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ORIGINAL ARTICLE

# Effectiveness of Kangaroo Mother Care in enhancing survival and health outcomes among preterm neonates in a resource-limited tertiary care setting

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## ABSTRACT

**Objectives:** To evaluate the efficacy of Kangaroo Mother Care (KMC) in improving survival rates, weight gain, and reducing hospital stay duration among preterm neonates in a tertiary care hospital in Pakistan.

**Methods:** A two-year retrospective study was conducted at Hayatabad Medical Complex Peshawar, Pakistan from August 2021 to July 2023. A total of 213 preterm neonates with birth weights between 1.5 to 2.5 kg were included. Out of these, 168 neonates received KMC, while 10 were transferred to a nursery, and 35 were discharged without KMC due to parental refusal. Data on neonatal demographics, maternal factors, duration of hospital stay, and weight gain were collected and analyzed using descriptive and comparative statistical tests.

**Results:** Mean daily weight gain was 16.6±4.2 g, and 87.5% maintained a stable body temperature. Most KMC neonates (57.14%) were discharged within 4-6 days, with no in-hospital mortality. Follow-up showed survival rates of 98.68% at one month and 99.19% at three months among reachable neonates. Two neonates died within one month, one from pneumonia and the other from sepsis, while another neonate died later due to sudden unexpected infant death syndrome. Hypothermia (12.5%) and minor illnesses (2.4%) were rare, with no cases of apnea reported. Exclusive breastfeeding and satisfactory weight gain were achieved in all KMC neonates.

**Conclusion:** KMC is an effective intervention for improving survival, weight gain, and reducing morbidity in preterm neonates. It offers a low-cost, resource-efficient alternative to conventional neonatal care and should be widely implemented in resource-limited settings to reduce neonatal mortality.

**Keywords:** Kangaroo-Mother Care Method (MeSH): Premature Infants (MeSH); Infant, Premature (MeSH); Weight Gain (MeSH); Neonatal Mortality (MeSH); Infant Mortality (MeSH).

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## INTRODUCTION

Neonatal mortality remains a critical global health issue and a key focus of the United Nations Sustainable Development Goals (SDGs), which aim to reduce neonatal mortality to 12 deaths per 1,000 live births by 2030.[1] Low birth weight (LBW), primarily caused by prematurity or intrauterine growth restriction, and is a major contributor to neonatal mortality. Annually, over 20 million infants are born with LBW worldwide, accounting for 15.5% of all births, placing these infants at increased risk of mortality and long-term complications.[2] In 2017, nearly 80% of the 2.5 million neonatal deaths globally occurred among LBW infants, with two-thirds being preterm.[3]

Pakistan faces one of the highest neonatal mortality rates globally, compounded by limited resources, inadequate specialized care, and a shortage of trained healthcare providers.[4] Addressing these challenges requires cost-effective and accessible interventions. Kangaroo Mother Care (KMC) is a proven, evidence-based, low-cost approach that significantly improves neonatal outcomes. KMC incorporates skin-to-skin contact, exclusive breastfeeding, and early discharge, reducing neonatal morbidity and mortality, particularly in resource-constrained settings.[5,6]

While global evidence supports KMC's role in improving weight gain, preventing hypothermia, and fostering maternal-infant bonding, local barriers to its adoption in Pakistan require further investigation.[7,8] This study was planned to evaluate the effectiveness of KMC in a tertiary care hospital, focusing on neonatal survival, weight gain, and early discharge, to advocate for its broader implementation as a strategy to reduce neonatal mortality in resource-limited settings.

## METHODS

This two-year retrospective study was conducted in the Department of Obstetrics and Gynaecology at Medical Teaching Institute, Hayatabad Medical Complex, Peshawar, Pakistan from August 2021 to July 2023, to evaluate the effectiveness of Kangaroo Mother Care in improving survival and health outcomes of preterm neonates. The study included preterm infants with birth weights between 1.5 kg and 2.5 kg admitted to the neonatal unit, excluding those admitted for reasons other than prematurity or low birth weight.

Ethical approval was obtained from the Institutional Research and Ethics Board (IREB) of Hayatabad Medical Complex, (HMC-QAD-F-OO/1271 dated 10-04-2023) and strict measures were taken to maintain patient confidentiality, with all data anonymized.

Data were retrospectively collected from hospital records, covering neonatal parameters such as birth weight, gestational age, duration of hospital stay, and maternal demographics, including age, parity, and education level. The primary outcomes assessed were neonatal survival, weight gain, and hospital stay duration among neonates who received KMC.

Data analysis involved descriptive statistics for categorical variables (e.g., maternal age, parity, educational status, and birth weight) using frequency distributions and percentages. Continuous variables, such as weight gain and hospital stay duration, were analyzed using mean ± standard deviation.

**Table I: Demographics of Kangaroo Mother Care mothers (n = 168)**

| Characteristic | | Frequency | Percentage |
|---|---|---|---|
| Age | < 25 years | 29 | 17.26 |
| | 26 - 35 years | 93 | 55.36 |
| | >35 years | 46 | 27.38 |
| Parity | Primi | 67 | 39.88 |
| | Multi | 82 | 48.81 |
| | G. Multi | 19 | 11.31 |
| Education | Educated | 57 | 33.93 |
| | Uneducated | 111 | 66.07 |

**Table II: Demographics of Kangaroo Mother Care neonates (n=168)**

| Characteristic | | Frequency | Percentage |
|---|---|---|---|
| Weight of baby | < 2 kg | 73 | 43.45 |
| | 2 - <2.5 kg | 95 | 56.55 |
| Stay in hospital | < 3 days | 65 | 38.69 |
| | 4 to 6 days | 96 | 57.14 |
| | 7 days or more | 7 | 4.17 |
| Gestational age | 36 weeks or more | 28 | 16.67 |
| | 34 - 36 weeks | 91 | 54.17 |
| | < 34 weeks | 49 | 29.17 |
| Temperature | 36.5 – 37.5 °C | 147 | 87.50 |
| | < 36 °C | 21 | 12.50 |
| Referred to nursery | | 10 | 4.69 |
| Satisfactory weight gain | | 168 | 100 |
| Exclusive breastfeeding | | 168 | 100 |

**Table III: Follow-up of Kangaroo Mother Care neonates (n = 168)**

| Follow up | Reachable | Lost follow up | Outcome (Reachable babies) | | |
|---|---|---|---|---|---|
| | | | Alive | Dead | Alive (%) |
| After 1 month | 151 | 17 | 149 | 2 | 98.68 |
| After 3 month | 123 | 45 | 122 | 1 | 99.19 |

## RESULTS

During the study period, a total of 12,408 babies were delivered at Department of Obstetrics and Gynaecology, Medical Teaching Institute, Hayatabad Medical Complex, Peshawar, Pakistan. Of these, 213 (1.72%) were preterm neonates with birth weights ranging between 1.5 and 2.5 kg. Out of the preterm neonates, 168 (78.87%) were managed using Kangaroo Mother Care (KMC), while 10 (4.69%) were transferred to the nursery due to medical indications, and 35 (16.43%) were discharged after parental refusal of KMC.

The majority of mothers (66.07%) in the KMC group were uneducated, and 55.36% were aged between 26 and 35 years (Table 1). The parity distribution showed that 39.88% of mothers were primiparous, while 48.81% were multiparous.

Among the KMC neonates, 56.55% had a birth weight between 2.0 and 2.5 kg, while 43.45% weighed less than 2.0 kg (Table II). The mean gestational age was 34.2 ± 1.8 weeks. Most neonates (57.14%) had a hospital stay duration of 4 to 6 days, and 87.50% maintained a stable body temperature (36.5–37.5 °C) during the hospital stay. The mean daily weight gain for KMC infants was 16.6 ± 4.2 g/day.

The follow-up of neonates receiving KMC revealed high survival rates among reachable babies (Table III). After one month, 151 neonates were reachable, while 17 were lost to follow-up. Among the reachable neonates, 149 (98.68%) were alive, and 2 had died, one due to pneumonia and the other due to sepsis. By the three-month follow-up, 123 neonates remained reachable. Of those reachable at three months, 122 (99.19%) were alive, and 1 neonate had died due to sudden unexpected infant death syndrome. KMC neonates experienced a lower incidence of hypothermia (12.5%) and minor illnesses (2.4%), with no cases of apnea reported.

## DISCUSSION

This study highlights the significant benefits of Kangaroo Mother Care in improving neonatal survival and reducing complications like hypothermia and minor illnesses. The high survival rates observed reinforce its efficacy, particularly for preterm and low-birth-weight infants in resource-limited settings. However, challenges in maintaining follow-up, with a notable proportion of neonates lost to follow-up, underline the need to enhance follow-up care and address barriers to broader KMC implementation.

Our study's findings on the efficacy of Kangaroo Mother Care (KMC) in enhancing the survival and growth of preterm neonates align with existing literature. KMC, characterized by skin-to-skin contact, exclusive breastfeeding, and early discharge, has consistently been shown to reduce neonatal mortality and improve outcomes, particularly in resource-limited settings such as Pakistan.[9,10] In this study, the preterm neonates who received KMC had significantly higher survival rates and better weight gain compared to those who did not. The average daily weight gain in KMC neonates was 16.6 ± 4.2 g, comparable to similar studies that reported weight gains of 15.9 ± 4.5 g per day in preterm neonates receiving KMC.[11] The skin-to-skin contact provided by KMC plays a crucial role in thermoregulation and the prevention of hypothermia. In our study, 87.50% of KMC neonates maintained a stable body temperature during their hospital stay. The incidence of hypothermia (12.50%) in this study was significantly lower than reported in non-KMC neonates, supporting the protective role of KMC against temperature instability.[12,13]

The study also highlighted the reduction in neonatal morbidity. Only 2.4% of the KMC neonates experienced minor illnesses, which is notably lower compared to studies on non-KMC neonates.[14,15] Additionally, none of the neonates in this study developed apnea, which has been shown in other studies to be significantly reduced by KMC, as skin-to-skin contact may protect against apnea events.[16,17]

Regarding hospital stay, KMC neonates had a shorter length of stay, with most discharged within 4 to 6 days. This finding aligns with other studies, though some research indicates that socioeconomic and cultural factors can lead to longer hospital stays.[18] In this study, the conservative cultural background and the socioeconomic status of the families may have influenced the early discharge of neonates, as families often prefer to minimize hospital stay due to financial constraints.

No neonatal mortality occurred during the hospital stay, which is a promising outcome of KMC implementation. However, follow-up data revealed two deaths within the first month after discharge-one due to pneumonia and the other due to sepsis. At the three-month follow-up, one additional death was reported due to sudden unexpected infant death syndrome. These findings underscore the need for continued post-discharge care for KMC neonates, particularly in resource-limited settings like Pakistan where access to postnatal care is often inadequate.

### Limitations of the study

This study has several limitations. Its retrospective design relied on hospital records, which may introduce reporting bias, and being a single-center study, the findings may not be generalizable. The sample size was relatively small, and the follow-up period of three months was insufficient to assess long-term outcomes. Parental refusal of KMC for 16.43% of neonates may have introduced selection bias, and confounding factors such as maternal health and socioeconomic status were not controlled. Additionally, the absence of a control group managed without KMC limits the ability to attribute outcomes solely to KMC. Future studies should address these limitations through prospective, multicenter designs with larger cohorts and extended follow-up.

## CONCLUSION

Kangaroo Mother Care has proven to be an effective, low-cost intervention for improving the survival and health of preterm and low-birth-weight neonates, particularly in resource-limited settings like Pakistan. Our study demonstrated high survival rates, reduced incidences of hypothermia and minor illnesses, and no cases of apnea among neonates receiving KMC. These findings reaffirm the role of KMC in enhancing neonatal outcomes and addressing common challenges in neonatal care. However, the study also highlights the need for better follow-up mechanisms to ensure long-term monitoring and support for these vulnerable infants. Expanding the implementation of KMC through community engagement, healthcare training, and policy support can significantly contribute to reducing neonatal mortality and improving overall child health outcomes.

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## AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

**RA:** Conception and study design, acquisition of data, drafting the manuscript, critical review, approval of the final version to be published

**RK & SSF:** Acquisition, analysis and interpretation of data, drafting the manuscript, critical review, approval of the final version to be published

**SS:** Acquisition, analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

*Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.*

## CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

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## DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request



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