

# A time–motion analysis of the mothers staying in the neonatal care unit

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## ABSTRACT

**Context:** In addition to various barriers studied for kangaroo mother care (KMC), time opportunities for better implementation of KMC need to be studied. **Aim:** Time-motion analysis of the mother's daily activities was carried out to identify scope to improve KMC. **Settings and Design:** This is a 24-h recall-based questionnaire study. Mothers were interviewed whose newborns were admitted at a tertiary and secondary care neonatal care unit of western India over a period of 9 months from November 2015 to July 2016. **Materials and Methods:** Mothers were approached when the preterm neonate and mother dyad was eligible for KMC, that is, when mothers were physically healthy and newborns were physiologically stable. A total of 60 mothers were enrolled in the study. Mothers' daily activities were noted, and time spent in each activity was charted for 3 consecutive days. Missed time opportunities which could be used to increase daily KMC hours were studied. **Statistical Analysis Used:** To compare quantitative variables, two-sample unpaired *t*-test and one-way analysis of variance were used. **Results:** The average time of activities which consumed most was 8.24 h for sleep/rest, 3.46 h for meals/snacks, 4.89 h for breastfeeding, and a daily average of only 1.4 h was used for KMC. A quite a significant proportion, that is, 3.89 h, was spent for meeting relatives which could be used for KMC as well without affecting social meetings. **Conclusion:** Time-motion analysis was helpful to find out weak links in KMC implementation. Providing family-centered environment in terms of implementing KMC during meeting hours with family may augment KMC hours.

**Keywords:** Activity, breastfeeding, family-centered care, kangaroo mother care, newborn

## Introduction

The magnitude of low birth weight (LBW) newborns (i.e. those with birth weight less than 2500 g) globally is enormous. Around 22 million LBW babies are born every year; from these, approximately 21 million belong to developing nations, and of these, India contributes to 7–10 million.<sup>[1,2]</sup> Preterm birth (born before 37 weeks of pregnancy) and LBW contribute to 60%–80% of all neonatal deaths.<sup>[3]</sup>

Kangaroo mother care (KMC) is one of the multiple strategies recommended to reduce neonatal mortality by the World Health

Organization (WHO).<sup>[3,4]</sup> KMC is an evidence-based approach, which was first developed in Bogotá, Colombia, where it was used as an alternative to costlier incubator care for maintaining normal temperature in preterm/LBW newborns who survived from initial problems.<sup>[4,5]</sup>

Although, there is significant heterogeneity in the definition of KMC,<sup>[6]</sup> according to WHO, KMC consists of prolonged skin-to-skin contact between mother and infant, exclusive breastfeeding whenever possible, early discharge with adequate follow-up and support, and initiation of the practice in the facility and continuation at home.<sup>[5]</sup> In KMC, the baby is placed between mother's breasts in an upright position so that there is constant skin-to-skin contact between the mother and the baby.

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10.4103/jfmpc.jfmpc\_348\_18

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**How to cite this article:** Morgaonkar VA, Patel DS, Patel DV, Phatak AG, Nimbalkar SM. A time–motion analysis of the mothers staying in the neonatal care unit. *J Family Med Prim Care* 2019;8:1129-33.

The baby is carried in kangaroo position, naked, except for the diaper, a warm hat, and socks. The mother then covers herself and the baby with her usual dress and/or warm cloth. KMC is effective in providing effective thermal care, and thus it prevents hypothermia in newborns.<sup>[5]</sup>

In addition to help maintain normal temperature, there are many additional advantages of KMC. KMC significantly reduces preterm mortality at 40–41 weeks corrected gestational age and improves other outcomes such as sepsis, emotional attachment in mothers, respiratory distress, and weight gain.<sup>[4,7]</sup> However, in spite of so many advantages, KMC is not practiced optimally in a majority of the units.<sup>[8]</sup> The barriers to implement KMC would be - lengthy time needed for KMC, energy-draining experience of parents, feeling exposed due to environmental reasons, physical and emotional burden, hindering other activities, fear of hurting, and barriers based on caregivers and institutional potential.<sup>[9–11]</sup> To scale up and integrate KMC into health systems, the barriers must be reduced to promote the uptake of the intervention by caregivers.<sup>[9]</sup>

In our setup, KMC has been implemented since 2003 and is still not practiced optimally.<sup>[12]</sup> To improve hours for utilization of KMC in daily routine, we needed to assess daily activity of mothers in time motion, and this would help us provide clues for improvement. We found no studies on evaluation of activities by mothers at Neonatal Intensive Care Units (NICUs) for their daily routine and time distribution from India as well as from developed nations. We hypothesized that knowing this could provide possible explanations of poor KMC implementation and help further improve it. This study explains how mothers spend their time when their babies were admitted to neonatal care unit, to assess time gaps and ways to provide more time for baby-centered activities, especially KMC.

## Materials and Methods

### Type of study

This was a 24-h recall-based questionnaire guided interview of the mothers over a period of 9 months from November 2015 to July 2016 at a tertiary care NICU and secondary care neonatal intermediate care unit (NIMC) of western India.

### Study site

During the hospital stay of the neonates, their mothers are provided with facilities of stay and basic amenities. Mothers are actively involved in baby-centered care such as providing KMC, expressing breast milk, changing nappies, rooming in, and feeding their newborns directly by breastfeeding or by cup or spoon. Formula feed is only used when mothers were not able to express breast milk and other absolute contraindications for breast milk. Bottle feeding is not practiced. Other family members are also encouraged to provide support to mothers like giving skin-to-skin care when mothers want to take rest. KMC is provided in special chairs in NICU, and it is provided with special chairs and on bed

in the NIMC. As insurance is a personal matter in India and most of the relatives come from rural area, they usually do not have health policy for perinatal care. Although the hospital does provide partial financial support to families belonging to below poverty line, they are required to pay the hospital bills periodically during the course of stay.

### Participant eligibility

Mothers were eligible to participate in the study when they were physically healthy (i.e., 2 days after cesarean section, after discharge from the intensive care unit if admitted, and physiologically in good condition) to provide care to baby and administer KMC when their preterm newborns were physiologically stable.

### Study procedure

After taking written informed consent in their native language, mothers were interviewed to share their daily routine during their hospital stay for 3 consecutive days (i.e. Day 1, Day 2, and Day 3) using the 24-h recall. All the activities reported by them were recorded along with approximate time taken for each activity. Demographic details of mothers and their newborns were recorded from the interview and the admission files of mothers and their newborns.

### Statistical analysis

For categorical variables, frequency/percentage and for quantitative variables descriptive statistics were used. For comparing quantitative variables, two-sample unpaired *t*-test and one-way analysis of variance were used. Statistical analysis was done using Stata 14. The study was approved by Institutional Ethics Committee.

## Results

Of the total 337 admissions over 9 months in NICU and NIMC, a total of 68 mother–newborn dyads were eligible for study. From these, one mother did not provide consent, six were not willing because of stitch pains of cesarean section, and one was not willing due to reason not specified. Therefore, a total of 60 were enrolled in the study. Maternal and newborn characteristics including demographic details and methods of feeding are depicted in Table 1.

All the newborns were below 2.5 kg at birth {mean [standard deviation (SD)] =1.87 (0.49)}, and the mean (SD) maturity was 33.1 (2.66) weeks. A significant proportion, 22 (36.67%), of neonates were small for gestational age. Only 8 (13.33%) received formula feeds along with Expressed Breast Milk (EBM) during their NICU stay, whereas the remaining received their mother's breast milk only. Eight (13.3%) received gavage tube feeding initially, which was later switched over to spoon feeds and then direct breastfeeding.

The average time of activities which consumed most of the time of a day and night was 8.24 h for sleep/rest, 4.89 h for breastfeeding, and 3.89 h for meeting relatives. Mothers spent an average of 4.83 h on breastfeeding-related activities

**Table 1: Maternal and neonatal characteristics**

Characteristics (n=60)	Mean (SD) [IQR]
Mothers' age	24.71 (3.81) [22, 26.6]
Socioeconomic status	Frequency (%)
Below poverty line	35 (58.33)
Industry (linked with insurance)	5 (8.33)
Type of delivery: cesarean section	36 (60)
Gravida	
1	32 (53.33)
2	16 (26.67)
3	7 (11.67)
4	4 (6.67)
8	1 (1.67)
Para	
1	36 (60)
2	15 (25)
3	6 (10)
4	2 (3.33)
5	1 (1.67)
Birth weight	1.87 (0.49) [1.57, 2.12]
Gestation (weeks)	33.11 (2.66) [32, 35]
SGA	22 (36.67)
AGA	38 (63.33)
Siblings	
0	37 (61.67)
1	16 (26.67)
2	4 (6.67)
3	2 (3.33)
4	1 (1.67)
Feeding	
Exclusive breast milk	50 (83.33)
Ryle's tube	8 (13.33)
Katori spoon	60 (100)
Formula feed	8 (13.33)
Maternal complications	
Eclampsia	11 (18.33)
Breech presentation	3 (5.0)
Anemia	7 (11.67)
ICU	3 (5.0)
Cephalo pelvic disproportion	1 (1.67)
Oligohydramnios	6 (10.0)

SD: Standard Deviation; IQR: Interquartile Range; SGA: Small For Gestational Age; AGA: Appropriate For Gestational Age; ICU: Intensive Care Unit

on the first day, and 4.9 h on second and third day each. The duration of KMC provided gradually increased over 3 days with mean (SD) duration of KMC being 0.7 h (1.46) on the first day, 1.6 h (2.01) on the second day, and 1.85 h (2.1) on the third day, respectively ( $P = 0.002$ ), although this was still below the recommended duration of minimum 4–6 hours per day. A significant portion of time was spent on meeting relatives: 4.2 h on the first day, 3.8 h on the second day, and 3.6 h on the third day which reduced as days passed ( $P = 0.029$ ).

The idle time was 0.43, 0.38, and 0.35 h on the first, second, and third days, respectively. The duration of activities such as personal hygiene (1 h), meals/snacks (3.47 h), exercise (0.18 h), and caring for other children (0.48 h) was fairly constant over 3 days [Table 2].

## Discussion

KMC is a well-known component of care of LBW infants. Despite its known multiple benefits, its routine uptake is slow.<sup>[8]</sup> The KMC procedure itself, the hospital policy, people, and place are contributory to reduced duration of KMC hours per day.<sup>[13]</sup> This study was done to identify time opportunities which can be used to increase the KMC hours per day.

The postnatal period is stressful for mothers. NICU/NIMC admission, preterm delivery, prolonged hospital stay, and mothers' own medical illness are factors that add to this. Mothers have to perform activities pertaining to self-care such as personal hygiene and dressing changes. They also need good sleep and rest as they are recovering during the postpartum period. They would have to spend time in caring for neonates for activities such as breastfeeding (direct/expressing milk), changing nappies, and changing position. Sick baby and separation also predispose to delayed lactation or lactation failure, which further add to emotional stress. There may be an element of postpartum depression in mother, which may lead to poor lactation and less time spent caring for neonates which may negatively affect implementation of KMC.<sup>[14]</sup>

If the mother is not sick, then she stays with the baby during hospital course. Mothers are provided separate common room in the vicinities of NICU/NIMC for rest and their daily routines. Maternal grandmother of the neonate usually remains present with mother to help her in daily activities. The fathers usually stay at home and earn their daily wages and frequently visit hospital during daily counseling sessions. This has more advantage as mothers can help with the daily care of their babies which is not feasible in most of the western NICUs, where parents stay at home and visit hospital infrequently.<sup>[15-17]</sup> This separation of parents from their sick baby has been criticized, and to improve their presence and improve neonatal outcome, many innovative measures have been carried in the last 10–15 years.<sup>[18]</sup>

The luxury of presence of mother 24 × 7 also carries inherent disadvantages such as significant amount of time being spent meeting relatives. One or two attendants usually stay with the mother during the course of hospital stay to provide physical, social, and financial support. Also, as our hospital is located in rural area, most of the households have joint family structure with a senior member taking important decisions of the maternal and neonatal care. The newborn care area does not allow presence of more than one relative at a time, and complex decisions are not only taken by parents but also senior family members, compelling mothers to go outside and meet the relatives leading to loss of hours for baby care. This time can be better utilized for providing KMC without compromising quality time with family members. This is also an opportunity for family-centered care (FCC) and empowering parents by educational-behavioral intervention starting from admission and extending beyond discharge.<sup>[19,20]</sup>

**Table 2: Time motion analysis of three days**

Activity	Day 1 (n=60), mean (SD) [IQR] h	Day 2 (n=60), mean (SD) [IQR] h	Day 3 (n=60), mean (SD) [IQR] h
<b>Main activities</b>			
Breastfeeding	4.83 (1.29) [4, 6]	4.93 (1.39) [4, 6]	4.92 (1.48) [4, 6]
Personal hygiene	1.02 (0.13) [1, 1]	1 (0) [1, 1]	1 (0) [1, 1]
Skin-to-skin care (KMC)	0.70 (1.46) [0, 0]	1.6 (2.01) [0, 3]	1.85 (2.10) [0, 3.5]
Meals	2.78 (0.41) [3, 3]	2.83 (0.37) [3, 3]	2.93 (0.76) [3, 3]
Sleep	6.67 (0.75) [6, 7]	6.48 (0.70) [6, 7]	6.43 (0.74) [6, 7]
Idle	0.43 (0.67) [0, 1]	0.38 (0.67) [0, 1]	0.35 (0.66) [0, 0.5]
<b>Other activities</b>			
Snacks	0.68 (0.50) [0, 1]	0.57 (0.50) [0, 1]	0.6 (0.49) [0, 1]
Meeting relatives	4.23 (1.18) [4, 5]	3.82 (1.30) [3, 5]	3.62 (1.33) [2, 5]
Rest	1.88 (1.06) [1, 3]	1.7 (0.91) [1, 2]	1.55 (0.89) [1, 2]
Exercise	0.2 (0.48) [0, 0]	0.18 (0.43) [0, 0]	0.18 (0.43) [0, 0]
Caring other children	0.48 (0.93) [0, 1]	0.45 (0.91) [0, 1]	0.48 (0.83) [0, 1]

SD: Standard deviation; IQR: Interquartile range; KMC: Kangaroo mother care

In the NICU, where the newborns are relatively more sick, parents do not remain with them bedside instead, visit them when their active participation is required like expressing breast milk, providing KMC, or when they want to see their baby. Father or other relative can also provide skin-to-skin care in NICU, but at NIMC, most of the time mothers remain present bedside and provide breastfeeding and express breast milk, it is impossible for male relatives to enter the NIMC and provide help to mothers especially with KMC. Therefore, the advantage of presence of other family members for providing KMC when the mother is resting, changing nappies/giving EBM, and relieving mother from social obligation of meeting relatives is limited. Hence, only female relatives can help a mother in baby care, especially for KMC. This is one of the barriers for FCC and is a matter of decision-making regarding policy change (for immediate effect) and change in infrastructure (for constant long-term effect) for providing privacy to other mothers and enabling fathers in providing active support. This is often challenging in developing countries due to financial reasons and availability of space. Involving other family members especially father/grandmother in caring for baby–mother pair can reduce mothers' stress.

Thus, the current environment of NICU/NIMC provides a lot of scope of optimum FCC. FCC is now universally promoted for, not only optimum outcome of newborn but also better familial relationships.<sup>[21,22]</sup>

Lactation nurses can help mothers to express milk in short time, providing more time for KMC, emphasizing benefits of KMC and providing supportive environment.<sup>[23,24]</sup> This needs frequent counseling and motivation of mothers by doctors and nurses. However, this may not be as effective in time of increased workload. The presence of KMC champions can greatly increase the duration of KMC provided.<sup>[12,24]</sup> Assigning this responsibility to lactation nurses may help by providing constant counseling along with lactation. Seeing other mothers provide KMC will also motivate a new mother to provide KMC. Other barriers to KMC could be maternal unwillingness due to stitch pain/back pain and fear of stitches being hurt by baby's kicks in mothers

with cesarean section.<sup>[11,25]</sup> This could be one of the possible reasons of lower duration of KMC on Day 1 than Days 2 and 3. Providing recreation facilities like television to mothers in step down nursery may also provide some motivation to continue KMC.<sup>[26]</sup> Mothers with high-risk pregnancy and possibility of preterm delivery who were informed about KMC and its benefits during antenatal period were better motivated to give KMC.<sup>[27,28]</sup>

In this study, we did not assess the role of other family members for active support when mothers spend most of their time meeting/discussing with them. We did not evaluate maternal stress, barriers, and enablers of KMC.

## Conclusion

Analyzing the hours spent during daily activities of mother helped identify potential periods which can be used for patient-centered care. There is a lot of scope to improve KMC hours by providing KMC champions, policy changes, and infrastructure changes for optimum presence of family members in neonatal care units. A focused group discussion regarding results of this study with mothers and family members to know about details of time spent may provide more clear understanding and help emphasize KMC and this needs to be studied further. Similar studies should be incorporated in different settings as the daily routine may be different culturally and geographically.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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