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Early Kangaroo Mother Care (Kmc) Adoption In The Neonatal Intensive Care Unit: A Quality Improvement Initiative

Dr Udita Chowdhury[1], Dr Kumutha J[2], Dr Harish Sudharsanan[3], Dr Asha A[4], Dr Santhosh Kumar K[5]

[1]Senior Resident, Department of Neonatology, Saveetha Institute of medical and technical sciences
[2]Professor, Dept of Neonatology, SIMATS
[3]Professor, Dept of Neonatology, SIMATS
[4]Professor, Dept of Neonatology, SIMATS
[5]Professor, Dept of Neonatology, SIMATS

ABSTRACT

Background: *Kangaroo Mother Care (KMC) is a proven intervention that enhances thermoregulation, promotes bonding, and improves neonatal outcomes, particularly among preterm and low birth weight infants. Despite well-established benefits, timely initiation of KMC—referred to here as early KMC (KMC)—remains suboptimal in many Neonatal Intensive Care Units (NICUs). Barriers such as lack of standardized protocols, insufficient staff training, and limited parental engagement delay the timely adoption of KMC.*

Methods: *We conducted a quasi-experimental quality improvement study in the NICU of Saveetha Medical College, Chennai, from January 2023 to September 2024. Eligible neonates included all preterm infants regardless of birth weight and term neonates weighing under 2500 g, excluding those with contraindications or mothers unavailable for KMC. A baseline assessment (January–December 2023) quantified current KMC initiation rates. Subsequently, four Plan-Do-Study-Act (PDSA) cycles were executed to address identified barriers. Interventions included standardized protocols, staff training, enhanced parental education, and infrastructural adjustments (e.g., increasing KMC chairs).*

Results: *Baseline data indicated that only 50% of eligible neonates received KMC within the first 24 hours. Post-intervention, this figure increased to 76%. Staff knowledge surveys showed a 50% improvement in awareness and proficiency, while parental engagement rose significantly, with more families participating in KMC sessions. Statistical analyses (chi-square and t-tests) demonstrated that the increase in KMC initiation was both clinically and statistically significant ($p < 0.05$).*

Conclusion: *A systematic quality improvement strategy combining protocol standardization, focused staff education, parental engagement, and resource maximization can significantly enhance the timely initiation of KMC in a resource-constrained NICU setting. Scaling up such efforts has the potential to improve neonatal outcomes by lowering barriers to early KMC initiation.*

Keywords: *Kangaroo Mother Care, Early KMC, NICU, Quality Improvement, PDSA Cycles, Neonatal Outcomes*

INTRODUCTION

Kangaroo Mother Care (KMC) is skin-to-skin contact between the newborn and mother (or caregiver), preferably begun as early as possible after delivery. Originally proposed as a substitute for incubator care in environments with limited resources, KMC has since been identified worldwide as a valuable intervention [1]. Among its benefits are better neonatal thermoregulation, increased success in breastfeeding, and decreased morbidity and mortality in preterm and low birth weight infants [2]. In the last two decades, a number of professional bodies, such as the World Health Organization (WHO), have placed a strong focus on the need to introduce early KMC (KMC) early after birth when the baby is stable [3].

In spite of robust evidence of its success, optimal initiation of KMC is still a challenge in most healthcare centers [4]. The most frequently reported obstacles are the lack of standardized guidelines, insufficient training of the nursing staff, and minimal parental education regarding the advantages and realities of KMC [5]. Organizational-level obstacles like inadequate physical infrastructure and limited monitoring devices also pose complexities in adopting early KMC [6]. Also, cultural beliefs, mother's health status,

and misperceptions by staff regarding the practicability of KMC—particularly during the first 24 hours—can pose impediments to its implementation [7].

Quality Improvement (QI) frameworks, including the Plan-Do-Study-Act (PDSA) model, provide a systematic method of addressing system-level gaps [8]. Systematically identifying bottlenecks, applying focus interventions, assessing outcomes, and refining the process enables QI methodologies to yield success in optimizing neonatal care practices globally [9]. In the setting of a Neonatal Intensive Care Unit (NICU), QI activities aimed at staff and parental involvement, as well as standardization of protocols, are best suited to improve the adoption of early KMC.

This paper reports a quasi-experimental QI study in the NICU of Saveetha Medical College in Chennai, India, between January 2023 and September 2024. The study had two objectives: (1) to measure the baseline rate of early initiation of KMC (within the first 24 hours of life) and the barriers that cause delays, and (2) to implement and assess a series of interventions aimed at enhancing KMC uptake. We anticipated that focused QI interventions—specifically, staff training, parent education, and protocol implementation—would greatly enhance the rate of eligible neonates treated with KMC during the initial 24 hours. By publishing our methods and results, we hope to offer a pragmatic guide for other NICUs to reproduce and modify, eventually enhancing neonatal outcomes for some of the sickest patients.

MATERIALS AND METHODS

Study Design and Setting: A quasi-experimental design with a strong QI component was employed to evaluate the impact of structured interventions on the early initiation of KMC. The study was conducted in the NICU of Saveetha Medical College, Chennai, over 21 months (January 2023–September 2024). This NICU is a tertiary-level care unit that admits both inborn and outborn neonates and manages a broad spectrum of neonatal pathologies.

Inclusion and Exclusion Criteria

- **Inclusion Criteria**:
    1. All preterm neonates, irrespective of birth weight.
    2. Term neonates weighing less than 2500 g.
- **Exclusion Criteria**:
    1. Neonates with contraindications to KMC (e.g., severe congenital anomalies).
    2. Neonates whose mothers were unavailable or unwilling to participate in KMC.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board (IRB) of Saveetha Medical College. Written informed consent was secured from parents or legal guardians prior to their participation in the study. Confidentiality and anonymity were maintained by using coded identifiers.

Study Phases

1. **Pre-Intervention (Baseline) Phase** (January–December 2023)
   During this 12-month period, we collected baseline data on KMC initiation rates within the first 24 to 72 hours. A standardized data extraction form was used to record the proportion of neonates receiving KMC, along with potential barriers such as staff workload, maternal education, and NICU infrastructure.
2. **Intervention Phase** (January–June 2024)
   Four sequential PDSA cycles were implemented, each lasting approximately three weeks, followed by a six-week monitoring period. The interventions targeted the barriers identified during the baseline assessment.
    - **PDSA Cycle 1**: Integration of immediate KMC into NICU protocols and standardization of guidelines.
    - **PDSA Cycle 2**: Staff training and education, including hands-on workshops, digital modules, and simulation.
    - **PDSA Cycle 3**: Parental education and engagement through counseling, printed materials, and demonstration videos.
    - **PDSA Cycle 4**: Establishment of a dedicated KMC ward area, increasing the number of KMC chairs, and ensuring mothers could remain close to their neonates.

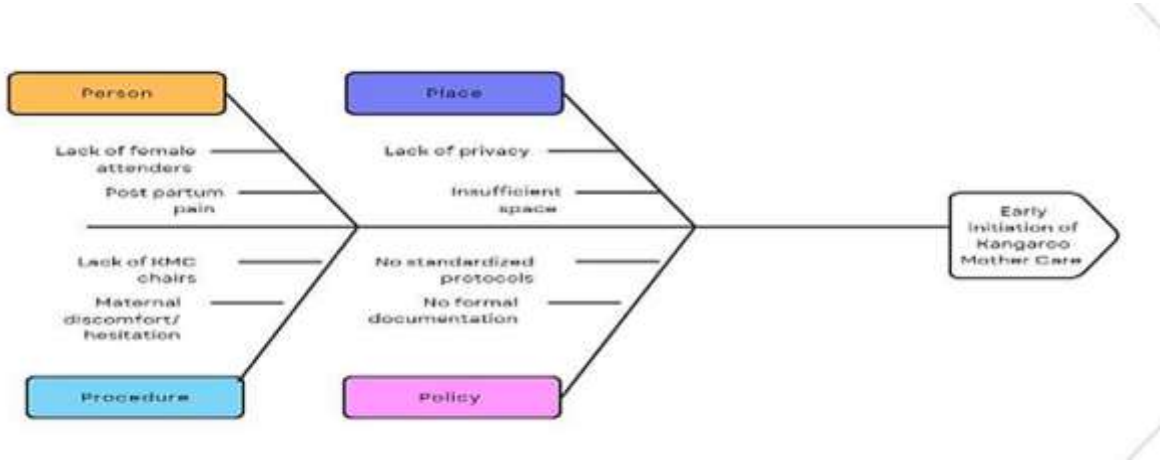
3. **Post-Intervention Phase:** (July–September 2024) Data were collected for an additional three months to measure improvements in early KMC initiation and associated outcomes. Ongoing feedback from staff and parents helped refine the protocols.

Data Collection and Outcome Measures

- **Primary Outcome**: Proportion of eligible neonates receiving KMC within the first 72 hours, with particular emphasis on the first 24 hours as a core milestone.
- **Secondary Outcomes**:
    1. Enhancement of staff knowledge (assessed by pre- and post-training surveys).
    2. Parental engagement (assessed by the frequency of mother–newborn contact sessions and parental feedback).
    3. Protocol adherence (e.g., completeness of documentation, timeliness of KMC initiation according to guidelines).

Statistical Analysis: Data were entered into a secure database and analyzed using SPSS (version 25.0). Categorical variables (e.g., proportion of neonates receiving KMC within 24 hours) were compared using chi-square tests. Continuous variables (e.g., mean time to KMC initiation) were assessed using Student's t-test. Statistical significance was defined as $p < 0.05$. Trends across the four PDSA cycles were evaluated to gauge the incremental effects of each targeted intervention.

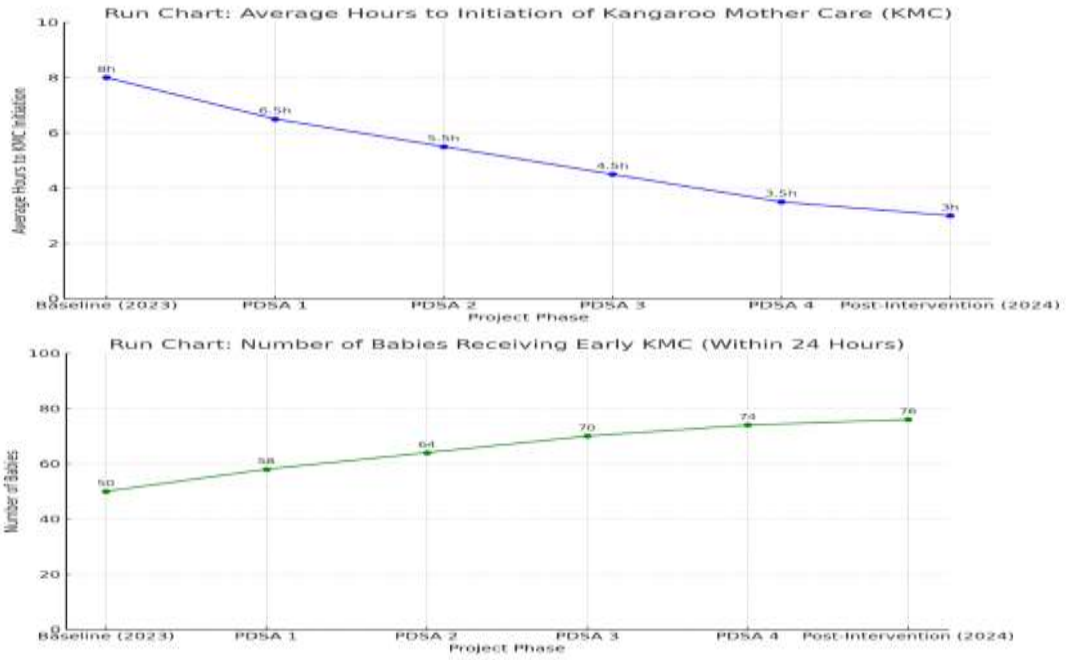
RESULTS



Overview of Findings: A total of 200 neonates (100 in 2023 and 100 in 2024) met the inclusion criteria. The baseline analysis (2023) revealed that only 50% of eligible infants were receiving KMC within the first 24 hours of life. The major identified barriers included a lack of consistent protocols, insufficient staff familiarity with KMC, and limited parental understanding of the benefits of skin-to-skin contact.

Following the implementation of the four PDSA cycles from January to June 2024, the proportion of infants receiving KMC within 24 hours rose to 76%. This was a statistically significant improvement ($p < 0.05$). Additionally, staff knowledge and confidence in initiating KMC showed a marked increase, and parental engagement metrics improved substantially.

Phase	Description	Avg. Time to KMC (hrs)
Baseline	Pre-intervention period (2023)	8
PDSA Cycle 1	Protocol standardization	~6.5
PDSA Cycle 2	Staff education	~5.5
PDSA Cycle 3	Parental education	~4.5
PDSA Cycle 4	Infrastructure improvements (KMC area, chairs, etc.)	~3.5
Post-Intervention	Jul–Sep 2024 (after all interventions)	3



DETAILED RESULTS

1. Baseline and Post-Intervention Comparisons

Staff and parent surveys conducted in the pre-intervention phase underscored the need for an official KMC protocol. Post-intervention surveys indicated that 80% of staff members felt "very confident" in initiating KMC, compared to only 30% in the baseline phase.

TABLE 1. BASELINE VS. POST-INTERVENTION KMC RATES

Period	Number of Eligible Neonates	KMC within 24h (%)	KMC within 72h (%)
Baseline (2023)	100	50	60
Post-Intervention (2024)	100	76	85

Chi-square analysis showed a significant increase ($p < 0.05$) in KMC initiation rates within the first 24 hours post-intervention.

2. Distribution of Gestational Ages and Birth Weights

During both study periods, neonates ranged from extremely preterm (28 weeks) to near-term (36+ weeks). In 2023, the distribution was skewed toward lower gestational ages (28–32 weeks), whereas in 2024, there was an increase in near-term and term low-birth-weight infants.

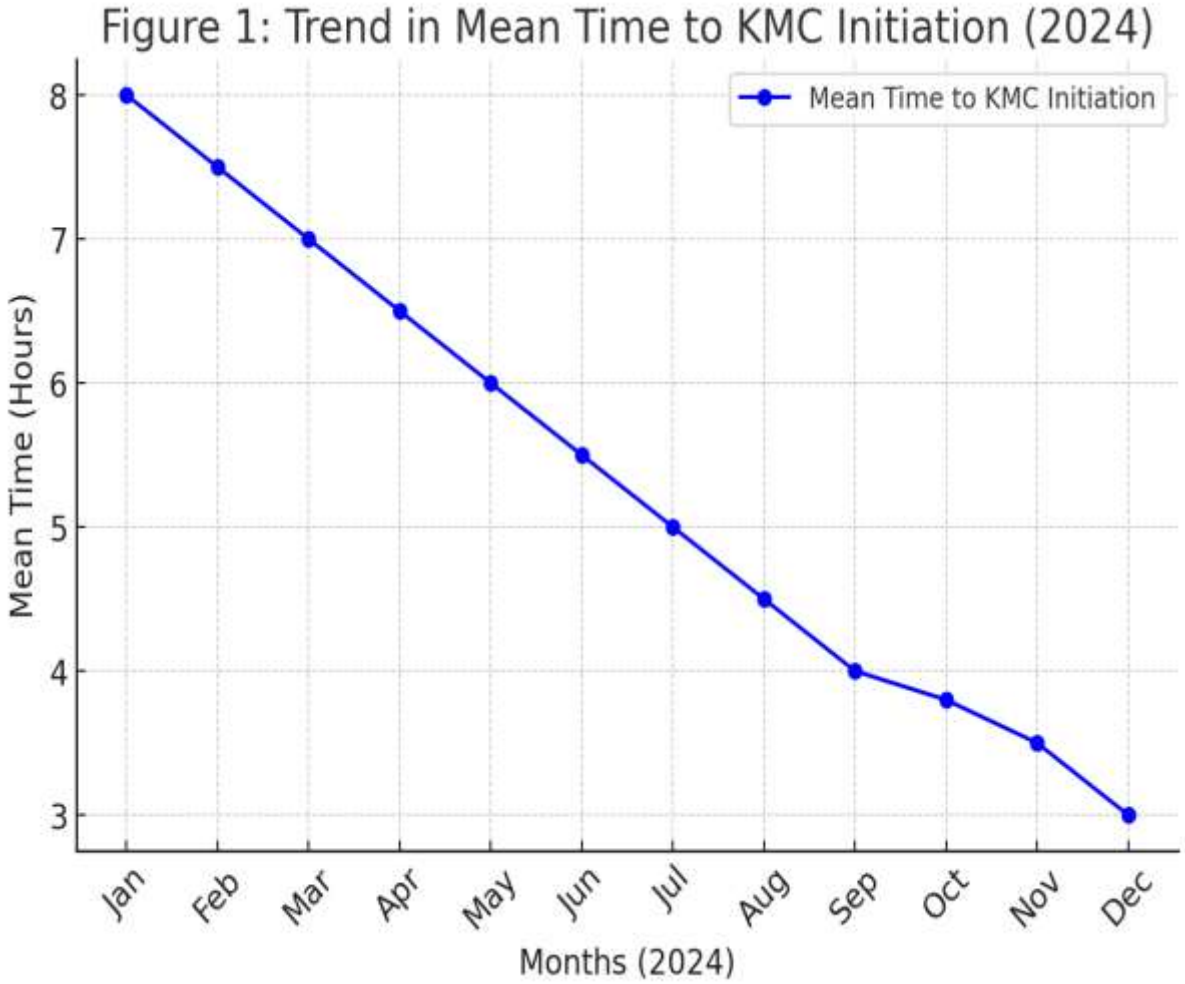
TABLE 2. DISTRIBUTION OF NEONATES BY GESTATIONAL AGE (2023 VS. 2024)

Gestational Age (weeks)	2023 (n=100)	2024 (n=100)
28–30	20	18
30–32	25	22
32–34	20	18
34–36	25	30
>36	10	12

A notable observation for the 2024 cohort: among those 34–37 weeks (n=65), 20 had birth weights >2500 g but still underwent KMC if clinically indicated.

3. Time to KMC Initiation: Figure 1 shows the trend in time (in hours of life) to KMC initiation from January to September 2024. A t-test comparing mean initiation time in January vs. August 2024 yielded $p < 0.05$, underscoring significant improvement.

FIGURE 1. TREND IN MEAN TIME TO KMC INITIATION (2024)



INTERPRETATION: The line chart indicates a significant reduction in the mean time taken to initiate Kangaroo Mother Care (KMC). The time has decreased from approximately 8 hours to around 3 hours over the observed period, reflecting improved awareness, efficiency, and accessibility of KMC practices in neonatal care.

4. Parental Engagement and Staff Knowledge

Parental acceptance of KMC improved markedly after repeated counseling and distribution of informational pamphlets. As displayed in Table 3, the percentage of parents providing positive feedback regarding KMC practices rose from 55% in 2023 to 83% in 2024. Similarly, staff knowledge assessed by a pre- and post-training test improved by 50%.

TABLE 3. PARENTAL ENGAGEMENT AND STAFF KNOWLEDGE SCORES

Variable	2023	2024
Positive Parental Feedback (%)	55	83
Staff Knowledge Improvement Score*	30	80

* Percentage of staff scoring ≥80% on standardized KMC knowledge tests.

5. Infrastructure and Protocol Adherence: During PDSA Cycle 4, a dedicated KMC ward area was introduced with additional chairs. Protocol adherence improved as staff could consistently position mothers for KMC without logistical hurdles. Figure 2 illustrates the increased use of KMC chairs over the monitored period.

Figure 2. Utilization Rate of KMC Chairs Over Time:

INTERPRETATION: The bar chart illustrates a steady rise in the percentage of neonates whose mothers utilized the dedicated KMC chairs. This upward trend suggests increased adoption of KMC, likely driven by enhanced facilities, training, and maternal education, ultimately improving neonatal health outcomes.

DISCUSSION

Our findings demonstrate that a structured quality improvement initiative can effectively increase the rate of early KMC initiation in a busy tertiary NICU setting. Before the QI interventions, staff and parental awareness was limited, and KMC lacked standard protocols, resulting in delayed initiation. These baseline observations align with earlier studies indicating that while KMC is universally endorsed, actual practice often lags behind recommended guidelines [10, 11].

Through four sequential PDSA cycles, this study targeted multiple layers of intervention—protocol standardization, staff training, parental education, and improved infrastructure. The synergy of these interventions was key. Staff training sessions, echoing prior research, proved crucial for boosting the confidence and competence of healthcare professionals, who are directly responsible for initiating KMC [12]. Our observations also mirror findings that robust parental engagement is vital for sustained success [13]. When parents were informed about the safety and advantages of KMC, their willingness to participate increased, thereby decreasing time to initiation [14].

Another salient feature was the introduction of a dedicated KMC ward area, a strategy reported in similar QI projects [15]. By providing additional chairs and a mother–newborn space, logistical barriers were reduced, and staff could swiftly and consistently facilitate KMC. This supports the notion that environmental modifications, combined with standardized protocols, can effectively remove structural barriers [16, 17].

Statistical analyses confirm the clinical relevance of the observed improvements: the jump from 50% to 76% of neonates receiving KMC within 24 hours was both statistically and practically significant. Previous studies suggest that early KMC within the first 24–72 hours can reduce complications like hypothermia, sepsis, and feeding difficulties [18, 19]. Although our study primarily focused on process outcomes (i.e., proportion receiving KMC), the observed changes hold promise for improved clinical endpoints [20].

Despite these positive findings, the study has certain limitations. It was confined to a single center with a particular patient population, limiting broader generalizability. Additionally, the relatively short post-intervention phase might not capture long-term sustainability. Nonetheless, our results highlight the feasibility and impact of a concerted QI approach. Future research could expand upon this framework by integrating telehealth modules for parental education or exploring cost-effectiveness analyses of KMC programs [21–25].

In summary, this QI initiative underscores the importance of simultaneously addressing institutional protocols, staff training, parental education, and physical infrastructure to optimize early KMC practices.

By doing so, NICUs can better align with global recommendations, ensuring that vulnerable neonates reap the established benefits of KMC.

CONCLUSION

In this quasi-experimental quality improvement project, the combined implementation of standardized practices, focused staff education, parent education, and increased infrastructure successfully raised early Kangaroo Mother Care (KMC) rates in a resource-constrained NICU. By rising KMC initiation within the initial 24 hours from 50% to 76%, we proved the potential of a multifaceted intervention to overcome delays to early skin-to-skin contact. These results provide a working model for other units to improve neonatal outcomes. Sustained efforts to maintain these gains and translate them into other settings are still critical to larger neonatal health gains.

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