

SUPPLEMENT ARTICLE

Government-led initiative increased the effective use of Kangaroo Mother Care in a region of North India

Arun S. Jadaun¹ | Suresh K. Dalpath² | Sonia Trikha² | Ravi P. Upadhyay¹  |
Nita Bhandari¹ | Jaswant Singh Punia³ | Manoj Rawal⁴ | Jose Carlos Martines⁵ |
Rajiv Bahl⁶ | Ramesh Agarwal⁷ | Sarmila Mazumder¹ 

¹Centre for Health Research and Development, Society for Applied Studies, New Delhi, India

²State Health Systems Resource Center, Haryana, Panchkula, Haryana, India

³Department of Health, District Hospital, Government of Haryana, Sonipat, Haryana, India

⁴Bhagat Phool Singh Government Medical College, Sonipat, Haryana, India

⁵Department of Global Public Health and Primary Care, Centre for Intervention Science in Maternal and Child Health, University of Bergen, Bergen, Norway

⁶Department of Maternal, Newborn, Child and Adolescent Health, World Health Organization, Geneva, Switzerland

⁷Department Pediatrics, All India Institute of Medical Sciences, New Delhi, India

Correspondence

Sarmila Mazumder, Centre for Health Research and Development, Society for Applied Studies, 45 Kalu Sarai, New Delhi 110016, India.

Email: sarmila.mazumder@sas.org.in

Funding information

This study was coordinated by the Department of Maternal, Newborn, Child and Adolescent Health and Ageing of the World Health Organization with financial support from the Bill & Melinda Gates Foundation (OPP1136804). The funder had no role in the study's design, data collection, analysis, write-up and decision to submit the final paper for publication.*

Abstract

Aim: To learn how to achieve high-quality, effective coverage of Kangaroo Mother Care (KMC), defined as 8 hours or more of skin-to-skin contact per day and exclusive breastfeeding in district Sonipat in North India, and to develop and evaluate an implementation model.

Methods: We conducted implementation research using a mixed-methods approach, including formative research, followed by repeated, rapid cycles of implementation, evaluation and refinement until a model with the potential for high and effective coverage was reached. Evaluation of this model was conducted over a 12-month period.

Results: Formative research findings informed the final implementation model. Programme learning was critical to achieve high coverage. The model included improving the identification of small babies, creating KMC wards, modification in hospitalisation criteria, private sector engagement and in-built programme learning to refine implementation progress. KMC was initiated in 87% of eligible babies. At discharge, 85% received skin-to-skin contact care, 60% effective KMC and 80% were exclusively breastfed. At home, 7-day post discharge, 81% received skin-to-skin care and 79% were exclusively breastfed in the previous 24 hours.

Conclusion: Achieving high KMC coverage is feasible in the study setting using a model responsive to the local context and led by the Government.

KEYWORDS

Health systems, Implementation research, Kangaroo Mother Care, Low birth weight, Programme scale up

Abbreviations: KMC, Kangaroo Mother Care; WHO, World Health Organization.

In any reproduction of this article there should not be any suggestion that WHO or the article endorse any specific organization or products. The use of the WHO logo is not permitted. This notice should be preserved along with the article's URL.*

*[The funding information and copyright line for this article were changed in July 2023 after original online publication].

This is an open access article distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2022 World Health Organization; licensed by Foundation Acta Paediatrica. *Acta Paediatrica* published by John Wiley & Sons Ltd on behalf of Foundation Acta Paediatrica.

1 | INTRODUCTION

The India Newborn Action Plan was launched in September 2014, and its aim is to accelerate the reduction of preventable newborn deaths and stillbirths in the country.¹ It set a Government target of less than 10 neonatal deaths per 1000 live births by 2030. Although India has made considerable progress in reducing the neonatal mortality rate from 38.0 to 23.5 per 1000 live births between 2000 and 2017, wide variations exist across the country.² New interventions are needed for India to achieve the Sustainable Development Goals for reduced neonatal mortality. The 2030 Agenda for Sustainable Development was adopted by all Member States of the United Nations in 2015.³

Kangaroo Mother Care (KMC) has been shown to reduce mortality, morbidity and the duration of hospital stays.⁴⁻⁷ However, its coverage is very low in India, as in other countries, and implementing it remains a challenge.⁸⁻¹¹

A multicountry study coordinated by the World Health Organization (WHO) was conducted in 7 sites in India and Ethiopia to scale up KMC in health facilities and after babies were discharged home. The WHO wanted to investigate a range of experiences from diverse contexts and identify lessons learnt across all of the sites.¹²

The aim of this study, which covered the period 1 March 2018 to 28 February 2019, was to learn how to achieve high-quality, effective coverage of KMC in Sonipat, one of 22 districts in the north Indian state of Haryana. We also wanted to develop, and evaluate, an implementation model that could be adapted for other settings.

2 | METHODS

2.1 | Study setting

Sonipat has a population of about 1.5 million and is situated about 44 kilometres from the national capital, Delhi. The district is primarily rural (69%)¹³ with 4 towns and 347 villages. The male and female literacy rates are 87.2% and 69.8%, respectively.¹³ The common occupations for young males are working in cultivation (27%) and agricultural labourers (19%). The remainder are Government servants, teachers, factory workers, plantation workers and self-employed.¹³ Most of the women (95%) do not work outside home.

Sonipat has about 26000 births per year. Most births (99.7%) take place in health facilities and nearly two-thirds (62.4%) of babies are delivered in public facilities. In the state of Haryana, 73.9% of the babies are weighed at birth and 20.9% of those weigh less than 2500 grams.¹⁴ The district has 30 rural and 2 urban primary health centres, 7 community health centres, 1 medical college hospital, 1 district hospital and 101 private facilities. Level 3 neonatal intensive care units are only available in the single medical college hospital and the nine super-speciality private hospitals. The special newborn care unit (level 2) in the single district hospital provides most aspects of newborn care, except assisted ventilation and major surgery. The area now has newborn stabilisation units in community health centres, which are meant to provide basic stabilisation and feeding

Key notes

- Despite the proven efficacy of Kangaroo Mother Care (KMC) for preterm or low birth weight babies, coverage is very low
- Principles of implementation research guided the development of a successful model to scale up KMC implementation in a district with 1.5 million population.
- Government-led implementation, context-adapted solutions including policy adjustments and private sector engagement were key components of model success.

support, but they had not been established in Sonipat at the start of the study. The community health workers were 364 auxiliary nurse midwives and 1326 accredited social health activists. The role holders are, respectively, trained to provide specialist and general interfaces between local villages and public health services.¹⁵ The infant and neonatal mortality rates were 20 per 1000 and 14 per 1000 live births, respectively, during the study period, which ran from 1 March 2018 to 28 February 2019. The maternal mortality ratio was 83 per 100,000 live births.¹⁶

This paper reports the experience of developing, and evaluating, a model for Sonipat. We present an in-depth report of the site-specific barriers and challenges, describe the strategies used to overcome those and provide data on the coverage of KMC as a result of the initiative. Effective coverage was defined as 80% of eligible babies receiving a minimum of 8 hours of skin-to-skin contact per day along with exclusive breastfeeding.⁸

2.2 | Study design and population

This study was based on the principles of implementation science and we used an iterative process and a mixed-method design to develop the final implementation model.^{8,12} From 1 March 2018 to 28 February 2019, 26964 babies were born in the entire district, including in facilities and at home and 918 (3%) weighed <2000g at birth. Of these, 762 were eligible for KMC initiation and 662 (87%) were initiated (Table 1). To the best of our knowledge, these births represented almost all of the babies born in the district during the study period. KMC initiation and status was ascertained at discharge, 7 days after discharge and when the infants were 28 days of age. The study excluded newborn infants who died, were taken from the hospital against medical advice or were referred to a hospital outside the district during the first 3 days of life.

The study was conducted in three stages by three specific research teams. The implementation support team provided technical and managerial support to the Government during the early project implementation. A programme learning team, with qualitative research skills, identified barriers and facilitators to KMC uptake and provided feedback to the implementation support team. The third

TABLE 1 Descriptive epidemiology of the babies and their KMC outcomes in health facilities

Baby/ Characteristics	Total	Type				Birth Weight (g)			
		Hospital- Government	Health Centre- Government	Hospital- Private	Home/in transit	1501-1999	1001-1500	501-1000	<500
Live birth	26,964	9175 (34%)	8776 (33%)	8925 (33%)	88 (0.3%)	-	-	-	-
Babies with birth weight <2000 g	918	403 (44%)	154 (17%)	330 (36%)	31 (3%)	687 (74.8%)	167 (18.2%)	62 (6.8%)	2 (0.2%)
Mean birth weight (g) (sd)	1650 (320.5)	1645 (357.05)	1688 (273.9)	1645 (293.1)	1585 (306.6)	-	-	-	-
Median birth weight (IQR) (g) in babies <2000 g	1750 (1500, 1890)	1780 (1530, 1900)	1800 (1600, 1890)	1727 (1500, 1880)	1650 (1450, 1800)	-	-	-	-
Babies eligible for KMC ^a	762	328	110	297	27	619	122	21	-
Babies initiated to KMC ^b	662 (86.9%)	300 (91.5%)	101 (91.8%)	238 (80.1%)	23 (85.2%)	558 (90.1%)	101 (82.8%)	3 (14.2%)	-

^aBabies excluded as not eligible=156; [children died in <3 days =100 (47 referred out and died <3 days and 53 died within the area); children referred out of area in <3 days =31; left against medical advice <3 days =25]

^bBabies not initiated =100 (babies referred to higher facilities after 3 days and before initiation: 17; babies died after 3 days before initiation: 14; directly discharged without sending them to the KMC units: 47; baby still admitted in newborn care unit: 12; left against medical advice: 9; and family refused admission to KMC unit: 1)

was the outcome measurement team, which independently measured coverage and other outcomes.

2.3 | Research team

The project was led by a coalition that comprised the Haryana political leadership, the National Health Mission and the research group. Sonipat was selected by the Government as it was the best-performing district in terms of maternal and newborn health parameters, with well-functioning health facilities and a high proportion of institutional deliveries. The aim of the Government was to create Sonipat as a demonstration site and model KMC district so that it could be replicated by other districts.

2.4 | Development of the implementation model

An analysis of the strengths, weaknesses, opportunities and barriers was carried out (Figure 1) to develop the implementation model. The formative research informed the conceptualisation and design of the initial model, which was named Model 0. Rapid iterative cycles were conducted, with concurrent implementation, evaluation and refinement, to reach a final scalable model. The initial cycle included different types of healthcare facilities, to provide insights into the unique challenges and effective solutions in these settings.^{8,12} These were due to the inherent differences in the infrastructure, human resources, capacity and administrative hierarchy, unique to each type of facility.

The KMC intervention package was implemented at 3 levels, prefacility, facility and postfacility, which has been described elsewhere.^{8,12} The specific activities and evolution from models 0 to 3 are described in the Results section.

2.5 | Evaluation of the final model

The evaluation of the final model that emerged out of three rounds was carried out from 1 March 2018 to 28 February 2019. At the start of the study, none of the public or private health facilities were using KMC, which meant that there was zero coverage at baseline. The cohort members who were born weighing <2000g, or admitted to the facilities, were followed up by the outcome measurement team until they were 28 days of age. The team assessed population-based coverage by visiting the homes of these subjects 7 days after they were discharged and at 28 days of age provided they were discharged from the NICU, irrespective of whether KMC had been initiated.

A sample of 310 newborn infants was estimated to be sufficient to evaluate 80% coverage with $\pm 5\%$ precision.⁸

2.6 | Statistics

Study data were collected and managed using REDCap electronic data capture tools hosted at the study site. REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive

Strengths Committed, proactive and enthusiastic government leadership. Best performing district selected High level of institutional births in the district. Long association of research group and the state government. In-depth understanding of the local context. Previous experiences in research of community-initiated KMC in the same state.	Weaknesses State government sanction for setting up KMC units restricted to district hospitals, no provision at sub-district facilities and medical college, no provision for maintenance cost. Two largest facilities controlled by different Ministries, need for separate approvals and operationalization. Operational guidelines generic, lacking practical implementation steps to scale up. KMC new concept, zero baseline coverage. Newborn stabilization units not functional at CHCs.
Opportunities Government operational guidelines on KMC in place. State orders with funding to all districts to implement KMC at district hospitals Stable leadership at study district. KMC unit at tertiary care hospital as a resource.	Barriers 30% births in private sector. Lack of concurrence on KMC between obstetricians and pediatricians. Inadequate human resources. Limited supervision/monitoring in facility/community.

FIGURE 1 Strengths, weaknesses, opportunities and barriers to KMC

interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources.

The performance of the final model was assessed in the population of 762 eligible newborns having birthweight of less than 2000 grams. Data analysis was conducted using Stata V.13 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP).

2.7 | Ethical approval and consent

The study was approved by, the Ethics Review Committees of the WHO and the Centre for Health Research and Development, Society for Applied Studies (SAS/ERC/KMCUS/2016), and the Department of Health & Family Welfare and the Government of Haryana. The study protocol was registered with ClinicalTrials.gov (ID: NCT03098069).

Parents were not asked for consent to receive the intervention, as KMC was the government standard of care. Individual written informed consent was requested from mothers, caregivers and health workers for the collection of study data. For those unable to read, the information was read by a team member in the presence of an impartial literate witness who signed the consent form, in addition to the thumb impression of the respondent.

3 | RESULTS

The study results are split into two sections a) development of an implementation model that was likely to reach high coverage, by providing effective KMC in the district and b) evaluation of the coverage achieved by this model.

3.1 | Development of the model

3.1.1 | Model 0

Prefacility

To improve the identification of small babies, the accredited social health activists were given new infant weighing scales and retrained in weighing small babies. Referral slips were designed, and ambulance services were strengthened to improve prompt referrals. Institutional births were promoted by accredited social health activists and auxiliary nurse midwives in facilities with a KMC ward.

Facility

KMC wards were established in selected facilities to facilitate KMC initiation, with funding from the Haryana Government. These provided adjustable reclining beds, round-the-clock water, electricity, clean toilets and bathing areas and controlled ambient temperatures. They were also equipped with televisions to show KMC videos and adequate security to promote the mothers' comfort and safety. Digital weighing scales, donated by the World Health Organization, were placed in labour rooms, special newborn care units, newborn stabilisation units and KMC wards in the Government birthing facilities with the high volume of deliveries, defined as more than 20 deliveries per month. Training was organised at the prestigious All India Institute of Medical Sciences in New Delhi for the district pool of 15 master trainers, especially constituted by the government for KMC scale up. They then trained all the Government personnel and provided on the job supportive supervision. Special newborn care unit staff nurses were responsible for the new KMC wards, since dedicated staff nurses were not available.

Postfacility

To improve the timeliness, frequency and quality of home-based postnatal care, accredited social health activists were trained in KMC. This training was supported by the implementation support team.

3.1.2 | Model 1

Programme learning indicated how Model 0 could be improved to increase its coverage. The changes are described below.

Prefacility

New accredited social health activists were recruited for areas not covered by accredited social health activists. Pregnancy surveillance was improved and expanded to include migrant populations and this led to higher and more complete population coverage. High-risk pregnancies were referred to birthing facilities with KMC units. Social and behaviour change communication activities increased community awareness of KMC and its demand.

Facility

Reporting formats, new tools for documenting and monitoring KMC practice were developed, and integrated with pre-existing tools. Kitchens were established responding to the need to provide hot cooked meals for the mothers. Four dedicated KMC support workers per district were sanctioned by Government. KMC coverage indicators were incorporated into the Government's health management information system and reviewed monthly, enhancing accountability. Staff nurses in the special newborn care units told accredited social health activists when babies receiving KMC were being discharged and sent home to ensure continuity of care. Families using private and medical college hospitals were encouraged to contact the accredited social health activists directly as these were not linked with these institutions.

Postfacility

Mass media was used more widely and this included posters of national sports personalities who lived in the district, promoting KMC. It also included pamphlets, KMC songs composed and played by accredited social health activists and KMC videos that were shown during community meetings. Accredited social health activists were increasingly encouraged to pay home visits within 24 hours of discharge. Integrated Child Development Scheme workers,¹⁷ who provide nutritional services, the village administrators and local non-Governmental organisations were also involved.

3.1.3 | Model 2

The implementation of Model 1 indicated that further improvements were needed to increase KMC coverage.

TABLE 2 Working with the private hospitals

Working with the private sector: The Government KMC model required adaptation. Due to limited space in private hospitals, establishing a dedicated KMC ward was not feasible. Women from higher socioeconomic strata were reluctant to share the same space with those from lower socioeconomic strata. Therefore, KMC was initiated wherever the mother and baby were placed. Incubator care is a source of high-profit margins; hence, it competed with KMC. KMC was thus allowed to be intermittent, alternating with incubator care. Initial reluctance to share data on total deliveries and birth weights was overcome later through continued dialogue. The duration of stay postbirth was usually shorter in private hospitals, due to high costs. Facilities preferred early discharge to enable new admissions. Staff shortage, particularly at night, was an additional challenge. The brief stay did not allow mothers to practice KMC, thus reducing conviction and confidence. Mothers were asked to visit the outpatient ward daily for learning KMC, which was not a practical solution due to the cost of travel and lack of time. Training duration was shortened due to staff shortage. The public-private partnership was demonstrated through practical training in the Government KMC ward by the Government paediatrician. Documentation of KMC practice was perceived as an additional burden. A district KMC network was created by the Chief Medical Officer with the president of the local Indian Academics of Paediatrics and KMC champions among private practitioners. KMC became an integral part of the group orientation sessions, one-on-one meetings and Continued Medical Education sessions, many of these initiatives were led by the district Chief Medical Officer. Families were encouraged to call accredited social health activists directly for home visits and overcome the problem of facility-community linkage

Prefacility

We needed to make the KMC initiation weight criteria used by the accredited social health activists consistent with those used in the project and their guidelines were modified from <1800g to <2000g. The Government introduced an additional incentive of INR 100 (1.31 USD) for these accredited social health activists to refer to KMC facilities. Innovative audio-visual aids were introduced to strengthen communication, including videos demonstrating KMC practices in various positions and mothers doing household chores using binders as special support to securely keep their baby in the KMC position. The videos were shown to mothers and families on the mobile phones of accredited social health activists and auxiliary nurse midwives. The latter is also responsible for immunisation and antenatal care. The supervision of community activities was further promoted to enhance KMC coverage and accountability.

Facility

Adaptations were made for private facilities (Table 2). Dedicated KMC wards were not feasible due to limited space and KMC was initiated wherever the mothers and babies were admitted. Private providers received shorter training, provided in the Government KMC ward, due to their limited availability. The emphasis was on practical sessions. The medical college hospital required other adaptations for effective KMC implementation (Table 4). Medical students

TABLE 3 KMC outcomes at discharge, 7 days post discharge and 28 days of age

Time point	Denominator (evaluated)	Any skin-to-skin care [CI]	Exclusive breastfeeding [CI]	Effective KMC [CI]	Mean duration skin-to-skin care (SD) (in hr)	Median duration skin-to-skin care (IQR) (in hr)
At discharge ^a	746	631/746 (85%) [0.81, 0.87]	596/746 (80%) [0.76, 0.82]	451/746 (60%) [0.56, 0.63]	11.08 (4.6)	11.5 (8, 14.5)
7-day postdischarge ^b	727	588/727 (81%) [0.77, 0.82]	577/727 (79%) [0.76, 0.82]	444/727 (61%) [0.57, 0.64]	10.6 (4.2)	11 (8, 14)
28 days of age	727	477/727 (66%) [0.62, 0.69]	595/727 (82%) [0.78, 0.84]	-	-	-

^aAt the time of discharge: the denominator reduced to 746 from 762 because 14 had died before initiation and 2 died after initiation.^bAt 7 days after discharge: Did not include 19 out of 746 babies in the evaluation as 5 babies died after discharge, and 7-day visit and 14 babies were admitted in the special newborn care unit during the entire neonatal period.

who were on rotatory internship managed the KMC wards at night and KMC was initiated in the postnatal wards, if there was a delay in transferring babies to KMC wards. Further changes included in Model 2 were creating family KMC areas with recliners, to promote family engagement, encouraging the use of binders as support while providing KMC so that women could move around during KMC. We also developed a counselling package to be delivered at discharge, in collaboration with the Government partners. KMC was initiated in special newborn care units, as brief intermittent sessions, and was integrated with essential newborn care to prevent it from evolving as a vertical programme.

Postfacility

Accredited social health activists received supportive supervision and refresher training. This strengthened their understanding of KMC and its benefits, their counselling and problem-solving skills.

3.1.4 | Model 3

The implementation of Model 2 was further improved to increase its coverage.

Prefacility

A district KMC network was set up by the local branch of the Indian Academy of Pediatrics and private practitioners most frequently accessed by families with newborn infants. This, together with the inclusion of KMC in continuing medical education sessions, helped to increase referrals from private facilities where KMC was not being practiced. During community meetings, positive KMC experiences were shared by local mothers.

Facility

Additional doctors and private hospitals who were interested, started to receive training, technical input, resource materials and KMC recliners. A predischARGE protocol was developed to assess the mothers' skills and confidence to practice KMC at home. Mothers were trained to use binders while they were mobile and family counselling encouraged continued KMC practice. A supervisory committee was established to monitor the quality of KMC in healthcare facilities. This comprised the pool of master trainers, district officers, paediatricians and physicians.

Postfacility

KMC was further advertised and incorporated into health fairs, community programmes and NGO activities.

3.2 | Coverage achieved by the model

During the evaluation period from March 2018 to February 2019, 26964 babies were born in the study district, 918/26964 (3%) weighed <2000 grams at birth and 762 eligible for KMC initiation.

Babies who died (100), referred out of the study area (31) and those who were taken away against medical advice (25), within 3 days of age, were excluded. Of these 762, 662 (87%) were initiated (Table 1). The reasons for non-initiation in 100 babies were; babies referred to higher facilities after 3 days and before initiation: 17, babies died after 3 days before initiation: 14, directly discharged without sending them to the KMC units: 47; babies still admitted in newborn care unit: 12; left against medical advice: 9; and family refused admission to KMC unit: 1. At discharge, the denominator was 746 (14 died after 3 days of birth before initiation and 2 died after initiation. At discharge, 631 (85%) out of 746 received any skin-to-skin contact and 596/746 (80%) were exclusively breastfed. 451/746 (60%) newborn infants received 8 or more hours of KMC with exclusive breastfeeding over the 24-hour period before they were discharged. The mean (SD) duration was 11 (4.6) hours, and the median (IQR) was 11.5 (8, 14.5) hours (Table 3). At home, 7 days after being discharged, 727 babies were followed (19 babies could not be followed up because 5 babies died after discharge, and 14 babies were re-admitted to the hospital), 588/727 (81%) received any skin-to-skin contact and 577/727 (79%) were exclusively breastfed. The data showed that 444/727 (61%) received 8 or more hours of KMC with a mean (SD) duration of 11 (4.2) hours of skin-to-skin contact and exclusive breastfeeding over the 24-hour period prior to the 7days visit. At 28 days of age 727 babies were followed, 477/727 (66%) received any skin-to-skin contact and 595/727 (82%) were exclusively breastfed (Table 3).

Within the 2-year project period, KMC was scaled up beyond the study districts, to 16 other districts within Haryana state and in selected facilities of 3 other states, Himachal Pradesh, Maharashtra and Delhi.

4 | DISCUSSION

We developed a model using the principles of implementation science that achieved high KMC coverage in the study setting. Starting from no practice of KMC at baseline, 85% of newborn infants received skin-to-skin contact, 80% were exclusively breastfed and 60% of mothers were practicing effective KMC (8 hours or more of skin-to-skin contact and exclusive breastfeeding), at hospital discharge. Encouraged by this experience the state Government expanded the implementation across other districts of the state.

As this study was not a blind trial the possibility of bias in measurement or reporting, cannot be ruled out. We believe, however, that these results do reflect the model effects. The team that collected the data on the impact, was independent of the team involved in intervention delivery. Triangulation of the data collected from different sources (the outcome team, the implementation support team and Government sources) does confirm the reported high coverage. A substantial proportion of newborns were excluded before KMC initiation, leading to a possible selection bias, which is a potential limitation of the study. However, since available evidence supported KMC initiation only in stable babies, immediate KMC was not feasible.

TABLE 4 Working with the Medical College hospital

The Medical College hospital, a tertiary care facility is the largest referral hospital in Sonapat. It is not under the jurisdiction of the state health department but is governed by the Director General of Medical Education and Research, a different administrative structure under the Ministry of Education. Major impediments included the nonavailability of human resources, lack of coordination across obstetrics and paediatrics departments within the hospital and difficulty in establishing a facility-community linkage. State health approvals for KMC support workers were not applicable in this hospital. The newborn intensive care unit staff nurses managed the KMC ward during the day, while medical graduates on rotatory internship managed at night. Due to the short duration of the internship (2 months), frequent KMC training sessions were needed. The interns acknowledged the benefit of the hands-on training and were motivated to promote KMC in their future practice. Conflict between the obstetricians and paediatricians, specifically around shifting mother and baby to a KMC ward from the labour room, newborn intensive care unit or postnatal ward, was a major challenge. Due to a lack of interdepartmental coordination, often the mother and baby were discharged directly from the postnatal ward, before KMC initiation, or KMC initiation was delayed till mothers were shifted to the KMC ward. Several solutions were implemented such as the continued orientation of hospital staff, repeated messaging and initiation of KMC after birth as soon as the baby was stable, wherever the mother and baby were admitted. Interdepartmental linkages were strengthened to enable synergy between the obstetricians and paediatricians, and the staff nurses in the two departments. Since medical college hospital was not directly linked with the accredited social health activists, families were encouraged to contact them directly after discharge for KMC support at home

The barriers and challenges, and the solutions that emerged from this study and addressed by our implementation model are similar to observations from others. Significant bottlenecks from the community's perspectives identified through previous studies include community ownership, cultural norms such as delayed breastfeeding, the belief that mother's illnesses are transferred through skin-to-skin contact and taboo in wearing front open clothes.¹⁸⁻²⁰ The other barriers from the mothers', families' and community's perspectives are highlighted as stigma associated with giving birth to small babies, lack of social support to the mother and adequate time availability to perform KMC.^{12,18-20} The challenges from the health systems perspective included insufficient health financing, optimal training and support to the mother, weak leadership and health workforce, and buy-in from Government partners.¹⁰ Key enabling factors that influenced successful implementation by the Government included training and supervision of facility staff, integrating KMC into quality improvement processes, strong local leadership, KMC champions and support from hospital management.²¹⁻²⁴ Additionally, positive attitude of health care providers, continuity of care from the facility to the home, availability of adequate resources and client-oriented care.²¹⁻²⁶ have been reported to enhance effective implementation, as were found in our study. Critical issues that have been addressed in previous studies and are found to be similar in our settings are the adaptation of guidelines

and policies, reorganising staff workload and gaps in knowledge and attitude towards KMC practice in facilities.²¹⁻²⁴ Other crucial issues addressed were inadequate infrastructure, absence of designated budgets and cost to the families for prolonged infant stay in facilities.²¹⁻²⁴ The solutions designed at our site, emerged from within the health system and were proposed by the local Government stakeholders, which facilitated their adoption and promised their sustainability. These are similar to what have been reported from other settings^{11,21-26} and thus reiterating the external validity of our findings. We acknowledge, nonetheless that the solutions incorporated in the Sonipat model may need further adaptation when used in other contexts.

The strengths of our study lie in deep Government engagement right from the conceptualisation of the programme and its alignment with the state's priority agenda. This enabled the rapid development of a model responsive to the local context, led by the Government. The model required improving the detection of small babies, creating KMC wards and modification in hospitalisation criteria such as weight. Engagement of private sector providers and in-built programme learning to review and refine implementation progress and identify and respond to problems detected during implementation, proved to be beneficial. In addition to promoting KMC, the project strengthened the health system through improved pregnancy surveillance, capacity building and improved Government health management information system.

A key factor that contributed to successful scale up was the dedicated infrastructure, to support KMC. This was an innovation that provided the opportunity to screen newborn infants for morbidity, reduce the duration of special newborn care unit stay and promote supervised personalised care of the newborn by the mother. It also legitimised respectful care for mothers thus enabling mothers to have the best conditions to care for their newborn infants. Another factor was the considerable media attention received by the study that led to visits by national and international delegates to the study site. The district was designated as a demonstration site and model district; this further enhanced Government motivation, energising them to bring about systems level transformations and generate additional resources.

The study has several policy implications. Updated operational guidelines with clear and standardised information on KMC, training modules and job aids, are essential. Having an in-built component that provides programme learning to Government was beneficial. Private sector involvement was feasible and can contribute to successful implementation in settings where the private sector is predominantly used for the care of preterm and LBW babies. However, this will require a continuous dialogue with the private practitioners, support and motivation to identify specific problems and generate solutions. Involvement of partners as local non-Governmental organisations may be helpful. Accreditation of private hospitals for promotion of KMC, the inclusion of KMC in continuing medical education, engagement of local professional paediatric and nursing associations and identification of KMC champions could be some potential solutions. Finally, enabling the provision of placing mother infant together and considering them as a single unit of

mother-infant dyad, will underscore the demand for coordination across obstetrics and paediatrics departments. Community-initiated KMC will strengthen the facility-community linkage continued care at home post discharge.

With recent studies demonstrating the improved survival of infants by community-initiated KMC²⁷ and immediate KMC,²⁸ updated guidelines for the care of small and sick babies, are underway.

The lessons learnt from this implementation research provide valuable insights towards future implementation at scale, but its roadmap will need to be adapted to the context of each country.

ACKNOWLEDGEMENTS

We are grateful to the WHO/MCA, which coordinated this study, the Government of Haryana, Dr Ajay Khera, Deputy Commissioner of the Ministry of Health and Family Welfare, Indian Government, for supporting the implementation of the study, and the health workers and families who took part. We thank Professor M K Bhan, Dr Peter Winch and Professor Anthony Costello for their contributions to the study. [This section was amended in July 2023, after original online publication.]

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

ORCID

Ravi P. Upadhyay  <https://orcid.org/0000-0003-0767-9637>

Sarmila Mazumder  <https://orcid.org/0000-0003-4200-6112>

REFERENCES

1. India Newborn Action plan 2014, Ministry of Health and Family Welfare Gov. Available from: <https://nhm.gov.in/index4.php?lang=1&level=0&linkid=153&lid=174> [Accessed 20 March 2022]
2. Mortality India State-Level Disease Burden Initiative Child, Collaborators, Rakhi D, Anil Kumar G, et al. Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–17. *Lancet*. 2020;395(10237):1640–1658.
3. UN General Assembly, Transforming our world : the 2030 Agenda for Sustainable Development, 21 October 2015, A/RES/70/1. Available from: <https://www.refworld.org/docid/57b6e3e44.html> [Accessed 20 March 2022].
4. World Health Organization. Packages of Interventions for Family Planning, Safe Abortion Care, Maternal, Newborn and Child Health. World Health Organization; 2010. <https://apps.who.int/iris/handle/10665/70428>
5. Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev*. 2016 Aug 23;2016(8):CD002771. doi:10.1002/14651858.CD002771.pub4. PMID: 27552521; PMCID: PMC6464509.
6. Thapa K, Mohan D, Williams E, et al. Feasibility assessment of an ergonomic baby wrap for kangaroo mother care: A mixed methods study from Nepal. *PLoS One*. 2018;13(11):e0207206.
7. Ellen O, Boundy EO, Dastjerdi R, et al. Kangaroo Mother Care and Neonatal Outcomes: A Meta-analysis. *Pediatrics*. 2016;137(1):e20152238.
8. Medhanyie AA, Alemu H, Asefa A, et al. Kangaroo Mother Care implementation research to develop models for accelerating scale-up

- in India and Ethiopia: study protocol for an adequacy evaluation. *BMJ Open*. 2019;9(11):e025879.
9. Lawn JE, Kinney MV, Belizan JM, et al. Born too soon: accelerating actions for prevention and care of 15 million newborn infants born too soon. *Reprod Health*. 2013;10 (Suppl 1):S6.
 10. Vesel L, Bergh AM, Kerber KJ, et al. Kangaroo mother care: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth*. 2015;15 (Suppl 2):S5.
 11. Charpak N, Angel MI, Banker D, et al. Strategies discussed at the XIIth international conference on Kangaroo mother care for implementation on a countrywide scale. *Acta Paediatr*. 2020;109(11):2278-2286.
 12. Mony PK, Tadele H, Gobezahehu AG, et al. Scaling up Kangaroo Mother Care in Ethiopia and India: a multi-site implementation research study. *BMJ Glob Health*. 2021;6(9):e005905.
 13. Census of India. District Census Handbook Sonipat. 2011. Available from: https://censusindia.gov.in/2011census/dchb/DCHB_A/06/0608_PART_A_DCHB_SONIPAT.pdf [Accessed on 20 March 2022]
 14. Rapid Survey on Children (2013-2014), Ministry of Women and Child Development, Haryana fact sheet. Available at <https://wcd.nic.in/sites/default/files/RSOC%20FACT%20SHEETS%20Final.pdf> [Accessed on 20 March 2022]
 15. National Health Mission MoHFW, Government of India. About Accredited Social Health Activist (ASHA). Available from: <https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=150&lid=226> [Accessed on 20 March 2022].
 16. Population Research Centre IoEG, University of Delhi Enclave, North Campus. Delhi A Report on Monitoring of Important Components of NHM Programme Implementation in Sonipat District, Haryana. In: Ministry of Health and Family Welfare Gol, 2017. Available from: <http://iegindia.org/upload/uploadfiles/Sonipat%20Haryana%202017.pdf> [Accessed on 20 March 2022]
 17. Kaur D, Thakur M, Saini S. ICDS: Key Role of Anganwadi Workers. *Res Rev J Food Sci Technol*. 2016;5(2):26-29p.
 18. Smith ER, Bergelson I, Constantian S, Valsangkar B, Chan GJ. Barriers and enablers of health system adoption of kangaroo mother care: a systematic review of caregiver perspectives. *BMC Pediatr*. 2017;17(1):35. doi:10.1186/s12887-016-0769-5
 19. Chan G, Bergelson I, Smith ER, Skotnes T, Wall S. Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. *Health Policy Plan*. 2017;32(10):1466-1475. doi:10.1093/heapol/czx098
 20. Mazumder S, Upadhyay RP, Hill Z, et al. Kangaroo mother care: using formative research to design an acceptable community intervention. *BMC Public Health*. 2018;18(1):307. doi:10.1186/s12889-018-5197-z
 21. Yue J, Liu J, Williams S, et al. Barriers and facilitators of kangaroo mother care adoption in five Chinese hospitals: a qualitative study. *BMC Public Health*. 2020;20(1):1234. doi:10.1186/s12889-020-09337-6
 22. Kinshella MW, Hiwa T, Pickerill K, et al. Barriers and facilitators of facility-based kangaroo mother care in sub-Saharan Africa: a systematic review. *BMC Pregnancy Childbirth*. 2021;21(1):176. doi:10.1186/s12884-021-03646-3
 23. Pratomo H, Uhudiyah U, Sidi IP, et al. Supporting factors and barriers in implementing kangaroo mother care in Indonesia. *Paediatr Indonesiana*. 2012;52(1):43-50.
 24. Mustikawati IS, Pratomo H, Martha E, Murty AI, Adisasmita AC. Barriers and facilitators to the implementation of kangaroo mother care in the community-a qualitative study. *J Neon Nurs*. 2020;26(2):109-114.
 25. Bergh AM, de Graft-Johnson J, Khadka N, et al. The three waves in implementation of facility-based kangaroo mother care: a multi-country case study from Asia. *BMC Int Health Human Right*. 2016;16:4.
 26. Bergh AM, Kerber K, Abwao S, et al. Implementing facility-based kangaroo mother care services: lessons from a multi-country study in Africa. *BMC Health Serv Res*. 2014;14:293.
 27. Mazumder S, Taneja S, Dube B, et al. Effect of community-initiated kangaroo mother care on survival of infants with low birthweight: a randomised controlled trial. *Lancet*. 2019;394(10210):1724-1736.
 28. Arya S, Naburi H, Kawaza K, et al. Immediate "Kangaroo Mother Care" and Survival of Infants with Low Birth Weight. *N Engl J Med*. 2021;384(21):2028-2038.

How to cite this article: Jadaun AS, Dalpath SK, Trikha S, et al. Government-led initiative increased the effective use of Kangaroo Mother Care in a region of North India. *Acta Paediatr*. 2023;112(Suppl. 473):6-14. doi:10.1111/apa.16376