

# Factors Impacting Practice of Home Kangaroo Mother Care with Low Birth Weight Infants Following Hospital Discharge

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## ABSTRACT

**Objective:** To identify enablers and barriers related to home Kangaroo Mother Care (KMC) adoption after hospital discharge.

**Study design:** An exploratory study, using a mixed methods evaluation, followed 60 mother–infant dyads from the hospital ward to 4 weeks post-hospital discharge.

**Results:** Fifty-three of the mothers (88.3%) completed all study visits. The majority of mothers were breastfeeding and practicing skin-to-skin contact 4 weeks post-discharge. Seven mothers (13.2%) discontinued skin-to-skin contact at 4 weeks. KMC was practiced on average 3.3 h/day and 5.1 days/week. The top two enablers reported were significantly related to the amount of time skin-to-skin was practiced, with support for household responsibilities being most significant ( $U=195$ ,  $p=0.008$ ). Lack of privacy ( $p=0.002$ ) and lack of motivation ( $p=0.034$ ) were negatively correlated to duration of skin-to-skin contact.

**Conclusion:** Future programs may increase dissemination and adoption of home KMC by specifically addressing enablers and barriers correlated to duration of skin-to-skin contact.

## INTRODUCTION

Infant mortality remains a major public health dilemma that disproportionately affects low-income countries [1]. In particular, the neonatal period is the most vulnerable time for an infant's survival [2].

Ninety-nine percent of all neonatal deaths occur in low- and middle-income countries [3]. India accounts for a quarter of neonatal deaths globally [4].

An estimated 7.5 million low birth weight (LBW) babies (less than 2500 g) are born annually, comprising 30% of India's total live births [4]. The majority of neonatal deaths (80%) in India occur among LBW/preterm neonates [4].

Low birth weight infants' usual care is in a hospital unit with highly specialized equipment and trained health professionals [5]. The cost of

sophisticated medical approaches for the care of LBW infants makes them less available to countries with the greatest need [6]. Kangaroo Mother Care (KMC) is a well-studied, low technology, low cost, highly effective alternative to conventional care for stable LBW infants. The core components to the KMC method are exclusive breast feeding and skin-to-skin contact [6]. Results from a comprehensive review of the literature and meta-analyses conclude, the KMC approach when compared with conventional hospital care of stable LBW infants, is more effective at decreasing morbidity and mortality, occurrences of sepsis, other infections and lower respiratory tract disease [5, 7]; while producing protective effects lasting up to 20 years [8].

The duration KMC is implemented has been identified as the most common determinant of intensified growth for LBW infants [9]. A prospective cohort study of LBW infants found infants receiving KMC for more than 12 h/day (while in the hospital) had greater gains in weight, head circumference and length than those receiving KMC <12 h/day. At a 6 month post-hospital discharge visit, results indicated that infants receiving home KMC had incremental growth compared with infants not receiving home KMC [9].

The question remains why is there not widespread implementation of KMC? Qualitative data from KMC implementation in hospitals were reviewed from 112 studies. The identified barriers to KMC implementation were at two levels; the health systems' delivery of care and within the context of cultural norms for the given population [10]. Studies that help determine barriers and enablers to KMC adoption are critical for developing methods to aid in its adoption and duration of practice. The KMC studies on effectiveness and successful adoption have been conducted with LBW infants in hospitals and medical facilities.

To fully realize the benefits of KMC implementation for LBW infants, data on the feasibility, effectiveness, and the identification of factors related to the successful adoption of home KMC implementation are needed. To that end, this exploratory study, using a convenience sample of mother–infant dyads, aims to: (i) assess if home KMC can be practiced; (ii) assess if infant growth measures improve during

home KMC practice; (iii) identify factors related to KMC adoption (enablers and barriers); and (iv) assess elements (enablers and barriers) related to the duration of KMC practice.

## METHODS

### Study design

This exploratory, observational study was conducted with a convenience sample of 60 mother–infant dyads. The study followed mothers' KMC practices from admittance to the hospital KMC ward to 4 weeks post-hospital discharge. A mixed methods evaluation design was used. The study was approved by the Ethics Committee at Kalawati Saran Children's Hospital.

### Recruitment

The mothers were recruited from a KMC ward situated in a level II neonatal intensive care unit at Kalawati Saran Children's Hospital in Delhi, India. Recruitment occurred between July and September of 2015. The hospital was selected because it serves high volumes of disadvantaged populations and is representative of government health facilities in urban Indian settings.

All infants admitted to the KMC ward were screened for study eligibility. Mothers were recruited 48 h after KMC initiation. This allowed potential study participants the opportunity to acquaint themselves with KMC procedures. The hospital nurse provided the study protocol to eligible mothers. Those wanting to participate gave verbal consent on a digital recorder.

### KMC instruction

Mothers were taught KMC practice while in the hospital's KMC infant ward. The hospital physician instructed each mother on techniques for how to position and engage the infant in skin-to-skin contact and exclusive breastfeeding. This approach follows recommendations from the Government of India and is explained in the Operational Guidelines for Kangaroo Mother Care and Optimal Feeding of Low Birth Weight Infants [11]. Physicians encouraged mothers to practice KMC daily for the maximum

amount of time the mother felt comfortable and at a minimum for 1 h per sitting.

### Data collection

There were three main data collection points; baseline (in hospital 48 h post-KMC training), 2 weeks post-discharge (phone visit) and 4 weeks post-discharge (home visit). Two research assistants, trained in qualitative research methods, administered questionnaires at baseline, 2 and 4 weeks post-discharge.

Infant weight was taken at baseline and 4 weeks after discharge using a Shakti Digital Baby Weighing Scale (Gujarat, India), hospital grade (precision up to 1 g). Infant length and head circumference were taken at birth and 4 weeks after discharge. Length was measured with an infantometer to the nearest 0.1 cm and head circumference measured with a non-stretchable tape to the nearest 0.1 cm.

Other baseline data included demographic information, close-ended questions assessing mothers' acceptability of KMC and self-reported (physician recorded) breastfeeding practices, and duration of KMC practiced.

Two-weeks after discharge a short KMC questionnaire was administered that included close-ended questions about home KMC acceptability; self-reported breastfeeding practice and duration of KMC practiced.

Four weeks after discharge data collected included infant anthropometric measures, self-reported breastfeeding practice and duration of KMC practiced, interviewer administered semi-structured questionnaire regarding mothers' home KMC experiences. Socio-economic status was measured by the Kuppuswamy's Socioeconomic Status Scale developed specifically for an Indian population [12].

### Questionnaire development, quality control

The questionnaire was designed to assess feasibility and acceptability of home KMC practice. When possible, questions were adapted from validated survey instruments in the literature [13, 14]. The questionnaire was translated from English to Hindi and piloted with mothers prior to the study. Week 4 post-discharge interviews were digitally recorded and transcribed into English. Recordings of the visits were randomly sampled, transcribed and reviewed by

the principal investigator for quality control purposes.

### Data analysis

Descriptive statistics were calculated for quantitative variables using SPSS (Version 23.0, 2015). This included infants' weight, head circumference, length, percentage of mother–infant dyads that completed 4 weeks post-discharge KMC implementation, exclusivity of breastfeeding duration (h/day), frequency of skin-to-skin contact practices each day and number of days per week KMC (skin-to-skin contact) was implemented.

Qualitative data from semi-structured interview questionnaire were de-identified and entered into NVivo qualitative data analysis Software (QSR International Pty Ltd. Version 10, 2012) for coding. Two research team members independently coded, summarized and categorized data as barrier or enabler. Any discrepancies between coders were discussed until agreement was reached. A senior research team member reviewed data to ensure themes were culturally appropriate.

An exploratory analysis was conducted using the Mann–Whitney U (SPSS version 23.0, 2015) to determine if there were any relationships between barriers, enablers and duration of time implementing home KMC. Nonparametric statistics was used because of skewed distribution of KMC hours. The total number of enablers and barriers for each mother was calculated. Spearman's rank correlation was used to determine if the total number of barriers or enablers was correlated with the duration of time KMC was practiced.

## RESULTS

### Mother–infant dyad participants

A total of 137 mothers were screened and 77 were ineligible for participation. Reasons for exclusion were infant birth weight >2000 g ( $n = 29$ ), mother lived  $\geq 20$  km from the hospital ( $n = 14$ ), mother in the ward  $<48$  h ( $n = 12$ ), multiple births ( $n = 14$ ) and mother refused to participate ( $n = 8$ ).

**Table 1** provides details about religion, income, mothers' age and number of children in the household. Nearly half of the mothers have less than a

middle school education. Over half (60%) of the mothers migrated to Delhi; and greater than 30% are lower class and 43.3% lower middle class (according to the Kuppuswamy's Socioeconomic Status Scale).

Of the 60 mothers recruited for the study, 88.3% ( $n=53$ ) completed all data collection visits. The reason for dropouts included a lack of response to

**Table 1.** Select demographic variables of sample population of mother–infant dyads

Variable	Measurement
Age of mother	26 years $\pm$ 4.5
Mothers education	
Post-high school	30 % (18)
High school	21.7% (13)
Primary and middle school	28.3% (17)
Illiterate	20.0% (12)
Socio-economic status	
Upper class	8.3% (5)
Upper middle class	16.7% (10)
Lower middle class	43.3% (26)
Upper lower class	31.7% (17)
Lower class	3.3% (2)
Age at marriage	
<18 years	15.0% (9)
$\geq 18$ years	85.0% (51)
Parity	
1	45.0% (27)
2	33.3% (20)
$\geq 3$	21.7% (14)
Number of children under 5 in household	
0 children	51.7% (31)
1 child	38.3% (23)
$\geq 2$ children	10.0% (6)
Normal delivery	70.0% (42)
Caesarean delivery	30.0% (18)
State of origin—Outside of Delhi	60.0% (36)
Religion—Hindu	88.3% (53)
Infant sex—Male	65.0% (39)
Gestational age at birth	31 weeks (29–34)
Infant day count at KMC initiation	9 days (4.0–18.8)
Infant day count at discharge	18 days (9.0–33.0)

Data expressed as mean  $\pm$  SD, median (IQR) or percentage ( $n$ ) where appropriate.

attempts to schedule visits ( $n=5$ ) and infants expired during the study period ( $n=2$ ).

### KMC practice at 4 weeks post-discharge

The majority of the 88.3% of mothers who completed the 4 weeks post-discharge visit were breastfeeding and practicing skin-to-skin contact. Seven mothers (13.2%) discontinued home KMC at 4 weeks post-discharge visit. KMC was practiced on average 3.3 h per day and 5.1 days per week. Infant growth measures were not analyzed for significance; however, there were positive gains in weight, length and head circumference (Table 2).

### Close-ended questions

Questions about attitudes and practice patterns of KMC were assessed at baseline and 2 weeks post-discharge. Table 3 shares information for key items asked at more than one visit. Between baseline and 2 weeks post-discharge, father's knowledge of KMC benefits increased from 48% to 80%. Support by husband or other family member practicing KMC increased from 49% to 58% between 2 and 4 weeks post-discharge.

### Semi-structured interview (open-ended questions)

The participants' interview information was coded and categorized. Table 4 lists the factors identified as enablers or barriers to KMC implementation at home.

The majority of mothers (51.7%) noted the top enabler to their KMC practice was help with household responsibilities/chores. Forty-two percent of mothers found the husband or family member performing skin-to-skin contact/KMC enabled them to also practice KMC. The total number of enablers reported was positively correlated ( $p = 0.000$ ) with the duration of KMC practice. The top two enablers were also significantly related to the amount of time KMC was practiced, with support for chores and household responsibilities being most significant ( $U = 195$ ,  $p = 0.008$ ).

The most frequently noted barriers to KMC practice was being responsible for the household chores and being uncomfortable. Nearly one-fourth of mothers cited privacy and hot weather as important barriers to KMC practice. The total number of barriers was significantly and negatively related to the

**Table 2. Mothers' KMC practice and infant anthropometric measures at baseline and 4 weeks post-discharge**

Variable	Baseline hospital KMC ward ( <i>n</i> = 60)	End point 4 weeks after discharge ( <i>n</i> = 53)
<b>Breastfeeding</b>		
Exclusively fed breastmilk	45.0 (27)	71.7 (38)
Partially fed breastmilk	31.7 (19)	18.9 (10)
Not fed breastmilk	23.3 (14)	9.4 (5)
KMC hours per day	4.3 ± 2.2	3.3 ± 2.7
Number of days/week practiced KMC	N/A	5.1 ± 2.3
Weight gain per day from KMC initiation to 4 weeks after discharge (g/kg/day)	N/A	12.5 ± 5.2
Infant head circumference at birth (cm)	28.2 ± 2.1	32.8 ± 1.0
Infant length at birth (cm)	40.1 ± 3.6	47.5 ± 2.2

Data expressed as mean ± SD or percentage (*n*) where appropriate.

duration of KMC practice ( $r_s = 0.462$ ,  $p = 0.000$ ). The barriers significantly related to the duration of KMC practice was the lack of privacy ( $p = 0.002$ ) and lack of motivation ( $p = 0.034$ ).

## DISCUSSION

This exploratory study of 53 mothers with LBW neonates demonstrated the feasibility and efficacy of home KMC practice following hospital KMC initiation. A comparable in-hospital KMC training to home KMC practice was not identified. A community study in India with 101 mother neonate dyads found slightly more than half receiving prenatal KMC education initiated home KMC within 72 h of birth [15]. Participants reported practicing KMC for an average of 5 h/day [15]. The mothers of LBW neonates reported barriers of KMC practice that included living arrangements, mothers' responsibility of household chores, hot weather and having more than one child [15].

Most studies of KMC practice with LBW neonates have been conducted during hospitalization. A review of studies on KMC implementation with LBW infants during hospitalization found several factors to be critical for caregivers' adoption of KMC [16]. The mother, father, mother-in-law and other family members must believe there are benefits to the infants' health [10]. The review of 99 articles confirmed that KMC acceptance and the

engagement of family members is more likely when there is a belief that KMC is beneficial for mother and infant. Our study found (at baseline) 48% of mothers reported their husbands knew about KMC benefits. After 2 weeks of home KMC practice 80% of husbands knew the benefits. The increased positive belief in benefit was a likely enabler to the continued practice of breastfeeding and skin-to-skin contact up to 4 weeks post-hospital discharge.

A study determined that the most common determinant of intensified growth for LBW neonates was the duration of KMC practice [9]. This prospective cohort study found LBW neonates receiving KMC for more than 12 h/day (while in the hospital) had greater gains in weight, head circumference and length than those receiving KMC <12 h/day. At the 6 month post-hospital discharge visit, infants receiving KMC at home were found to have incremental growth compared with infants not receiving KMC once at home [9].

Our exploratory study found the most frequently reported enablers of KMC practice were also significantly related to the duration mothers' practiced KMC. Enablers cited most frequently were 'help with household responsibilities' (51.7%) and 'family members performing KMC (skin-to-skin contact)' (41.7%). Other studies have identified social support as a key to successful KMC implementation [10]. A review of KMC studies found that mothers lacking

**Table 3. Mothers' attitudes and practices of home KMC implementation**

Survey question	% Yes (n=) in hospital (n = 60)	% Yes (n=) at home (2 weeks; n = 54)	% Yes (n=) at home (4 weeks; n = 53)
Are you practicing KMC?	100.0 (60)	94.4 (51)	86.8 (46)
Can you handle KMC alone?	95 (57)	83.3 (50)	N/A
Are you scared of smothering baby?	31.7 (19)	11.7 (7)	N/A
Is privacy a concern?	16.7 (10)	25.0 (15)	N/A
Do strange looks from others prevent you from KMC?	N/A	16.7 (10)	13.5 (7)
Will (did) you practice KMC outside of the house?	38.3 (23)	0 (0)	3.8 (2)
Does your husband know about benefits of KMC?	48.3 (29)	80.0 (48)	N/A
Does husband or someone else practice KMC?	N/A	49.1 (26)	57.7 (30)

**Table 4. Relationship between barriers and enablers with duration of KMC practice**

	Percentage participants naming factor influencing KMC practice (n)	Correlation of relationship between variables and duration of KMC practiced (U-value)	p-Value
<b>Enablers</b>			
Family helps w/household responsibilities	51.7 (31)	195	0.008*
Family performs KMC	41.7 (25)	215	0.016*
Family helps with childcare of other children	33.3 (22)	290	0.462
Motivated to perform KMC by family members	13.3 (8)	113.5	0.098
<b>Barriers</b>			
Responsible for household chores	41.7 (25)	306	0.432
Baby felt uncomfortable in KMC position	40.0 (24)	242	0.058
Privacy	21.7 (13)	112	0.002*
Hot weather	21.7 (13)	170.5	0.064
Mother felt physically uncomfortable	20.0 (12)	160.5	0.069
Lack of motivation	13.3 (8)	95	0.034*

\*Statistically significant values.

healthcare staff support during hospitalization had a harder time implementing KMC [16].

A review of 103 qualitative studies about KMC utilization during hospitalization reported that primary barriers were factors related to lack of support and the mother neonate dyads' discomfort (pain, fatigue, heat). These studies also found the lack of privacy limited a family's adoption of KMC [16–18].

Our study of home KMC practice also found 'lack of privacy' and 'lack of motivation' to be significantly, and negatively, related to the length of time KMC was practiced. Factors that foster KMC practice and positively influence the duration of practice includes 'help with household responsibilities' and 'family members performing KMC (skin-to-skin contact)'. Strategies to increase social support (including

paternal involvement), may help address a mothers' lack of motivation and help increase the duration infants experience skin-to-skin contact.

In many countries, societal norms do not support the father having an active role in child care or helping with household chores because these are typical roles for the mother [10]. Older generations, such as a mother-in-law that lives with the family, may add to the barriers by not supporting KMC because of traditions and norms for handling infants and role delineation [16]. This study found husband's knowledge of KMC benefits increased within 2 weeks post-hospital discharge. This implies the husband became more interested and with encouragement could be further engaged in home KMC practice. Our study found a primary enabler to KMC practice and practice for longer duration was the participation of fathers and other family members. Nearly half of participants reported fathers and/or other family members practiced KMC (skin-to-skin) care. Future studies to assess barriers to paternal engagement and ways to overcome these barriers will be critical to widespread utilization of KMC at home post-hospital discharge.

### Study limitations

This was an exploratory study using a convenience sample, with a non-experimental design. The study findings are relevant to other urban mothers in India with stable LBW infants interested in home KMC practice. Mothers self-reported the amount of time spent on KMC practice. Duration was reported using several questions asking about days/week, minutes/day, time of day and frequency per day. There is not a standardized method for reporting on duration of KMC/skin-to-skin contact practice.

In general, surveys and questionnaires can lead to participant bias as they may want to please study staff and report what they think they ought to have done. The questions about KMC implementation, barriers and enablers were modified from other questionnaires. Questions were reviewed with subset of participants to assess clarity of question and some changes were made. At the week-4 visit, the interviewer asked each participant questions and follow-up depending on responses made. Many times, the last interview was conducted in a joint family

environment with husbands, mothers-in-law and other family members present. This could have resulted in some biased responses.

### CONCLUSION

Resource limitations that prevent the availability of specialty hospital units, or cause overcrowding and earlier discharges from hospital units, amongst other issues, make home KMC implementation imperative to the survival of LBW/premature infants. KMC education and instruction with ongoing support for families with LBW infants need to be made available. Future programs may increase the dissemination and adoption of KMC by specifically addressing enablers and barriers correlated to duration of home KMC.

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### REFERENCES

1. World Fact Book. Washington, DC: Central Intelligence Agency, 2017 [Internet]. <https://www.cia.gov/library/publications/the-world-factbook/fields/2091.html> (11 November 2017, date last accessed).
2. United Nations Inter-agency Group for Child Mortality Estimation. UNICEF Data: Monitoring the Situation of Children and Women: United Nations International Children's Emergency Fund; 2017 [Internet]. <https://data.unicef.org/topic/child-survival/neonatal-mortality/> (15 May 2018, date last accessed).
3. Lawn JE, Cousens S, Zupan J. Team. LNSS. 4 million neonatal deaths: when? where? why? Lancet 2005;365: 891–900.

4. Sankar MJ, Neogi SB, Sharma J, et al. State of newborn health in India. *J Perinatol* 2016;36:S3–S8.
5. Conde-Agudelo A, Diaz-Rosello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev* 2016;23:CD002771.
6. Chan GJ, Valsangkar B, Kajeepeta S, et al. What is kangaroo mother care? Systematic review of the literature. *J Glob Health* 2016;6:1–9.
7. Boundy EO, Dastjerdi R, Spiegelman D, et al. Kangaroo mother care and neonatal outcomes: a meta-analysis. *Pediatrics* 2016;137:e20152238.
8. Charpak N, Tessier R, Ruiz JG, et al. Twenty-year follow-up of kangaroo mother care versus traditional care. *Pediatrics* 2017;139:e20162063.
9. Vohra AS, Shah BH, Mehariya KM. Effect of kangaroo mother care on feeding, morbidity and neuro development of low birth weight neonates. *Int J Contemp Med Res* 2017;4:1029–32.
10. Chan GJ, Labar AS, Wall S, et al. Kangaroo mother care: a systematic review of barriers and enablers. *Bull World Health Organ* 2016;94:130–41.
11. Khera A, Prabhakar PK, Srivastava R, et al. Kangaroo Mother Care and Optimal Feeding of Low Birth Weight Infants. New Delhi: Child Health Division, Ministry of Health Family and Family Welfare, 2014.
12. Gururaj M. Kuppuswamy's socio-economic status scale; a revision of income parameter for 2014. *Int J Recent Trends Sci Technol* 2014;11:1–2.
13. Nguaah SB, Wobil PNL, Obeng R, et al. Perception and practice of kangaroo mother care after discharge from hospital in Kumasi, Ghana: a longitudinal study. *BMC Pregnancy Childbirth* 2011;11:99.
14. Sloan NL, Ahmed S, Mitra SN, et al. Community-based kangaroo mother care to prevent neonatal and infant mortality: a randomized controlled cluster trial. *Pediatrics* 2008;121:e1047–59.
15. Rasaily R, Ganguly KK, Roy M, et al. Community based kanagroo mother care for low birth weight babies: a pilot study. *Indian J Med Res* 2017;145:51–57.
16. Smith ER, Bergelson I, Constantian S, et al. Barriers and enablers of health system adoption of kangaroo mother care: a systematic review of caregiver perspectives. *BMC Pediatr* 2017;17:35.
17. Seidman G, Unnikrishnan S, Kenny E, et al. Barriers and enablers of kangaroo mother care practice: a systematic review. *PLoS One* 2015;10:e0125643.
18. Chan G, Bergelson I, Smith ER, et al. Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. *Health Policy Plan* 2017;32:1466–75.