

Impact of Kangaroo Mother Care on Severely Acute Malnourished Infants- A Comparative Hospital-Based Study

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ABSTRACT

Background: An established strategy that has been demonstrated to be successful in lowering newborn morbidity and mortality among critically acutely malnourished Kangaroo mother care (KMC) refers to low-birth-weight babies.

Methods: Fifty infants with severe malnutrition were randomly assigned to the KMC and non-KMC groups, with 25 infants in every category. The socio-demographic data, growth, physiological stability, and promotion of breastfeeding for both groups, vital signs, length of hospital stay, weight gain upon release, and RBS were tracked.

Results: The majority (84%) of the infants were 1-3 months of age group, predominantly male babies (56%). The majority of the subject 72% in KMC and 60% in non-KMC had breastfed. In non KMC group 96% of subjects had adequate development and 4% had inadequate development. There was no statistically significant change ($p>0.05$). Hospital stays in KMC and non-KMC groups were 14.60 ± 4.69 and 19.96 ± 4.84 , respectively, whereas weight gain in KMC and non-KMC groups were 13.09 ± 1.78 and 11.24 ± 1.37 , respectively. A statistically significant difference was observed ($p<0.05$). In both the KMC and non-KMC groups, heart rate and respiratory rate were not statistically significant. In both the KMC and non-KMC groups, the temperature and SpO_2 were statistically significant ($p<0.05$).

Conclusion: Prolonged and early kangaroo mother care has been linked to improved growth in critically malnourished newborns, protection against hypothermia, and enhanced exclusive breastfeeding practice.

Key-words: Kangaroo mother care, Non-KMC, Severely acute malnourished infants, Weight gain

INTRODUCTION

Serious public health concerns surround severe acute malnutrition. The International Institute for Population Sciences estimates that 8.1 million Indian children under the age of five are affected by this condition. Thus, SAM results in 24.6 million DALYs and approximately 0.6

million fatalities per year ^[1]. According to the National Family Health Survey-4, the estimated prevalence rate for children with SAM in the years 2015–16 was 7.4%. Mitigating the risk of SAM is an urgent problem. Diseases including diarrhoea, acute respiratory infections, malaria, and measles worsen the already elevated risk of mortality associated with SAM ^[2].

The criteria for diagnosing children with severe acute malnutrition include specific weight measurements. Weight for age is assessed and determined to be less than minus three standard deviations from the median, according to the WHO growth reference. Bipedal edema is a critical sign, and weight for length—which may be less than -3 SD—is another set of requirements ^[3].

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According to NFHS-3 data, 6.4% of children under five are seriously wasted, and roughly 19% of children under five are wasted. Based on available data, around 8 million of the 25 million cases of severely wasted children in the nation are thought to exist ^[4].

The World Health Organization defines low birth weight (LBW) as a birth weight of less than 2500 grams, and it remains one of the most urgent public health challenges. LBW is linked to a significant burden of newborn morbidity and mortality as well as several short- and long-term consequences. Every year, some 20 million low-birth-weight babies are born, primarily in low- and middle-income nations, with India accounting for a sizable portion of these births. Currently, 18.6% of births in the country are underweight, accounting for almost 40% of the global burden ^[5,6].

A promising technique to address issues associated with low birth weight and severe acute malnutrition is kangaroo mother care. KMC was made up of four essential components: early skin-to-skin contact between the mother and child, exclusive breastfeeding, prompt hospital release, and careful home follow-up ^[7]. The baby is often merely clad in a diaper and a bonnet and is kept upright for the majority of the time. This can begin as soon as the baby is stabilized. By reducing the risk of hypothermia, severe illness, and nosocomial infections, as well as lengthening hospital stays, improving growth, increasing breastfeeding, and fostering a psychological relationship between mother and child, KMC is put into practice ^[8].

It is an attempt to assess the effectiveness of the therapeutic intervention for infants provided by KMC infants below six months by evaluating and comparing its impact on weight gain, hospital stay duration, temperature regulation, and insight into acute malnutrition. After that, it is equally relevant to delineate the lines of improvement for boosting the health and well-being of vulnerable infants in India ^[9,10].

MATERIALS AND METHODS

Study design- This prospective comparative study was carried out in a tertiary care hospital's pediatric department in central India.

Study population- Fifty severely acute malnourished (SAM) infants admitted to the pediatric intensive care unit during the study period were enrolled.

Inclusion criteria

- Infants 1-6 months of age with both gender
- Severely acute malnourished infants
- All SAM infants admitted to the PICU of our hospital
- Whom parents or guardians provide consent for the study

Exclusion criteria

- <1 or >6 months age children
- Infants with Severe respiratory distress or Ventilated or Infants with congenital anomalies
- Those parents or guardians did not give the study's consent.

Data Collection- In the study, 50 infants were randomly divided into two groups of 25 each and received either Kangaroo Mother Care or were not provided with the above. Mothers who provided written informed permission and who ensured that all participating mothers or parents understood the purpose, nature, advantages, and outcomes of kangaroo mother care were the ones offering kangaroo mother care. To reduce observer bias, a similar individual was hired, and data were gathered by bodily inspecting infants, interviewing moms, and analyzing case files. Age, gender, place of residence, socioeconomic status, and family structure were among the socio-demographic information gathered. Other critical measures included body temperature, heart rate, respiration rate, weight gain at discharge, and random blood sugar levels. Therefore, the parameters determined following KMC were used to evaluate its impact.

Methodology- This was a prospective comparative study conducted at the pediatric ward of a tertiary care hospital in central India on fifty babies aged 1-6 months diagnosed to have severe acute malnutrition (SAM) and admitted to the PICU. The infants were divided into two groups of 25 each: one that received KMC and the other that did not receive it. SAM Infants were strictly included with parental consent only. The data were collected from a careful and systematic assessment of socio-demographic factors and clinical parameters such as body temperature, heart rate, respiration rate, weight gain at discharge, and random blood sugar levels. Infants beyond the age range, having severe respiratory distress, congenital anomalies, or a lack of consent from parents,

were excluded. To reduce observer bias, a researcher explicitly assigned for data collection conducted physical examinations, interviews with mothers, and reviews of their medical records. The statistical package for analysis was SPSS version 22. Frequencies and percentages were used in the description of categorical variables, and differences between groups were found using the chi-square test at a threshold of $p < 0.05$.

RESULTS

In the current study, 25 SAM babies in total got KMC. The majority (84%) of the infants were 1-3 months of age group, predominantly male babies (56%). Most of the

Statistical Analysis- The data was analyzed using SPSS (Statistical Package for Social Sciences) version 22. Frequencies and percentages were utilized to describe the data for categorical variables. A chi-square test was used to compare percentages. The threshold for statistical significance was less than 0.05.

subjects (80%) reside in rural areas, 80% live in joint families, and most of them (52%) belong to the upper class (Table 1).

Table 1: Socio-demographics characteristics of the KMC infants

Socio-demographic characteristics		Frequency	Percentage (%)
Age(months)	1-3	21	84
	4-6	4	16
Gender	Male	14	56
	Female	11	44
Residence	Rural	20	80
	Urban	5	20
Type of Family	Joint	20	80
	Nuclear	5	20
Socio-economic Status	LMC	3	12
	UL	13	52
	LC	9	36

The majority of the subjects, 72% in KMC and 60% in non-KMC, breastfed. There was no statistically significant change ($p > 0.05$). In the non-KMC group, 4% of

participants had inadequate development, while 96% of subjects had acceptable development. There was no statistically significant change ($p > 0.05$) (Table 2).

Table 2: Nutrition and Developmental Status among KMC and Non-KMC group

Assessment		KMC		Non-KMC		p-value
		No.	%	No.	%	
Nutrition	Breast Feed	18	72	15	60	0.66
	Bottle Feed	2	8	3	12	
	Mix Feed	5	20	7	28	
Development Assessment	Adequate	25	100	24	96	0.31
	Inadequate	0	0	1	4	

Hospital stays in KMC and non-KMC groups were 14.60 ± 4.69 and 19.96 ± 4.84 , respectively. There was a statistically significant difference ($p < 0.05$) (Table 3).

Table 3: Hospital stay comparison between the KMC and non-KMC groups

Hospital Stay	KMC (Mean±SD)	Non-KMC (Mean±SD)	p-value
	14.60±4.69	19.96±4.84	0.001*

RBS in the KMC and non-KMC groups were 82.48±14.59 and 71.76±13.12, respectively. A statistically significant difference was observed ($p < 0.05$) (Table 4). The weight

gain for the case and control groups was 13.09, 1.78 and 11.24, 1.37, in that order. There was a statistically significant difference ($p < 0.05$) (Table 4).

Table 4: Comparison of Weight Gain (gm /kg/day) and RBS (mg/dl) between KMC and non-KMC group

	KMC (Mean±SD)	Non-KMC (Mean±SD)	p-value
RBS (mg/dl)	82.48±14.59	71.76±13.12	0.009
Weight Gain (gm/kg/day)	13.09±1.78	11.24±1.37	0.001

In both the KMC and non-KMC groups, heart rate and respiratory rate were not statistically significant. In both

the KMC and non-KMC groups, the temperature and SpO₂ were statistically significant ($p < 0.05$) (Table 5).

Table 5: Effects of KMC on Hemodynamic parameters of severely malnourished children

Hemodynamic parameter	KMC	Non-KMC	p-value
	Mean±SD	Mean±SD	
Heart Rate	134.36±9.93	136.48±13.19	0.52
Respiratory Rate	34.16±7.23	35.20±5.15	0.56
Temperature	98.32±.62	97.76±.76	0.007*
SPO ₂	36.91±.51	36.55±.60	0.02*

p-values less than 0.05 were deemed statistically significant.

DISCUSSION

The KMC was established as a robust intervention in the management of low-birth-weight and malnourished newborns through providing health services from all dimensions of life, encompassing both physical and emotional well-being. KMC encourages nursing exclusively and having skin-to-skin contact with mothers, thus indirectly supporting immediate health outcomes and educating antenatal mothers on the importance of a health practice by the mother^[11]. This educational dimension can best be delivered by midwives, community health workers, and mothers who have already benefited from KMC. They could be a source of inspiration and role models, creating a network support environment that would allow for the successful implementation of this program in the community^[12].

Our results show that alarming numbers of stunted children belong to rural places and are staying in joint family settings. This demographic reality is consistent with the research conducted by Jana *et al.*^[12], and thus, such interventions demand focused efforts to address several socio-economic and cultural issues prevalent among such populations. As a result of this, KMC is regarded as a viable intervention that best suits the family environment within the rural scenario owing to its likely constraint regarding easy access to health and nutrition facilities. Through the well-available support structures from families, KMC can make mothers take an active role in the care and health of their babies, thus making them feel responsible and in control. Regarding the growth and weight gain issues, our

research outcome supports the same referred to in Menezes *et al.* ^[13] as well as Mazumder *et al.* ^[14], in which infants receiving KMC did better significantly compared to those who did not receive it. This improvement in nutritional status is essential because adequate growth during the early months of life is foundational for long-term health and development. Why the benefits of KMC might lead to more growth-full experiences, including better bonding experiences, which are known to result in more frequent breastfeeding and more excellent maternal responsiveness to the infant's needs.

In addition, our results on the possible protective role of KMC against hypoglycemia were also consistent with the study of Boundy *et al.* ^[15], mainly because under nourished infants are susceptible to any alterations in their metabolic environment. In the case of KMC, due to the stable, warm, and nurturing environment offered to the infant, their physiological responses will be regulated, and consequently, fewer hypoglycemic events will appear. This is very important because avoiding hypoglycemia has dramatic impacts on an infant's trajectory of health.

The lowered number of hospital stays for infants under KMC, as agreed with Ramanathan *et al.* ^[16], therefore strengthens the effectiveness of this intervention. Apart from relieving pressure on hospitals, the shortening of hospital stays will also help bring families back to their home setting much earlier, where they may continue to administer KMC, besides gaining the benefit of supportive families. This transition is fundamental, as most changes in practice occur in the home setting.

Temperature control was also an essential benefit of KMC. The ability of infants in this group to maintain within normal temperature ranges was greater than that of those not receiving KMC. The researchers did find results quite similar to Ibe *et al.* ^[17] here by pointing to the way that hypothermia, one of the widespread risks for low-birth-weight infants, can be protected via KMC. By encouraging the KMC to come into contact with the mother's skin, she uses her heat to warm the infant; this reduces the other interventions utilized and enhances the overall safety of neonatal care.

Early initiation of breastfeeding among infants in the KMC group further reinforces the benefits of this intervention, and the evidence is evident, as is the case with Gidey *et al.* ^[18]. Early initiation of breastfeeding initiates a good milk supply, a crucial role in the

development of immunology in infants. The skills both cohorts gained could easily indicate the significance of KMC as an all-around educational tool that addresses these immediate health issues and empowers mothers with the required skills to help them raise their infants successfully.

A far more critical aspect is that the reduction in respiratory distress among the infants of the KMC group mentioned by Bhavana *et al.* ^[19] has much broader implications for the care approach as well. The contact offers the stress relief of maternal interaction with a closeness that might stabilize the respiratory pattern and decrease stress responses among the infants in the KMC group. Such a finding shows the advantages of KMC as a complex intervention that benefits respiratory and general developmental outcomes.

The confidence of mothers was enhanced, and bonding with their infants was improved in the KMC group. The emotional and psychological benefits of this intervention were comparable to those observed by Koreti *et al.* ^[20]. The bonding thus developed due to KMC is vital for the mental health of the mother as well as for the emotional development of the infant. This bonding may influence maternal care practices and, thus, the entire nurturing environment for the infant's comprehensive growth and development.

Though these results are encouraging, one has to acknowledge some limitations of this study. Although the sample size achieved was large enough to generate meaningful inferences, it would not have captured the full range of dissimilarity among malnutrition cases from different regions and socio-economic backgrounds. This limitation justifies further research in more extensive and more diverse populations to achieve greater generalizability of the findings. Additionally, because we relied upon self-report measures of initiation of breastfeeding and mother-to-child bonding, biases may have been inadvertently introduced that may have influenced our results. Future studies should be designed to include objective assessments and a wider range of socio-economic factors so that a more comprehensive understanding of the influence of KMC is presented.

The benefits that Kangaroo Mother Care provides for malnourished infants highlight its potential as a critical intervention strategy for improving health outcomes in this vulnerable population. An approach by KMC addressing both the physical and emotional dimensions

of care may empower mothers and help improve infant health, hence setting critical trajectories for better long-term development. Findings point to the importance of incorporating KMC as part of routine neonatal care practices, particularly in settings where resources are limited, because its benefits may be best maximized here.

CONCLUSIONS

Kangaroo Mother Care is the most affordable, secure, and humane way to provide care for severely acute malnourished infants. Additionally, it was seen that KMC promoted the babies' growth and development, which enhanced the moms' sense of bonding. It is essential to keep in mind that newborns with very low birth weights (VLBW) respond better to KMC. The mother-child bond improves suckling and feeding, and KMC babies have higher growth parameter means.

CONTRIBUTION OF AUTHORS

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