



EFFECT OF KANGAROO MOTHER CARE ON PHYSIOLOGICAL PARAMETERS OF LOW BIRTH WEIGHT (LBW) BABIES

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ABSTRACT

BACKGROUND: Kangaroo mother care (KMC) implies placing the newborn baby in intimate skin-to-skin contact with the mother's chest and abdomen coupled with frequent breastfeeding. It has been found to be a feasible and cost-effective method of care of LBW babies in the hospital as well as home setting as a major problem with such babies is their inability to control body temperature.

AIMS & OBJECTIVES: To study the effectiveness of KMC on physiological parameters of low birth weight babies and to determine the influence of the Gestational Age, Parity, Education on the effectiveness of Kangaroo Mother Care on physiological parameters of LBW babies.

METHODS & MATERIALS: A Cross Sectional Prospective Observational study was done on 120 LBW patients admitted in NICU and PNC ward in 1 year duration. Data for heart rate, respiratory rate, temperature and SpO₂ were collected and appropriate statistical tests were applied. P value <0.05% was considered statistically significant.

RESULT: Out of 120, male to female ratio was 1.55:1. On day 1, 2, 3 of KMC, change in mean were found 4.6, 4.8, 4.6 for heart rate, respectively. Likewise, change in mean for respiratory rate on day 1, 2, 3 were 2.8, 4.2, 4.6. Data for temperature on day 1, 2, 3 were 0.4, 0.8, 0.6. Change in mean for SpO₂ for all 3 days were 5.6, 6.0, 5.8. All 4 parameters showed statistically significant result on all 3 days.

CONCLUSION: As per result of our study LBW babies with KMC showed significant improvement in all vital parameters. So it is recommended to study the importance of KMC to LBW babies for extended periods to achieve benefits for the same.

KEYWORDS :

INTRODUCTION

Low birth weight (LBW; <2500 g regardless of gestational age), which is often associated with preterm birth, is an important predictor of infant death within 28 days of birth.¹ More than 95% of these LBW babies occur in developing countries, mainly in South Asia and sub-Saharan Africa.² LBW infants are approximately 13 times more likely to die than normal birth weight counterparts.³

A major problem with such babies is their inability to control body temperature which is a preventable cause of their morbidity and mortality. A study from India revealed that 2.9% of intramural babies and 45% of babies born at home developed mild to moderate hypothermia.⁴

India ranks 36th in the list of 199 countries for pre-term births globally and has the highest number of deaths due to preterm births. Kangaroo mother care (KMC) implies placing the newborn baby in intimate skin-to-skin contact with the mother's chest and abdomen coupled with frequent and preferably exclusive breastfeeding.⁵ On thorough literature search we found a significant number of studies on the effect of KMC on physiological parameters in normal weight babies. However there were very few studies on the effect of KMC on physiological parameters in LBW babies. Hence we decided to study the effect of KMC on physiological parameters in LBW babies in our tertiary institute. The broader intention is to generate data to recommend wider implementation of this cost-effective strategy in the community.

METHOD & MATERIAL

It was a cross-sectional prospective observational study done in Neonatal Intensive Care Unit and Post Natal Care (PNC) ward of a tertiary care institute. Duration was from June 2018 to May 2019 (12 months). 120 (Estimated based on Hospital Records of the Previous Year) neonates with birth weight less than 2500 gm born in our hospital who are either admitted in NICU or PNC ward of our tertiary care institute, were included.

AIM:

To study the effectiveness of kangaroo mother care on physiological parameters of low birth weight babies

OBJECTIVES:

Primary objective was to evaluate the effect of KMC on physiologic parameters of low birth weight LBW babies while secondary objective was to determine the influence of the following demographic variables on the effectiveness of Kangaroo Mother Care on physiological parameters of Low Birth Weight (LBW) babies: Gestational age, parity, education.

Following inclusion and exclusion criteria were included:

INCLUSION CRITERIA

- Stable LBW babies (1500 gm to 2499 gm) and very low birth weight babies (1000 gm to 1499 gm)
- Mothers who give consent and who are willing to participate in the study.

EXCLUSION CRITERIA

- Babies who are on ventilator or CPAP or Oxygen (O₂) support.

b) During the study if any baby is diagnosed with a critically ill condition such as any major illness like congenital heart disease, respiratory distress etc.
 c) Mothers who fail to execute KMC correctly despite repeated demonstrations were withdrawn from the study, although they were made conversant with the KMC technique ultimately.

Four vital physiological parameters of the baby, namely temperature, respiration rate, heart rate, and oxygen saturation, were assessed and recorded immediately just before and just after implementing KMC in the mother-baby pair for 3 consecutive days. Axillary temperature was measured (in °C) by digital thermometer for 1 minute. Respiration rate was assessed by observing chest movements for full one minute. Heart rate and oxygen saturation were recorded with the help of pulse-oximeter. The baseline mean values of all these 4 physiological parameters calculated separately before giving KMC in all participant babies were recorded. Similarly the mean values of all these 4 physiological parameters calculated separately after giving KMC in all participant babies were also recorded. Subsequently the change in the mean values (before and after giving KMC) for all 4 physiologic parameters were calculated and recorded on all 3 days separately. The effect of the demographic variables like gestational age, parity of mother and education status (illiterate/literate) of mother on the 4 physiologic parameters was individually assessed by calculating the average value all the three before KMC mean values on day 1, 2, 3 and also for after KMC mean values separately for each parameter and applying statistical tests of significance.

STATISTICAL ANALYSIS

It was done with appropriate statistical methods using SPSS software version 20 (Statistical program for scientific study). Data was collected using case record forms and was entered on Microsoft excel spread sheet. All numerical physiological parameters was analyzed using descriptive statistics of mean for continues variables and frequencies and percentages for categorical variables. The relationship between effect of kangaroo mother care on physiological parameters of LBW babies and demographic variable like gestational age, parity of mother and education status(illiterate/literate) of mother was tested by using chi square test, t- test. The significance level for all statistical analysis were at 0.05(95% CI). P value (significance) of <0.05 (significant) was deemed statistically significant (SS), p<0.01 as highly significant (HS) and p<0.001 as very highly significant (VHS)Result

Total 120 newborn babies, who were admitted in Postnatal Care (PNC) ward and NICU over a period of one year, fulfilling the inclusion criteria, included in the study. Demographic data including gender, patient age, age of mother, parity, education of mother, religion, and birth weight were written in table 1.

Table 1: Demographic data

Gender distribution		
Gender	Frequency	Percent
Male	73	61
Female	47	39
Total	120	100
Distribution of cases according to patient age		
Patients age in Days	Frequency	Percent
Less than 12 hours	71	59
13 - 24 hours	28	23
24 to 48 hours	14	12
more than 48 hours	7	6
Total	120	100
Distribution of cases according to age of mother		
Age of mother	Frequency	Percent

20 to 24 years	50	41.7
25 to 29 years	48	40
30 to 35 years	22	18.3
Total	120	100
Distribution of cases according to parity		
Parity	Frequency	Percent
Primi	82	68
Multi	38	32
Total	120	100
Distribution of cases according to education status of mother		
Education status of mother	Frequency	Percent
Literate	114	95
Illiterate	6	5
Total	120	100
Distribution of cases according to religion		
Religion	Frequency	Percent
Hindu	80	67
Muslim	35	29
Christian	5	4
Total	120	100
Distribution of cases according to birth weight		
Birth weight	Frequency	Percent
Stable LBW babies (1500 gm to 2499 gm)	76	63
Very low birth weight babies (1000 gm to 1499 gm)	44	37
Total	120	100

All 4 parameters showed significant result statistically as per in Table 2, 3.

Table 2: Range of values for the four physiological parameters recorded in the study population

PARAMETER	DAY 1		DAY 2		DAY 3	
	Before KMC	After KMC	Before KMC	After KMC	Before KMC	After KMC
HR (beats/min)	141.5 ± 11.31	146.1 ± 6.78	142.1 ± 9.54	146.9 ± 7.89	142.5 ± 8.82	147.1 ± 6.63
RR (per min)	38.4 ± 6.34	41.2 ± 5.52	38.9 ± 5.43	43.1 ± 4.8	39.1 ± 4.78	43.7 ± 4.72
TEMP.	36.3 ± 0.11	36.7 ± 0.17	36.1 ± 0.12	36.9 ± 0.17	36.5 ± 0.11	37.1 ± 0.15
SPO2	92.9 ± 2.17	98.5 ± 1.99	92.8 ± 2.37	98.8 ± 0.33	93.4 ± 3.11	99.2 ± 0.87

Table 3: Change in mean the four physiological parameters recorded in the study population

PARAMETER	DAY 1		DAY 2		DAY 3	
	Change in mean	P value*	Change in mean	P value*	Change in mean	P value*
HR (beats/min)	4.6	P < 0.001	4.8	P < 0.001	4.6	P < 0.001
RR (per min)	2.8	P < 0.001	4.2	P < 0.001	4.6	P < 0.001
TEMP.	0.4	P < 0.001	0.8	P < 0.001	0.6	P < 0.001
SPO2	5.6	P < 0.001	6	P < 0.001	5.8	P < 0.001
Chi-Square test	Statistically Significant(SS)		Statistically Significant(SS)		Statistically Significant(SS)	

DISCUSSION

The current study was carried out to assess the effect of KMC on physiological parameters like Temperature, HR, RR and SPO2 of low birth weight babies. Four vital physiological parameters of the baby, namely temperature, respiration rate, heart rate, and oxygen saturation, were assessed and recorded immediately just before and just after implementing KMC in the mother-baby pair for 3 consecutive days and the change in

parameters was recorded to determine the effect of KMC.

In the present study, there was male predominance (61%) amongst study population. This findings is in agreement with the study conducted by Zohreh Badiie et al., in which the number of male premature infants were more(62%).⁵ Similar findings was reported by Keerti Swarnkar et al⁴ where the study group had male (58%).

Most of study population had age of less than 12 hours (59%) followed by 13 - 24 hours (23%).

It was observed that most mother was between 20-24 years (41.7%) of age group followed by 25 -29 years (40%). The mean age of the study population was 25.33 ± 6.03 years. These findings are in agreement with the study conducted by Alpanamayi Bera et al., in which the age of the mothers was 25.7 ± 5.19 years.⁷ Similarly, a Brazilian study on KMC found mean maternal age to be 24.6 years.⁸

There was male predominance (61%) amongst study population.

In the present study, 95% of baby's mothers were literate. Similarly in the study conducted by Rasaily et al., 35.6 % mothers were illiterate and 47.5 % had education high school and above.⁹ Similarly in the study conducted by Trivedi, et al., 37% of study population were illiterate.¹⁰ Similarly in the study Jamal S et al., 12.8 % of study population were illiterate and 97.2% were literate.¹¹

Most of the study population were Hindu (67%) followed by Muslim (29%) and Christian (4%). Similarly in the study conducted by Trivedi, et al., 91.74% of study population were Hindu.¹⁰

Most of study population had birth weight of 1500 gm to 2499 gm (63%) followed by 1000 gm to 1499 gm (37%). The mean birth weight (in grams) was 1987.94 ± 436.62 . This finding is in agreement with the study conducted by Ranjan A et al. in which The mean birth weight (in grams) was 1847.94 ± 333.62 .¹² Similarly study conducted by Alpanamayi Bera et al., in which birth weight was 1450.9 ± 311.19 g.⁷

In the present study, Heart rate showed a rise during KMC, and the mean changes were modest but statistically significant on all 3 days - 4.6 on day 1 ($P < 0.001$), 4.8 on day 2 ($P < 0.001$), and 4.6 on day 3 ($P < 0.001$).

No baby had respiratory distress at baseline. Respiratory rate showed a rise during KMC, and the mean changes were modest but statistically significant on all 3 days - 2.8 on day 1 ($P < 0.001$), 4.2 on day 2 ($P < 0.001$), and 4.6 on day 3 ($P < 0.001$).

Temperature showed a small rise during KMC, and the changes were statistically significant on all 3 days. 0.4 On day 1 ($P < 0.001$), 0.8 on day2 ($P < 0.001$), 0.6 on day3($P < 0.001$).

Mean oxygen saturation also improved by about 5% on all 3 days, the change being statistically significant. Mean oxygen saturation showed a rise during KMC, and the mean changes were modest but statistically significant on all 3 days - 5.6 on day 1 ($P < 0.001$), 6 on day 2 ($P < 0.001$), and 5.8 on day 3 ($P < 0.001$).

Our study results are broadly in agreement with earlier studies. Although not a marked rise, the smooth upward trend in temperature during KMC sessions should protect the newborn against temperature fluctuations and cold stress. Jothipriya J has reported that mean axillary temperature and mean heart rate were higher during KMC than during routine care.¹³ If nothing else, KMC achieves the goal of 'keeping baby warm,' which is one of the most cost-effective interventions to protect babies during the critical neonatal period.¹⁴

Ludington-Hoe et al. have reported that kangaroo care promotes stability of physiological function.¹⁵ In their study, heart rate remained stable (mean 143.9), respiratory rate ranged from 20 to 72 (mean 41.2), and apnea episodes did not occur during KMC.¹⁶ After placing babies in KMC position, their temperature never fell below 36.8°C and remained at a mean of 37.1°C.

There was distinct improvement in oxygen saturation during the KMC sessions. This is relevant for sick newborns, particularly those requiring oxygen supports. Earlier studies also report decrease in apnea and improvement in oxygen saturation in mechanically ventilated babies able to tolerate transfer and position changes.^{17,18}

A meta-analysis of 23 studies of 190 term and 326 preterm infants (gestational age 26 to 36 weeks) concluded that there was an increase in body temperature of 0.22°C, no change in heart rate, and a statistically but not clinically significant decrease in oxygen saturation of 0.60% during periods of skin-to-skin contact.¹⁹

Prematurity did not affect the stability of these parameters. Our study found a similar rise of temperature (normalization of temperature from hypothermia), a small but statistically significant rise in heart rate, and a definite improvement in oxygen saturation. These improvements are unlikely to have been due to chance alone since similar improvements were noted on all 3 days, even with as little as 1 hour of kangaroo care on the first day. The reasons for the beneficial effects of KMC are yet to be fully explored. Heat transfer from mother to baby is obvious. The intimate and early skin-to-skin contact between mother and baby, with repeated nutritive and non-nutritive suckling, possibly also evokes neuropsychological responses that program physiology and behavior. Further, during KMC, the infant experiences maternal heart sounds, rhythmic maternal breathing, warmth and prone positioning, all of which offer gentle stimulation across auditory, tactile, vestibular, and thermal sensory systems, which may in sum total have a tranquilizing effect on the baby, allowing physiological parameters to stabilize.²⁰

On evaluating trends of changes in respiratory rate (RR), present study revealed a statistically significant improvement stabilization of RR with KMC. Similar findings of statistically significant stabilization of RR was seen in studies conducted by Almeida et al ($P < 0.001$), Princely JR et al ($P < 0.001$), Kumar G ($P < 0.05$) and Parmar VR et al ($P < 0.05$).²¹⁻²⁴ Though, a meta-analysis by Boundy et al and a RCT conducted by Dehghani et al didn't show any statistically significant stabilization of respiratory rate.^{25,26} Similarly, observational studies by Jain PK and Verma P also found insignificant change RR with KMC.^{27,28} An observational study by Phirke D also showed similar results with stabilization of HR and RR ($P < 0.0001$).²⁹ Another quasi-experimental study by Azevedo et al in intubated neonates concluded statistically significant decrease in the HR within the normal range with KMC ($P < 0.001$).³⁰ Thus, the findings of above-mentioned studies were in concordance to the results of present study. There was a statistically significant increase in HR in studies conducted by Gunjana et al and Bera et al.^{7,23}

CONCLUSION

Babies receiving KMC showed modest but statistically significant improvement in all the vital physiological parameters (SpO₂, temp., HR and RR). So, without using special and costly equipment, the KMC strategy can offer developmentally supportive care to newborns. There was no significant difference in four physiological parameters like heart rate, Respiratory rate, Temperature and SpO₂ irrespective of the Gestational age, parity and education status of the mother. It is recommended to study the importance and effect of giving KMC to LBW babies for extended periods to achieve benefits other than that observed in physiological parameters of the neonates. The broader intention

is to generate data to recommend wider implementation of this cost-effective strategy in the community.

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