ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Improving The Duration Of Kangaroo Mother Care (KMC) Using KMC Sling Bag: A Quality Improvement Initiative In A Tertiary Neonatal Unit.

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ABSTRACT

Kangaroo Mother Care (KMC) stands out as a straightforward, evidence-based, high-impact intervention that requires minimal resources. It effectively improves both short-term and long-term outcomes in preterm and low birth weight infants. Despite the evidence, its adoption & implementation has been low. Aim of the present study is to improve the duration of KMC in stable LBW & preterm babies from an average of 3 hours per day to atleast 9 hours per day over 6months period by quality improvement approach in a rural tertiary neonatal unit. All haemodynamically stable preterm/LBW mother-baby dyads admitted in our NICU & postnatal ward were enrolled (n=100) in this Quality improvement (QI) study. With the point of care QI methodology, we performed Plan-Do-Study-Act (PDSA) cycles to improve the duration of KMC practice. KMC sling bags were introduced & subsequently tested by multiple PDSA cycles. Data on duration of KMC per day was recorded & analysed on daily basis. The duration of KMC increased to 9hours per day over a period of 6months.We achieved our goal by step-wise implementation of QI changes through construction of 5PDSA cycles. Introduction of KMC sling bags was an important quality improvement initiative to increase the duration of KMC in this study.

Keywords: Neonate, Preterm babies, Counselling, low birth weight.

https://doi.org/10.33887/rjpbcs/2024.15.3.29

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ISSN: 0975-8585

INTRODUCTION

Premature birth (defined as gestational age less than 37 weeks) and low birth weight (<2.5 kg) are significant contributors to both neonatal and infant mortality, as well as long-term neurodevelopmental disabilities [1]. These issues disproportionately affect low and middle-income countries (LMICs), where the burden of preterm births and low birth weight infants is highest [2]. In India, roughly 18% of live births are due to prematurity, while the prevalence of low birth weight is around 20%, according to the National Family Health Survey-4 [3]. Kangaroo mother care (KMC) is an uncomplicated, cost-effective, evidence-based intervention that yields substantial impact, leading to decreased neonatal mortality and reduced risk of severe infection among low birth weight (LBW) and preterm neonates [4].

As per the World Health Organization (WHO), KMC is characterized by early, continuous, and extended skin-to-skin contact between the mother (or other caregivers) and the baby [5]. KMC serves as a pivotal global benchmark for evaluating the quality of newborn care [6, 7]. When contrasted with conventional newborn care methods, Kangaroo Mother Care (KMC) has demonstrated a mortality reduction of over 50% [8, 9]. Moreover, it diminishes the occurrence of morbidities such as severe infection by 42% and hypothermia by 23% [9]. Additionally, KMC facilitates improved growth in weight, head circumference, and length, while simultaneously reducing readmission rates. Furthermore, it promotes breastfeeding initiation and nurtures the bonding between the mother and the newborn [10, 11]. The Government of India has issued guidelines to improve healthcare workers' proficiency in facility-based Kangaroo Mother Care (KMC) [10]. However, despite its incorporation into various guidelines and training modules, there exists an implementation gap for KMC [12, 13]. Adoption and execution of KMC remain low, with average durations ranging from 3 to 5 hours per day in Indian studies [14, 15]. Even in units where KMC policies exist, uptake remains relatively low. A preliminary survey in our unit revealed an average KMC duration of 3 hours/day, prompting the initiation of this study as our unit's first Quality Improvement (QI) project.

To tackle this issue, we employed a Quality Improvement (QI) approach to systematically address bottleneck areas. Our aim was to enhance the duration of Kangaroo Mother Care (KMC) per day from the current baseline of 3 hours to 9 hours for eligible preterm mother-infant pairs admitted to our facility.

MATERIALS AND METHODS

The research was carried out in Bangalore, India, spanning a period of six months (June 2023 to December 2023). Ethical clearance was obtained from the Institutional Ethics Committee [MVJMC & RH / IEC-12/2023] before conducting the study. Informed consent was obtained from the mother's enrolled in the study.

Inclusion criteria

All haemodynamically stable preterm/LBW mother-baby dyads admitted in our NICU & postnatal ward were enrolled in this Quality improvement (QI) study.

Exclusion criteria

Clinically unstable babies those on invasive respiratory support, phototherapy, where mothers/care givers were not available & term or post term babies.

Data Collection

Baseline data collection was done. The study aimed to increase Kangaroo Mother Care (KMC) duration from 3 to 9 hours/day over six months for stable preterm and low birth weight infants in Bangalore, India. A Quality Improvement (QI) team (includes consultants, resident doctors, nurses) led by a consultant, utilized Plan-Do-Study-Act (PDSA) cycles to address barriers identified through a fishbone diagram (Figure 1).

Barriers were pinpointed through fishbone analysis, revealing several key obstacles. Foremost among these were insufficient support and counseling for mothers, along with a lack of knowledge and documentation regarding KMC. Concerns over the baby slipping during KMC, inadequate privacy, as well as stress and discomfort due to uncomfortable seating, were also identified as significant factors hindering implementation. These potential barriers to prolonged KMC in our unit were discussed during the first QI meet. Based on this analysis, possible interventions were listed out.

The QI team opted for a strategy of implementing one intervention per week, accompanied by weekly meetings to evaluate the impact of each intervention. The primary focus was on increasing the duration of KMC expressed in hours/day. To sustain these improvements, the QI team convened monthly meetings to review pertinent data, ensuring continuous feedback for all staff members. The duration of KMC was recorded in the daily monitoring sheet, with hours calculated from 8 am the previous day to 8 am the following day. Interventions were implemented and tested as part of the Plan-Do-Study-Act (PDSA) cycle. Throughout the study, a total of five PDSA cycles were conducted to assess and refine the interventions. [Table 1].

Statistical analysis

For statistical analysis, The data was entered in excel, and analysed statistically using SPSS version 23.0. (SPSS Inc., New York, Ill., USA).

Figure 1: Fish bone diagram for root cause analysis of low KMC duration

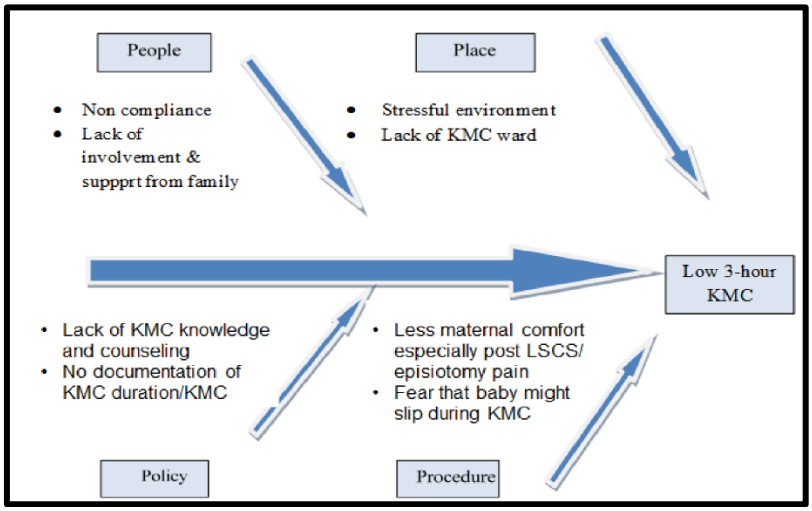

Figure 2: Commercially available KMC sling bags

ISSN: 0975-8585

Table 1: Summary Of PDSA Cycles

PDSA Cycle	PLAN	DO	STUDY	ACT
1	Sensitization of parents and other family members regarding the important benefits of KMC	• Comprehensive counselling of parents and other family memberusing educational material • Allowing father and other family member todo KMC • Modification of visiting restrictions to allow fathers or grandmothersat any time for doing KMC	Average KMC duration increased from 3 hrs/day to 4hrs/day	Ongoing sensitization reinforced and plan adopted andcontinued implementation
2	Documentation of KMC duration	• Introduction of KMCchart • Documentation of KMC in KMC chart and making it an integral partof daily rounds & treatment order	Total average KMC duration increased to 5 hours/day	KMC chart adopted in routinecare
3	Quality assurance	• Availability of KMCchairs	Total average KMC duration remained the same as 5 hours/day	KMC chairs weremade available toall KMC providers
4	Ensuring comfort & privacy	• Opening of designatedKMC room adjusant topostnatal ward	Total average KMC duration increased to 6hours/day	KMC room was provided with a KMC chair and also a bed where mothers were encouraged to usethis KMC room for providing KMC
5	Ensuring comfort during prolonged KMC	• KMC slings [Fig-2]weremade available to all KMC providers • Education about how touse the KMC sling and its benefits	Total average KMC duration increased to 9hours/day	KMC sling bag was adopted as a KMC tool to provide prolongedKMC daily

RESULTS

A total of 100 mother infant dyads were included in the study. The demographic characteristics of the participants are delineated in Table 2. We observed that insufficient knowledge and formal counseling on KMC for mothers and family members posed a challenge to its successful implementation. Therefore, we theorized that educating them about KMC would enhance the duration of its practice.

PDSA cycle 1

PDSA cycle 1 as a part of PDSA cycle 1, one-to-one counselling of mother and other family members on KMC and its benefits was done by the consultant/resident doctor at the time of daily NICU counselling and this was also continued by the nurses at bedside. Also fathers were encouraged to do KMC. Initially, our unit restricted visitation for fathers, while grandparents and other relatives were prohibited. However, mothers faced no entry restrictions. Parents were counseled daily to engage in foster Kangaroo Mother Care (KMC) involving either fathers or grandmothers. Later, visiting rules were modified to allow fathers or grandmothers at any time for KMC sessions, with posters promoting foster KMC displayed in the counseling room. Awareness was created by showing them pictorial charts, &

videos on KMC. Hands on training sessions of KMC were conducted for mothers & other family members. Encouragement & acknowledgement of mothers and family members for increasing the duration of KMC was done. The duration of KMC increased from base line of 3 hours/day to 4 hours/day at the end of 1st PDSA cycle.

PDSA Cycle 2

PDSA Cycle 2 involved enhancing the record-keeping of Kangaroo Mother Care (KMC). The team conducted a review of the current status of KMC and underscored the importance of both practicing and documenting KMC sessions. As part of this cycle, the plan aimed to ensure the objective documentation of KMC duration. To facilitate this, KMC charts were distributed to all mothers engaged in KMC. These charts were designed to be user-friendly, requiring daily entries by mothers or other caregivers participating in KMC, marking the hours of KMC sessions. Furthermore, to identify noncompliance among mothers and other foster KMC givers, the daily duration of KMC was documented in the baby's case sheet during morning rounds. This proactive measure directed the attention of doctors and nurses towards KMC providers who were not adhering to the recommended duration, enabling them to offer additional support and counseling to encourage compliance. As a result, the duration of KMC increased to 5 hours per day. Presently, all KMC-eligible babies in our unit have their KMC duration documented in their case sheets as part of their daily treatment regimen.

PDSA cycle 3

KMC providers, especially mothers and other female attendants gave feedback about the discomfort they experienced sitting on a visitor chair. Hence as a part of quality assurance measure, KMC (inclined plastic) chairs were introduced. This intervention was not accepted by all mothers especially post LSCS mothers or in early postnatal mothers, as these mothers were unable to sit for a long duration on a KMC chair, hence it was noticed that there was fall in the duration of KMC to 4 hours/day. Hence this phase of intervention was not well accepted by the KMC providers.

PDSA cycle 4

It was noticed that lack of privacy especially in the postnatal ward was one of the barriers, so this was addressed in this 4th PDSA cycle. A separate KMC room in the postnatal ward which had a KMC chair and a bed, also KMC posters was marked and mothers were encouraged to provide KMC in the designated KMC room. However not much increase in the duration of KMC was noted as the KMC duration increased to 6 hours/day.

PDSA cycle 5

It was noticed that most of the mothers and foster KMC providers were scared to hold babies during prolonged KMC as they felt that the babies would slip down, hence to ensure comfort during prolonged KMC, commercially available KMC sling bags were introduced in our unit. This change was well accepted by all the mothers and foster KMC providers in our unit. There was an increase in KMC duration to 9 hours/day [Fig-3]. In the period following implementation, numerous changes that were introduced did not maintain longevity. However, our study found that the incorporation of KMC sling bags demonstrated exceptional durability, persisting even beyond the initial implementation phase.
The challenges we faced was encouraging father & foster KMC, which we were able to achieve it by counselling and involving the family members.

Providing KMC for at least 8-10 hours/day and providing KMC chart was made part of the discharge policy and advised to continue KMC post discharge at home and to maintain the KMC chart. Also, the foster KMC helped us for prolonged KMC in the unit and also gave a road map for continuing KMC at home.

Maintaining a Quality Improvement (QI) project poses an ongoing challenge. It's imperative that any change implemented is not just temporary but sustainable in the long term. In this study, the important strategy that helped in the sustenance of prolonged KMC was introduction of KMC sling bags which was well accepted not only by mothers but also fathers and other foster KMC providers.

ISSN: 0975-8585

Figure 3: Run chart showing the duration of KMC in hours/day during the PDSA cycles

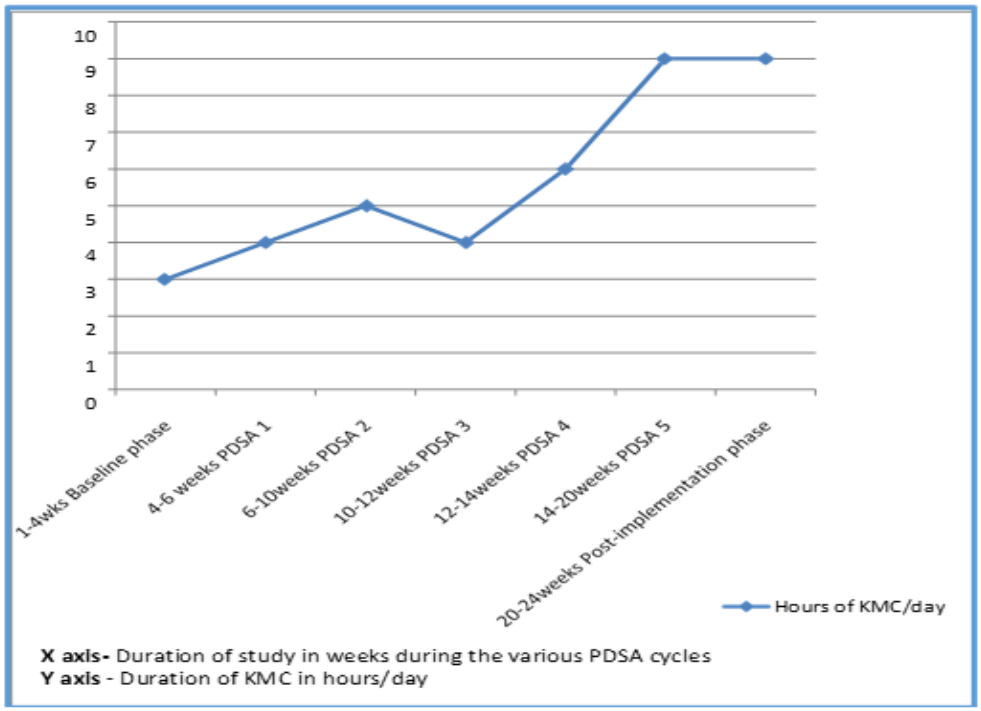

Table 2: Demographic Details Of Participants

Parameter	Numbers
Mean Gestational age [weeks]	31.5
Mean birth weight [kg]	1.25
Preterm babies	100
ELBW [less than 1kg]	7
VLBW [1-1.5 kg]	32
LBW [1.5 – 2 kg]	61
Males	48
Females	52

DISCUSSION

Kangaroo Mother Care (KMC) has demonstrated effectiveness in reducing hypothermia, hypoglycemia, and sepsis among low birth weight (LBW) babies, while also significantly decreasing neonatal mortality rates [16, 25]. However, despite these benefits, the global integration of KMC into routine LBW care encounters challenges. One such obstacle is the insufficient involvement of family members in administering KMC, coupled with limited family support, identified as barriers to sustained KMC practices. [17]. So,we tackled this issue by counselling & training not only mothers but also father and other family members, along with modification of visiting restrictions to allow the father/grandparents to provide KMC which was similar to other studies [18-21,24]. All KMC providers demonstrated excellent adherence to delivering KMC, without encountering any socio-cultural barriers, unlike the challenges noted in the findings reported by Yue et al. [22, 24].

Joshi et al. gauged the average duration of Kangaroo Mother Care (KMC) per baby per day [27], reflecting the unit's overall daily performance. In contrast in our study, we recorded the duration specified KMC as number of hours of KMC per day. Mothers and other female attendants who provided KMC expressed discomfort while seated on visitor chairs. Henceas a part of quality assurance measure, KMC (inclined plastic) chairs were introduced in our unit.

However, this intervention was not well accepted by all mothers and also no increase in the

duration ofKMC was noted which was similar to a study by Joshi A et al [24]. In contrast to this, in a study by Jegannathan S *et al* the use of KMC chairs was well accepted and increase in the duration of KMC was noted in their study [25].

In a study by Brimdyr *et al and* Jegannathan S *et* al one of the barriers of prolonged KMC was hot climate leading to irritation and sweating[26,25] hence it was noted that use of KMC sling bag was less accepted practice in their study, which is contrary to our study in which we noticed a significantincrease in the duration of KMC after introduction of KMC sling bags and also it was noted that notonly mothers but also father and other KMC providers were more comfortable and felt more safe in providing prolonged KMC using KMC sling bags, it also alleviated the fear of baby being slipped during KMC. Hence KMC sling bags acted as a major factor for increasing the duration of KMC inthis study.

Limitation

The primary focus of this study was to enhance the duration of KMC. However, the study did not examine the impact of prolonged KMC duration on the length of hospital stay or its effect on weight gain. The other limitation of our studywas that on follow up no monitoring for post discharge continuation of KMC was done. Incorporatingthese in future studies can help in enhancing the duration of KMC and also help in sustaining it in post discharge period. While we successfully achieved our target of 9 hours per day for this initiative as planned, it falls below the standard set by the World Health Organization (WHO). We feel that with continuation of education in post- implementation phase and also the concept of M-NICU may help in improving the KMC duration andalso better bonding between mother & baby.

CONCLUSION

Simple QI initiatives like introduction of the KMC sling bag which was feasible and acceptable by allparticipants in our study helped in achieving our goal of increasing the KMC duration to atleast 9 hours per day. Other factors which improved the duration of KMC included – comprehensive counseling & encouragement of other family members to do KMC, modification of NICU visiting restrictions and daily documentation of KMC.

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