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Comparison of Effect of Kangaroo Mother Care on Vital Parameters in Different Weight Groups of Low Birth Weight Newborns

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Abstract: Low birth weight and prematurity is a stemming cause of deaths in new borns. Kangaroo Mother Care (KMC) is a most cost effective method of care for low birth weight (LBW) infants. Aim of this study was to compare the effectiveness of Kangaroo Mother Care on vital parameters i.e. temperature, heart rate, respiratory rate and oxygen saturation of different weight groups of low birth weight newborns. It was a hospital based observational study, conducted over a period of one year from June 2015 to April 2016. 100 mother-low birth weight baby pairs (weight <2.5 kg) were selected. KMC was started for 1 hour on day 1 and then increased by 1 hour each day for next 2 days. Results were analyzed before and after KMC. Maximum benefit of KMC was being observed in babies weighing between 1.5 to 2 kg, although beneficial effect was also observed in other weight groups ((1 to <1.5 kg and 2 to <2.5 kg) also. KMC may prove to be an effective method of care in LBW babies in resource limiting settings.

Keywords: Kangaroo, mother, care, low, birth, weight.

INTRODUCTION

Low birth weight is considered to be a major cause of neonatal death and complications like hypothermia, hypoglycemia, hypocalcemia, HMD, NEC, ROP, and ICH [1]. KMC is an alternative method to conventional neonatal care for low birth weight babies. It reduces the overall mortality of the baby, increases the confidence and self-esteem in mother and bondage between mother and baby.

KMC is a comprehensive, humanized, cost effective, developmentally supportive therapy for preterm infants and is a proven method of care for Low Birth Weight Infants. Previous evidences support the role of KMC in improving the vital physiological parameters and outcomes of LBW infants [2-4]. But Indian data on outcome of KMC in relation to birth weight are limited. So we planned to compare the effectiveness of KMC on vital parameters of low birth weight newborns.

MATERIALS & METHODS

The present study was conducted in Sir Padampat Mother and Child Health Institute, department of Pediatric Medicine, SMS Medical College. Formal permission from ethical committee of the college was taken. It was a hospital based observational study, conducted over a period of one year from June 2015 to April 2016. The study cohort comprised of 100 mother-low birth weight baby pairs (weight <2.5 kg) and babies were divided into 3 groups according to their weight – Group A (1 to <1.5 kg), Group B (1.5 to <2 kg) and Group C (2 to <2.5 kg).

The mothers were counseled regarding breastfeeding, KMC and their benefits. After motivation, formal written informed consent was taken from all participating mothers. A predesigned Performa was used to collect following informations: temperature, heart rate, respiratory rate, oxygen saturation of low birth weight babies; immediately before and after KMC for 3 consecutive days.

Inclusion Criteria

Babies weighing 1000 to < 2500 gm; <37 weeks of gestation; and who were vitally stable

Exclusion Criteria

Babies <1000gm; with gross congenital malformations; were vitally unstable; and whose mother refused to give consent.

Statistical Analysis

Data have been summarized by mean and standard deviation; 95% confidence interval (CI) values. All 4 physiological variables were normally distributed. Boxplots have been used to depict the range of values encountered for individual parameters. Mean values before and after KMC were compared (two-tailed analysis) by Students' paired *t* test; *P*< 0.05 has been considered statistically significant. Statistical version SPSS Trial version 20 and PRIMER software was used for analysis.

RESULTS

A total of 100 mother baby pairs were enrolled in the study. Among which maximum number of babies were present in Group B (1.5 to <2 kg) i.e. 48% followed by 43% in Group A (1 to <1.5 kg), and 9% to Group C (2 to <2.5 kg). The mean weight of the study group was 1.61±0.29 Kg.

Table-1: Distribution of study subjects according to Birth weight

Groups	Birth weight (in Kg)	Number of babies	Percentage (%)
Group A	1 to<1.5 Kg	43	43
Group B	1.5 to < 2 Kg	48	48
Group C	2.0 to <2.5 Kg	9	9
	Total	100	100

In our study, the mean temperature before KMC on day 1, day 2, day 3 was 97.26 ± 0.68 , 97.32 ±0.66 ,97.36 ± 0.65 respectively while after KMC mean temperature was 98.04 ± 0.56 , 98.29 ± 0.47 ,98.53 ± 0.38 respectively. On comparing the effect of KMC on three weight groups (Table no.2) we found that KMC showed improvement in temperature on all the 3 days of KMC session in all the weight groups. Overall the maximum rise in temperature was observed in group B i.e. 1.5 to <2 kg babies which was highly significant (p <0.001).

Table-2: Effect of KMC on Temperature in relation to birth weight

Birth weight	Day of KMC	Before KMC Mean ± SD	After KMC Mean ± SD	P value
1 to <1.5 Kg (Group A)	Day 1	97.26 ± 0.606	98.01 ± 0.519	0.032
	Day 2	97.36 ±0.661	98.25±0.473	0.022
	Day 3	97.35±0.664	98.55±0.375	0.023
1.5 to <2 Kg (Group B)	Day 1	97.25 ± 0.696	98.10 ± 0.66	**<0.001**
	Day 2	97.31±0.689	98.39 ± 0.55	**<0.001**
	Day 3	97.43 ± 0.647	98.66 ± 0.42	**<0.001**
2.0 to <2.5 Kg (Group C)	Day 1	97.23 ± 0.43	97.9 ± 0.70	0.021
	Day 2	97.11 ± 0.42	97.95 ± 0.63	0.021
	Day 3	97.044 ± 0.45	98.15 ± 0.47	0.032

In our study we observed that ,while comparing the change in the heart rate in different weight groups on 3 days of KMC session (Table no.3), there were no significant change in heart rate in group A and group C but there was a significant increase in heart rate in group B (p<0.05) on all 3 days.

Table-3: Effect of KMC on Heart rate in relation to birth weight

Birth weight	Day of KMC	Before KMC Mean ± SD	After KMC Mean ± SD	P value
1 to <1.5 Kg (Group A)	Day 1	139.29 ± 9.03	140.83 ± 6.60	0.204
	Day 2	138.22 ± 7.29	138.60 ± 5.98	0.677
	Day 3	137.72 ± 8.454	137.31 ± 5.57	0.678
1.5 to <2 Kg (Group B)	Day 1	139.72 ± 8.66	141.44 ± 6.40	**0.037**
	Day 2	138.51 ± 6.65	140.52 ± 5.99	**0.013**
	Day 3	137 ± 6.29	139.33 ± 6.271	**0.027**
2.0 to <2.5 Kg (Group C)	Day 1	137.67 ± 5.27	138.11 ± 4.73	0.242
	Day 2	137.89 ± 5.69	136.33 ± 1.73	0.248
	Day 3	136.22 ± 5.83	137.56 ± 4.1	0.108

In our study we found that there was a significant decrease in respiratory rate in group B on day 1 and day 3 (p<0.05). Group A and Group C did not show any significant change in respiratory rate (Table no.4).

Table-4: Effect of KMC on Respiratory rate in relation to birth weight

Birth weight	Day of KMC	Before KMC Mean ± SD	After KMC Mean ± SD	P value
1 to <1.5 Kg (Group A)	Day 1	50.50 ± 6.70	47.18 ± 6.44	.051
	Day 2	46.20 ± 5.39	46.208 ± 4.48	1
	Day 3	45.68 ± 4.88	45.625 ± 4.70	0.916
1.5 to <2 Kg (Group B)	Day 1	45.77 ± 4.70	43.6 ± 3.96	**0.001**
	Day 2	43.4 ± 5.50	43.21 ± 3.92	**0.822**
	Day 3	45.02 ± 3.23	43.7 ± 4.08	**0.023**
2.0 to <2.5 Kg (Group C)	Day 1	45.67 ± 8.67	45.44 ± 7.84	0.874
	Day 2	45.22 ± 5.85	44.67 ± 5.29	0.594
	Day 3	43.67 ± 3.77	43.78 ± 4.41	0.927

On analysing the effect of KMC on oxygen saturation (Table no.5) we found that there was a significant increase in oxygen saturation in all the 3 groups on all the 3 days of KMC session but significant increase was observed in group B (P value <0.001).

Table-5: Effect of KMC on Oxygen saturation in relation to birth weight

Birth weight	Day of KMC	Before KMC Mean ± SD	After KMC Mean ± SD	P value
1 to <1.5 Kg (Group A)	Day 1	94.7 ±	96.6 ±	0.021
	Day 2	94.98 ±	96.09 ±	0.014
	Day 3	95.26 ±	96.74 ±	<.001
1.5 to <2 Kg (Group B)	Day 1	94.56 ±	96.39 ±	**<.001**
	Day 2	95 ±	96.16 ±	**<.001**
	Day 3	95.29 ±	96.56 ±	**<.001**
2.0 to <2.5 Kg (Group C)	Day 1	95.33 ±	96.11 ±	0.015
	Day 2	95.22 ±	96.11 ±	0.212
	Day 3	96.44 ±	96.6 ±	0.038

DISCUSSION

In present study we found statistically significant improvement in temperature on all the 3 days of KMC session in all weight groups (p<0.05), the maximum rise in temperature was observed in group B babies which was highly significant (p <0.001). Therefore it can be stated that 1.5 to 2 kg babies were maximally benefited from KMC, although there was a positive response in all the 3 groups.

Jothipriya J[5], in their study found that there was a statistically significant rise in the temperature in KMC group than in control group (p<0.001).Ludington-Hoe *et al*.[6], observed that after KMC the temperature of babies never fell below 36.8°C and remained at a mean of 37.1°C , whilst the mean value of temperature before KMC was 36.1°C . This increase in temperature after KMC was found to be statistically significant (p<0.05).

Almeida CM *et al*.[7], in their study found that the median temperature before KMC was 36.4°C, and 30 minutes after KMC, it went up to 36.65°C which was statistically significant. Alpanamayi Bera, *et al*.[8], demonstrated the small but statistically significant rise in temperature on all 3 days of KMC session (p<0.05).

Pramila Verma *et al*.[9], in their study concluded that there was a mean rise in temperature from 34.69± 1.45ºC to 36.97± 0.412ºC during KMC session which was statistically significant (p<0.05). Christensson k, *et al*.[10], demonstrated that, rise in axillary and skin temperature were significantly higher at 90 min after KMC session in comparison to the control group (p<0.05).

Sahbaei Roy F, *et al*.[11], concluded that there was a significant rise in the temperature in KMC group in comparison to the control group (p<0.05). Parmar VR, *et al*.[16], in their study found that the body temperature (ºC) rose from 36.75± 0.19ºC to 37.23±0.25ºC during KMC session which was highly significant statistically .(p<0.05)

Amel k, *et al*.[12], in their study found a statistically significant rise in babies temperature after KMC (p value of 0.001). Ali, *et al*.[13], found that the mean value of rectal temperature before KMC was 98.2 ± 0.2ºF which had shown a significant rise to 98.6 ± 0.1ºF after KMC session.(p value <0.001 at 95 % C I) .

In most of the studies the comparison was not done on effect of KMC on temperature in relation to birth weight. However most of the studies showed the steady and statistically significant rise in temperature during KMC session which is comparable to our study. We tried to find the effect of KMC in 3 birth weight groups and it was found that the babies with birth

weight 1.5 to < 2kg (group B) were maximally benefitted.

While comparing the change in the heart rate in different weight groups on 3 days of KMC session, it was found that there was a significant increase in heart rate in group B (1.5 to <2 Kg) (p<0.05). This effect was noticed on all 3 days of KMC session (p <0.05). Although small increase in the heart rate was also observed in the other 2 groups but this was not statistically significant (p>0.05). This sort of increase in the heart rate was also observed in the below mentioned studies.

Sahbaei Roy, *et al*.[11] in their study with 60 LBW babies of <2 kg of weight have found to have a statistically significant increase in the heart rate, p value of <0.05. This effect was noticed even when the KMC was performed at home. Alpanamayi Bera, *et al*.[8], in their study of 300 babies of <2.5Kg detected that the heart rate showed a rise during KMC, and the mean changes were modest but statistically significant on all 3 days - 4.8 ± 8.22 on day 1 ($P < 0.001$), 4.6 ± 7.99 on day 2 ($P < 0.001$), and 5 ± 7.35 on day 3 ($P < 0.001$).

Nagger, *et al*.[14], observed the statistically significant increase in the heart rate when the response of KMC was compared pre and post KMC (chi sq coefficient = 17.64, P-value ≤0.05). In our study we found a small but statistically significant decrease in respiratory rate in Group B (1.5–2 Kg) on day 1 and day 3 (p <0.05). However an insignificant response was seen in group A (1 – <1.5 kg) and group C (2 - <2.5 Kg) on all the 3 days. This decrease in respiratory rate was found to be in concordance with the following studies

Almeida *et al*.[15], in their study with babies of 1- 1.6 kg , have found there was a significant decrease in respiratory rate by 4 breaths per minute and showed a statistically significant fall in respiratory rate (p <0.001). Parmar VR *et al*.[16], during their observation of babies undergoing KMC of 1000 – 1500 gm discovered that the respiratory rate decreased from 62±5.3 to 52±4.8 (p<0.05).

Kadam S, *et al*.[17], had proven in their observation that there was a significant decrease in respiratory rates in babies weighing 1.5 to 2 Kg (36.2 v/s 40.7, p-value < 0.01). Ali, *et al*.[13], in their study design of babies weighing 1.2 – 1.8 kg have found significant reduction in respiratory rate (p<0.001).

In most of the above mentioned studies which were showing the positive response of KMC on respiratory rate (positive response in the form of decrease respiratory rate) they have included the babies of birth weight 1000 to 2000 g, but they have not compare the effect in different weight groups.

There was a significant increase in oxygen saturation in all the 3 groups on all the 3 days except in group C which did not showed improvement on day 2. Maximum significant increase was observed in group B (P value <0.001). Ludington-Hoe, *et al*.[6], found that there was a significant change in the oxygen saturation before and after KMC respectively. (P<0.001)

Mori R, *et al*.[18], in their meta analyses of 23 studies found that the change in the oxygen saturation during KMC session was found to be significant (p<0.05). D Sarkar, *et al*.[19], had shown a significant increase in saturation from 92.3 ± 1.6 to 94.7 ± 2.8 during KMC (p<0.05). Parmar VR, *et al*.[16] ,had also shown the significant improvement in oxygen saturation by 2-3% with the mean value depicting change from 95±0.96 to 97±1.50 after KMC session.(p<0.05)

In the study conducted by Amel k, *et al*.[12], they concluded that the KMC group showed significant rise in temperature (P<0.05) in contrast to control group (p>0.05). Similarly Ali *et al*.[13], found the mean rise in oxygen saturation from 92.1 ± 1.5 to 93.6 ± 1.6 during the period of KMC which was statistically significant (p<0.05).

In our study similar result of increase in oxygen saturation during KMC session was found which is comparable to the above studies. In most of the studies the comparison was not done on effect of KMC on vital parameters in relation to birth weight. We tried to find the effect of KMC in 3 birth weight groups and it was found that the babies with birth weight 1.5 to < 2kg was maximally benefitted.

CONCLUSION

KMC has a significant role in stabilising the vital parameters of LBW newborns especially with regard to improvement in temperature and oxygen saturation, although the changes observed with heart rate and respiratory rate was not significant.

KMC is a well-known low cost non-conventional method of care of low birth weight newborn. If babies in the weight range of 1.5-2.0 kg are feed well and have no risk factors, they can be cared at home and if we provide the KMC it will further improve their chance of survival.

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