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EFFECT OF EARLY SKIN-TO-SKIN CONTACT (KANGAROO MOTHER CARE) ON NEUROBEHAVIORAL RESPONSE AND PHYSIOLOGICAL PARAMETERS IN TERM NEWBORNS: A RANDOMIZED CONTROLLED TRIAL

Ashutosh Paldiwal — Assistant Professor, Department of Pediatrics, Government Medical College, Akola, Maharashtra, India & Ex -Resident, Department of Pediatrics, TNMC & BYL Nair hospital, Mumbai.

Sushma Malik* — Professor, Incharge of Neonatology, Department of Pediatrics, TNMC & BYL Nair hospital, Mumbai, Maharashtra, India. *Correspondening Author

Charusheela Korday — Ex-Associate Professor, Department of Pediatrics, TNMC & BYL Nair Hospital, Mumbai, Maharashtra, India.

Mani Singla — Ex- Specialty Medical Officer, Department of Pediatrics, TNMC & BYL Nair hospital, Mumbai, Maharashtra, India

ABSTRACT

Introduction: Skin to Skin Contact (SSC) or early Kangaroo mother care (KMC) is an important modality to facilitate the adaptation of the neonate to the outside world. Studies have revealed that the benefits of KMC are documented not only in preterm babies but also term neonates. This study was planned to assess the effect of SSC on neurobehavioral response and physiological parameters in term newborns.

Materials and methods: It was a prospective randomized controlled study conducted over two years on 80 eligible term neonates. The study group (40) received early SSC in the labour room and the control group (40) received standard perinatal care. Neurobehavioral response was assessed by the modified Brazelton behavioral assessment scale and for physiological parameters axillary temperature, heart rate, respiratory rate, oxygen saturation and blood pressure were determined.

Results: Analysis suggested that babies receiving early SSC had better and stable physiological parameters and neurobehavioral responses as compared to newborns who received routine care.

Conclusions: Our study revealed that instituting early KMC / SSC immediately after birth is beneficial adaptation of term newborns both in regards to physiological and neurobehavioral responses

KEYWORDS : Kangaroo Mother Care, Neurobehavioral Score, Modified Brazelton Scale

Introduction: The transition from fetal to neonatal life represents one of the most dynamic and potentially hazardous events in the human life cycle. Therefore, methods that enhance stabilization of neurobeh avioral and state regulation, autonomic maturation and facilitate the adaptation of the infant to the outside world should be introduced so that they are beneficial in the early postnatal adaptation and help in the smooth transition of the newborn baby. Skin to Skin Contact (SSC) / Kangaroo Mother Care (KMC) is one such modality that helps to achieve the neurobehavioral stabilization. (1)

KMC was initially started only for low birth weight babies for keeping them warm, improvement in weight gain and growth, better neurobehavioral development, motor system balance and sleep organization during the transition from the womb to the extra uterine life. Studies have revealed that benefits of KMC which are seen in preterm and low birth weight babies can also be extrapolated for well grown full term babies and can be practiced in perinatal care units. Skin-to-skin contact in the normal mammalian post-natal condition has additionally been found to improve a number of physiological parameters. (2,3)

We studied the effect of early skin-to-skin contact (SSC) or early kangaroo mother care (KMC) in the labor room, used as a post delivery facilitation of the neurobehavioral self- regulatory responses of the term infant and also its effects on physiological parameters (heart rate, respiratory rate, temperature, blood pressure, mean arterial pressure and oxygen saturation) (2).

Material and Methods:

We conducted a randomized controlled study to determine the effect of early SSC / KMC on neurobehavioral response and physiological parameters in term newborns. We enrolled 80 eligible term neonates in our study which was carried out over a period of 24 months. These neonates were randomly allocated into either the study group (40 cases) in which they received early SSC for one hour after routine newborn care or the control group (40 cases) who received only routine perinatal / postnatal care. Then at four hours of life, babies in the groups were studied for one hour for neurobehavioral response and physiological parameters.

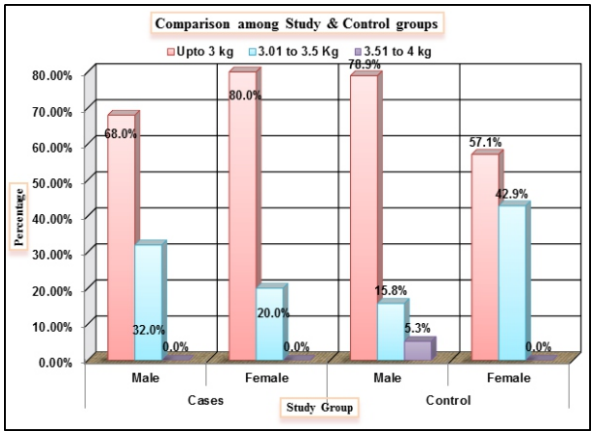
For neurobehavioral response, we used modified Brazelton behavioral assessment scale, which consisted of six states and scores. They are as follows: Deep quiet sleep (score 6), Active sleep state (score 5), Drowsy state (Score 4), Quiet alert state (Score 3), Active alert state (Score 2), and Crying state (Score 1) (4). The highest score amongst the four readings taken at the interval 20 minutes was considered as a score for that particular newborn. For physiological parameters, we studied axillary temperature, heart rate, respiratory rate, oxygen saturation and blood pressure, at the interval of 20 minutes for one hour, and average of the four scores was considered a mean for each parameter for each newborn in study as well as control group (4). No adverse effects were observed in any newborn enrolled in the study. For statistical analysis, we used Chi-square test and Fisher's Exact Test.

Results: The demographic profile of the subjects enrolled in our study and control groups was nearly same and there was no statistical difference regarding their various parameters. In study group male neonates (25) were more than females (15) whereas in the control group, there was a slight preponderance of females (21) as compared to males (19). In weight wise distribution, maximum number of newborns (56) were in the weight range of 2500 to 3000gms, followed by 23 neonates in the weight range of 3010 to 3500gms. (Table No-1 & Figure-1)

Table No. 1: Demographic Profile of Study and Control Group'

Birth Weight		Study		Control		Total
		Male	Feamale	Male	Female	
2.5 to 3 kg	N	17	12	15	12	56
	%	68.0%	80.0%	78.9%	57.1%	70%
3.01 to 3.5 Kg	N	8	3	3	9	23
	%	32.0%	20.0%	15.8%	42.9%	28.5%
3.51 to 4 kg	N	0	0	1	0	1
	%	0.0%	0.0%	5.3%	0.0%	1.5%
Total	N	25	15	19	21	
	%	100.0%	100.0%	100.0%	100.0%	

Figure-1- Graphical Comparison of Demographic Profile of Study and Control Group

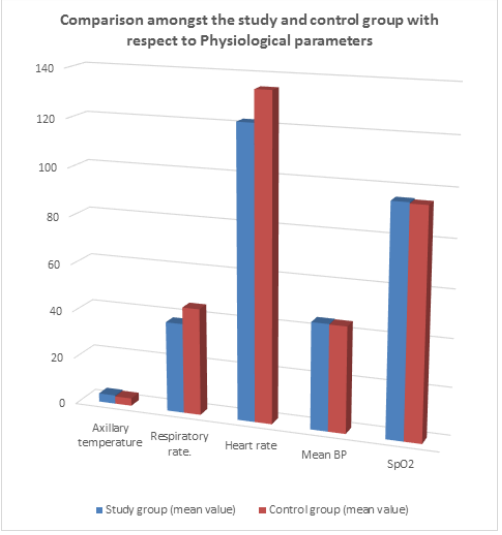


In our study, we compared various physiological parameters with respect to axillary temperature, heart rate, respiratory rate, mean BP and SpO2 taken at intervals of 20 min for 1 hour of observation time in the all neonates recruited in both groups (Table No-2 and Figure 2).

Table No. 2: Comparison amongst the study and control group with respect to Physiological parameters.

S.No	Parameter	Study group (mean value)	Control group (mean value)	p value	Difference significant/ not significant
1	Axillary temperature	3.60	3.20	0.000	Significant
2	Respiratory rate.	38	45	0.000	Significant
3	Heart rate	122	135	0.000	Significant
4	Mean BP	44.7	44.5	0.590	Not significant
5	SpO2	95.7	95.2	0.382	Not significant

Figure-2-Graphical Comparison amongst the study and control group with respect to Physiological parameters.



p value	0.000 Significant	0.000 Significant	0.000 Significant	0.590 Not Significant	0.382 Not Significant

Analysis revealed that the mean temperature in the study group was 37.620 C which is more than control group 37.270C and this difference was statistically highly significant as ($p < 0.000$) and SSC/ KMC helps to keep the baby warmer as compared to routine care. On comparison amongst study and control group subjects with respect to mean of heart rates taken at intervals of 20 min for 1 hour of observation time in the all neonates the analysis revealed that mean heart rate in the study group was 122.25 beats per minute which is less than control group 135.25 beats per minute and this difference was statistically highly significant as ($p < 0.000$).

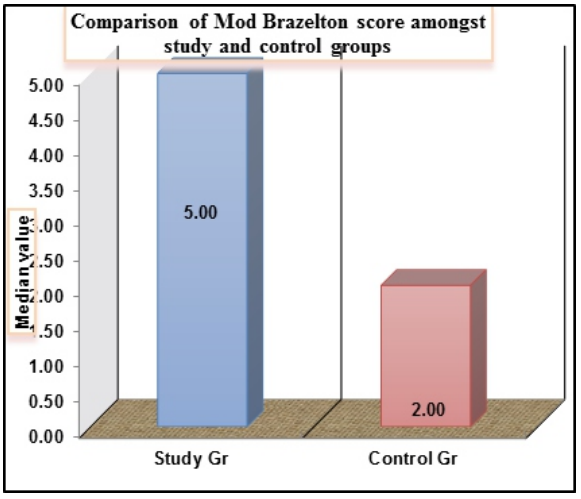
Similarly, with respect to mean of respiratory rates in both the groups we observed that the mean respiratory rate in the study group was 38.10 breaths per minute which is less than control group 45.25 breaths per minute and this difference was statistically highly significant as ($p < 0.000$). With respect to measurements of systolic, diastolic and mean blood pressure in the study group was 60/37/43.5 mm of Hg and in control group was 60/36/43.5 respectively. However, statistical analysis did not reveal a significant difference in the blood pressure values in the study and control cases (P values 0.934 for SBP, 0.772 for DBP, 0.590 for MAP). In the neonates recruited we documented that median of oxygen saturation in the study group was 96% and in control group was 95%. However, the difference between study group and control group was not significant ($P < 0.382$).

Our study also involved documenting the neurobehavioral state of newborns using modified Brazelton scores taken at intervals of 20 min for 1 hour of observation time in the all neonates recruited in the study. Statistical analysis revealed that median modified Brazelton score in the study group was 5 which is more than control group 2, and this difference was statistically highly significant as ($p < 0.000$). (Table No-3 & Figure-3)

Table No. 3 Comparison amongst the study and control group with respect to Modified Brazelton Score.

Mod Brazelton Score	Mean	Std. Dev	Median	IQR	Mann-Whitney Test	P Value
Study Group	4.58	1.28	5.00	1.00	-5.515	0.000
Control Group	2.38	1.44	2.00	2.00	Difference is significant	

Figure-3- Comparison amongst the study and control group with respect to Modified Brazelton Score



So, in our study it was evident that neonates in the study group had a statistically better control on temperature, heart rate and respiratory rate, but not in regards to blood pressure and oxygen saturation in the two groups. Our results also revealed that the infants given SSC / early KMC had better sleep states, were calmer and had statistically better modified Brazelton score.

Discussion:

Kangaroo Mother Care (KMC) adapted from Kangaroos, involves placing the new born infant in close skin-to-skin contact with the mothers. It is an effective way to meet the baby's need for warmth following birth and the immediate postnatal period. This method has the advantages of increasing the mother-child bond; avoiding long periods without sensory stimulation by reducing the mother-child separation time; stimulating breastfeeding by the mother; improving the thermal control, reducing the hospital infection rate; and allowing shorter stays in hospital. Early SSC also ensues a quiet sleep during the first day after birth and this may enhance a competent response in the newborn infant, which is an adaptive healthy behaviour. KMC care also results in better central nervous system control by reduction in

stress experience for the infants, as reflected in smoother and more flexed movements. This can be considered as an index of nervous system maturation and also it reduces the likelihood of neuro developmental delay. (4)

In our study, analysis of the axillary temperature maintenance in the study and control groups, the results revealed that the study group infants receiving SSC / KMC had on an average a higher axillary temperature (statistically highly significant difference-$p < 0.000$) as compared to the control group that received only standard care of practice. These results are similar to the study by Parmar VR et al on 'Experience with Kangaroo Mother Care in a Neonatal Intensive Care Unit (NICU) in Chandigarh, India'. In their study it was evident that the body temperature rose from 36.75± 0.19 to 37.23±0.250C; ($p<0.05$) and was sustained during the period of KMC, so none of the babies developed cold stress, hypothermia. (5). Similar results were obtained by Syfrett 1996. Mean hourly axillary temperature was 37 0C in the SSC infants and 36.70C in control infants (WMD 0.30 degrees, 95% CI 0.22 to 0.38). Syfrettin 1996 also found that SSC infants had significantly less temperature variability around their temperature mean and that their temperatures were more likely to remain in the neutral thermal range (defined as 36.5 to 37.5 degrees centigrade) (6,7).

On comparison of the effect of early SSC / KMC it revealed that even in the physiological variable of heart rate, the difference in the mean heart rate was significantly (p value 0.000) lower in the subjects that received SSC versus those who did not receive SSC. This result clearly shows that the SSC has a soothing effect on the baby and the baby remains less stressful and calmer. Contrary to our findings, the study by Parmar VR et al, who had also observed when KMC was instituted the heart rate dropped by 3-5 beats per minute (150 ±8.5 to 147±7.50, $p>0.05$) but remained within the physiological limits, however the difference was not statistically significant. (5) In the study by Gazzolo D, Masetti P, Meli M 'Kangaroo care improves post-extubation cardiorespiratory parameters in infants after open heart surgery', has shown that during kangaroo care, heart rate (123 +/- 4 vs128 +/- 5 bpm significantly decreased ($p <0.05$), and these findings were similar to our study (8).

On analyzing further physiological parameters like the blood pressure (Systolic BP, Diastolic BP, and the Mean BP) and oxygen saturations between study and control group the difference was not statistically significant. Similarly a study by Almeida CM, Almeida AFN and Forti EMP of 'Effects of kangaroo mother care on the vital signs of low-weight preterm newborns' it has been found that the median of mean arterial pressure before KMC (51.4mmHg) and 30 minutes after applying the method, it was (44.3mmHg) also did not find any difference statistically. (9) The probable reason of not getting any difference in blood pressure after giving KMC/SSC is, because blood pressure control is a multifactorial in nature.

In our study on assessing the neurobehavioral state in our newborns in the two groups that received SSC / KMC and those that received standard treatment practice, it revealed that the infants given SSC had better sleep states and better modified Brazelton score. The median modified Brazelton score in the study group was 5 which is more than control group 2, and this difference was statistically highly significant (p- value is 0.000). Thereby our study clearly revealed the beneficial effect of KMC on the neurobehavioral state of neonates and made them less stressful and calmer (10). These have been documented by various studies in literature like the the study 'Comparison of radiant warmer care (RWC) and kangaroo mother care (KMC) shortly after birth on the Neurobehavioral response of newborn' by Joha RR , Nayak S, Paul S, it is evident that, there was a significant difference in neurobehavioral response of radiant warmer care and Kangaroo Mother care units. (1) The mean neurobehavioral response score (modified Brazelton score) of radiant warmer care infants was 5.650 and KMC was 5.950, and mean difference of 0.300. The calculated 't'-value (2.064) at 0.05 level of significance. Even, the study by Ferber SG and Makhoul IR 'The effect of Skin-to-skin (Kangaroo Care) shortly after birth on the Neurobehavioral responses of term newborn: A Randomized controlled trial' also revealed that there is significant difference in the sleep state scores between KMC group and control group with p value of 0.019 and our study too documented the same. (4)

Conclusions: It is evident from our study that instituting early SSC/ early KMC immediately after birth is beneficial for some physiological parameters (like maintenance of temperature, heart rate and respiratory rate) as well as for the improvement in the neurobehavioral status in term newborns. Thus, early kangaroo mother care or skin to skin contact is an effective, economical and sustainable intervention to improve neurobehavioral and physiological status in neonatal period. The results of our study can be extrapolated on a large scale for use in our country where neonatal mortality is still a major concern.

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