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IMPLEMENTATION AND OUTCOME OF INTERMITTENT KMC- EXPERIENCE AT A SECONDARY LEVEL HOSPITAL IN BANGLADESH

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**Md Mozammel Haque¹ , Farzana Hoque Parna²,
Mirza Farzana Holy², Nazma Parvin Shammy³,
A. Z. M. Motiur Rahman¹, Dhiman Chowdhury⁴,
Muhammad Javed Bin Amin Chowdhury⁴,
Jannatul Ferdous⁵, Muhammad Ismail Hasan⁶,
Md Shohidul Islam Khan⁷,
Mosammad Tanbir Nahar Shamima⁸,
Mirza Md Fazli Elahi⁹, Kamrunnaher Shultana¹⁰**

¹ Department of Pediatrics, 250 Bedded Hospital, Moulvibazar, Bangladesh

² Department of Obstetrics & Gynaecology, 250 Bedded Hospital, Moulvibazar, Bangladesh

³ Department of Pediatrics, Uttara Adhunik Medical College Hospital, Dhaka, Bangladesh

⁴ Department of Pediatrics, Chattogram Medical College Hospital, Chattogram, Bangladesh

⁵ Department of Obstetrics & Gynaecology, Chattogram Medical College Hospital, Chattogram, Bangladesh

⁶ Department of Pediatrics, Sadar Hospital, Laxmipur, Bangladesh

⁷ Department of Pediatrics, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh

⁸ Department of Obstetrics & Gynaecology, Enam Medical College and Hospital, Savar, Bangladesh

⁹ MNCH, UNICEF

¹⁰ Department of Pediatrics and PICU, Square Hospitals Ltd., Dhaka, Bangladesh

✉ mmhaque16rmc@yahoo.com

INTRODUCTION

Kangaroo mother care (KMC) is a low-cost health care method that is practiced in conjunction with conventional newborn care, especially in pre-term and low birth weight (LBW) infants [1]. KMC is widely recognized as an excellent intervention for improving the health and survival chances of premature infants. KMC consists of early, continuous and prolonged skin-to-skin contact between the caregiver and the baby, exclusive breastfeeding or breast milk feeding, and context-appropriate discharge and follow-up provided to the baby and his or her family [2]. KMC has shown to have more advantages over conventional new born care in preventing neonatal mortality and morbidity especially in resource limited

ABSTRACT — **INTRODUCTION:** The term Kangaroo mother care (KMC) is derived from the practical similarities to marsupial care giving – mother acts as an incubator as kangaroo and put low birth infant vertically in between the chest. It is an effective way to meet baby's needs for warmth, breastfeeding, protection from infection, stimulation, safety and love. **OBJECTIVE:** The general objectives were to see the implementation challenges and outcome of intermittent KMC at a secondary level district hospital. The specific objectives were to observe the nature of family participation, practice pattern of intermittent KMC, length of hospital stay, effect on weight gain, mortality and problem experienced by the newborns and mothers/caregivers during KMC practice. **MATERIALS & METHODS:** This was an observational study for three months at 250 Bedded District Hospital, Moulvibazar, Bangladesh involving 50 preterm (gestational age <37 week) & low birth weight (<2000 g) newborns and their mothers/caregivers. Participants were included and KMC was initiated in stable newborns according to the national KMC guideline. Information related to the study objectives were obtained from examination and interview and the findings were recorded during the hospital stay and follow up visits in a pre-structured data collection sheet. **RESULTS:** Among the studied newborns male female ratio was 1.5:1 and 32 (64%) were out born (delivered at home or any other hospitals). The mean postnatal age at the time of admission was 57.90 h, at the time of initiation of KMC was 115.38 h and at discharge was 227 h. So, there was mean delay of 66 h from admission to initiation of KMC and in 47(94%) newborns. Mostly, the delay was due to absence of mothers or eligible caregivers and unstable clinical condition of the newborns. The mean weight at admission and discharge was 1625.80 g and 1520.60 g respectively. Among the family members, mother practiced KMC in 45(90%) [n=50] followed by grandmother 28 (56%). KMC was practiced in 44 (88%) newborns in the evening shift followed by 43 (86%) & 27(54%) in the night & morning shifts respectively. The mean duration of KMC was 2.58 h in the night shift followed by 2.46 h & 2.46 h in the evening & morning shifts respectively. The mean hospital stay was 109.95 h. Total 32 studied newborns completed up to 3rd follow up after discharge among which 5(15.62%) did not gain weight, 6(18.75%) gained weight at 1st follow up (7th day of age), 14(43.75%) at 2nd follow up (15th day of age) & 7(21.87%) at 3rd follow up (30th day of age). The total mortality was 6(12%). Most of the newborns and mothers/caregivers experienced no problem during KMC practice. **CONCLUSION & RECOMMENDATION:** Family motivation and participation is a key to standard KMC practice. Constant supervision and follow up home visit involving community health personnel until the neonatal age is completed constitute the most important aspect for implementing KMC effectively and reducing the mortality.

countries. KMC improves the lactation in mother, boost the psychological bonding between mother and neonate, improves the sleep cycle and oxygenation in sick preterm and reduces the apneic spells [3].

KMC has three components: Kangaroo position- The kangaroo position consists of skin-to-skin contact (SSC) between the mother and the infant in a strictly vertical position. The infant will be placed between the mother's breasts and under her clothes. SSC should be started as early as possible after birth. It can be two types depending upon the duration which are continuous or intermittent. Kangaroo nutrition- Kangaroo nutrition is the delivery of nutrition to "kangaroed" infants as soon as oral feeding is possible. It is based on exclusive breastfeeding by direct sucking, whenever possible. Goal is to provide exclusive or nearly exclusive breastfeeding. Kangaroo discharge and follow up- Early home discharge in the kangaroo position from the neonatal unit is one of the original components of the KMC intervention [4].

The experience of facility-based KMC in Bangladesh is relatively recent, though there are a few facilities that have been providing KMC services for over a decade. In 2013, the Government of Bangladesh signed onto "A Promise Renewed (APR)" as a sign of its determination and commitment to reduce child deaths to 20 per 1,000 live births by 2035. Through this commitment, KMC is integrated into newborn care for preterm & LBW babies in an effort to decrease preventable neonatal deaths [5]. In 2015, the Bangladesh Every Newborn Action Plan (BENAP) was instituted. There are two main objectives in the BENAP that focus on KMC: the establishment of counseling on KMC practice at facilities including the provision of follow-up KMC services using community health workers (CHWs) and the establishment of centers of excellence for KMC in tertiary and secondary level facilities. The targets for KMC initiation were set at 20% for public health facilities at the upazila health complexes UHC (sub-district level) and above by 2016, and at 50% for public health facilities at the UHC and above to provide KMC services by 2020. In 2016, KMC was included as an essential service for preterm LBW newborns at UHC, district hospitals (DH), and maternal and child welfare centers (MCWC) (Bangladesh Essential Service Package (ESP), MOHFW) [5]. From this point of view, this study was conducted to see the implementation challenges and outcome of KMC at 250 Bedded Hospital, Moulvibazar, a secondary level district hospital in Bangladesh.

MATERIALS & METHODS:

This was an observational study done with the cooperation of UNICEF, Moulvibazar, involving the

Special Care Newborn Unit (SCANU) and the department of Obstetrics & Gynaecology of 250 Bedded Hospital, Moulvibazar, Bangladesh. The study period was three months, November 2019 to January 2020. A total 50 preterm (gestational age <37 completed weeks) and low birth weight (birth weight less than 2000 g) newborn babies either inborn (delivered at 250 Bedded Hospital, Moulvibazar) or out born (delivered at home or any other hospitals) and their mothers/caregivers were included. The inclusion and exclusion criteria was set according to the Bangladesh National Guideline on Kangaroo Mother Care 2014. Inclusion criteria for the newborns — birth weight >1800–2000 g, if stable, KMC was initiated immediately after birth; birth weight >1200–1800 g, if stable, KMC was initiated immediately, if not, KMC was initiated after stabilization; birth weight <1200 g, most infants suffer from serious morbidities and KMC was initiated after stabilization. Stable newborn was defined according to the guideline-normal heart rate 100–160 per minute, respiratory rate 30–59 per minute (breaths comfortably, no sign of respiratory distress, pink in room air or with 40% oxygen, no prolonged or frequent apnea). Inclusion criteria for the mothers — should be willing to provide KMC after counseling on KMC, health condition allowing full-time availability to provide care, in absence of mother, other family members like father, grandparents, aunts can also provide KMC with obvious extra support for feeding. Exclusion criteria for the newborns were major surgical problem and gross congenital anomalies. Exclusion criteria for the mothers — bad obstetric situation like postpartum hemorrhage, eclampsia, mother suffering from serious illness potentially dangerous to the baby like active tuberculosis, chicken pox, psychosis etc. After taking written informed consent patients were enrolled in this survey from the date of admission. Intermittent KMC was initiated on the decision of the SCANU consultant after fulfillment of the criteria. For KMC to be given intermittently, we divided the 24 h into 3 shifts — 8am to 2.30 pm (morning shift), 2.30 pm to 8 pm (evening shift), 8 pm to 8 am (night shift) according to the duty shifts of hospital nurses. KMC was practiced using standard KMC binder, cap and socks provided by UNICEF. In every shift, the number of hours KMC given, KMC given by whom (caregiver), and problems experienced during KMC by the caregivers were monitored, interviewed and documented by the duty nurses. A fixed digital weight machine was used to measure the initial and daily weight. Day of initiation of feeding either breastfeeding, dropper feeding or nasogastric feeding was recorded. Daily decision regarding overall treatment, KMC and discharge was made by the SCANU

consultant. During discharge, the KMC binder was given to the mother to continue it at home and a pre-scheduled follow up plan was given for day 7th, 15th and 30th. At each follow up conducted by the on duty consultant and a fixed nurse, thorough examination of the newborns was performed, weight was measured, and interview on the duration of KMC, problem related to KMC, etc. were carefully documented on the data collection sheet.

RESULTS

Table 1 shows the baseline characteristics of the studied newborns. Here, the total male newborns were 30 (60%) and female 20 (40%) and the M:F=1.5:1. Most of the newborns 32(64%) were out born, either delivered at home or referred from other hospitals. The mean postnatal age at the time of admission was 57.90 h and the time of initiation of KMC was 115.38 h. So, there was a time difference from admission to the initiation of KMC in 47(94%) newborns and 66 h (mean). In most cases, cause of the time difference was unstable clinical condition at the time of admission or other medical conditions requiring immediate treatment. Regarding the weight, the mean weight at admission and discharge was 1625.80 g and 1520.60 g respectively.

Table 2 shows the caregivers who were involved in KMC practice during the study period. Mostly, KMC was given by mother 45(90%) and grandmother 13(26%). Other family members were also involved in KMC practice namely father, aunt and uncle.

The number of newborns in whom KMC was provided by the caregivers in three shifts is shown in Table 3. In the morning session, 27(54%), in the evening 44(88%) and at night 43 (86%) newborns were given KMC by the caregivers. Table 4 shows the duration of KMC in three different shifts where the mean duration of KMC in the morning shift was 1.97 h and in the evening and night, 2.46 h and 2.58 h respectively.

In Table 5, the length of hospital stay of the studied newborn is revealed where the minimum hospital stay was 5 h, maximum 383 h and the mean duration was 109.95 h. Effect of KMC on weight gain who completed the pre-scheduled three follow up is shown in Table 6. Five newborns (15.62%) did not gained weight throughout the follow up period. Six newborns (18.75%) gained weight at 1st follow up on day 7th, 14(43.75%) at 2nd follow up on day 15th and 7(21.87%) at 3rd follow up on day 30th.

The total death observed in this study was 6 (12%) among which 5 (10%) death occurred after hospital discharge Table 7. Table 8 shows the pattern of problems in the newborn and the mother/caregiver

during KMC practice. Most of the newborns 32(64%) faced no problems during KMC, 5(10%) & 4(8%) experienced excess hot/sweating & excess crying respectively and 2 (4%) had restlessness, breathing problem & umbilical bleeding. Among the caregivers, 45 (90%) experienced no problem, 3 (6%) had physical weakness & hot feeling and 2 (4%) excess sweating & tiredness.

DISCUSSION

In this study, 50 neonates were enrolled where male participants were 60% and female 40% and male female ratio was 1.5:1. Similar gender ratio was observed in the study by Joshi M et al 60% [6]. Among the studied newborns, 36% were inborn, delivered in the obstetric department of 250 Bedded Hospital, Moulvibazar, whereas the rest of the percentage 64% were referred cases (delivered at home or other hospitals).

The minimum postnatal age of the newborns at the time of admission was 0.33 h and maximum age 360 h (mean age 57.90 h). The postnatal age at admission might not be the same as the age of KMC initiation due to some factors- unstable infant at admission, stable but other clinical condition present (under phototherapy due to jaundice, etc), absentee of the mother or eligible caregiver, unwillingness of the caregiver to provide KMC, engagement of the duty nurses with other newborns as there was lacking of nurses at SCANU, etc. Hence, in this study we observed the time delay in 94% patients and 66 h mean. A community base pilot study in India by Rasaily R et al [7] showed that the time of initiation of KMC in 21.8% (n=22) within 24 h, 55.4% (n=56) within 72 h and 13.9% (n=14) after one week whereas we observed it 16% (n=8), 40% (n=20) and 44% (n=22) respectively.

In this study we measured the weight of the newborns at the time of admission which did not necessarily mean the birth weight because in some cases birth weight was unknown due to home or other hospital delivery. The mean weight measured was 1625.80 g whereas Joshi M et al [6] showed the birth weight to be 1359 g. In another study by Subedi K et al [8] the weight of the babies ranged between 1200 g to 2000 g and 50% (n=60) of the total included babies had weight more or equal to 1800 g, in our study the weight ranged between 820 g to 2000 g and 28%(n=14) of the total having weight \geq 1800 g. After enrollment, all the available family members were counseled in details about KMC and we observed that, mother and in case of absentee of the mother, grandmother played the pivotal role for providing the newborns with KMC. In few cases, father, aunt, grand-

Table 1. Baseline characteristics of the studied newborns [n=50]. Data presented as number (%) and mean value

Patient profile	Variables	Number (%)	Minimum	Maximum	Mean
Sex	Male	30(60)			
	Female	20(40)			
Delivery status	Inborn	18(36)			
	Out born	32(64)			
Postnatal age at admission (in hour)			0.33	360	57.90
Time of initiation of KMC (in hour)	< 24 h	8(16)			
	24 h to 72 h	20(40)	2.10	560	115.38
	>72 h	22(44)			
Age at discharge(in hour)			39	877	227
Delay from admission to KMC initiation(in number of patients)		47(94)			
Delay from admission to KMC initiation(in hour)			1.50	459	66
Causes of delay	Mother admitted in another hospital	1(2)			
	Unstable at admission	34(68)			
	Under phototherapy	10(20)			
	Nurse on duty was busy with other babies	1(2)			
	Eligible caregiver unavailable	1(2)			
Weight at admission(gram)	<1200	2(4)			
	1200-1399	8(16)			
	1400-1599	10(20)	820	2000	1625.80
	1600-1799	16(32)			
	≥1800	14(28)			
Weight at discharge(gram)			730	2030	1520.60

Table 2. Pattern of caregivers involved in KMC practice [n=50]. Data presented as number (%)

Caregivers	Number (%)
Mother	45(90)
Grandmother	28(56)
Father	17(34)
Aunt	13(26)
Uncle	1(2)

Table 3. KMC practiced (number of newborns) in three shifts [n=50]. Data presented as number (%)

Shift	KMC practiced, Number (%)	KMC not practiced, Number (%)
Morning 8am–2.30pm	27(54)	23(46)
Evening 2.30pm–8pm	44(88)	6(12)
Night 8pm–8am	43(86)	7(14)

Table 4. KMC practiced (duration) in three shifts

Shift	Minimum duration (hour)	Maximum duration (hour)	Mean duration (hour)
Morning [n=27] 8am-2.30pm	1	4	1.97
Evening [n=44] 2.30pm-8pm	1	5	2.46
Night [n=43] 8pm-8am	0.8	10	2.58

father and uncle provided KMC willingly. Studies by Nimbalkar S et al [2], Pratomo H et al [9] and Urmila K.V et al [3] showed that the caregiver for KMC was mother. Kadam et al [10] and Cattaneo [11] reported that 64% and 83% of husbands accepted KMC and supported their wives respectively.

KMC was practiced by the caregivers intermittently in three shifts, morning (8am–2.30pm), evening (2.30pm–8pm) and night (8pm–8am). In the morning shift, 54% newborns were given KMC, in the evening shift 88% and in the night shift 86%. The mean duration of KMC in the three shifts were 1.97 h, 2.46 h

Table 5. Length of hospital stay [n=50]. Time calculated from the date & time of KMC initiation

Hospital stay	Minimum duration (hour)	Maximum duration (hour)	Mean duration (hour)
	05	383	109.95

Table 7. Mortality pattern [n=50]. Data presented as number (%)

Outcome	Variables	Number (%)
Survival		44(88)
Death	At hospital At home Total	1(2) 5(10) 6(12)

and 2.58 h respectively which was 7.01 h/day cumulatively. Joshi M et al [6] showed in their study that the duration of KMC among all eligible babies remains around 9 h/day, almost similar to our study. All mothers practiced KMC intermittently; maximum duration (median) of practice/day was 8 h (Odisha) and minimum 3 h (Maharashtra) [7]. Most mothers practiced KMC 2–4 h/day in the morning or evening hours when the temperature is relatively cool [7]. Aliganyira P. et al, in their cross sectional study [12] including 11 health care facilities in Uganda showed that in only 3 facilities KMC was practiced for more than 20 h/day. Heidarzadeh M et al in a study in Iran [13] showed that the duration of KMC was at least 1–3 h which was repeated at least three times a day. Another study by Mekle D et al [14] in India revealed that >1 h KMC was practiced per sitting in 56% studied newborns (n=50) and >4 h/day KMC was practiced

Table 6. Effect of KMC on weight gaining (who completed up to 3rd follow up) [n=32]. Data presented as number (%)

Changes in birth weight	Number(%)
No weight gain until 3 rd follow up (30 th day of age)	5 (15.62)
Weight gain at 1 st follow up (7 th day of age)	6 (18.75)
Weight gain at 2 nd follow up (15 th day of age)	14 (43.75)
Weight gain at 3 rd follow up (30 th day of age)	7(21.87)

Table 8. Problems during KMC practice. Data presented as number (%)

Problem during KMC	Pattern of problem	Number (%)	
Problem related to newborns[n=50]	No problem	32(64)	One newborn might have multiple problems, so, [n] and Number (%) may be different
	Restlessness	2(4)	
	Vomiting	1(2)	
	Excess hot/ sweating	5(10)	
	Breathing problem	2(4)	
	Excess crying	4(8)	
	Umbilical bleed	2(4)	
Problem related to caregivers[n=50]	No problem	45(90)	One caregiver might have multiple problems, so, [n] and Number (%) may be different
	Restlessness	1(2)	
	Excess sweating	2(4)	
	Physical weakness	3(6)	
	Hot feeling	3(6)	
	Tiredness	2(4)	

in 14% which was similar to our study result where the mean duration of KMC was 2.3 h per shift and 7 h/day(n=50).

It was observed that the mean hospital stay was 109.95 h (4.58 days). Uwaezuoke SN [15] in a study in Nigeria showed that infants who weighed ≤1500 g at birth and received KMC had shorter duration of admission than those who received conventional method of care (4.0 days Vs13.8 days). Randomized control trial demonstrated that KMC infants discharged from hospital earlier than control group [16, 17]. Infants who received conventional care stayed longer in the hospital than the KMC infants [18]. Gupta M et al [19] observed the mean duration of hospital stay was 15.5 days. Similarly, in a study in Merida newborns were discharged at 13.4 days after enrolment [20]. In Delhi studies the average day of hospital stay was 27.2±7 days [17].

Because of loss of extra cellular fluid, around 5–15% of weight loss occurs in newborn babies. The nadir of weight loss occurs by 4–6 days of life and then gradually weight gain starts and birth weight regained by 14–21 days of life [8]. Various other studies had shown that KMC babies had better average weight gain per day [8]. Ramanathan et al [17, 19] found the average weight gain in KMC babies after the first week of life was 15.9 g/day. Another study by Urmila K.V et al [3] revealed that birth weight was regained from 6 to 29 days and maximum number regained birth weight on 14th day. In our study, weight gain started from 7th day of age in 18.75%, from 15th day in 43.75% and from 30th day in 21.87% newborns.

Different studies revealed the mortality pattern in relation to KMC. In a study by Ahmed S et al [21] found that most newborn deaths in the community KMC(CKMC) group occurred in babies who were held skin to skin (STS) ≤1 h/day (neonatal mortality rate NMR, 8.4%) or who had missing newborn STS

assessment (NMR 8.1%). NMR was 2.8% in babies held STS between 2 to 6 h/day in the first 2 days of life. Only five newborn deaths (NMR 0.9%) occurred in CKMC babies held STS ≥ 7 h/day in the first 2 days of life. Conde-Agudelo A, et al. found no evidence in difference in infant mortality in KMC as compared to conventional care after stabilization [22]. The Cochrane review [23] included seven trials that assessed mortality at discharge or at 40–41 weeks. These trials reported a statistically significant reduction 3.4% in the risk of mortality among KMC infants, compared with 5.7% for babies receiving traditional care. In this study it was observed that the mortality in KMC newborn was 12% (at hospital 2% and at home 10%). During each follow up session mother or the caregivers were interviewed about the problems experienced by themselves or the newborns during KMC practice. Most of the participants (64% newborns, 90% caregivers) experienced no problems. The other problems common to both were restlessness (4% newborns, 2% caregivers) and excess sweating (10% newborns, 4% caregivers). Quasem et al [24] in his study reported that mothers experience discomfort when the infant grows bigger. Urmila K.V. et al [3] reported that 6.2% of mothers experienced physical difficulties for practical implementation compared to 54% who experienced back pain in this study. Trials have shown that infants rarely cry when in KMC [25–30], a Cochrane meta-analysis has confirmed a reduction in crying during KMC [32] whereas we observed that 8% newborns (n=50) cried excessively during KMC. The effect of KMC on infant body temperature has been studied extensively [28, 32–39] which revealed that when the healthy preterm infants are placed in KMC, infant body temperature rises. This finding was consistent with our result (10% newborns experienced excess body temperature/sweating).

Grace JC, et al in their systematic reviews mentioned that there are several barriers to implementing KMC, including the need for time, social support, medical care and family acceptance [40]. KMC should be practiced more systematically and consistently to enhance adoption and to build trust, with motivated trained staff, education of the staff and parents, clear eligible criteria, improved referral practices and creation of communities among KMC participants through support groups. By addressing barriers and by building trust, effective uptake of KMC into the health system will increase and this will help to improve neonatal survival [40].

CONCLUSION & RECOMMENDATION:

It was observed that mothers involved in KMC practice mostly in spite of their household work load,

sometime making KMC inadequate, inappropriate and distressful. Family motivation and participation is a key to standard KMC practice. More focus should be made on morning and evening hours when KMC practice was observed less in terms of number and duration. Constant supervision and follow up home visit involving trained and motivated community health personnel until the neonatal age is completed constitute the most important aspect for implementing KMC effectively and reducing the mortality.

REFERENCES:

1. PRATOMO H, UHUDIYAH U, SIDI IPS, RUSTINA Y, SURADI R, BERGH AM, ET AL. Supporting Factors and Barriers in Implementing Kangaroo Mother Care in Indonesia. *Paediatrica Indonesiana*. 2012;52(1):43–50.
2. NIMBALKAR S, SADHWANI N. Implementation of Kangaroo Mother Care – Challenges and Solutions. *Indian Pediatrics*. 2019;56(15):725–729.
3. URMILA K.V, RAVIKUMAR, KARUNAKARAN U. Study to Assess the Knowledge, Attitude and Practice of Kangaroo Mother Care Among Post-natal Mothers in a Tertiary Care Centre of North Kerala, India. *International Journal of Contemporary Pediatrics*. 2018;5(3):992–996.
4. AKHTAR K, HAQUE M, KHATOON S. Kangaroo Mother Care: A Simple Method to Care for Low-Birth-Weight Infants in Developing Countries. *Journal of Shaheed Suhrawardy Medical College*. 2013;5(1):49–54.
5. SAVE THE CHILDREN. Kangaroo Mother Care in Bangladesh; [accessed 2nd April 2020]. Available from: <https://www.healthynewbornnetwork.org/hnn-content/uploads/Bangladesh-KAP-Summary-Sheet.pdf>
6. JOSHI M, SAHOO T, THUKRAL A, JOSHI P, SETHI A, AGARWAL R. Improving Duration of Kangaroo Mother Care in a Tertiary-care Neonatal Unit: A Quality Improvement Initiative. *Indian Pediatrics*. 2018;55(15):744–749.
7. RASAILY R, GANGULY KK, ROY M, VANI SN, KHAROOD N, KULKARNI R. Community Based Kangaroo Mother Care for Low Birth Weight Babies: A Pilot Study. *Indian Journal of Medical Research*. 2017;145(1):51–57.
8. SUBEDI K, ARYAL DR, GURUBACHARYA SM. Kangaroo Mother Care for Low Birth Weight Babies: A prospective Observational Study. *Journal of Nepal Pediatric Society*. 2009;29(1):6–9.
9. PRATOMO H, UHUDIYAH U, SIDI IPS, RUSTINA Y, SURADI R, BERGH AM, ET AL. Supporting Factors and Barriers in Implementing Kangaroo Mother Care in Indonesia. *Paediatrica Indonesiana*. 2012;52(1):43–50.
10. KADAM S, BINOY S, KANBUR W, MONDKAR JA, FERNANDEZ A. Feasibility of Kangaroo Mother

- Care in Mumbai. *The Indian Journal of Pediatrics*.2005;72(1):35–38.
11. CATTANEO A, DAVANZO R, WORKU B, SURJONO A, ECHEVERRIA M, BEDRI A, ET AL. Kangaroo Mother Care for Low Birth Weight Infants: A Randomized Controlled Trial in Different Settings. *Acta Paediatrica*.1998;87(9):976–985.
 12. ALIGANYIRA P, KERBER K, DAVY K, GAMACHE N, SENGENDO NH, BERGH AM. Helping Small Babies Survive: An Evaluation of Facility-Based Kangaroo Mother Care Implementation Progress in Uganda. *The Pan African Medical Journal*.2014;19:37–47.
 13. HEIDARZADEH M, HOSSEINI MB, ERSHADMANESH M, TABARI MG, KHAZAAE S. The Effect of Kangaroo Mother Care (KMC) on Breast Feeding at the Time of NICU Discharge. *Iran Red Crescent Medical Journal*.2013;15(4):302–306.
 14. MEKLE D, PATIL R, JHA P. Implementation of Kangaroo Mother Care for Low Birth Weight Babies: Supportive Factors and Barriers Perceived by Mothers. *Pediatric Review: International Journal of Pediatric Research*.2018;5(2):87–92.
 15. UWAEZUOKE SN. Kangaroo Mother Care in Resource-Limited Settings: Implementation, Health Benefits and Cost-Effectiveness. *Research and Reports in Neonatology*.2017;7:11–18.
 16. GATHWALA G, SINGH B, BALHARA B. KMC Facilitates Mother Baby Attachment in Low Birth Infants. *The Indian Journal of Pediatrics*.2008;75:43–47.
 17. RAMANATHAN K, PAUL VK, DEORARI AK, TANEJA U, GEORGE G. Kangaroo Mother Care in Very Low Birth Weight Infants. *The Indian Journal of Pediatrics*.200;68:1019–1023.
 18. ALI SM, SHARMA J, SHARMA R, ALAM S. Kangaroo Mother Care as Compared to Conventional Care for Low Birth Weight Babies. *Dicle Medical Journal*.2009;36(3):155–160.
 19. GUPTA M, JORA R, BHATIA R. Kangaroo Mother Care (KMC) in LBW Infants- A Western Rajasthan Experience. *The Indian Journal of Pediatrics*.2007;74(8):747–749.
 20. CATTANEO A, DAVANZO R, WORKU B, SURJONO A, ECHEVERRIA M, BEDRI A, ET AL. Kangaroo Mother Care for Low Birth Weight Infants: A Randomized Controlled Trial in Different Settings. *Acta Paediatrica*.1998;87(9):976–985.
 21. AHMED S, MITRA SN, CHOWDHURY AMR, CAMACHO LL, WINIKOFF B, SLOAN NL. Community Kangaroo Mother Care: Implementation and Potential for Neonatal Survival and Health in Very Low-Income Settings. *Journal of Perinatology*.2011;31:361–367.
 22. CONDE-AGUDELO A, DIAZ-ROSSELLO JL, BELIZAN JM. Kangaroo Mother Care to Reduce Morbidity and Mortality in Low Birth Weight Infants. *The Cochrane Library*.2000;(4):CD002771.
 23. USAID from the American People. Kangaroo Mother Care Implementation Guide; [accessed 11th April 2020]. Available from: <https://www.mchip.net/sites/default/files/mchipfiles/MCHIP%20KMC%20Guide.pdf>
 24. DIMMENNA L. Consideration for Implementation of a Neonatal Kangaroo Care Protocol. *Neonatal Network*.2006;25(6):405–412.
 25. LAI HL, CHEN CJ, PENG TC, CHANG FM, HSIEH ML, HUANG HY, ET AL. Randomized Controlled Trial of Music During Kangaroo Care on Maternal State Anxiety and Preterm Infants' Responses. *The International Journal of Nursing Studies*.2006;43(2):139–146.
 26. DE LEEUW R, COLLIN EM, DUNNEBIER EA, MIRMIRAN M. Physiologic Effects of Kangaroo Care in Very Small Preterm Infants. *Biology of the Neonate*.1991;59(3):149–155.
 27. MESSMER PR, RODRIGUES S, ADAMS J, WELLS-GENTRY J, WASHBURN K, ZABALETA I, ET AL. Effect of Kangaroo Care on Sleep Time for Neonates. *The Journal of Pediatric Nursing*.1997;23(4):408–414.
 28. LUDINGTON-HOE SM, HASHEMI MS, ARGOTE LA, MEDELLIN G, REY H. Selected Physiologic Measures and Behavior During Paternal Skin Contact with Colombian Preterm Infants. *Journal of Developmental Physiology*.1992;18(5):223–232.
 29. LUDINGTON SM. Energy Conservation During Skin-to-Skin Contact between Preterm Infants and Their Mothers. *Heart & Lung*.1990;19:445–451.
 30. WHITELAW A, SLEATH K, ACOLET D. Safety and Effectiveness of Skin-to-Skin Contact for Very Low Birth Weight Infants. *The Journal of Pediatric Research*.1988;24:269.
 31. MOORE ER, ANDERSON GC, BERGMAN N. Early Skin-to-Skin Contact for Mothers and Their Healthy Newborn Infants. *Cochrane Database Systematic Reviews*.2007;(3):CD 03519.
 32. CHWO MJ, ANDERSON GC, GOOD M, DOWLING DA, SHIAU SH, CHU DM. Randomized Controlled Trial of Early Kangaroo Care for Preterm Infants: Effects on Temperature, Weight, Behavior, and Acuity. *The journal of nursing research*.2002;10(2):129–142.
 33. BOHNHORST B, GILL D, DORDELMANN M, PETERS CS, POETS CF. Bradycardia and Desaturation During Skin-to-Skin Care: No Relationship to Hyperthermia. *The Journal of Pediatrics*. 2004;45:499–502.
 34. BAUER J, SONTHEIMER D, FISCHER C, LINDERKAMP O. Metabolic Rate and Energy Balance in Very Low Birth Weight Infants During Kangaroo Care Holding by Their Mothers and Fathers. *The Journal of Pediatrics*.1996;129(4):608–611.
 35. BAUER K, UHRIG C, SPERLING P, PASEL K, WIELAND C, VERSMOLD HT. Body Temperatures and Oxygen Consumption During Skin-to-Skin (Kangaroo) Care in Stable Preterm Infants Weighing Less than 1500 grams. *The Journal of Pediatrics*.1997;130(2):240–244.

36. **BYSTROVA K, WIDSTROM AM, MATTHIESEN AS, RANSJÖ-ARVIDSON AB, WELLES-NYSTRÖM B, WASSBERG C, ET AL.** Skin-to-Skin Contact may Reduce Negative Consequences of “The Stress of Being Born”: A Study on Temperature in Newborn Infants Subjected to Different Ward Routines in St. Petersburg. *Acta Paediatrica*.2003;92(3):320–326.
37. **HUANG YY, HUANG CY, LIN SM, WU SC.** Effect of Very Early Kangaroo Care on Extra Uterine Temperature Adaptation in Newborn Infants with Hypothermia Problems. *Hu li zazhi The Journal of Nursing*.2006;53(4):41–48.
38. **JONAS W, WIKLUND I, NISSEN E, RANSJO-ARVIDSON AB, UVNAS-MOBERG K.** Newborn Skin Temperature Two Days Postpartum During Breastfeeding Related to Different Labor Ward Practices. *Early Human Development*.2007;83:55–62.
39. **SUMAN RPN, UDANI R, NANAVATI R.** Kangaroo Mother Care for Low Birth Weight Infants: A Randomized Controlled Trial. *Indian Pediatrics*.2008;45(1):17–23.
40. **GRACE JC, AMY SL, STEPHEN W, RIFAT A.** Kangaroo Mother Care: A Systematic Review of Barriers and Enablers. *Bulletin of the World Health Organization*.2016;94:130–141. <https://dx.doi.org/10.2471%2FBLT.15.157818>