Kangaroo Mother Care in Kangaroo ward for improving the growth and breastfeeding outcomes when reaching term gestational age in very low birth weight infants

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ABSTRACT

Aim: To study the effect of Kangaroo mother care in the Kangaroo ward in comparison with conventional care at neonatal unit on growth and breastfeeding in very low birth weight infants at 40 weeks' corrected gestational age.

Methods: One hundred and forty neonates with birth weight <1500 g were randomized. The primary outcome was the average weight gain (g/kg/day) from the time of randomization to term gestational age.

Results: Mean birth weight, age in days and weight at randomization were similar in both the groups. At term gestational age, average weight gain (g/kg/day) post randomization (23.3 ± 8.7 g vs. 22.64 ± 9.1 g, p = 0.67) and breastfeeding rate (85.9% vs. 87.0%) were comparable. There was no difference in weight gain (g/kg/day) from randomization to hospital discharge between the Kangaroo care group and conventional care group (18.01 g vs. 15.64 g, p = 0.12). Mortality, morbidities like sepsis, hypothermia, apnoea, hypoglycaemia and duration of hospitalization were equally distributed. On average, 11.5 days of intermediate care were saved in the kangaroo group.

Conclusion: Kangaroo mother care in the Kangaroo ward is as effective as conventional care in the neonatal unit without any increase in morbidity or mortality in stable VLBW infants.

INTRODUCTION

Past two decades of implementation and research have made it clear that Kangaroo mother care (KMC) may be an alternative to incubator care for stable low birth weight (LBW) infants (1). Despite the said advantages of KMC, it is still not a widely practiced method of care for all the LBW infants in India (2); also, there is insufficient data regarding the effect of KMC on growth parameters, acceptability of kangaroo care and long-term outcomes in very low birth weight (VLBW) infants. Randomized trials of kangaroo mother care in very low birth weight infants reported better

weight gain, shorter duration of hospitalization and better breastfeeding rates in the infants randomized to KMC compared with the standard incubator care (3–5). The present study was intended to determine if use of KMC in the Kangaroo ward for stable very low birth weight infants is an effective alternative to conventional methods of care in the intermediate care unit.

PATIENTS AND METHODS

Study Design

This was an open labelled randomized controlled trial conducted at a level III tertiary care hospital, in south India from April 2009 to February 2011.

Key notes

- In stable very low birth weight infants.
- Kangaroo care in the kangaroo ward is effective as conventional care at neonatal unit.
- Kangaroo care decreases stay in intermediate care unit.
Subjects
Inborn singleton, VLBW (birth weight <1500 g) infants, tolerating spoon feeds of 150 mL/kg/day and hemodynamically stable (not on oxygen or respiratory support, no apnoea for 72 h, not on any intravenous fluids) were eligible. Infants with major malformation were excluded. All enroled neonates were randomized, using random numbers, generated using a web-based random number generator; the same were placed in a serially numbered, sealed, opaque envelope and were opened, after taking informed consent by the research coordinator. Babies were randomized to kangaroo mother care (KMC) or conventional method of care (CMC). This study was approved by the institutional ethics committee.

Intervention
Kangaroo mother care
All infants allocated to KMC were shifted to the KMC ward, which is located near to the NICU. In the KMC ward, mother-infant dyads were together, and care of the baby was supervised by a trained nurse. Neonates were given skin-to-skin contact between the mothers’ breasts in an upright position dressed with a cap, socks and diaper and supported at the bottom with a cloth sling/binder. Front open gowns were made available for the mothers and privacy was provided to them. Comfortable chairs and beds were provided for the mothers practicing KMC. Mothers were encouraged to do KMC for as many hours per day as possible, ensuring a minimum of eight hours per day. When not in KMC position, infants were placed in open cribs well covered with clothes, socks and mitten. Infants were discharged home at a minimum weight of 1300 g or when gaining weight at a rate ≥10 g/day on three consecutive days, if weight at randomization was >1500 g. Mothers were encouraged to continue KMC at home as long as the baby was tolerating it.

Conventional care
Infants allocated to CMC care (incubator/warmer) were cared for in the intermediate care unit by a nurse under constant monitoring. Mother’s entry into the unit was encouraged for baby care activities such as diaper change, oil massage and paladai feeding. Infant’s temperature was maintained in the servo mode of the incubator. Infants were discharged home when they were euthermic (skin temperature of 36–37°C) in the servo mode with heater output less than 25%, weight gain of ≥10 g/day for three consecutive days, with minimum discharge weight of 1300 g and the mother/guardian was confident of taking care of the baby.

Feeding in both the groups was expressed breastmilk given with a paladai (a traditional spoon used for feeding neonates in India) at 2 hourly intervals. When expressed breast milk was not available, a preterm formula was used. Supplements were used as per the unit protocol. Expressed breast milk feeding was supplemented with human milk fortifier in case of poor weight gain (weight gain <10 g/day for three consecutive days).

Outcome variables
The primary outcome was weight gain (g/kg/day) after randomization till term gestational age (40 weeks). All discharged infants were followed once a week in the follow-up clinic and when reaching 40 weeks of gestational age, the assessment included weight measured, using an electronic weight machine (precision up to 5 g), head circumference measured with a nonstretchable tape, length measured with an infantometer to the nearest 0.1 cm. Secondary outcome variables included weight gain (g/kg/day) from randomization to hospital discharge, proportion of babies on exclusive breastfeeding and any breastfeeding, duration of hospitalization and number of hospital days after randomization. The physician assessing the growth outcomes was blinded to the intervention group of the infant.

Sample size
Assuming an effect size of 5 g/day weight gain difference between the two groups and a standard deviation of 10 g/day for the total population (from a previous published study), the standardized effect size was 0.5. With an alpha of 0.05 and power of 80%, the estimated sample size for the study was 63 neonates in each group. Allowing for 10% attrition in the follow-up till 40 weeks, the required sample size was 70 neonates in each group.

Statistics
Comparisons between study groups for discrete variables were performed with the chi-square or Fisher’s exact test. Continuous variables were compared by Student’s t-test or nonparametric tests, when appropriate. Intention to treat analysis was performed.

RESULTS
A total of 342 VLBW infants were assessed for eligibility during the study period. After exclusions, 140 infants were enroled and randomized either to KMC (n = 71) and CMC (n = 69) groups (Figure 1). Base line maternal and neonatal characteristics were similar in both groups. Nearly one-third of the study population was growth restricted at birth. Prerandomization morbidities like respiratory distress syndrome, culture positive sepsis, symptomatic PDA, apnoea, need for CPAP or mechanical ventilation, jaundice and weights at randomization (1191 ± 131 g vs. 1223 ± 125 g, p = 0.56) were similar in both groups (Table 1).

Baseline nutritional characteristics
There were no differences in average time to reach full enteral feeds or in time to regain birth weight between study groups. Similarly, there were no differences in the proportions of infants needing total parenteral nutrition or receiving fortified breastmilk (table 2). Age at randomization was comparable (14.1 ± 10.3 days vs. 13.7 ± 10.2 days; p = 0.56) between the groups.
Outcomes
Upon reaching term gestational age, average weight gain (g/kg/day) postrandomization was similar in both the groups (23.3 ± 8.7 g vs. 22.64 ± 9.1 g, p = 0.67). Weight (2449 ± 456 g vs. 2532 ± 487 g, p = 0.30), length (46.5 ± 2.6 cm vs. 47.4 ± 3.1 cm, p = 0.08) and head circumference (33.0 ± 1.3 cm vs. 33.3 ± 1.6 cm, p = 0.21) of the infants in KMC group were similar to that in CMC group.

There was no difference in the weight gain (g/kg/day) from randomization to hospital discharge between the Kangaroo care group and conventional care group (18.01 g vs. 15.64 g, p = 0.12). Nearly similar proportions of infants were on exclusive breastfeeding (31.0% vs. 31.9%, p = 0.91).
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and resources required in the intermediate care unit would
be more than that in the KMC ward, at our hospital it would
mean a cost saving of nearly US $ 500 (Rs. 25 000) for each
patient enrolled in the KMC group compared with that en-
rolled in the CMC group. Studies evaluating the role of KMC
in VLBW infants reported an average weight gain of 1–
3 g/day higher in the KMC group compared with conven-
tional incubator care (3–5). Studies evaluating the role of
KMC in LBW infants reported weight gain as high as 10–
17 g/day in the KMC group infants compared with those
subjected to conventional intensive care (5–9). Our study
also displayed a better weight gain till hospital discharge
in the KMC group (mean difference 2.4 g/kg/day) but was not
powered to identify this difference.

The breastfeeding rates at 40 weeks was similar between
two groups. Exclusive breast feeding rate was 31% in both
groups, and any breastfeeding was above 85% in both
groups. Strict adherence to breastfeeding is a rigorous policy
in our hospital. A breastfeeding counsellor, milk banking,
milk expression room, electric breastpumps, all help us in
achieving these high breastfeeding rates. KMC may have
effect on breastfeeding rates when prevalence of breastfeed-
ing is low (10,11). This result is in concurrence with the
meta-analysis where positive effects of KMC on breastfeed-
ing were demonstrated in the subgroup of trials that used
intermittent KMC, but not in the subgroup of trials that used
continuous KMC. As in the meta-analysis, duration of hos-
pitalization was not affected by the policy of KMC (1).
However, in the trial by Charpak et al. (12) and that by Cat-
taneo A et al. (13), KMC reduced the number of total days
in the hospital, and the reduction was more marked for
newborns with lower birth weights, and nonexistent for
those >1800 g. We did not observe this benefit, as the
infants in our study were discharged at weight >1500 g as
against 1700 g in the previous report. As per our observa-
tions, discharging infants at weight >1500 g did not result in
any adverse events or mortality till term gestational age.
This may be possible because of the intense family support
the mother-infant dyad receives in our population.

A fairly large RCT, including only VLBW infants, is a
major merit of our study. In all the previous reports,
infants in the KMC group were subjected to kangaroo
care in the intermediate care unit and were under the
supervision of both doctors and nurses, while in our
study, infants in KMC group were cared for solely by their
mothers, assisted by a trained nurse. All the mothers
received a minimum of 8-hrs KMC during hospitalization
postrandomization. We did not measure the exact dura-
tion of KMC per day and also duration of kangaroo care,
potidischarge from the hospital. We are still evaluating
whether this is a cost saving or not.

**DISCUSSION**

This is one of the few randomized controlled trials evaluat-
ing the role of KMC in KMC ward for stable VLBW infants.
From this study, we conclude that kangaroo care in KMC
ward is an effective alternative to conventional incubator
care for the management of stable VLBW infants. Infants
managed in the KMC ward had similar growth parameters,
breastfeeding rates and morbidities compared with those
managed in the intermediate care unit. This result is similar
to that published in the meta-analysis by Conde-Agudelo
et al. (1) and that reported by Robert et al. (6). As required
by the study methods, postrandomization, infants in the
KMC group spent an average of 11.5 days in the KMC ward
in place of the intermediate care unit. As the cost of care
and resources required in the intermediate care unit would

**Table 3** Outcome variables at 40 weeks of Postmenstrual age

<table>
<thead>
<tr>
<th>Variable</th>
<th>KMC (n=68)</th>
<th>CMC (n=68)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain postrandomization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g/kg/day) (mean ± SD) till 40 weeks*</td>
<td>23.3 ± 8.7</td>
<td>22.64 ± 9.1</td>
<td>0.67</td>
</tr>
<tr>
<td>Weight (g) (mean ± SD)</td>
<td>2449 ± 456</td>
<td>2532 ± 487</td>
<td>0.30</td>
</tr>
<tr>
<td>Length (cm) (mean ± SD)</td>
<td>46.5 ± 2.6</td>
<td>47.4 ± 3.1</td>
<td>0.08</td>
</tr>
<tr>
<td>Head circumference (cm) (mean ± SD)</td>
<td>33 ± 1.3</td>
<td>33.3 ± 1.6</td>
<td>0.21</td>
</tr>
<tr>
<td>Breastfeeding rate</td>
<td>18.01 ± 9.5</td>
<td>15.64 ± 8.5</td>
<td>0.12</td>
</tr>
<tr>
<td>Randomization to hospital discharge weight gain* (g/kg/day) (mean ± SD)*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Data include infants lost to follow-up.
*p not significant.

**Table 4** Postrandomization morbidities

<table>
<thead>
<tr>
<th>Variable</th>
<th>KMC (n=71)</th>
<th>CMC (n=69)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>2.8 (2.8)</td>
<td>2.8 (2.8)</td>
<td>0.63</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>1 (1.4)</td>
<td>0 (0)</td>
<td>0.98</td>
</tr>
<tr>
<td>Apnoea</td>
<td>0 (0)</td>
<td>2.8 (2.8)</td>
<td>0.46</td>
</tr>
<tr>
<td>Hypoglycaemia</td>
<td>0 (0)</td>
<td>1 (1.4)</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Figure in the brackets are percentages.
References


