that decreased were hypothermia, hypoglycaemia, sepsis and apnoea which have shown statistically significant difference after starting the practise of KMC. Hypothermia was observed in 3 neonates after initiation of KMC. All neonates were extremely low birth weight neonates and technique of KMC was not correct. Further hypothermia was prevented in these neonates after proper positioning and counselling. Five neonates develop hypoglycaemia after initiation of KMC; reason for hypoglycaemia were inborn error of metabolism – urea cycle disorder (1 neonate), improper amount of feeding (2 neonates), infant of diabetic mother (1 neonate) and intrauterine growth retardation (1 neonate). No further episode of hypoglycaemia was observed in neonates after proper feeding counselling except in neonate with inborn error of metabolism. One neonate develop sepsis after initiation of KMC; reason for sepsis was nosocomial infection. Associated Morbidities (Hypothermia, hypoglycaemia, sepsis and Apnoea) are lower in the present study as compared other studies - Rao et al[14], Chatterjee et al[25], Socorro et al[26] and Shah et al[27] (n=40) which were Randomized control trials.

As study was conducted at tertiary level care hospital – most of the high risk pregnancies were conducted at our institute and they were the referral patients from the far distance; which was the reason for low follow up rate. Reasons for not providing KMC at home were –busy schedule of mother, small house, lack of privacy at home.

Kangaroo mother care provides warmth, soothing sounds of mother's heartbeat, gentle tactile stimulation and kinaesthetic sensation which help in promoting the emerging flexor tone, spontaneous movement and upright postural control.[28] Kangaroo position is optimal for visualizing the mother's face which is the most potent visual stimulus for infants. KMC also provides **"***Butterfly Effect"* which means smallest changes induced by kinaesthetic stimuli during practise of KMC can result in substantial differences in function of brain over time.[29] Kangaroo care has been shown to increase both the duration of sleep and the amount of quiet sleep during the sleep period. Overall, integrity of sleep is improved in KMC.[30] Present study demonstrate evelopment was better in neonate who received KMC at home as compared to who did not receive KMC at home ($p < 0.05$), however there is no comparative studies in india to compare the effect of KMC on neuro development.

CONCLUSION

Practice of KMC helps to achieve smooth and early transition from infant feeding tube feeding to direct breastfeeding, increases the exclusively breastfeeding rate, better neuro developmental outcome and reduces the morbidities associated with low birth weight neonates; hence achieved better growth, early and smooth transition of mode of feeding help to decrease total duration of hospitalization.

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