
The Impact of Kangaroo Mother Care on Neonatal Temperature and Weight in Newborns

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ABSTRACT

Taking into consideration multiple, long term benefits of Kangaroo Mother Care (KMC), a study was undertaken to compare the weight reduction and temperature of neonates on maternal kangarooing and professional mummification, and also correlate these with demographic variables. The sample consisted of 50 post-natal mothers with term neonates, both from experimental and comparison group. It is concluded that KMC leads to better weight gain, temperature and shorter hospital stay.

The benefits of Kangaroo Mother Care (KMC) for the baby are numerous: there stable heart rate (no bradycardia), regular breathing (a 75% de-crease in apneic episodes), improved oxygen saturation levels, no cold stress, longer periods of sleep, rapid weight gain, rapid brain development, reduction of “purpose-less” activity, decreased crying, longer periods of alert-ness, successful breastfeeding episodes and earlier hos-pital discharge.

Kangaroo Mother Care consists of placing a diaper clad premature & mature baby in an upright position on a mother’s bare chest - tummy to tummy, in between the breasts. The baby’s head is turned so that the ear is above the mother’s heart (Larimer, 2004).

In rural Bangladesh, where postnatal mothers are com-munity based, incidence of home delivery is high, birth weight low, neonatal and infant mortality rates are high and neonatal intensive care like KMC is unavailable. This trial tested and concluded that community-based Kan-garoo mother care reduces the overall neonatal mortality rate by 27.5 percent, infant mortality rate by 25 percent, and low birth weight neonatal mortality rate by 30 per-cent.

NEED FOR THE STUDY

Kangaroo Mother Care (KMC) is a simple, feasible, and widely accepted intervention among mothers in hospitals. Research by Kadam et al. (2015) highlights the benefits of KMC, such as reducing the incidence of hypothermia, without any observed adverse effects. Warmth is a fundamental requirement for a newborn’s survival and well-being. Unlike adults, newborns often struggle to maintain their body temperature, particularly in colder environments, which can result in hypothermia—a significant risk factor for neonatal health.

Globally, neonatal mortality remains a pressing issue. Each year, an estimated four million neonatal deaths and an additional four million stillbirths (beyond 22 weeks of gestation) occur. In countries like India, neonatal mortality accounts for nearly two-thirds of the infant

mortality rate, with approximately 1.1 million neonatal deaths annually. With a global neonatal mortality rate of 28 per 1,000 live births, the disparity between high- and low-income countries raises critical human rights concerns. The slow decline in neonatal mortality is a major obstacle to achieving Millennium Development Goal 4. However, evidence from several countries demonstrates that neonatal mortality can be significantly and cost-effectively reduced by addressing key causes such as asphyxia, infection, low birth weight, prematurity, and congenital malformations.

An article titled “*Kangaroo Mother Care Can Bring Down Infant Mortality Rate*” (2010) reports that in eight low- and middle-income countries, studies—including three randomized controlled trials—showed a 51% reduction in neonatal mortality when stabilized preterm infants (weighing less than 2,000 grams) received continuous skin-to-skin contact and breast milk through KMC. Findings suggest that up to half a million neonatal deaths caused by preterm birth complications could be prevented annually if KMC were universally available, especially in low-income countries with the highest newborn mortality rates.

The guide “*Thermal Control of the Newborn*” (2009) emphasizes the critical importance of maintaining normothermia in newborns during the early days of life. Ensuring warmth, detecting hypothermia early, and taking prompt corrective measures can significantly reduce neonatal mortality and morbidity. Establishing a “warm chain” for newborn care is essential to achieving this goal.

OBJECTIVES

The current study was conducted with two objectives:

- (i) To compare the weight loss and temperature of neonates receiving Kangaroo Mother Care (maternal kangarooing) with those undergoing professional swaddling (professionally mummifying); and
- (ii) To examine the association between temperature and weight loss of neonates in maternal kangaroo care and professional swaddling with their demographic variables.

HYPOTHESIS

- A significant difference was observed in weight reduction and temperature between neonates receiving maternal kangaroo care and those undergoing professional swaddling.
- A significant association was found between temperature, weight reduction, and neonatal demographic variables in both maternal kangaroo care and professional swaddling groups.

THEORETICAL FRAMEWORK

Theoretical framework selected for this study was based on General System theory by Bertalanffy (1968). In this theory main focus is on the discrete part and their inter relationship which make up and describe the whole. In-put is assessment of neonatal parameters such as weight and temperature, crying state and frequency of breast feeding. Throughput is Application of Kangaroo Mother Care for experimental group and professional

mummification for control group newborns. The output is Post assessment of experimental and control group newborns.

REVIEW OF LITERATURE

To assess the impact of the introduction of kangaroo mother care (KMC) in hospitals using the Perinatal Problem Identification Programme (PIIP) in South Africa, a survey was conducted for 40 hospitals. Of these, eight hospitals had not initiated KMC, 21 hospitals had PIIP data for a period after KMC had commenced and 11 hospitals had PIIP data for periods before and after the introduction of KMC. The neonatal death rate (NNDR) for all hospitals with no KMC or before the introduction of KMC was 88.14/1000 live births, whereas the NNDR for hospitals with KMC or after the introduction of KMC was 71.43/1000 live births [relative risk (RR) 0.81; 95% confidence interval (CI) 0.72-0.91]. For the 11 hospitals that had reliable PIIP data for periods before and after the initiation of KMC, the NNDR was 87.72/1000 live births before KMC and 60.76/1000 live births after KMC had been introduced (RR 0.62; 95% CI 0.53-0.73). The large and significant reduction in the NNDR of neonates weighing between 1000 and 1999 gm was associated with the introduction of KMC (Pattinson, Bergh, Malan & Prinsloo, 2006).

A randomised controlled trial was performed over one year period in which 89 neonates were randomized into two groups kangaroo mother care and conventional method of care (CMC) in a tertiary care hospital in India. Forty-four babies were randomized into KMC group and 45 to CMC. There was significant reduction in KMC vs CMC group of hypothermia (10/44 vs 21/45, $p < 0.01$), higher oxygen saturations (95.7 vs 94.8%, $p < 0.01$) and decrease in respiratory rates (36.2 vs 40.7, $p < 0.01$). There were no statistically significant differences in the incidence of hyperthermia, sepsis, apnea, onset of breastfeeding and hospital stay in two groups; 79 percent of mothers felt comfortable during the KMC and 73 percent felt they would be able to give KMC at home. KMC is feasible, as mothers are already admitted in hospitals and are involved in the care of newborn (Kadam, Binoy, Kanbur et al, 2005).

A quasi-experimental study was conducted to evaluate the benefits of KC on neurobehavioral responses in term infants. Out of 47 healthy mother-infant pairs 25 of the pairs were in the treatment group and 22 pairs were in the control group. Data were collected through observation for a 60-minute period 4 hours after birth using a behavioral recording tool. The findings of this study support the positive benefits of KC on term infants and their efforts in self-regulation, neurobehavioural responses, motor system balance, sleep organisation after delivery, and ease of transition to the external environment from the comforts of the womb. The study concluded that when the baby got cold, the mother's body temperature would increase to 'warm' the baby up. Kangaroo care performed in a quiet, low light environment with ANY baby has been proven to reduce crying and help the baby learn to transition from one sleep state to another. It shows a significant increase in sleep time for the neonates during Kangaroo Care (Asher & Brooke, 2006).

A randomised controlled trial was performed to evaluate the earlier continuous KMC for relatively stable low-birth-weight (LBW) infants in Madagascar. A total of 73 infants (intervention 37, control 36) were included. Earlier continuous KMC had higher but not statistically different mortality in the first 28 days post birth (1 vs. 2; risk ratio, 1.95; 95% CIs, 0.18-20.53; $p = 1.00$). There were no differences in incidence of morbidities. Body

weight loss from birth to 24 hr post-birth was significantly less in ear-lier KMC infants compared with later KMC infants. (-34.81 gm vs. -73.97 gm; mean difference, 39.16 gm; 95% CIs, 10.30-68.03; $p = 0.01$; adjusted $p = 0.02$). Adverse events and duration of hospitalisation were not different between the two groups (Nagai et al, 2010).

Ninety-nine percent of the 4 million neonatal deaths per year occur in developing countries. The World Health Organization (WHO) Essential Newborn Care (ENC) course sets the minimum accepted standard for training mid-wives on aspects of infant care (neonatal resuscitation, breastfeeding, kangaroo care, small baby care, and ther-moregulation), many of which are provided by the mother. The mothers were categorised into 2 groups, those who had completed 7 years of school education (primary edu-cation) and those with 8 or more years of education. ENC training is associated with decreases in early neonatal mortality; rates decreased from 11.2 per 1000 live births pre-ENC to 6.2 per 1000 following ENC implementation ($p < 0.001$). Prenatal care, birth weight, race, and gender did not differ between the groups. Mortality for infants of mothers with 7 years of education decreased from 12.4 to 6.0 per 1000 ($p < 0.0001$) but did not change significantly for those with 8 or more years of education (8.7 to 6.3 per 1000, $p = 0.14$). ENC training decreases early neonatal mortality, and the impact is larger in infants of mothers without secondary education. The impact of ENC may be optimized by training health care workers who treat women with less formal education (Chomba, 2008).

METHODOLOGY

The study had comparative quasi experimental repeated measure time series design, and its setting was Private Hospitals Sehore (M.P). The population consisted of postna-tal mothers with newborns. The sample size was 50 post-natal mothers with term newborns (25 each in experi-mental and comparison groups). Sampling technique employed was convenient sampling.

Inclusion Criteria: Both primi and multipara mothers; and mothers who delivered normally and were having term newborn babies.

METHOD OF DATA COLLECTION

- Observation of measuring parameters of Neonates (recording of temperature and weight), crying state of newborn and frequency of breast feeding.
- Steps of Kangaroo Mother Care.

Comparison of mean, standard deviation of neonatal weight after implementation of Kangaroo mother care and professional mummification shows that in experi-mental group gained 30 gm of weight but in compari-son group shows weight reduction of 40 gm on day 3 of post observation. It concludes that rapid weight gain was observed in Kangarooed infants.

In neonatal temperature, paired ‘t’ test shows that the experimental group newborns have highest significant (‘t’ = 3.27, 3.89 & 3.05) thermal controlling in all 3 consecutive days when compared to com-parison group newborns. In ‘Z’ test shows both groups had highest significant on thermal controlling.

- * In neonatal weight recording, the both Paired ‘t’ test and ‘Z’ test shows that the experimental and comparison groups had non-significant in weight reduction (Table 3).
- * There is no significant association between thermal control and weight reduction with neonatal variables.

Data Collection Procedure

- * Neonatal temperature and weight was checked morning and evening before and after implementation of Kangaroo mother care. Crying state and frequency of breast feeding was checked every 2 hrs a day after implementation of initial KMC.
- * Kangaroo Mother Care was given 4 times a day for experimental group newborns and mummification of the baby at the same time for comparison group newborns.
- * Observation of neonatal parameters, crying state of newborn and frequency of breast feeding and Kangaroo Mother Care was done for 5 days to the newborn babies.

Validity and reliability: Split-half method was used to find the reliability of the tool.

Plan for data analysis: Descriptive Statistics - Percentage, Mean and Standard Deviation; Inferential Statistics - Paired ‘t’ test and Independent ‘t’ test.

Neonatal Temperature	
	Independent - 't' test value
Day I	5.755
Day II	7.33
Day III	6.13

Comparison group

Neonatal Weight	
	Independent - 't' test value
Day I	0.634
Day II	0.921
Day III	0.488

RESULTS

- > The highest mean and standard deviation of neonatal temperature for experimental group newborns were observed in three consecutive days (Table 4). In mean and standard deviation for day 1 pre-observation was 35.4 ± 0.256 when in post-assessment it was

Neonatal Weight Observation	Experimental Group			Comparison Group		
	Mean	Standard Deviation	't' Value	Mean	Standard Deviation	't' Value
Day I						
Pre Observation	3.003	0.280	2.5	3.04	0.287	0.116
Post Observation	3.016	0.279		3.04	0.289	
Day II						
Pre Observation	3.013	0.279	1.14	2.999	0.326	0.5
Post Observation	3.024	0.280		2.999	0.327	
Day III						
Pre Observation	3.024	0.281	0.004	2.96	0.351	0.104
Post Observation	3.039	0.275		2.966	0.351	

36.6 ± 0.316 . In day 1 the mean difference shows 1.2°C after implementation of Kangaroo mother care. On day 3 the mean and standard deviation of pre-observation shows, it was 36.4 ± 0.197 and in post-test it was 37.4 ± 0.168 . The mean difference was 1°C . It shows that Kangaroo mother care is much effective.

- > In comparison group the temperature was slightly increased after professional mummification. In day 1, the pre-test mean was 35.4 ± 0.249 , and post-test was 36.1 ± 0.165 , the mean difference shows that 0.7°C after implementing of mummification. In same like in day 3, the pre-test mean was 36.3 ± 0.195 , the post-test was 36.4 ± 0.2 , and the difference in mean was 0.1°C . Hence, the comparison of groups shows that the effective thermoregulation is maintained by Kangaroo mother care group babies than the professional mummification babies.
- > In experimental group newborns, the number of crying state and frequency of breast feeding was observed

Neonatal Temperature Observation	Experimental Group			Comparison Group		
	Mean	Standard Deviation	't' Value	Mean	Standard Deviation	't' Value
Day I						
Pre-observation	35.4	0.256	3.27	35.4	0.249	2.25
Post-observation	36.6	0.316		36.1	0.165	
Day II						
Pre-observation	35.9	0.199	3.89	35.9	0.136	1.97
Post-observation	37.2	0.181		36.2	0.173	
Day III						
Pre-observation	36.4	0.197	3.05	36.3	0.195	1.29
Post-observation	37.4	0.168		36.4	0.2	

for 11-12 times a day for 3 consecutive days. Whereas in comparison group frequency of breast feeding was observed for 6-7 times a day and crying state was increased to 14 times a day for 3 consecutive days.

Retention of body warmth is higher among maternal kangarooed neonates 30 minutes post exposure, the effect size is the same at the level of $p < 0.05$ in all the final observations for the three consecutive days. Experimental group gained 30 gm of weight but in comparison group shows weight reduction of 40 grams on 3rd day of post observation, rapid weight gain was observed in Kangarooed infants. This increased weight gain also leads to shorter hospital stays. Maternal kangarooing promotes temperature control and weight maintenance effectively for preterm and term newborns.

Implications

The findings of the study highlight that mothers often lack adequate practice in Kangaroo Mother Care during the early postnatal period. Nurse educators should focus on training peripheral health workers and educating mothers to enhance their knowledge and encourage the immediate adoption of Kangaroo Mother Care after delivery, thereby improving neonatal outcomes and saving lives.

RECOMMENDATION

- A comparative study can be conducted to evaluate the effectiveness of Kangaroo Mother Care versus professional swaddling on neonatal temperature and weight among preterm newborns in selected communities and hospitals.
- A similar study could be designed using a video-based teaching program on Kangaroo Mother Care to educate mothers in government hospitals.

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