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EFFECT OF KANGAROO MOTHER CARE ON SURVIVAL AND MORBIDITY AMONG PRETERM NEONATES IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Preterm birth is a leading cause of neonatal mortality, particularly in low- and middle-income countries. Kangaroo Mother Care (KMC) is an evidence-based, cost-effective intervention that promotes skin-to-skin contact and exclusive breastfeeding, potentially improving neonatal outcomes.

Objectives: To evaluate the role of Kangaroo Mother Care in improving survival and reducing morbidity among preterm neonates admitted to a tertiary care hospital in South India.

Methods:A prospective observational cohort study was conducted from April 2020 to October 2020 in a tertiary care hospital. A total of 116 preterm neonates were enrolled and divided into two groups: KMC (n = 58) and conventional care (n = 58). Data on demographic characteristics, clinical parameters, and outcomes were collected using a structured proforma. Primary outcome was survival at discharge, while secondary outcomes included incidence of hypothermia, sepsis, feeding intolerance, and duration of hospital stay. Statistical analysis was performed using SPSS version 20.0, with $p < 0.05$ considered statistically significant.

Results: Baseline characteristics were comparable between the two groups. The survival rate was significantly higher in the KMC group (89.7%) compared to the conventional care group (75.9%) ($p = 0.048$). The incidence of hypothermia (13.8% vs 31.0%, $p = 0.02$) and sepsis (17.2% vs 34.5%, $p = 0.03$) was significantly lower in the KMC group. The mean duration of hospital stay was also significantly shorter among neonates receiving KMC (11.2 ±3.6 days vs 14.5 ±4.2 days, $p = 0.001$). The survival benefit was more pronounced among neonates with birth weight <1500 g.

Conclusion: Kangaroo Mother Care significantly improves survival and reduces morbidity among preterm neonates. Its integration into routine neonatal care can substantially enhance outcomes, particularly in resource-limited settings.

Keywords: Kangaroo Mother Care; Preterm neonates; Neonatal survival; Low birth weight; Hypothermia; Sepsis; Tertiary care hospital

INTRODUCTION

Preterm birth remains a major global public health challenge and is a leading cause of neonatal mortality and morbidity worldwide. According to estimates by the World Health Organization, approximately 15 million babies are born preterm each year, accounting for nearly one in ten live births globally, with a disproportionate burden in low- and middle-income countries [1].

Complications related to prematurity contribute to nearly one million deaths annually, highlighting the urgent need for cost-effective, evidence-based interventions to improve survival outcomes [2]. In resource-limited settings, the survival of preterm neonates is often compromised by inadequate access to advanced neonatal intensive care, including incubators, respiratory support, and trained personnel [3]. In such contexts, simple and scalable interventions assume critical importance.

Kangaroo Mother Care (KMC), first introduced in Colombia in the late 1970s, is a comprehensive care strategy that includes prolonged skin-to-skin contact, exclusive breastfeeding, and early discharge with close follow-up [4]. KMC has been shown to improve thermal regulation, promote breastfeeding, reduce infections, and enhance mother–infant bonding, thereby contributing to improved neonatal outcomes [5].

Evidence from multiple randomized controlled trials and meta-analyses suggests that KMC significantly reduces mortality among low birth weight and preterm infants compared to conventional care [6]. The benefits of KMC extend beyond survival, including reduced incidence of severe infections, hypothermia, and length of hospital stay [7]. The World Health Organization has endorsed KMC as a standard of care for stable preterm and low birth weight infants, particularly in low-resource settings [8].

India accounts for a substantial proportion of the global burden of preterm births, with an estimated 3.5 million preterm deliveries annually [9]. Despite improvements in neonatal care infrastructure, disparities persist between urban and rural healthcare facilities, and neonatal mortality remains a concern, especially in tertiary care centers that cater to high-risk referrals. While national programs have promoted the adoption of KMC, its implementation and effectiveness vary across institutions due to differences in infrastructure, awareness, and caregiver acceptance [10].

In the context of South India, where healthcare systems often experience high patient loads and resource constraints, evaluating the effectiveness of KMC in real-world hospital settings is essential. Although previous studies have demonstrated the efficacy of KMC, there remains a need for institution-specific data to assess its impact on survival outcomes and to identify potential barriers to its implementation. Furthermore, limited data exist from tertiary care hospitals in this region regarding the survival benefits of KMC under routine clinical conditions.

Therefore, this study was undertaken to evaluate the role of Kangaroo Mother Care in improving the survival of preterm neonates admitted to a tertiary care hospital in South India. The primary objective was to compare survival outcomes among preterm neonates receiving KMC versus those receiving conventional care. Secondary objectives included assessing the association of KMC with selected neonatal outcomes such as duration of hospital stay and incidence of common complications.

METHODOLOGY

Study Design: This study was designed as a hospital-based prospective observational cohort study, conducted to assess the effect of Kangaroo Mother Care (KMC) on survival outcomes among preterm neonates, in accordance with Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Study Setting: The study was carried out in the Neonatal Intensive Care Unit (NICU) and KMC ward of a tertiary care teaching hospital in South India, which caters to both inborn and referred high-risk neonates.

Study Duration: The study was conducted over a period of six months, from April 2020 to October 2020.

Study Population: The study population comprised preterm neonates (gestational age <37 completed weeks) admitted to the NICU during the study period.

Inclusion Criteria

Preterm neonates (<37 weeks gestational age)
Birth weight <2500 grams
Hemodynamically stable neonates eligible for KMC
Neonates whose mothers/caregivers consented to participate

Exclusion Criteria

Neonates with major congenital anomalies
Neonates requiring immediate mechanical ventilation or critical intensive care support
Neonates with severe birth asphyxia (Apgar score <3 at 5 minutes)
Cases where caregivers refused consent

Sample Size: The sample size was calculated based on an expected difference in survival proportions between KMC and conventional care groups. Assuming a survival rate of 85% in the KMC group and 65% in the non-KMC group, with a confidence level of 95% and power of 80%, the minimum required sample size was estimated to be approximately 104 neonates. Accounting for possible attrition and incomplete data, a total sample size of 116 neonates was included in the study.

Sampling Technique:A consecutive sampling technique was employed, wherein all eligible preterm neonates admitted during the study period and meeting the inclusion criteria were enrolled until the desired sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned and pretested structured proforma. Baseline information including demographic details, gestational age, birth weight, mode of delivery, and clinical status at admission was recorded. Eligible neonates were categorized into two groups based on whether they received Kangaroo Mother Care or conventional care. KMC was initiated as per standard institutional protocol, involving continuous skin-to-skin contact for as many hours as feasible per day, along with encouragement of exclusive breastfeeding. Neonates were monitored daily for clinical parameters, including temperature regulation, feeding patterns, weight gain, and signs of infection. Outcomes were recorded until discharge or death.
Study Variables: The primary independent variable was the type of neonatal care (KMC versus conventional care). Dependent variables included survival outcome (alive or deceased at discharge), duration of hospital stay, incidence of hypothermia, sepsis, and feeding intolerance. Additional

covariates such as gestational age, birth weight, and sex of the neonate were also considered for analysis.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Descriptive statistics were used to summarize baseline characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized as mean ±standard deviation. The Chi-square test or Fisher's exact test was used to assess associations between categorical variables. Independent t-test was applied for comparison of continuous variables between groups. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee (IEC) of the participating hospital. Written informed consent was obtained from the parents or legal guardians of all enrolled neonates prior to inclusion in the study. Confidentiality of patient information was strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring respect for participants, beneficence, and non-maleficence throughout the research process.

RESULTS

A total of 116 preterm neonates were included in the study, with 58 neonates each in the Kangaroo Mother Care (KMC) and conventional care groups. Baseline characteristics, including gestational age, birth weight, sex distribution, and mode of delivery, were comparable between the two groups, with no statistically significant differences observed (Table 1)

Table 1: Baseline Characteristics of Study Participants (n = 116)

Variable	KMC Group (n = 58)	Conventional Care (n = 58)	p-value
Mean gestational age (weeks)	33.4 ± 2.1	33.1 ± 2.3	0.42
Mean birth weight (grams)	1820 ± 320	1785 ± 340	0.53
Male sex, n (%)	32 (55.2%)	30 (51.7%)	0.71
Cesarean delivery, n (%)	24 (41.4%)	26 (44.8%)	0.71
Inborn neonates, n (%)	36 (62.1%)	34 (58.6%)	0.70

The survival rate was significantly higher in the KMC group (89.7%) compared to the conventional care group (75.9%), indicating a beneficial effect of KMC on neonatal survival (p = 0.048) (Table 2)

Table 2: Survival Outcome in KMC vs Conventional Care

Outcome	KMC Group (n = 58)	Conventional Care (n = 58)	p-value
Survived, n (%)	52 (89.7%)	44 (75.9%)	0.048*
Died, n (%)	6 (10.3%)	14 (24.1%)	

*Statistically significant (p < 0.05)

Regarding morbidity, the incidence of hypothermia and sepsis was significantly lower among neonates receiving KMC compared to those receiving conventional care ($p = 0.02$ and $p = 0.03$, respectively). Although feeding intolerance was less frequent in the KMC group, the difference was not statistically significant (Table 3).

Table 3: Morbidity Profile in Both Groups

Complication	KMC Group (n = 58)	Conventional Care (n = 58)	p-value
Hypothermia, n (%)	8 (13.8%)	18 (31.0%)	0.02*
Sepsis, n (%)	10 (17.2%)	20 (34.5%)	0.03*
Feeding intolerance, n (%)	6 (10.3%)	12 (20.7%)	0.12

*Statistically significant ($p < 0.05$)

The mean duration of hospital stay was significantly shorter in the KMC group (11.2 ±3.6 days) compared to the conventional care group (14.5 ±4.2 days), suggesting faster recovery and stabilization ($p = 0.001$) (Table 4)

Table 4: Duration of Hospital Stay (Days)

Parameter	KMC Group (n = 58)	Conventional Care (n = 58)	p-value
Mean duration (days)	11.2 ± 3.6	14.5 ± 4.2	0.001*

*Statistically significant ($p < 0.05$)

Subgroup analysis based on birth weight revealed that the survival advantage of KMC was more pronounced among very low birth weight neonates (<1500 g), where a statistically significant difference was observed ($p = 0.04$). However, in neonates weighing 1500–2499 g, the difference in survival between groups was not statistically significant (Table 5)

Table 5: Survival by Birth Weight Category

Birth Weight Category	KMC Group Survival (%)	Conventional Care Survival (%)	p-value
<1500 g	85.0%	65.0%	0.04*
1500–2499 g	92.3%	82.6%	0.18

*Statistically significant ($p < 0.05$)

DISCUSSION

The present study evaluated the role of Kangaroo Mother Care (KMC) in improving survival among preterm neonates in a tertiary care hospital setting in South India. The findings demonstrate that KMC is associated with a statistically significant improvement in survival, along with reductions in key morbidities such as hypothermia and sepsis, and a shorter duration of hospital stay. These results reinforce the growing body of evidence supporting KMC as an effective, low-cost intervention in resource-limited settings.

The observed survival rate in the KMC group (89.7%) was significantly higher than in the conventional care group (75.9%). This finding is consistent with earlier systematic reviews and meta-analyses, including the Cochrane review by Conde-Agudelo and Díaz-Rossello, which reported a significant reduction in neonatal mortality among low birth weight infants receiving KMC [6]. Similarly, Boundy et al. demonstrated that KMC was associated with a reduction in mortality by up to 40% among stable preterm neonates [7]. The survival benefit observed in the present study, although modest, aligns with these findings and supports the applicability of KMC in routine clinical practice.

A notable finding in this study was the significantly lower incidence of hypothermia in the KMC group. Thermal regulation is one of the primary physiological benefits of skin-to-skin contact, which helps maintain neonatal body temperature within the optimal range. This observation is in agreement with previous studies that have demonstrated improved thermoregulation with KMC compared to incubator care [7]. Given that hypothermia is a major contributor to neonatal morbidity and mortality in preterm infants, particularly in low-resource settings, this finding has important clinical implications.

The reduction in sepsis rates among neonates receiving KMC is another important outcome. The protective effect of KMC against infections may be attributed to multiple mechanisms, including enhanced breastfeeding, colonization with maternal skin flora, and reduced exposure to nosocomial pathogens. This finding is consistent with earlier reports that have documented lower rates of severe infections in neonates managed with KMC [6].

Although the difference in feeding intolerance between the two groups was not statistically significant, the trend toward lower incidence in the KMC group suggests potential benefits that may become more evident with larger sample sizes.

The study also demonstrated a significantly shorter duration of hospital stay among neonates receiving KMC. This finding has both clinical and economic implications, as reduced hospitalization not only reflects faster recovery but also decreases healthcare costs and resource utilization. Similar observations have been reported in previous studies, where KMC was associated with earlier discharge and improved weight gain trajectories [7]. In high-burden healthcare settings, such reductions can help alleviate pressure on neonatal intensive care units.

Subgroup analysis revealed that the survival advantage of KMC was more pronounced among very low birth weight neonates (<1500 g), where a statistically significant difference was observed. This is particularly relevant, as this subgroup is at the highest risk of mortality and complications. Previous studies have also highlighted that the benefits of KMC are more evident in smaller and more vulnerable neonates, further supporting targeted implementation strategies.
From a public health perspective, the findings of this study underscore the importance of integrating KMC into routine neonatal care protocols, especially in resource-constrained settings. Given its

simplicity, cost-effectiveness, and minimal technological requirements, KMC has the potential to bridge gaps in neonatal care where advanced facilities are limited. In India, where the burden of preterm birth remains high, strengthening KMC implementation could contribute significantly to achieving national and global neonatal survival targets.

The strengths of this study include its prospective design, standardized data collection, and comparable baseline characteristics between study groups, which enhance the validity of the findings. However, certain limitations must be acknowledged. As an observational study, the potential for selection bias and residual confounding cannot be entirely excluded. The relatively small sample size and single-center setting may limit the generalizability of the findings. Additionally, long-term neurodevelopmental outcomes were not assessed, which could provide further insight into the broader benefits of KMC.

CONCLUSION

This study demonstrates that Kangaroo Mother Care (KMC) is associated with a significant improvement in survival among preterm neonates in a tertiary care hospital setting. In addition to enhancing survival rates, KMC was found to reduce the incidence of hypothermia and sepsis and was associated with a shorter duration of hospital stay. These findings highlight the clinical effectiveness of KMC as a simple, low-cost, and feasible intervention in resource-constrained environments. The benefits observed were particularly pronounced among very low birth weight neonates, emphasizing the importance of early initiation and sustained implementation of KMC in high-risk groups. Given its minimal infrastructure requirements and strong physiological basis, KMC should be integrated as a standard component of neonatal care protocols, especially in settings with limited access to advanced neonatal intensive care facilities. Further multicentric studies with larger sample sizes and long-term follow-up are recommended to validate these findings and assess neurodevelopmental outcomes. Strengthening training, awareness, and institutional support for KMC can play a crucial role in improving neonatal survival and achieving broader public health goals.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.
Consent: Written informed consent was obtained from the parents or legal guardians of all participants.
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