

Quality improvement initiative to improve the duration of Kangaroo Mother Care in tertiary care neonatal unit of South India

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ABSTRACT

Background India has the highest number of preterm births and maximum number of deaths due to prematurity. Chengalpattu Government Medical College had 11 593 deliveries annually in 2020, of which 2252 of neonates were low birth weight. 2016 Cochrane review concluded that Kangaroo Mother Care (KMC) reduces the morbidity and mortality in low birthweight infants. The average duration of KMC in our unit was around 4.6 hours/baby/day.

Objective To improve the duration of KMC in stable low birthweight babies from short duration to continuous duration (>12 hours) over 8 weeks.

Methods The implementation phase was conducted during January 2021 and February 2021. All babies with birth weight <2 kg and who were haemodynamically stable were enrolled. QI (Quality improvement) team included staff nurses, nursing in charge, resident doctors and consultants. Potential barriers were listed using fishbone analysis. Various possible interventions were identified and a priority matrix was formed to decide the sequence of introduction of changes. The following measures were subsequently tested by multiple PDSA (Plan Do Study Act) cycles: ensuring the availability of KMC charts, combining KMC chart with individualised weight chart, documentation of KMC duration in case sheets, increasing number of KMC chairs, opening of mother–neonatal ICU (M-NICU), KMC slings for mothers, education videos in local language and rewards for mothers.

Outcome indicator Duration of KMC, recorded by bedside nurses on daily basis.

Results A total of 86 newborns were enrolled. At the end of 8 weeks, average duration of KMC increased to 16.6 hours/baby/day. The intervention which was most useful in increasing KMC duration was opening of M-NICU. We were able to sustain the improvement at the end of 6 months.

Conclusion Sequential measures taken as a part of QI initiative, helped to increase the average duration of KMC from 4.6 hours/day to 16.6 hours/day, without much additional resources.

BACKGROUND

Kangaroo Mother Care (KMC) is an evidence-based low-cost initiative, which is expected to prevent around 4.5 lakh deaths annually.^{1 2} However, despite all its known benefits, the

implementation is not satisfactory and average institutional duration of KMC in all Indian studies is very low as compared with recommended standards.^{3 4}

There are almost 12 000 live births annually in Chengalpattu Medical College, with around 1500 babies born less than 2 kg weight every year. We have a 66-bed neonatal unit, with 16-bed level 3 NICU, 20-bed level 2 NICU and 30-bed level 1 NICU. In a preliminary survey conducted prior to discharge in our unit, our KMC duration was 4.6 hours/baby/day. So, this study was implemented as first QI project in our unit.

Cochrane meta analysis published in 2016 showed that KMC was associated with mortality reduction at 40 weeks post menstrual age (40%); reduced late onset sepsis (LOS) (65%); reduced hypoglycaemia (80%); reduced hypothermia (72%); increased rates of exclusive breast feeding; increased weight gain, head circumference and length; and decreased readmission rates.⁵

METHODS

This study was conducted in Department of Neonatology at Chengalpattu Medical College during January–August 2021. All babies weighing less than 2 kg, who were haemodynamically stable and not on invasive mechanical ventilation or phototherapy, were included in the study. Each eligible mother baby dyad was taken as one participant.

QI team consisting of faculty members, resident doctors, staff nurses, lactation counsellor and research nurse was formed and head nurse of NICU was chosen as a team leader, since she would act as a link between doctors and staff nurses implementing the changes in PDSA cycles and communicate the problems faced by the QI team.

Baseline data collection was done in the end of December 2020. Based on 24-hour



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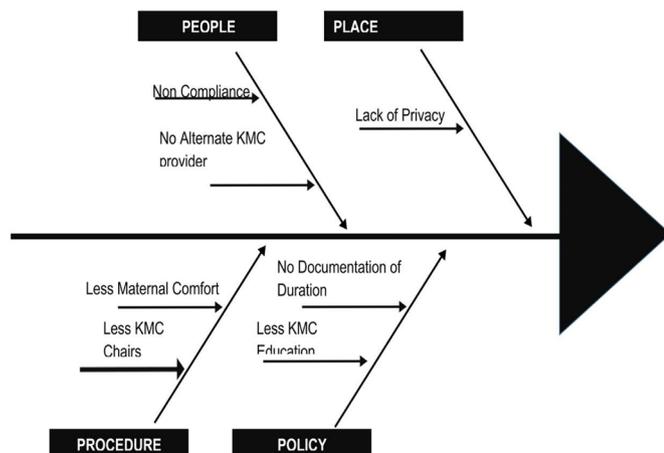


Figure 1 Fishbone analysis for causes of less KMC. KMC, Kangaroo mother care.

recall from the mothers putting KMC, the average KMC duration was 4.6 hours/baby/day. So, we made a SMART aim—“To improve the duration of KMC in our unit from baseline of 4.6 hours/baby/day to 12 hours/baby/day over a period of 8 weeks in all stable babies with birth weight of less than 2 kg”.

In the first QI meet, we discussed the potential barriers to prolonged KMC in our unit, and a fishbone diagram was constructed to enlist them. [Figure 1](#) shows the fishbone diagram.

Based on this analysis, we listed out possible interventions. Priority matrix was constructed to decide the order of testing changes on weekly basis.

QI team decided to have one intervention per week with weekly meetings to discuss the effects of intervention. The primary outcome indicator was duration of KMC expressed in hours per baby per day. A research nurse working in our unit was assigned the task of daily collection of data.

For sustaining the improvement, QI team met on monthly basis in post-implementation phase, relevant data were reviewed and continuous feedback was to given to all staffs. The duration of KMC was plotted on run chart. Informed consent was taken from mothers prior to enrolment in study.

RESULTS

A total of 86 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, so this addressed in the first PDSA cycle. In the first PDSA cycle, a separate area was marked out in each ward to segregate the mothers putting KMC in unit. 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 each ward to ensure privacy.

As a part of the second PDSA cycle, plan was to ensure objective documentation of KMC duration. KMC charts

Table 1 Demographic details of participants in implementation phase

Parameter	Numbers
Mean gestational age	32.6 weeks
Mean birth weight	1483.2 g
Males	39
Females	47
VLBW	36
ELBW	5
Term babies	9
Preterm babies	77

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 at the end of PDSA 2.

As a part of the third PDSA cycle, 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. Beyond 1.5 kg birthweight babies, we constructed two charts using Dancis weight charts, although Dancis weight charts are no longer used as a standard.

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 the fourth PDSA cycle, 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.

During the fifth PDSA cycle, 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 the sixth PDSA cycle, 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

Table 2 Summary of PDSA cycles in implementation phase

PDSA cycle number	Plan	Do	Study	Act
1	Ensuring privacy for mothers	Segregation of mothers putting KMC to a separate area in each ward	Total average KMC duration=6.9 hours/baby/day	Separate areas marked out in each ward for mothers putting KMC
2	Documentation of KMC duration	Ensuring that all mothers have KMC chart	Total average KMC duration=8.5 hours/baby/day	KMC chart routinely given to all mothers
3	Motivation of mothers for KMC	Combining KMC chart with weight chart	Total average KMC duration=9.5 hours/baby/day	KMC chart routinely combined with weight chart for all mothers
4	Identifying non-compliance	Documentation of KMC duration in case sheet	Total average KMC duration=10.3 hours/baby/day	Documentation of KMC duration in case sheets adopted as a routine
5	Quality assurance	Ensuring availability of KMC chairs	Total average KMC duration=11.1 hours/baby/day	KMC chairs are made available to all mothers putting KMC in our unit
6	Ensuring comfort to mothers and decreasing stress	Opening of M-NICU and family centred care unit	Total average KMC duration=13.1 hours/baby/day	Postnatal mothers who are not very sick, are admitted in M-NICU and routine obstetric care is provided
7	Ensuring KMC education to mothers	KMC education videos in local language	Total average KMC duration=15.2 hours/baby/day	KMC education videos are shown routinely to mothers of all LBW babies.
8	Ensuring maternal comfort during prolonged KMC	KMC slings for mothers	Total average KMC duration=16.6 hours/baby/day	We educated the mothers about benefits of using slings for prolonged KMC

KMC, Kangaroo mother care; M-NICU, mother–neonatal ICU.

cot being next to her baby. Routine obstetric postnatal care is provided to mothers round the clock by the obstetric team. At the end of this PDSA cycle, KMC duration increased to 13.1 hours/ baby/day.

In the seventh PDSA cycle, to increase KMC-related education among mothers and our healthcare staff, we prepared KMC education videos in local 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.

In the last PDSA cycle, to ensure maternal comfort during prolonged KMC, KMC slings were used in our unit. This change was, however, not well accepted in our unit despite educating mothers about its benefits. Some of the prime reasons we found were the hot climate causing more sweating among mothers and making it uncomfortable and use of front open gowns by mothers, making use of KMC slings a less prevalent practice in unit. Though at the end of week 8 average KMC duration increased to 16.6 hours/baby/day, it was probably due to better implementation of changes introduced in previous PDSA cycles and not due to KMC slings. [Table 2](#) provides a summary of all PDSA cycles. [Figure 2](#) shows the run chart during implementation phase.

During the post-implementation phase, most of the changes introduced in the implementation phase were well sustained. Data collection was done fortnightly. Additionally, to improve motivation among mothers, the concept of weekly KMC champions was introduced, wherein the mothers practicing maximum duration of KMC were awarded with certificates of appreciation every week. [Figure 3](#) shows the run chart of the KMC duration during entire study period, including post-implementation phase.

Though we faced challenge of second wave of COVID-19 pandemic, during which manpower constraints caused the total KMC duration to decline to 13.7 hours/baby/day, it was above our target of 12 hours/baby/day. One more challenge faced was ensuring father KMC in night time. Though we segregated an area for father KMC in our unit, practising father KMC at night is still a challenge due to staff constraints in night time for continuous monitoring. One thing which needs to be highlighted here is the role of hospital administration in supporting this study. Our team was able to convince the administrators regarding benefits of KMC and its impact on improving survival of LBW babies. As a result, a lot of quality assurance steps like increasing the number of KMC chairs, opening of M-NICU and KMC slings for mothers could be ensured.

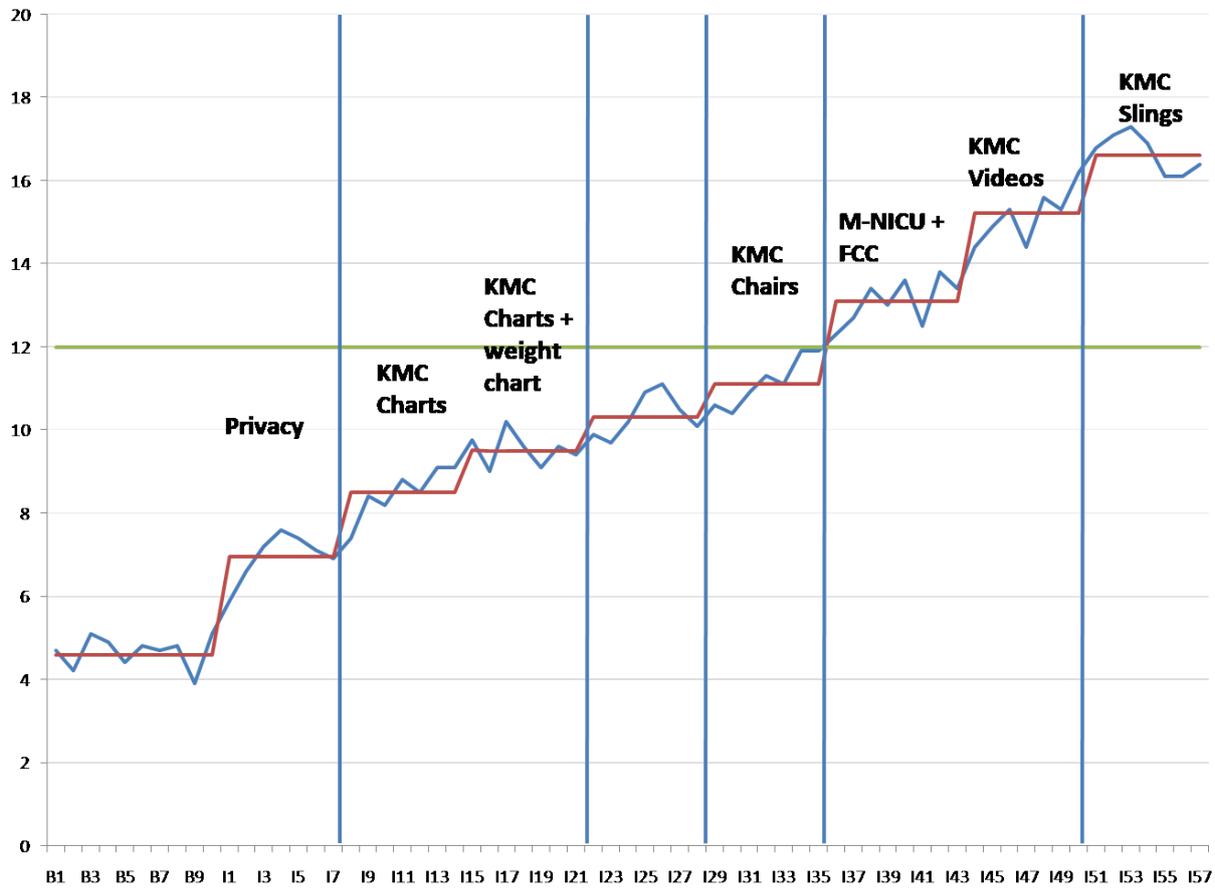


Figure 2 Run chart showing average KMC duration during implementation phase. M-NICU, mother–neonatal ICU; KMC, Kangaroo mother care.

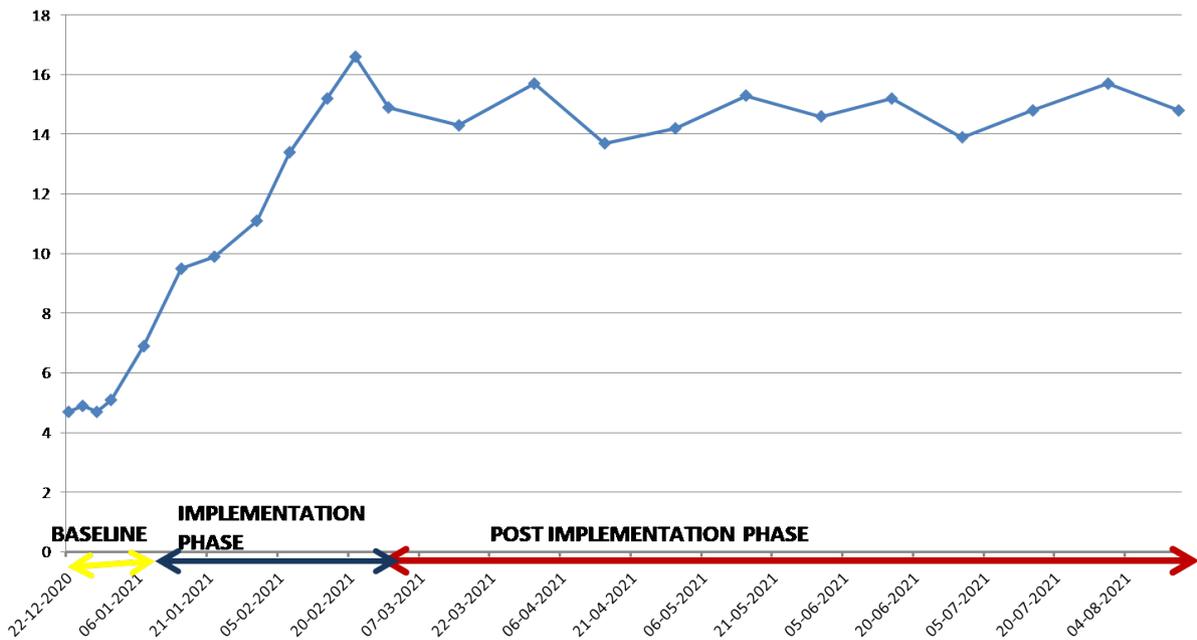


Figure 3 Run chart showing average KMC duration in hours/baby/day throughout the duration of study. KMC, Kangaroo mother care.

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 haemodynamically 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 and also the number of PDSA cycles to achieve the target 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 al*.^{4,12} 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.

CONCLUSION

Simple steps taken as a part of quality improvement initiative with more education of mothers and involvement of family members can help to increase duration of KMC significantly and help in the improvement.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants. This work is exempt from institutional ethics committee approval since it involves use of existing data and records. Sources are publicly available. Information is collected by investigators in such a way that identity of subjects is not revealed. Participants gave informed consent to participate in the study before taking part.

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Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information.

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