RESEARCH PAPER

Improving Duration of Kangaroo Mother Care in a Tertiary-care Neonatal Unit : A Quality Improvement Initiative

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Objectives: To increase the duration of Kangaroo mother care (KMC) in preterm infants from an average of 3 hours/day to at least 6 hours/day over 7 weeks through a Quality improvement (QI) approach in a tertiary-care neonatal unit.

Methods: Preterm mother-infant dyads who were admitted in the Neonatal intensive care unit and KMC ward were enrolled in this study. A QI team comprising of nurses, nurse educators, resident physicians and nursing-in-charge of unit was formed. The potential barriers for prolonged KMC were evaluated using fish bone analysis. A variety of measures (allowing family members including male members during night for doing KMC, making KMC an integral part of treatment order, introducing the concept of weekly KMC champions, etc.) were introduced and subsequently tested by multiple Plan-do-study-act (PDSA) cycles. Data on duration of KMC per day was measured by bedside nurses on daily basis.

Results: 20 eligible mother-infant dyads were studied during implementation period (50 d). The mean (SD) weight and gestation of infants were 1199 (356) g and 31.1 (2.3) wks, respectively. We achieved our goal by step-wise implementation of changes through construction of 3 PDSA cycles. The duration of KMC increased to 6 hours-a-day over a period of 7 weeks. Evaluation at 6 and 12 months in the post-implementation phase suggested sustenance of improved KMC duration up to 9 h/day in the unit.

Conclusions: Ongoing quality improvement measures increased the duration of KMC from a baseline of 3 h to 6 h in eligible preterm infants, and the results were sustained at 6-12 month.

Keywords: *Breastfeeding, Neonate, Skin-to-skin contact, Survival.*

Kangaroo mother care (KMC) is an evidence-based cost effective approach, and can avert up to 450,000 preterm deaths each year if near-universal coverage is achieved [1,2]. Invest-ment in KMC has benefits beyond survival including healthy growth and long term development [3,4].

However, despite its known benefits, the adoption and implementation of KMC has been low. Even at the places where KMC is being practiced in the facility, the number of hours of KMC remain low. Average duration of KMC varies from 3-5 h/day in previous Indian studies [5,6]. Various potential barriers to KMC include issues with facility resources and environment, negative impressions about staff attitude, and lack of awareness about KMC benefits [7].

A recent study in our unit reported median (IQR) KMC duration in eligible preterm infants of 3.14 (2.1-4.3) h/day. To address this problem we used QI approach to target the bottle neck areas in a step-wise manner. We formulated an aim statement to increase the duration of KMC per day from a current baseline of 3 hours to 6 hours in admitted eligible preterm mother- infant dyads.

METHODS

Our hospital has a 10-bedded level III and a 20-bedded level II NICU in addition to 8 Kangaroo mother care and rooming-in beds. Each eligible mother-infant dyad was a single participant in the present study. All eligible preterm neonate admitted in NICU were included. Sick neonates [defined as those requiring invasive or non-invasive mechanical ventilation (NIMV) or shock (defined as the presence of tachycardia (heart rate more than 180 beats/ minute, extremities cold to touch, and capillary fill time more than 3 seconds, with or without pallor, lethargy or unconsciousness) or apnea (>4 apneas in the last 24 h)], neonates receiving phototherapy, and for whom no eligible relatives were available and/or the mother was sick or discharged from the hospital were excluded.

A team comprising one faculty in-charge, one resident physician, one nurse educator and two senior staff nurses was formed to evaluate the barriers for improved KMC duration and to plan the subsequent steps

for promoting the same.

In baseline phase, data was collected in a predesigned proforma for 10 days for ten eligible preterm infant-mother dyads. We tried to evaluate various barriers faced by mother as well as staff members for providing KMC of pre-specified duration by using another proforma. The barriers were identified using fish bone analysis (***Web Fig.* 1**). The predominant barriers were lack of adequate support to mother, absence of formal counselling on KMC by the healthcare team, and other maternal factors including lack of privacy, stress and fatigue. On one-to-one discussion with the mothers, the authors found that they were spending nearly 5 hours of the day for expression of breast milk and almost a similar duration for feeding the baby (total 10 hours), and no KMC was being practiced during the night hours.

A comprehensive KMC improvement package was planned. This consisted of two main elements: one was education and sensitization of health care providers and family members and secondly, a simultaneous reinforcement of ongoing practice. We took some corrective steps which included felicitation for both relatives as well as staff-nurses. These changes were tested as a part of Plan-Do-Study-Act (PDSA) cycle. We conducted three PDSA cycles (***Web Table* I**).

A combined meeting of the nurse-educator, team leader nurses, other staff nurses, and resident doctors was conducted every week in the implementation phase for apprising every one of the current situation. For sustenance of the improvement initiative, the combined meeting was conducted on a monthly basis and the results were collected on an ongoing basis and reviewed fortnightly, and continuous feedback to given to all staff.

The primary outcome measure was the duration of KMC. This was evaluated by staff nurse on duty by recording the exact hours of KMC in each 8-hour shift and then adding total duration of 3 shifts/day) in eligible preterm infant-mother dyads. The duration was then plotted on a run-chart. The outcome was evaluated daily in implementation phase, and one day every fortnight in post-implementation phase.

Data analysis: The data was coded and analyzed statistically using STATA version 11.1 (Stata Corp, College station, Texas, US). A *P* value of <0.05 was taken as significant.

RESULTS

The baseline demographic characteristics of mother as well as preterm infant were similar in both the phases (Baseline phase and implementation phase) (***Table* I**). The biggest barrier to successful implementation of KMC was absence of formal KMC counselling for the mothers and family members. We hypothesized that educating them regarding benefit of KMC would be useful.

As a part of PDSA Cycle 1 (first two weeks), four nursing staff working in NICU in different shifts were identified and were involved in comprehensive counselling and on KMC for the mothers and their family members. This included creation of supportive environment in NICU for KMC, and showing them videos and pictorial charts on KMC in small groups. One-to-one counselling of mother and family members on KMC and its benefits was done by the assigned bedside nurse. Encouragement and acknowledgment of mothers and family members for increasing the duration of KMC was done by the nurses. The mean duration of KMC increased from 3.25 hours to 4.5 hours by the end of first PDSA cycle (***Web Fig.* 2**). The resident doctors included emphasis of KMC duration as a part of daily treatment order.

In PDSA Cycle 2 (3rd and 4th week) the overall target of 6 hours was split as ensuring at least 2 hours in each shift by the respective nursing staff. The staff nurses were felicitated for ensuring maximum KMC hours in their shifts on weekly basis in periodic meetings. We also ensured availability of more breast-pumps (total number of electronic breast pumps was increased from 2 to 4) which resulted in decrease in waiting time for mother's expression of milk with breast pumps. The average duration of KMC increased to more than 6 hours (at the end of 4th week). During the 5th week of the project the mean duration of KMC declined slightly. This was postulated due to lack of active participation of infants in KMC who were in respiratory support. So in PDSA Cycle 3, the assigned nurses were made available round the clock with babies and mothers/family members at the

TABLE I BASELINE CHARACTERISTICS OF PARTICIPANTS

Parameter	*Baseline phase (n=10)*	*Implementation phase (n=20)*
Maternal age, y	29.4 (5.1)	30.3 (4.1)
Gestational age, wks	30.9 (6.2)	31.1 (2.3)
Birthweight, g	1359 (305)	1199 (356)
Primipara mother*	5 (50)	19 (95)
Mother's education#	7 (70)	14 (70)
Males	6 (60)	8 (40)
GA<32 wk	4 (40)	7 (35)
Small for GA	5 (50)	7 (35)
Need for resucitation	2 (20)	6 (30)

*Data expressed as number (%) or mean (SD); *P<0.001; #Graduate or above.*

WHAT IS ALREADY KNOWN?

- Duration of Kangaroo mother care (KMC) KMC is often suboptimal, due to various barriers.

WHAT THIS STUDY ADDS?

- Simple measures such as involving family members to provide KMC, positive reinforcement and felicitation have the potential to improve KMC duration.

time of KMC, especially who were on some kind of respiratory support like oxygen therapy and non-invasive ventilation to build up their confidence and alleviate anxiety and fear related to baby's desaturation at the time of KMC. Nurses provided constant positive re-enforcement and encouragement to the mothers and the family members for doing KMC. At the end of 7 weeks, average number of hours of KMC increased from 4.1 to 7.2 hours.

We were able to sustain improved average KMC duration in the unit in post-implementation phase, even after 1 year of completion of QI project. Fathers and other close family members are allowed to give KMC in the unit even at night time, so that mothers can get rest. Even after one year of implementation of study, the duration of KMC among all eligible babies remains around 9 h/day (***Fig.* 1**).

One of the balancing outcomes which the QI team found during the study process was an increase in the breakage of temperature probes of radiant warmer due to excessive dragging of probes while babies were transferred from radiant warmer to caregiver for initiation of KMC. However, this was subsequently sorted out by careful detachment of probes from radiant warmer side by staff nurses each time KMC was started for a baby.

DISCUSSION

Maternal lack of time and supportive environment and fatigue were the main barriers for practice of optimum KMC [7]. Hence, allowing other family members for KMC addressed these issues. Active involvement of family members not only scales- up facility based KMC, but it is also known to sustain home-based KMC after discharge [8].

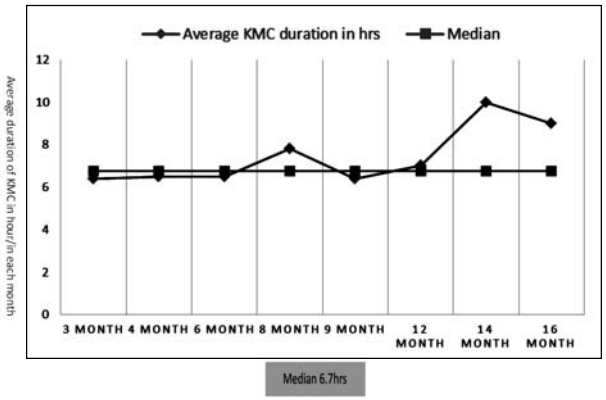

FIG. 1 *Sustenance of KMC in post-implementation phase.*

Although increasing staff support and implementing temporary project staff is known to scale up KMC practices, the effect seems transient and fades with withdrawal of support [8,9]. A unique effort in our study was the utilization of existing resources and infrastructure for strengthening KMC.

Audit-and-feedback is considered as one of the backbones of quality improvement initiative for changing healthworker behavior as well as an ongoing policy which formed an important milestone in our study. We conducted weekly audit in our study to evaluate the potential reasons for decreased KMC duration. In addition, the concept of weekly declaration of champions encouraged the healthcare providers. Similar role of healthcare champions has been described in recent studies from Western India [5].

Our study was a single-center quality improvement initiative. The limitation of the study was that the morbidity data was not evaluated. The data on day of KMC initiation, details on KMC continuation after discharge for each baby was not prospectively collected. Mothers were not comfortable doing KMC while they were walking or eating. Similarly the idea of pumping of both breasts simultaneously to save time were not adopted by our mothers. We hence resorted to active involvement of other family members for facilitating KMC. Although we could reach our target of 6 hours as planned for this initiative, this is still low as per the WHO standard. However, we feel that with continuation of education in post-implementation phase further improvement is expected.

We demonstrated feasibility and sustainability of a simple quality improvement approach for increasing KMC duration in eligible preterm neonates. This was achieved within existing resources without addition of

extra manpower by involving family members.

Contributors: MJ: developed study protocol, implemented the study, collected data and wrote the first draft of the paper; TS, AT AS: helped in protocol development, supervised implementation of the study and contributed to writing of the manuscript; PJ: important inputs in conduction of study and writing of the manuscript; RA: supervised implementation of the study and corrected the final manuscript as well as analyzed the data.
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