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IMPACT OF A STRUCTURED QUALITY IMPROVEMENT BUNDLE ON THE DURATION OF KANGAROO MOTHER CARE (KMC) IN HEMODYNAMICALLY STABLE LOW BIRTH WEIGHT NEONATES IN A TERTIARY NEONATAL UNIT: A PROSPECTIVE INTERVENTIONAL STUDY

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ABSTRACT

Kangaroo mother care is a method for caring for preterm and low birth weight babies by keeping them in continuous skin to skin contact with their mother (caregivers). Quality improvement research in Kangaroo Mother Care (KMC) for neonates focuses on enhancing the effectiveness and consistency of this crucial care practice. Research efforts aim to increase the duration and coverage of KMC, improves its implementation and ensure its sustainability. This involves identifying barriers to KMC and implementing interventions such as staff training, providing resources, and optimizing the care environment.

KEYWORDS: *KMC, Low Birth Weight, Quality Improvement, Team Work, PDSA*

What is already known ?

**KMC is a low-cost intervention known to reduce mortality in LBW babies*

What this study adds?

In LMICs sustain improvement in KMC is feasible with system changes. The tools for KMC can be developed using QI approach.

Article History

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INTRODUCTION

Background and National Burden

India has the highest number of preterm births globally and contributes substantially to neonatal mortality due to prematurity and low birth weight (LBW) [1]. With nearly 30% of babies born with a weight less than 2500 grams [2], India faces an urgent need for low-cost, effective interventions to improve survival outcomes. According to NFHS-5, institutional deliveries have increased significantly, creating an opportunity to implement facility-based neonatal interventions such as Kangaroo Mother Care (KMC) [3].

Kangaroo Mother Care: Global and Indian Evidence

KMC, as endorsed by the WHO, includes early and prolonged skin-to-skin contact and exclusive breastfeeding. It is a proven intervention that reduces neonatal mortality by 40%, sepsis by 65%, and hypothermia by over 70% [4]. A 2016 Cochrane review confirmed that KMC significantly improves neonatal outcomes including exclusive breastfeeding rates, anthropometric gains, and hospital discharge readiness [5].

Despite being included in national guidelines since 2014 [6], KMC remains underutilized across Indian neonatal units. A national audit by the National Neonatology Forum found that only 52% of public SNCUs were routinely implementing KMC [7]

Challenges to KMC in Indian Settings

Multiple Indian studies have highlighted barriers to prolonged and sustained KMC. These include lack of privacy, inadequate staff training, discomfort due to climate, and socio-cultural constraints [8–10].

In Tamil Nadu, a QI initiative by Jegannathan et al. found that in a high-delivery-volume government hospital, the average KMC duration was only 4.6 hours/day prior to intervention [11]. Their study included systematic intervention using eight sequential PDSA cycles, which increased the average KMC duration to 16.6 hours/day by the end of 8 weeks. The most impactful intervention was the opening of a dedicated *Mother–Neonatal ICU (M-NICU)* — only the second of its kind in India — that allowed for 24/7 maternal presence alongside the neonate [11].

Rationale for the Present Study

Despite strong evidence and national policy backing, real-world implementation of prolonged KMC remains suboptimal in many Indian public health settings. Shorter durations (<6 hours/day) limit the full benefits of KMC. Furthermore, many units lack systematic approaches to sustain KMC over time, especially in resource-constrained hospitals.

This study aims to replicate and adapt a successful QI model developed by Jegannathan et al. in a similar tertiary government setting. It focuses on:

- Improving KMC duration to ≥12 hours/day in stable LBW neonates.
- Identifying context-specific barriers.
- Embedding sustainable practices through education, family support, and structural innovations.

The outcome of this study could inform scale-up strategies in other tertiary neonatal units and align with national goals of reducing neonatal mortality and morbidity.

Primary Objective

To increase the average daily duration of KMC from a baseline of <5 hours to ≥12 hours per baby per day over 2 weeks.

Secondary Objectives

- To identify and address key barriers to KMC implementation.
- To assess the sustainability of improvements over 6 months.
- To evaluate maternal satisfaction and acceptance of KMC practices.

METHODOLOGY

Materials and Methods

Study Design

Prospective interventional QI study

Study Site

NICU, [Neonest hospital], a tertiary care center with Level III neonatal services. Study Duration [January 2025 to June 2025]

Inclusion Criteria

- Neonates <2000g, hemodynamically stable, not on invasive ventilation or phototherapy.

Exclusion Criteria

- Neonates with major congenital anomalies, critical illness.

Intervention Strategy

- Privacy provision
- Documentation via KMC charts
- Motivation via customized weight tracking
- Case sheet monitoring
- Increase in KMC
- Establishment of mother–neonatal ICU (M-NICU)

Outcome Measures

- Primary: Average KMC hours per baby per day.
- Secondary: Percentage of mothers using charts, maternal comfort, and satisfaction (survey-based).

Sample Size Calculation

Based on paired-sample t-test assumptions from previous Indian QI studies [1,3], a sample size of **30 mother–baby dyads** was considered adequate to detect an increase in KMC duration from a baseline of 4.6 hours/day to ≥12 hours/day, with 90% power and 5% significance level. An additional 20% was added for potential attrition, leading to a target sample size of **36 dyads**.

Baseline Data Collection

Over a two-week period, baseline data were collected using:

- **24-hour maternal recall** of KMC duration
- Bedside nurse logs
- Review of case sheets

The average KMC duration was calculated in **hours per baby per day**.

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Table 1

Mean Gestational Age	31.3 Weeks
Mean Birth Weight	1450 Grams
Male	20
Female	16
LBW	18
VLBW	13
ELBW	5

A **Fishbone (Ishikawa) diagram** was used to identify barriers to prolonged KMC, as per the methods used in Jegannathan et al. and Joshi et al. [1,2].

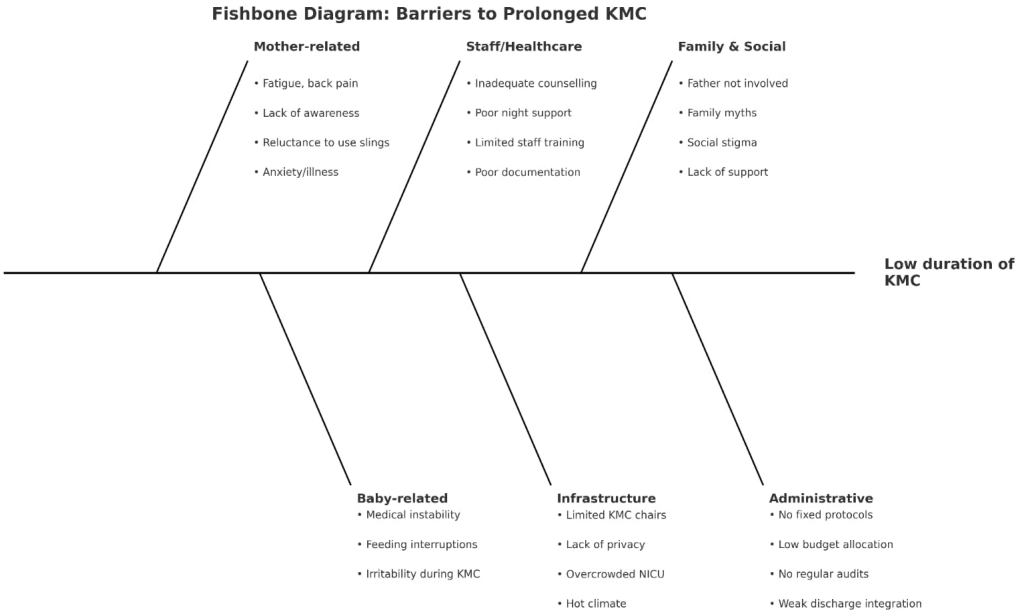

Figure 1

RESULT

A total of 36 mother infant dyads participated in the implementation phase of 2 months. Demographic details of the participants are mentioned in table 1.

Lack of privacy was one of the main barriers, To address this, a separate room designated as KMC room was allocated. Process indicator used for this was number of mothers putting KMC outside this segregated area. The mean duration increased to 6.9 hours/baby/day. We continue to segregate mothers putting KMC in KMC room to ensure privacy.

We also planned and ensured the objective documentation of KMC duration. KMC charts were given to all mothers practicing KMC. This was an easy to use chart, which required daily marking the hours of KMC by mothers. Data was then compiled by research nurse on daily basis. Process indicator was percentage of mothers having KMC charts. Duration of KMC increased to 8.5 hours/baby/day by using this.

To improve motivation among the mothers putting KMC, customised weight chart was printed at the back of KMC chart. This would help to track the weight of the baby on a daily basis and reinforce to mothers that prolonged KMC duration will help to achieve better weight gain for the baby. We used Ehrenkranz weight chart customised to nearest 100 g of baby's birth weight for babies with weight between 800 g to 1500 g.

Average KMC duration increased to 9.5 hours/baby/day. This practice of combining KMC charts with weight charts is now a routine in our unit.

In order to identify the non-compliance among mothers, daily KMC duration was documented in baby case sheet during morning rounds. This drew the attention of doctors and nurses toward the mothers who were not practising KMC for adequate duration and helped to provide more attention and counselling to such mothers to further motivate them. KMC duration increased to 10.3 hours/baby/day. All the KMC eligible babies in the unit now have KMC duration documented in case sheet.

As a part of quality assurance measure, the number of KMC chairs in the unit was increased. Process indicator used was percentage of mothers practising KMC without a KMC chair. This helped to increase the KMC duration to 11.1 hours/baby/day.

In order to promote the policy of 'zero separation' of mother baby dyad and to improve family centred care in our unit, 'mother–neonatal ICU' was opened in our hospital. This is only second of its kind unit in entire country. In this 10-bedded unit, babies requiring level 2 care are kept in warmers, with mother's cot being next to her baby. Routine obstetric postnatal care is provided to mothers round the clock by the obstetric team. KMC duration increased to 13.1 hours/ baby/day.

To increase KMC-related education among mothers and our healthcare staff, we prepared KMC education videos inocal language. These videos were displayed in the department daily for educating the mothers. These videos also helped in clearing doubts among many healthcare workers regarding ideal KMC practices. The average KMC duration increased to 15.2 hours/baby/day.

DISCUSSION

KMC is proven to reduce hypothermia, hypoglycaemia and sepsis among LBW babies, but also has a direct role in reducing neonatal mortality significantly.6 Despite these, full integration of KMC in routine care of LBW worldwide is facing challenges. Lack of involvement of family members in providing KMC and less family support is identified as a significant barrier to prolonged KMC.7 So, to tackle this, M-NICU and family centred care ward was established in our unit, wherein mother and one more relative is allowed to stay with baby, and asked to provide KMC as soon as baby is hemodynamically stable.

A similar study was conducted by Joshi et al at AIIMS, New Delhi. However, in the current study, the number of mother baby dyads included is more.8

Quasem et al had reported that lack of knowledge among mothers and family members regarding benefits of KMC is one of the main reasons for less KMC duration.9 To address this issue, we had prepared educational videos for mothers in local language. This did help in increasing KMC duration.

Brimdyr et al had reported that one of the barriers was hot climate leading to irritation and sweating among mothers, thereby decreasing KMC duration.10 Though most of the mothers did not complain the same routinely, but they felt that use of KMC slings was causing more sweating and so use of slings is less accepted practice in our unit. To achieve prolonged KMC duration, mother and baby bonding is very important. Kambarami et al had reported that lack of bonding leads to less KMC duration.11 So, the concept of M-NICU was introduced, which ensured that mother stays next to baby and spends more time with baby.

Although appointment of extra nurses and manpower will improve KMC duration, but such change cannot be sustained and will revert back to older ways once additional manpower is withdrawn, as reported by Seidman et al and Jayaraman et al4 Hence, we did not employ additional manpower during this study. Available manpower was used to introduce and sustain changes. Auditing and feedback are considered as backbone of QI project, so we conducted weekly audits to review our performance in various change ideas introduced and to review overall KMC duration. After the discussion, necessary modifications were implemented, so as to sustain the change introduced. Some of the other strengths of our study were a higher set target of 12 hours/baby/day as compared with previous studies, combining KMC chart with weight chart customised to that baby, opening of M-NICU and strengthening concept of family centred care.

In a 2021 systematic review by Narciso et al, KMC was proved to be a safe and low-cost intervention, which helps to reduce the duration of hospital stay.13 However, the impact of increased KMC duration on length of hospital stay was not evaluated in the present study.

Mony et al conducted an implementation research study to scale up KMC at multiple sites across Ethiopia and India, with help of local administrative bodies. They were able to ensure good rates of KMC initiation in hospital and were able to sustain them post discharge from hospital.14

KMC has the components, namely, skin-to-skin contact, exclusive breast feeding and early discharge from hospital. This study mainly focused on improving duration of skin-to-skin contact. Impact on rates of exclusive breast feeding were, however, not studied. Also, the impact of prolonged KMC duration on length of hospital stay was not studied. Some of the other limitations of the study were that we did not study the morbidity of the participants and its effect on KMC duration, anthropometric data of babies on prolonged KMC was not studied and we did not follow-up duration of KMC in these babies in community post discharge.

CONCLUSIONS

The findings from this study have shown that quality improvement methods have helped increase the coverage and percentage of babies receiving at least 6-hours KMC per day in our NICU. The duration specified KMC Coverage should be adopted as the quality indicator of KMC. The training of healthcare workers and KMC provider should include hands-on session involving the mother and baby. Minimizing interruption is possible with family support and appropriate scheduling of activities.

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