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 neurobehavioral, aviral 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. 

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. 

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 option during the transition from the womb to the extra uterine life. Skin to Skin Contact (SSC) / Kangaroo Mother Care (KMC) is one such modality that helps to achieve the neurobehavioral stabilization. 

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. The demographic profile of the subjects enrolled in our study 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) 

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)
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 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.

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

Analysis revealed that the mean temperature in the study group was 37.620°C which is more than control group 37.270°C 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 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)

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).

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

<table>
<thead>
<tr>
<th>Mod Brazelton Score</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Median</th>
<th>IQR</th>
<th>Mann-Whitney Test</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Group</td>
<td>4.58</td>
<td>1.28</td>
<td>5.00</td>
<td>1.00</td>
<td>-5.515</td>
<td>0.000</td>
</tr>
<tr>
<td>Control Group</td>
<td>2.38</td>
<td>1.44</td>
<td>2.00</td>
<td>2.00</td>
<td>Difference is significant</td>
<td></td>
</tr>
</tbody>
</table>

Discussion:
Kangaroo Mother Care (KMC) adapted from Kangaroos, involves placing the newborn 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 separation time; stimulating breastfeeding by the mother; improving the maternal-infant 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 flexible movements. This can be considered as an index of nervous system maturation and also it reduces the likelihood of neurodevelopmental 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. This is 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±0.250°C; (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 Sylfrett 1996. Mean hourly axillary temperature was 37°C in the SSC infants and 36.70C in control infants (WMD 0.30 degrees, 95% CI 0.22 to 0.38). Sylfrett 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 that when KMC had been 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 vs 128 +/- 5 bpm, p>0.05) but remained within the physiological limits, however the difference in the mean heart rate was significantly (p value 0.000) lower in the subjects that received SSC / KMC as compared to the control group that received only standard care / 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’. (6,7).

REFERENCES

4. Ferber SG, Makoul IR. The effect of skin-to-skin contact (Kangaroo Care) shortly after birth on the neurobehavioral responses of the term newborn: a Randomized Controlled Trial. Pediatrics. 2004;113:858