

# **Adaptation of Kangaroo Mother Care for Community-Based Application**

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| <b>Content</b>            | <b>Page</b>  |
|---------------------------|--------------|
| <b>1. Condensation</b>    | <b>1</b>     |
| <b>2. Abstract</b>        | <b>2</b>     |
| <b>3. Objective</b>       | <b>3-5</b>   |
| <b>4. Study design</b>    | <b>5-6</b>   |
| <b>5. Results</b>         | <b>6-9</b>   |
| <b>6. Conclusions</b>     | <b>10-11</b> |
| <b>7. Acknowledgement</b> | <b>12</b>    |
| <b>8. Tables</b>          | <b>13-14</b> |
| <b>9. References</b>      | <b>15-16</b> |

### **Condensation**

The kangaroo mother care method was successfully adapted in Bangladesh for community-based application that does not require birth weight measurement or clinical judgment.

**Abstract**

*Objective:* Working with a multi-disciplinary team of Ecuadorians, Bangladeshis and Americans, we developed a simple protocol for community-based implementation of kangaroo mother care (CKMC) that does not require birth weight or clinical judgment to identify which newborns should receive CKMC. CKMC could stabilize newborns and possibly reduce neonatal mortality where there is little medical care for newborns and low birth weight (LBW) is common.

*Study Design:* During their CKMC training, community-based workers identified 35 expectant or recently delivered women in the pilot study area and taught them about CKMC. Women were interviewed at one month postpartum to evaluate their experience with CKMC.

*Results:* 77% of mothers initiated skin-to-skin care and 85% with LBW babies did so (37% were LBW). CKMC mothers delayed newborn bathing. Few slept upright with their newborns.

*Conclusions:* CKMC was quickly and popularly adopted. A randomized controlled cluster trial is planned to determine whether CKMC reduces neonatal mortality.

## Objectives

Dramatic improvements have been achieved in child survival in developing countries, yet there is limited success in reducing infant mortality, two-thirds of which occurs in the neonatal period.<sup>1</sup> Low birth weight (LBW) is a worldwide problem<sup>1,2</sup> that increases the risk of the respiratory and gastrointestinal conditions that cause much neonatal and infant mortality.<sup>3,4,5</sup>

The kangaroo mother care (KMC) method, whereby hospital-born LBW newborns are placed in an upright position in twenty-four hour skin-to-skin contact on the mother's breast<sup>6</sup> has been shown to significantly reduce the incidence of life-threatening morbidity in stabilized newborns.<sup>7,8,9</sup> Yet KMC has never before been formally adapted for community-based implementation. Fewer than 50% of women in give birth in health facilities in developing countries,<sup>10</sup> and LBW is most common in places where there is little access to specialized neonatal medical care. Under these circumstances, community-based KMC, could prove to be the best means of stabilizing neonates and reducing neonatal mortality.

Because the home birth environment is very different from hospital delivery, we met with a group of experts to discuss the best way to successfully get mothers delivering at home to provide kangaroo mother care to their newborns. Together with the Bangladesh Rural Advancement Committee (BRAC), Mitra and Associates, Ecuadorian, American and Bangladeshi KMC experts, pediatricians, sociologists and community workers in Bangladesh, we adapted KMC for community-based application (CKMC) and developed a simple, CKMC protocol that can be easily transferred to other countries and cultures. The protocol does not require birth weight or clinical judgment to identify which newborns should receive CKMC as, unlike hospital settings, the birth weight of babies born at home in developing countries is seldom measured and clinical assessment is rarely available to identify which newborns should receive KMC. Teaching mothers to provide KMC to the babies they perceive to be small or frail would exclude newborns who might benefit from kangaroo mother care in countries where the birth weight distribution is low and small babies may be perceived as "average" size. This group of experts decided that we should try to teach all women and those who provide postpartum support to them about CKMC, starting when the women are pregnant, visiting at or soon after the birth with continued reinforcement of CKMC after birth to help women successfully conduct CKMC. This way, mothers and their "support groups" will be prepared to provide this special newborn care to their babies regardless of who helps them deliver the baby, as many different people (mothers, sister-in-laws, trained and untrained attendants), and, in some cases only women themselves attend their own births.<sup>11</sup>

We attempted to mimic the spirit and messages of KMC, relying almost exclusively on person-to-person communication and demonstration of skin-to-skin contact; cleaning babies with a damp or dry cloth (as hospital-born low birth weight babies are not cleaned by immersion in water to avoid unnecessary reduction of their temperature); promotion of breastfeeding on demand; and advise to seek medical care for babies' danger signs. To help explain the characteristics of KMC, we developed two laminated flash cards with back-to-back pictures showing babies in a hospital incubator (to keep their body temperature "just right"),<sup>12</sup> holding the baby skin-to-skin, chest-to-chest (to regulate the babies breathing by feeling the mothers breathing pattern), and sleeping in an upright position (to maintain skin-to-skin contact and prevent choking on spit or vomit). Although the effect of keeping the babies head in an upright position on prevention of choking has not been demonstrated, it is promoted as a standard component of KMC and therefore we included its promotion in CKMC. We also developed an inexpensive paper pamphlet similar to the one given to KMC mothers in the Maternidad Isidro Ayora Hospital in Ecuador to reinforce the basic KMC messages.<sup>7</sup> Illiteracy is common in the study area of Sylhet, Bangladesh,<sup>11</sup> so we developed a mostly pictorial pamphlet to remind mothers about the basic components of CKMC.

Our strategy integrates CKMC into an existing government program, a feasible, replicable mechanism for transferring CKMC to other developing countries should CKMC prove effective in reducing neonatal mortality. We elected to train community-based nutrition promoters (CNP) who provide maternal and child nutrition advice to mothers as part of their regular duties in the Bangladesh Integrated Nutrition Programme (BINP). CNPs are female community residents with seventh grade or more education who receive little remuneration (about 50 cents USD) for their part time BINP work. The CNPs participated in a week long training, including two days of explanations of the rationale, potential benefits and key messages of KMC and CKMC, one day of supervised hands-on training teaching KMC to women with low birth weight infants at the Institute of Child and Mother Health, a high volume local peri-urban hospital, an additional day of role-playing and two days of supervised initiation of their training expectant and recently postpartum women in the communities where they work. The CNPs also attended periodic meetings to discuss their experiences teaching CKMC over the remaining eight-week pilot study period.

### **Study Design**

We conducted a pilot test of our CKMC strategy to determine whether it was successful in getting women to practice skin-to-skin contact, delay bathing, and sleep in an upright position with their newborn babies, uncommon practices in Bangladesh.<sup>13</sup> The pilot study was conducted in Sylhet, located in northwest Bangladesh. Sylhet has the highest infant and neonatal mortality rates in the country, respectively 12.8%

and 8.2%.<sup>11</sup> The majority of women give birth at home and newborn intensive care is almost non-existent in the local health clinics and hospitals. Transportation to get to health care is relatively expensive for villagers and infrequently available from the villages.

The pilot study was designed to initially enroll approximately 30 expectant women to determine whether  $75\% \pm 15\%$  of women conducted skin-to-skin care most of the time with a 5% probability of a chance finding. (If CKMC implementation was considered insufficient, up to three additional pilot tests of 10 women were planned.) To achieve this sample within an eight week data collection period, 22 community nutrition promoters and two supervisors from 19 villages in a single union (geographic area of approximately 33,000 population), Kulaura, in the thana (geographic area of approximately 333,000) of Sylhet, Bangladesh were included. The community nutrition promoters were trained to teach CKMC to mothers and their postpartum “support people.” On the last day of their training, the community nutrition promoters drafted a list of expectant women (in their seventh or greater month of gestation) and newly (within 7 days) postpartum women in their coverage area. The nutrition promoters then started teaching these women CKMC.

Observation of the training sessions and interviews of the community nutrition promoters was conducted by an independent observer to evaluate the content of the CKMC training sessions and the community workers prior training and work experience. Supervisors conducted unannounced spot checks to observe community workers teaching CKMC. After obtaining informed consent (approved by the Population Council and Bangladesh Medical Research Council ethical review boards), quantitative and in-depth qualitative interviews (using structured guides) were conducted with mothers approximately one month after delivery by experienced interviewers to determine their experience with CKMC.

Univariate and bivariate (by whether the mother first received CKMC instruction in the prenatal or postpartum period) results were conducted using SPSS for Windows software, version 11.5. The pilot study was not designed to test bivariate differences and statistical differences are not presented for the bivariate analyses.

## Results

### *Quantitative Results*

All thirty-five women identified as pregnant ( $n=27$ ) or newly postpartum ( $n=8$ ) consented to be interviewed. Structured interviews were conducted on all women at  $32.0 \pm 3.2$  days postpartum. Women

were  $24.8 \pm 6.3$  years old (range 14-37), and 31% were nulliparous, with an average parity of  $2.3 \pm 2.2$  prior to the study birth (Table 1). Most women were married (97%), 66% to the head of the household, 57% had at least one other child under five years of age living in their home, 77% were Muslim, 89% had never worked outside the home. Although 63% had attended school, an equal percent were unable to read or write. A few (14%) spoke another language than Sylheti Bengali in their household. Most (89%) gave birth at home, 77% with an untrained assistant. Fifty-seven percent of husbands were reported to have the final decision-making power regarding infants' health care and more (66%) had this power regarding women's health care.

The infants were weighed at  $1.3 \pm 1.5$  days old. Thirty-seven percent of infants weighed less than 2.5 kg and 14% weighed less than 2 kg, with an average weight of  $2723 \pm 474$  (range 1800 to 3700) grams. Mothers considered 26% of these babies to be small. Three had minor congenital abnormalities (extra digit, absence of lacrimal sac, talipes equinovarus). Sixty-six percent of the sample was male, likely due to chance associated with the small pilot study sample size.

The observation of the training sessions indicated that the training was exclusively focused on CKMC and was not diluted by the infusion of other infant care messages. All of the mothers had contact with the CNPs, most had multiple contacts before delivery, and 83% received the CKMC mother's pamphlet in the last month. Over half (54%) of the mothers also frequently received information on infant care from others. All mothers received information about holding their babies skin-to-skin from the CNPs, and 20% received this information from others. None received information about infant care or nutrition from a village health worker, and only 14% and 3% heard infant care or nutrition messages from the radio or a community event in the last month.

Seventy-seven percent of mothers initiated usual (i.e., "usually" or "almost always") skin-to-skin care (Table 2). More did so who had LBW (85% v. 73% not LBW) and female (83% v. 74% male) babies. The proportion of mothers who initiated usual skin-to-skin contact was similar if they were taught before or within the first week of delivery (78% v. 75%), however those taught before delivery (70% v 63%) initiated usual skin-to-skin contact sooner, i.e., in the first two days of life. Sixty-six percent of mothers provided skin-to-skin care most of the time in the first two days of life, and 45% did so in the first week of life. Twenty-six percent provided usual skin-to-skin care in the first month of life. Only one mother attempted skin-to-skin care "once in a while" (never more often) and quickly discontinued giving skin-to-skin care.



All women reported bathing their baby by immersing the baby in water and all reported cleaning the baby with a damp or dry cloth since birth. Mothers reported first bathing their babies by immersion in water at  $3.3 \pm 4.8$  days (range 1 to 25). Fifty-nine percent of women who initiated usual skin-to-skin contact bathed their babies on the day they delivered by immersing them in water compared with 75% of those who did not initiate usual skin-to-skin care. Those who initiated usual skin-to-skin care delayed bathing their babies compared to those who did not (babies age in days at first bath by immersion in water  $3.8 \pm 5.1$  v.  $1.8 \pm 1.8$ ).

Only 14% slept with the baby in an upright position. Four of the five women who slept with the baby initiated usual skin-to-skin care. Few (11%) homes had baby cots.

Most babies were breastfed within an hour after delivery, and all babies continued to be breastfed at one month. Only 37% were exclusively breastfed during the neonatal period (other fluids were commonly provided as is the custom). Exclusive breast feeding was more common among those who initiated usual skin-to-skin care (41% v. 25%). Only three babies were fed soft foods (at 17-29 days), and none had received solid foods by one month of age.

Eighty percent of infants were observed to be wearing more clothing than recommended (the method suggests only diapers, a hat and socks be worn at maximum). Accordingly, only 9% were observed being held skin-to-skin during the interview (only 14% were <30 days old). Twenty percent were observed sleeping on the bed apart from the mother, 34% were caressed and 74% were observed breastfeeding at some point during the interview.

Only one baby had been taken to well baby care although one had received BCG vaccination and 54% had received oral polio vaccination. Reported morbidity in infants was common; 31% had fever, 20% had cough, 11% had rapid breathing, 9% had difficulty breathing and 9% had diarrhea in the last two weeks. Nine percent had been taken to a clinic or hospital for fever, and 6% each had been taken for cough, for rapid breathing and for difficulty breathing. None were taken for diarrhea, but one baby was taken to health care because the baby did not want to breastfeed and one was taken for agitated behavior, both CKMC messages. In all, 17% were taken for illness, 14% to the NGO static clinic and 3% to the thana hospital.

Women commonly reported postpartum symptoms such as fever (62%), weakness (69%), backache (54%), bleeding (37%), and trouble breathing (12%), but few sought medical care for these conditions.

### *Qualitative Assessment*

In depth interviews were conducted on the nineteen mothers who were available at the time the qualitative interviewers visited the homes. Mothers' responses indicated that they had received the "key" CKMC messages. Women stated they held their babies skin-to-skin to keep the babies warm (especially small babies). One mother said, "I would like to keep the baby inside my chest." Mothers also said holding the baby skin-to-skin would help prevent disease, improve growth and maternal infant bonding ("affection"), and help them to identify problems the baby might experience. Some mothers found it more comfortable to hold their babies skin-to-skin, beneath their saris without wearing a blouse, rather than attempt to place the baby inside their blouses (what women commonly do in hospital-based KMC). Mothers said they stopped skin-to-skin care when the babies became too big or difficult to hold and because they needed more familial postpartum support. One mother said, "I did care my baby up to nine days intensively. At that period my sister helped me in all aspects. But after she left I had to do household work and due to my resistant mother-in-law I had to stop to take care of my baby with this special care." Some said postpartum illness also made them stop. Mothers felt there was little familial resistance to CKMC, and the few who encountered resistance found it emanated from the mother-in-law and sister-in-law. One of the baby's fathers was initially resistant as he had not been included in the CKMC instructions. Once the community worker explained CKMC to him, he actively participated, helping to hold the baby skin-to-skin when his wife required rest.

Mothers who immersed their babies in water on the day of delivery did so to clean the baby after cord cutting "because it is the custom." "Resisting pneumonia" was cited as a common reason for not bathing the baby. In general, mothers felt cleaning the baby with a cloth was sufficient but only for a week or so. Mothers felt that cleaning the baby only with a cloth for a month would make the baby "stinky," "irritable," or "the baby will get mad in this hot climate" (the pilot study was conducted during the hot season), or "the baby may suffer from rash."

Only five mothers slept upright with their babies. Mothers said they were not used to sleeping in an upright, almost sitting position, that it was uncomfortable, gave them back and neck pains, and some were afraid of mashing the baby if they unintentionally changed their sleeping position. Some also felt it was difficult to breastfeed the baby in this position. By the end of this short pilot study, the mothers who attempted sleeping upright with their babies developed creative and more comfortable ways of doing so, including bolstering their backs with a pillow at about a 45 instead of a 90 degree angle, and bolstering

the babies head with a tiny pillow of cloth placed under the babies cheek. This way, mothers felt they could sleep more comfortably and with greater confidence that they would not hurt the baby while sleeping.

## Conclusions

The three month pilot study found our adaptation of kangaroo mother care for community-based implementation was quickly and popularly adopted. Over three quarters of women initiated CKMC and 85% of mothers with low birth weight babies did so. Although mothers of LBW and non-LBW babies initiated usual skin-to-skin care, mothers of larger babies found this more difficult. Both hospital- and our community-based KMC instructions teach mothers that the babies give the signal (they become restless, fidgety and try to push themselves away) when they no longer need to be held "in the pouch" (skin-to-skin), and that bigger babies generally give this signal sooner while smaller babies are comfortable being held skin-to-skin for longer periods of time. Because approximately two-thirds of infant mortality occurs in the neonatal period, and two-thirds of neonatal mortality occurs in the first two to seven days of life, prolonged maintenance of skin-to-skin contact may not be essential to significantly reduce neonatal and infant mortality.

The KMC, as applied in hospitals, has been demonstrated to reduce the incidence of severe illness, particularly respiratory illness, in low birth weight babies.<sup>7,9</sup> Most of this effect has been associated with skin-to-skin contact. But KMC or skin-to-skin care has never been proven to prevent infant death in studies using similar (rather than self- or clinician-selected) comparison and intervention groups,<sup>14</sup> because most infant deaths occur in the first week and month of life, before clinicians generally consider the babies medically stabilized and thus eligible for kangaroo care. One study compared the mortality rates of low birth weight infants (stabilized and unstabilized) with another group of stabilized infants and erroneously interpreted that hospital-based KMC reduced mortality.<sup>8</sup> In the randomized controlled trial of KMC at the Isidro Ayora Maternity hospital in Ecuador babies had not stabilized and were therefore not eligible for KMC until about 2 weeks of life. This excluded 85% of the deaths that occurred in the first six months of life.<sup>7</sup>

Mothers who initiated usual skin-to-skin care reported more frequent breast-feeding, delayed immersing their babies in water to clean them, and more sleeping with their babies. As occurs with hospital-based KMC, mothers find sleeping with their babies in an almost 90 degree upright position is uncomfortable, both physically and psychologically. Other differences between mothers who initiated and did not initiate

usual skin-to-skin care were observed, but the pilot study sample is too small and the study design inappropriate to draw conclusions about these differences. If community-based KMC increases exclusive and predominant breast-feeding, as has been demonstrated in hospital-based KMC studies,<sup>15, 16, 17</sup> the method would be expected to influence the incidence of diarrhea and possibly growth. In addition, CKMC may improve early childhood development.

No previous formal attempts have been made to provide and evaluate community-based kangaroo care to determine whether the method will reduce neonatal and infant mortality outside the hospital setting. We now plan to conduct a randomized controlled cluster trial in Bangladesh to determine the effectiveness of CKMC to save newborns' lives. Additional assessment of the method's effect on infant growth, development, morbidity and mortality is also warranted. If proven effective, BRAC will expand teaching CKMC to its program area, covering one-third of Bangladesh, and the CKMC training materials and strategy will be widely disseminated to facilitate global reduction of neonatal and infant mortality.

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**Table 1: Subject Characteristics**

| Characteristics                     | Initiated     | Not Initiated | Total                        |
|-------------------------------------|---------------|---------------|------------------------------|
|                                     | Skin-to-Skin* | Skin-to-Skin  |                              |
|                                     | (n=27)        | (n=8)         | (n=35)                       |
| Woman's age (years)                 | 24.2±6.1      | 26.6±7.2      | 24.7±6.3                     |
| Gravidity                           | 3.4±2.2       | 4.3±2.7.6     | 3.6±2.3                      |
| Parity                              | 2.2±2.0       | 2.8±2.8       | 2.3±2.2                      |
| Number of living children under 5   | 0.6±0.6       | 0.5±0.5       | 0.6±0.6                      |
| Birthweight (gm)                    | 2696±497      | 2812±405      | 2723±474                     |
| Babies' Age (days) at Interview     | 31.4±2.8      | 33.9±4.1      | 32.10±3.2.4<br>(range 27-42) |
| Age When First Bathed Baby          | 3.8±5.1       | 1.8±1.8       | 3.3±4.7<br>(range 1-25)      |
| How Many Times Breastfed Yesterday  | 14.1±6.4      | 10.4±5.2      | 13.3±6.2                     |
| Daytime                             |               |               |                              |
| How Many Times Breastfed Last Night | 10.2±3.6      | 8.9±3.9       | 9.9±3.7                      |

\* Usually or Almost Always

**Table 2: Implementation of Community-based Kangaroo Mother Care**

| <b>CKMC CHARACTERISTICS</b>                       | <b>TOTAL<br/>(n=35)</b> |
|---------------------------------------------------|-------------------------|
| Initiated Usual CKMC (“Usually or Almost Always”) | 77.1                    |
| <i>Antenatal CKMC Contact (n=28)</i>              | 77.8                    |
| <i>Postpartum CKMC Contact (n=7)</i>              | 75.0                    |
| Skin-To-Skin First 2 Days Of Life                 |                         |
| <i>Once in a While</i>                            | 5.7                     |
| <i>Usually or Almost Always</i>                   | 68.6                    |
| Skin-To-Skin First 7 Days Of Life                 |                         |
| <i>Once in a while</i>                            | 22.9                    |
| <i>Usually/ Almost always</i>                     | 48.5                    |
| Skin-To-Skin First Month Of Life                  |                         |
| <i>Once in a while</i>                            | 14.3                    |
| <i>Usually/Almost always</i>                      | 28.6                    |

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