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Comparison of Two Different Durations of Kangaroo Care on Daily Weight Gain in Preterm and Low Birth Weight Neonates in a Neonatal Intensive Care Unit: A Randomized Controlled Trial

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Abstract:-
Kangaroo Care (KC) in response to a crisis with the large numbers of low birth weight infants, shortage of staff and facilities, overcrowded nurseries & High mortality due to hospital infection. There had been many documented advantages of KC in previous literature. In this study we planned to compare the effect of duration of kangaroo care on daily weight gain in hemo-dynamically stable preterm and low birth weight neonates. This was a stratified randomized control trail which was done for duration of 9 months from March 2019 to November 2019. In this study, haemodynamically stable preterm infants weighing less than 2000 grams were included. Total 79(71.2%) preterm and low birth weight neonates fulfilled the inclusion criteria and were included in the present study. Mean Daily weight gain in both the subgroups was 18.30 grams and 19.85 grams respectively. (p=0.4643) among group I whereas in group II Mean Daily weight gain in both the subgroups was 15.5 grams and 13.78 grams respectively. (p=.553). Initiating early kangaroo ward care is efficacious as daily weight gain is seen in both the groups. Kangaroo ward care should become an essential component of care for stable VLBW and ELBW infants. A KMC module as described in this study would have huge implications in saving more newborns and improving quality care in resource limited as well as resource rich facilities.

Keywords: - *Kangaroo Care, Low-birth weight neonates, Pre-term Infants care*

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I. Introduction:-

Kangaroo care (KC) was first practiced in 1978 in Instituto Materno Infantil in Santa Fe de Bogota, (Capital of Colombia in South America). Doctors Edgar Rey first started KC in response to a crisis with the large numbers of low birth weight infants, shortage of staff and facilities, overcrowded nurseries & High mortality due to hospital infection. It involves skin-to- skin positioning of the infant in an upright position against the mother's chest. The care giver uses her own body temperature to keep her infant warm & co-regulates neonate's physiology & behavior. It provides basic needs for survival i.e. Warmth, stimulation, breast milk, love and protection. It is useful for nursing LBW 2500gm. KC has been studied for its effect on mortality, morbidity, physiological stability, breastfeeding, parental bonding, development, and pain control. It is a low-cost alternative to incubator care in areas with limited resources, settings & has both physiologic and behavioural benefits. KC is associated with decreased likelihood of infection, severe illness, and death. KC is a simple, natural, and cost-effective intervention to effectively diminish behavioural pain response in preterm infants. There had been many documented advantages of KC in previous literature. In this study we planned to compare the effect of duration of kangaroo care on daily weight gain in hemo-dynamically stable preterm and low birth weight neonates.

II. Material & Methods: -

This was a stratified randomized control trail which was done for duration of 9 months from March 2019 to November 2019. In this study, haemodynamically stable preterm infants weighing less than 2000 grams were included. Neonates with life threatening congenital anomalies or neonates who were critically ill requiring ventilator or CPAP were excluded from this study.

Sample Size & Sample Technique: Assuming the mean weight gain of 10 grams/kg/day, based on study comparing the impact of duration of Kangaroo Care on growth in high risk preterm and low birth weight neonates and expecting a 20% increase in weight gain by increasing duration of Kangaroo Care, we calculated our sample size.[4] Considering a power of 90% and level of significance at 5 % ($\alpha = 0.05$), the estimated sample size for study is 21 in each group (a total of 42). However, considering some of trial deviation from study dueto development of morbidities, an oversampling by 10%-20% was done, amounting to a total of 50 infants with 25 in each group

$$= \frac{[z1- /2 + z1-]2}{(z1- z2)2}$$

1 1 + 1 ƒ1=2 1− 1

1 1− + 0 ƒ2=2 1− 0

Data Collection Technique and Tools: Mother/Caregivers whose neonate fulfilled the inclusion criteria were informed about procedure and duration of KC in presence of their family member at the time of admission and alternative day as per routine counselling sessions. If they were willing to participate in study informed consent was taken from them and then neonates were randomized in to two groups using computer generated random table.

1. KC provided for 1 hour every 8 hourly (KC1)

2. KC provided for 2 hours every 8 hourly (KC2)

Mother/caregiver was allowed to give Kangaroo Care only inside NICU every 8 hourly. When giving kangaroo care, each mother or care giver in the KC group wore an open front gown and sitting comfortably on chair. The baby was positioned between her breasts inside her dress giving skin-to-skin contact. The baby was naked except for a cap and nappy. The gown covered the baby's trunk and extremities but not the head. The KC was given for a minimum of 1 hour at a stretch. A "KC chart" was kept as a record of the duration of kangaroo care provided. All babies were given exclusive breast milk or preterm formula (in absence of availability of EBM). Babies unable to take direct breastfeeds were given expressed breast milk by orogastric tube or using a paladey or bowl and spoon. All the neonates were monitored for growth and compications. Details were noted in a Performa.

Growth monitoring: The weight of the infant was measured daily in the morning shift. Weight was taken in four digits on an electronic digital weighing scale adjusted to 5gm error. Reading was made zero every time before taking weight. The length (using infantometer) and head circumference (using non-stretchable plastic tape) was measured twice weekly.

Monitoring of complications: Neonates were monitored for following morbidities.

I. Hypothermia: Axillary temperature less than 36.5°C every 6 hourly and continuous monitoring by using skin probe under the servo control warmers.

II. Apnea: Cessation of breathing for more than 20 seconds or associated with cyanosis and/ bradycardia (HR<100/min). SpO_2 was measured pre and post KMC. Babies on oxygen therapy monitored with pulse oxymetry during kangaroo care

III. Sepsis: Probable sepsis: Positive septic screen (two of the five parameters namely, TLC <5000/mm3 or >15000/mm3, band to total polymorph ratio of >0.2, absolute neutrophil count less than 1800/mm3 or >7200/mm3, C reactive protein >10.0 mg/L, platelets <1 lakh/mm3); or Proven sepsis: Isolation of pathogens from blood or cerebrospinal fluid or urine

IV. Feed intolerance in the form of vomiting, increase in abdominal girth by >2cms or pre-feed residue of more than 25% of the previous feed

V. Time to achieve full feeds.

VI.Retinopathy of prematurity

Randomization & Allocation: - Neonates were randomized as per their weight criteria in to 2 strata**.**

I. 750grams to 1499 grams

II. 1500grams to 2000grams

Effect of duration of KC on increase in daily weight gain was considered as primary outcome of this study whereas, Length and head circumference, Duration of hospital stay and morbidities such as hypothermia, apnea, sepsis, feed intolerance, retinopathy, time to achieve full feed and outcome in form of discharge or death were also measured as secondary outcomes.

Data Compilation and Statistical Analysis: All data was entered in pre structured case record form. Data was transferred to MS EXCEL spread sheet & exported to Social Sciences analyzed using (SPSS) version 21.0 for analysis. Data were tested for normality by Kolmogorov- smirnov and Shaprio wilk test. Descriptive statistics were done by calculating frequency with percentages

& mean with standard deviation (SD). Continuous variables were summarized to proportion and percentage. Mean (SD) was calculated where data were normally distributed. Difference of mean between 2 groups was compared by unpaired t-test. Difference of proportion between 2 groups was compared by Chi-square test or Fischer exact test.

III. Observation And Results

Total neonates admitted during the study period between March 2019 to November 2019 were 468 out of which 111 (23%) were preterms less than 36 weeks of gestation and less than 2000 grams in weight. Total 79(71.2%) preterm and low birth weight neonates fulfilled the inclusion criteria and were included in the present study.

Table 1.1: IUG status

IUG Status	Group I (<1500 grams)		Group II (>1500 but <2000g)	
	KC 1 (N1=22)	KC 2 (N2 =22)	KC1 (n=15)	KC2 (n=20)
AGA (%)	33.3	50	73.3	40
SGA (%)	66.7	50	26.7	60

In Subgroup KC1 2/3rd neonates were SGA in comparison to KC2 group where SGA and AGA were equal in number. whereas in group II 1/3rd were AGA in KC1 subgroup.

GESTATIONAL AGE & AGE AT ENROLLMENT:

Gestational age was 33.30 weeks in KC 1 and 31.85 weeks in KC 2 which was similar in both subgroups. (p=0.091) and Day of life on the day of enrollment in both KC1 and KC 2 subgroup were 14.6 days and 14.1 day respectively which is not statistically significant. (p=0.8409)

Table 1.2: Gestational age & Age at enrollment

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		P value
	KC1 (N1=22)	KC2 (N2 =22)		KC1	KC2	
Gestational age in weeks (Mean ± SD)	33.30 ± 2.70	31.85 ± 2.86	0.091 (-3.16 to 0.26)	35.0 ± 3.0	34.1 ± 1.66	0.2652 (-2.51 to 0.71)
DOL at enrolment in days (Mean ± SD)	14.60 ± 7.80	14.11 ± 8.09	0.8409 (-5.388 to 4.41)	9.60±7.40	14.31±8.60	0.0986 (-0.92 to 10.34)

Male to Female ratio was similar in both subgroups.

Table 1.3: Sex distribution

Sex	Group I		Group II	
	KC 1	KC 2)	KC1	KC2
Male (%)	47.62	36.3	60	50
Female (%)	52.38	54.6	40	50

OUTCOME PARAMETERS:

MEAN WEIGHT GAIN PER DAY:

Mean Daily weight gain in both the subgroups was 18.30 grams and 19.85 grams respectively. (p=0.4643) among group I whereas in group II Mean Daily weight gain in both the subgroups was 15.5 grams and 13.78 grams respectively. (p=.553)

Table 1.4 : Average daily weight gain

Variables	Group I		p value (95% CI)	Group II		P value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC 1	KC2	
Daily wt gain in grams (Mean ± SD)	18.30 ± 7.1	19.85 ± 6.82	0.4643 (-2.68 to 5.78}	15.5 ± 10.0	13.78± 6.98	0.553 (-7.55 to 4.11)

WEIGHT AT DISCHARGE:
The mean weight at discharge was almost the same in both the group: 1533 grams in KC1 and 1546.81 grams in KC 2 (p-value=-0.782)

The mean weight at discharge was almost the same in both the group: 1924.90 grams in KC1 and 1829.6 grams in KC2 (p= 0.220)

Table 1.5- Weight at discharge

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		P value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Weight at discharge in grams (Mean ± SD)	1533.00 ± 136.40	1546.81 ± 188.98	0.782 (- 86.46 to 114.08)	1924.90 ± 259.50	1829.60 ± 191.50	0.220 (-250 to 59.60)

LENGTH & HEAD CIRCUMFERENCE GAIN WEEKLY:
The mean length gain in KC1 was 1.40cm and 0.92cm in KC2. Below Table showing that Length gain was statistically significant (p=0.015). The mean HC gain was almost the same in both the group: 0.70 cm in KC1 and 0.61cm in KC 2 (p-value=-0.573)

The mean length gain in KC1 was 1.40cm and 0.85cm in KC2. (p=0.112). and mean HC gain was almost the same in both the group: 0.70 cm in KC1 and 0.61cm in KC 2 (p-value=-0.253)

TABLE 1.6: Weekly Length & Head Circumefernce gain

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		P value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1 (N1=15)	KC2 N2=20)	
Weekly Length gain in cm (Mean ± SD)	1.40 ± 0.70	0.92 ± 0.55	0.015 (-0.86 to 0.09)	1.40±1.40	0.85±0.49	0.112 (-1.23 to0.13)
Weekly Head Circumference gain in cm (Mean ± SD)	0.70 ± 0.70	0.61 ± 0.25	0.573 (-0.409 to 0.22)	0.70±0.70	0.50±0.28	0.253 (-0.55 to 0.15)

LENGTH & HEAD CIRCUMFERENCE AT DISCHARGE:
The mean length at discharge was almost the same in both the group: 42cm in KC1 and 42.23cm in KC 2 (p-value=-0.735) & The mean HC gain was almost the same in both the group: 29.5 cm in KC1 and 29.36 cm in KC 2 (p-value=-0.770)

The mean length at discharge was almost the same in both the group: 44.20 cm in KC1 and 45.17 cm in KC2 (p value= 0.290) & The mean HC gain was almost the same in both the group: 31.45 cm in KC1 and 31.14 cm in KC2 (p value = 0.681)

Table 1.7: Length & Head Circumference at discharge:

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		P value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Length at discharge in cm (Mean ± SD)	42.00 ± 1.80	42.23 ± 2.60	0.735 (- 1.13 to 1.59)	44.20 ± 2.40	45.17 ± 2.58	0.290 (-0.77 to 2.71)
Head Circumference at discharge in cm (Mean ± SD)	29.50 ± 1.50	29.36 ± 1.65	0.770 (-1.099 to 0.82)	31.40 ± 1.80	31.14 ± 1.86	0.681 (-1.53 to 1.01)

DURATION OF HOSPITAL STAY:

Duration of hospital stay in KC 1and KC 2 was 14.8 days & 22.54 days respectively (p=0.0089). Since number of ELBW neonates more than two times in KC2 so these neonates were stayed for longer duration. Duration of hospital stay days KC1 were 13.3 days and 13.55 in KC2. (p value =0.940)

Table1.8: Duration of hospital stay

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		p value
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Duration of hospital stay days (Mean ± SD)	14.8 ± 7.9	22.54 ± 10.35	0.0089 (2.04 to 13.43)	13.30 ± 9.60	13.55 ± 9.54	0.940 (-6.39 to 6.89)

OXYGEN REQUIREMENT & ROP:

Oxygen requirement was present in 30% neonates of KC1group and 27% neonates of KC2 group (p=0.8275) & ROP (%) in KC1 were 13.6% and 9% in KC2 subgroups. (p=0.6338)

Oxygen requirement was present in 33% neonates of KC1group and 30% neonates of KC2 group (p=0.8375) & ROP (%) in KC1 were 0% and 10% in KC2 subgroups. (p=0.2138)

Table 1.9: Oxygen requirement & ROP

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		P value
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Oxygen	30%	27%	0.8275 (-	33.3	30	0.8375 (-

requirement in neonates (%)			22.67 TO 28.16)			25.13 to 32.65)
ROP(%)	13.6%	9%	0.6338 (-16.09 to 25.34)	0	10	0.2138 9-11.62 to 30.100)

AVERAGE DAY TO ACHIEVE FULL FEED & DURATION OF INTRAVENOUS FLUIDS

Average day of full feed in KC1 were 17.10 days and 22.59 days in KC2 subgroups. (p=0.1316) & Mean duration of IVF was 1.1 days in subgroup I and 1.32 in subgroup II

(p=0.6952).Average day of full feed in KC1 were 14.5 days and 14.11 days in KC2 subgroups.

(p=0.9118) & Mean duration of IVF was 1.9 days in both groups (p=0.9402).

Table 1.10: Time to full feed & Duration of IV fluid

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		p value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC 1	KC 2	
DOL of full feed days (Mean ± SD)	17.10 ± 9.0	22.59 ± 13.78	0.1316 (-1.71 to 12.69)	14.5 ± 111.2	14.11 ± 9.44	0.9118 (-7.49 to 6.71)
Duration of iv fluid (days)	1.10 + 1.97	1.32 + 1.72	0.6952 (-0.90 to 1.34)	1.9 ± 1.7	1.94 ± 1.43	0.9402 (-1.03 to 1.11)

DURATION OF KANGAROO CARE:

Mean duration of KC given in subgroup 2 was 108.90 hours which was two times more than the subgroup I. (p=0.0001)

Mean duration of KC given in KC2 group 2 was 64.35 hours which was two times of KC1. (p=0.1102)

Table 1.11: Duration of kangaroo care

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		p value
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Total duration of KC in hours (Mean ± SD)	45.31 ± 27.9	108.90 ± 62.22	0.0001 (33.64 to 93.53)	38.9 ± 29.1	64.35 ± 54.35	0.1102 (-6.09 to 56.99)

EPISODES OF APNEA, SEPSIS, NECROTISING ENTEROCOLITIS & FEED INTOLERENCE:
(Excluding Apnea of Prematurity) apnea occurred in none of subgroups; none of the neonate in KC 1 subgroup had sepsis and in KC 2 subgroup 10% had sepsis. (p=0.1325); Feed intolerance in KC1 and KC2 were present in 31.8% and 27.27 % of neonates respectively. (p= 0.7447) NEC was present in around 14% of neonates in both KC1 and KC2 subgroups. (p= 1.0000)

(Excluding Apnea of Prematurity) apnea occurred in none of subgroups; Sepsis (%) in KC1 were 13.3% and 5% in KC2 subgroup (p= 0.3919), feed intolerance (%) in KC 1 was 26.7% and 20% in KC2 subgroup. (p= 0.6453) and NEC (%) in KC1 was 6.7% and 10% in KC2 subgroup. (p= 0.7339)

Table 1.12- apnea, sepsis, necrotising enterocolitis & feed intolerence occurance

Variables	Group I (Less than 1500 grams)		p value (95% CI)	Group II		p value (95% CI)
	KC 1 (N1=22)	KC 2 (N2 =22)		KC1	KC2	
Apnea episodes (%)	0	0	0	0	0	0
Sepsis (%)	0%	10%	0.1325 (-6.45 to 28.95)	13.3	5	0.3919 (-12.63 to 33.18)
Feed intolerance (%)	31.8%	27.27%	0.7447 (-21.44 to 29.72)	26.7	20	0.6453 (-20.05 to 34.65)
NEC (%)	13.6%	13.6%	1.0000 (-21.29 to 21.59)	6.7	10	0.7339 (-20.95 to 24.14)

OUTCOME: DISCHARGE\ DEATH:
95.45 % (n=21) neonates in KC1 and 100% (n=22) neonates in KC2 subgroups were discharged. 4.55% (n=1) neonate in KC1 died on day seven of enrollment due to sepsis with necrotizing enterocolitis.

All neonates of both the subgroup were discharged.

Table: 1.13: Discharge\ Death

Outcome	Group I (Less than 1500 grams)		Group II	
	KC 1 (N1=22)	KC 2 (N2 =22)	KC1	KC2
Discharge (%)	95.45	100	100	100
Death (%)	4.55	0	0	0

IV. Discussion :–

Mean Gestational age in group I was 33.1 weeks in KC1 and 31.85 weeks KC2 subgroups; in group II it was 35.0 weeks in KC1 and 34.1 weeks in KC2 with no significant difference hence making the groups comparable. Mean gestational age in our study was comparable to previous studies conducted by Geeta

Gathwala et al[5]. Mean gestational age was 35.48 ± 1.20 week in KMC group and 35.04±1.09 week in the control group (p>0.05). In other studies mean gestational age were Sloan et at (34.6 wks), Charpak et al[6-8 50] (35.3wks-1696g), (33.6 wks-1705g), Cattaneo et al[9] (33.7wks-1622g) and Rao et al[10] (36.2wks-1683g). However, Blaymore et al[11] and Ramnathan[12] enrolled at 29 and 30 weeks gestation respectively as their enrollment criteria was weight ≤ 1500gm.

Male: Female ratio was found to be 1:1.1 in KC1 and 1:1.5 in KC2 of group I. In group 2 it was 1.5:1 in KC1 and 1:1 in KC2. Results of study by Udani et al[4] and Chow et al[13] was also similar to our study. (1.1, 1.1).

Primary outcome in our study was daily weight gain which shows mean daily weight gain of 18.30gm in KC1 and 19.85gm in KC2 of group I with no statistically significant difference between them(p= 0.4643). Similarly mean daily weight gain in group II was 15.50gm in KC1 and 13.78gm in KC2 which was also not showing any significant difference (p=0.553). Hence from above findings we infer that no significant difference in daily weight gain is found after 1 hour and 2 hours of Kangaroo Care). Probable reasons for this are less duration of KMC and small sample size and more of Extremely Low Birth Weight Neonates (ELBW) in group II and all are out born neonates and were more sick. Though there are many studies comparing weight gain in KMC group and standard care group viz. Gathwala et al[5] Weight gain in g/day
21.92+1.44 in KMC group; 18.61+1.28 in control group;(p< 0.05), Sharma et al(2016) weight gain PR in hospital (g/day) (SD)b in KMC group 24.4 (6.9); in control group 21.5 (5.4) (p=

0.011). Samra et al[14] conducted a study of effect of intermittent KMC on weight gain of low birth weight neonates shows comparable result. Daily weight gain in kmc group was 20-28gm/day in kmc group compared to control group. As per our knowledge no study has been found to correlate daily weight gain with duration of KMC.

Various secondary outcomes were –
Weekly length gain shows significant difference in group I (p=0.015) with lesser length gain in KC2 compared to KC1 (1.40, 0.92). This can be explained by 7 ELBW babies in KC2 group. Gathwala et al[5] in there study found that length gain in kmc group was 1.03+0.05 cm/week and in control group 0.74+0.05 cm/week (p= 0.05). Sharma et al (2016)[15] found length gain in hospital (cm/week) (SD) 1.0 (0.6) in kmc group; 1.0 (0.7) in intensive care group (p= 0.908).

Weekly gain in head circumference in KC1 of group I was 0.70 cm/week and 0.61 cm/week in KC2 (p= 0.573). Weekly gain in head circumference in KC1 of group II was 0.70 cm/week and 0.50 cm/week in KC2 (p= 0.573). Sharma et al (2016)[15] found Head circumference gain in hospital (cm/week) (SD) 1.06 (0.6) in KMC; 0.9 (0.6) in intensive care group (p= 0.146).

Duration of hospital stay in group1 of KC 1 and KC 2 was 14.8 days & 22.54 days respectively. Duration of hospital stay days in group II KC 1 were 13.3 days & 13.55 days in KC2. Udani et al[4] duration of Hospital stay was 7.40±3.81 in less than 6hrs,11.60±6.93 in 6-12hrs, 12.45±8,66 in more than 12hrs, 11.15±5.20 in more than 20hrs of KMC. (p<0.009) total 11.21±7.03. Geeta Gathwala et al[5] the duration of hospital stay was significantly shorter in the KC group (3.56±0.57 days) compared to control group (6.80±1.30 days).

Average day of full feed in KC1 were 17.10 days and 22.59 days in KC2 subgroups. (p=0.1316) & Mean duration of IVF was 1.1 days in subgroup KC1 and 1.32 in subgroup KC2 in group1. Average day of full feed in KC1 were 14.5 days and 14.11 days in KC2 subgroups. (p=0.9118) & Mean duration of IVF was 1.9 days in both the groups (p=0.9402) in group II.

Mean duration of oxygen requirement in group I was 3.60hrs/ shift in KC1 and 3.71hrs/ shift in KC2 (p=0.8262). Mean duration of oxygen requirement in group II was 4.03hrs/shift in KC1 and 3.66 hrs/shift (p= 0.6807). There was no significant difference in both group I and group II;

Oxygen requirement in neonates were 30% in KC1 and 27% in KC2. (p=0.8275) in group1 & occurrence of ROP (%) in KC1 were 13.6% and 9% days in KC2 subgroups in group1. (p=0.6338) Oxygen requirement was present in 30% neonates of KC1group and 27% neonates of KC2 group (p=0.8275) & ROP (%) in KC1 were 13.6% and 9% in KC2 subgroups of group2. (p=0.6338)

Intervention in present study was to different duration of KC (1 hour and 2 Hours) given by parents inside the NICU, Average duration of KMC in group I was found to be 45.31 hrs in KC 1 per shift (KC1) and 108.90 hrs in KC 2hr per shift (KC2). Average duration of KC in group

II was 38.9hrs and 64.35hrs in KC1 and KC2 respectively. In the study conducted by Charpak et al[6,7] KMC was provided for 24 hrs a day and in the study by Cattaneo et al[9.] KMC was given for 20 hours a day. There are very few studies comparing different duration of KC. Udani et al[4] in their study compared different duration of KMC and its outcome. Duration of KMC was

3.3±1 hrs in <6 hours duration KMC and it was 9±1 in > 6hrs; 16.2±5 in >12hrs. The average duration of KMC per day was 13.6 ±7 hrs and total duration of KMC in days was 34.2 ±16 days. A randomized control trial conducted by Rao et al[10] at the same institute had an average KMC duration of 13.5 hours per day.

(Excluding Apnea of Prematurity) In group I apnea occurred none of the neonate in KC 1 subgroup had sepsis and in KC 2 subgroup 10% had sepsis. (p=0.1325); Feed intolerance in KC1 and KC2 were present in 31.8% and 27.27 % of neonates respectively. (p= 0.6453) NEC was present in 14% of neonates in both KC1 and KC2 subgroups. (p= 1.0000). In group II in none of subgroups had apnea; Sepsis (%) in KC1 were 13.3% and 5% in KC2 subgroup; Feed intolerance (%) in KC1 was 6.7% and 10% in KC2 subgroups & NEC (%) in KC1 was 6.7% and 10% in KC2 subgroups. In an RCT conducted by Rahman et al[16] on effect of KMC on LBW babies episode of apnea is seen in 7.5% in KMC group and 15% in control group with no significant difference. Culture proven sepsis in the same study was 15% in KMC group and 20% in control group (p= 0.56).

We speculate that longer the duration of KMC provided per day, better are likely to be neonatal short term and long term outcomes. Mother/other KMC provider functions somewhat like a human incubator. From quoted study it is clear that to replace incubators, the kangaroo position should be maintained as long as possible, ideally 24hrs a day, however shorter KMC duration did have the beneficial effects on morbidity, mortality and breastfeeding. In our study we found no significant difference between primary and secondary outcome after 1hr and 2 hrs of kangaroo care. However better outcome is seen in children given kangaroo care. As mortality rate of neonates inversely increases as birth weight decreases but by providing KC we were able to discharge more than 10 ELBW neonates. Though it was not mentioned in study but neonates who were receiving KC was very active by appearance. Parents and family member who were involved in KC was very satisfied as they were part of neonate care. Compare to other neonates who were not receiving KC their mother were more confident at the time of discharge.

V. Conclusion:-

The results from the present study showed that Kangaroo care for 1hr (group1) and 2hrs (group2) every 8 hourly shows no significant difference in daily weight gain in both less than and more than 1500gm groups. Initiating early kangaroo ward care is efficacious as daily weight gain is seen in both the groups. Other parameters like weekly length gain, weekly gain in head circumference, attainment of full feed, duration of hospital stay shows no significant difference in group1 and group2. Outcome parameters were not associated with any significant increase in the incidence of mortality, NEC, sepsis and apnea in group1 and group2. Thus from our study we conclude that initiation of kangaroo care is essential tool for early rehabilitation of preterm and low birth weight babies with no untoward complications when compared for 1hr and 2hrs groups.

Kangaroo ward care should become an essential component of care for stable VLBW and ELBW infants. A KMC module as described in this study would have huge implications in saving more newborns and improving quality care in resource limited as well as resource rich facilities. Very early initiation of KC at weights as low as 824 g did not result in any increase of adverse events such as severe hypothermia, apneas, aspiration pneumonia, sepsis, readmissions to NICU, and mortality.

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