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REGULAR ARTICLE

Observation study showed that the continuity of skin-to-skin contact with low-birthweight infants in Uganda was suboptimal

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ABSTRACT

Aim: Kangaroo mother care (KMC) is a safe and effective method of reducing neonatal mortality in resource-limited settings, but there has been a lack of data on the duration of skin-to-skin contact (SSC) in busy, low-resource newborn units. Previous studies of intermittent KMC suggest the duration of SSC ranged from 10 minutes to 17 hours per day.

Methods: This was an observational study of newborn infants born weighing less than 2000 g, which collected quantitative data on SSC over the first week after birth. The study took place in July 2016 in the newborn unit of a low-resource facility in Uganda.

Results: The mean daily duration of SSC over the first week after birth was three hours. This differed significantly from the World Health Organization recommendation of at least 20 hours of SSC per day. SSC was provided by mothers most of the time (73.5%), but other family members also took part, especially on the day of birth.

Conclusion: Our study found a disappointingly low daily duration of SSC in this Ugandan newborn unit. However, advocacy and community education of SSC may help to decrease the stigma of KMC, improve overall acceptance and reduce the age at SSC initiation.

INTRODUCTION

Nearly half of all deaths in children under five occur during the neonatal period. Complications of preterm birth, defined as birth before 37 completed weeks of gestation, were responsible for 35% of the 2.7 million neonatal deaths across the globe in 2015 (1). Low-birthweight, defined by the World Health Organization (WHO) as weighing less than 2500 g at birth, irrespective of gestational age, has been used as a surrogate for preterm birth (2,3) and is correlated with neonatal survival (2,4,5). Estimates suggest that at least 75% of global neonatal deaths occur in low-income and middle-income countries (6), where neonatal intensive care is often not available (7).

Kangaroo mother care (KMC) is an alternative to conventional thermal care for infants considered to be clinically stable (7). Key features of KMC are early, continuous and prolonged skin-to-skin contact (SSC) between the infant and the mother or another caregiver, frequent and exclusive breastfeeding, early discharge from hospital, whenever possible, and postdischarge follow-up (2,3). KMC provides the infant with thermal support, protection from infection, appropriate stimulation and a nurturing environment (3,8,9).

Evidence supports KMC as a safe and effective way of reducing neonatal mortality (2,7,9,10). In 2015, the WHO issued a strong recommendation that KMC should be part of the routine care of newborn infants weighing up to 2000 g at birth and that it should be initiated in healthcare facilities as soon as infants were clinically stable (11). The WHO recommendations advocate continuous KMC, defined as at least 20 hours of SSC per day. Where

Abbreviations
KMC, Kangaroo mother care; SSC, Skin-to-skin contact; WHO, World Health Organization.

Key notes

- Data on Kangaroo mother care (KMC) and the duration of skin-to-skin contact (SSC) in busy, low-resource newborn units are lacking.
- This study found that the mean daily duration of SSC provided to low-birthweight infants admitted to a newborn unit in Uganda was three hours.
- SSC was mostly provided by mothers (73.5%), but other family members also took part, especially on the day of birth.

continuous KMC is not feasible, intermittent SSC is preferable to conventional thermal care (11).

Prolonged direct SSC between infants and caregivers is the cornerstone of KMC (12). Most studies of KMC have taken place in dedicated KMC wards (13–18), where staff were trained to care for both newborn infants and postpartum women. Intermittent SSC may occur in the absence of a KMC ward or where adequate space to practice continuous SSC does not exist or is not used.

The 2016 Cochrane Review of KMC included 21 randomised controlled trials (RCT), three of which evaluated continuous KMC in stabilised infants (Table 1) (7). These three studies took place in neonatal intensive care units (NICU) or KMC wards at maternity, university or tertiary care hospitals. The review also evaluated 16 RCTs of intermittent KMC in stabilised infants and found that the mean daily duration of SSC in these trials ranged from 10 minutes to 17 hours per day (Table 2). Most of these studies also took place in NICUs, intermediate nurseries or maternity wards in tertiary care hospitals. When infants were not receiving SSC, they were kept in incubators or under radiant warmers. The remaining two RCTs included in the Cochrane Review evaluated KMC in infants prior to stabilisation.

None of the RCTs of intermittent KMC took place in sub-Saharan Africa, and none of the studies evaluated KMC in an environment without a KMC ward or other dedicated space for KMC. Quantitative descriptions of the duration of SSC have rarely been reported (3). Many studies have only stated whether KMC is practised in a facility (19) or how health workers promote KMC, such as advising mothers to provide SSC to their infants at all times, except for brief interruptions to use the bathroom (15). Other studies have described KMC as irregular (20) or almost continuous (21). On the rare occasions when the hours of SSC are recorded, details on whether the data were obtained through observation, self-report or other methods were not provided (13).

Lack of data on the duration of SSC in routine practice has been cited as a limitation in the current evidence (3), and poor-quality data on low-birthweight infants are a significant barrier to KMC success (12). This study aimed to address the knowledge gap surrounding the continuity of facility-based KMC through direct observation of SSC in a busy newborn unit at a resource-limited hospital in Uganda. The objectives were to quantify the daily duration of SSC over the first week of life and to compare these findings with the data collected on SSC continuity by the existing literature.

METHODS

This was an observational study of newborn infants that collected quantitative data on SSC practices in July 2016. A sample of participants was recruited after birth using the following inclusion criteria: inborn, born weighing up to 2000 g, deemed clinically stable by the admitting clinician and the mother was willing and able to participate in KMC. Infants were excluded from study if they were outborn, born outside the study period, born weighing greater than 2000 g, born with congenital anomalies or severe medical problems that precluded the safe use of KMC or the mother was unwilling or unable to participate in KMC. Ethical approval for this study was obtained from the London School of Hygiene and Tropical Medicine, Makerere University and the Uganda National Council of Science and Technology.

Study site

The study took place at Jinja Regional Referral Hospital in south-eastern Uganda. The hospital serves a catchment area of four million people and has approximately 6600 deliveries per year (22). Sick newborn infants are cared for in a newborn special care unit, adjacent to the labour ward. Common admitting diagnoses include prematurity, birth asphyxia, sepsis, respiratory distress syndrome and jaundice. During the study, the approximate daily occupancy was 10–15 patients and the unit had 13 cots, three radiant warmers and one incubator. A total of eight midwives and nurses staffed the newborn unit on a rotating day–night schedule, with one or two working per shift.

Data collection

A data collection tool, based upon the WHO's KMC guide (2) was specifically designed for this study. When eligible newborn infants were admitted to the newborn unit, we immediately obtained informed consent from the mother or father. When no family members accompanied the patient on admission, we visited the mother in the labour ward to

Table 1 Randomised controlled trials of the Cochrane Review* evaluating continuous KMC (20 hours) in stabilised newborn infants

Study	Setting (country; type of facility)	Mean age at recruitment	Source of temperature control for conventional care (control) group
Cattaneo et al. (1998) (23) (n = 285)	Ethiopia, Mexico and Indonesia; neonatal units of university hospitals	Median age 10 days (1–74) in KMC group (n = 149); 8 days (1–40) in control group (n = 136)	Radiant warmer or open crib in warm room in Ethiopia; Incubators in Mexico and Indonesia
Charpak et al. (1997) (24) (n = 777)	Colombia; Kangaroo Mother Care ward or neonatal intensive care unit of tertiary care hospital	Median age 4 days (1–60) in KMC group (n = 396); 3 days (1–55) in control group (n = 381)	Incubator until able to regulate temperature and thriving
Sloan et al. (1994) (25) (n = 300)	Ecuador; neonatal intensive care unit of maternity hospital	13.0 days ± 10.5 in KMC (n = 140) and control (n = 160) groups	Incubator or radiant warmer

*Conde-Agudelo and Díaz-Rossello JL (7).

Table 2 Randomised controlled trials of the Cochrane Review* evaluating intermittent KMC in stabilised newborn infants

Study	Setting (country, type of facility)	Mean age at recruitment	Source of thermal care for control group	Mean daily hours of KMC
Nimbalkar et al. (2014) (26) (n = 45)	India; maternity ward	43 minutes ± 13 in KMC group (n = 22); 30–60 minutes in control group (n = 23)	Radiant warmer	17.0 ± 0.3 during first 24 hours; KMC discontinued at 24 hours
Suman et al. (2008) (27) (n = 220)	India; neonatal intensive care unit of tertiary care hospital	3.7 days ± 2.8 in KMC group (n = 108); 2.3 days ± 1.9 in control group (n = 112)	Radiant warmer	13.5
Kumbhojkar et al. (2016) (28) (n = 120)	India; neonatal intensive care unit of university hospital	3 days in KMC group (n = 60); 4 days in control group (n = 60)	Radiant warmer	11.5
Gathwala et al. (2008) (29) (n = 110)	India; neonatal unit of university hospital	1.7 days ± 0.5 in KMC (n = 50) and control (n = 50) groups	Incubator or radiant warmer	10.2 ± 1.5 in the first month
Eka Pratiwi et al. (2009) (30) (n = 93)	Indonesia; neonatal intensive care unit of public hospital	Not provided (n = 48 KMC group; n = 45 control group)	Incubator or open crib in warm room	10.0 ± 1.8 (range 5.3–13.5)
Kadam et al. (2005) (31) (n = 89)	India, neonatal intensive care unit of tertiary care hospital	3.2 days (1–8) for KMC (n = 44) and control (n = 45) groups	Radiant warmer	9.8 ± 3.7
Ghavane et al. (2012) (32) (n = 140)	India; Kangaroo Mother Care ward (KMC group), neonatal intensive/ intermediate care unit (control group) of tertiary care hospital	14.1 days ± 10.3 in KMC group (n = 71); 13.7 days ± 10.2 in control group (n = 69)	Incubator or radiant warmer	≥8, placed in open cribs when not in KMC
Ali et al. (2009) (33) (n = 114)	India; neonatal intensive care unit of tertiary care hospital	4.7 days ± 2.9 in KMC group (n = 58); 4.8 ± 2.4 in control group (n = 56)	Radiant warmer or open cot in warm room	6.3 ± 1.52 (range 4–12)
Acharya (et al.) (2014) (34) (n = 126)	Nepal; newborn nursery of tertiary care hospital	Not provided (n = 63 KMC group; n = 63 control group)	Radiant warmer	≥6
Neu and Robinson (2010) (35) (n = 60)	United States; initially neonatal intensive care unit of hospitals, then at home	15.0 days ± 6.7 for KMC group (n = 31); 15.0 days ± 4.9 for control group (n = 29)	Incubator while in hospital	4.81 ± 2.12 (participant reported data)
Ramanathan et al. (2001) (36) (n = 28)	India; neonatal intensive care unit of tertiary care hospital	Median age at KMC initiation 11.8 days for KMC (n = 14) group	Incubator or radiant warmer	≥4
Roberts et al. (2000) (37) (n = 30)	Australia; neonatal intensive care units of university or tertiary care hospitals	31.5 days ± 2.7 for KMC (n = 16) and control (n = 14) groups	Incubator	1.6 ± 0.9, 5 days a week
Rojas et al. (2003) (38) (n = 60)	United States; neonatal intensive care unit of tertiary care hospital	19.6 days in KMC group (n = 33); 18.2 days in control group (n = 27)	Incubator	1.3 ± 0.7
Boo and Jamli (2007) (39) (n = 128)	Malaysia; neonatal intensive care unit of tertiary care hospital	Median age 24.5 days in KMC group (n = 65); 20.5 days in control group (n = 63)	Incubator until infant reached 1750 g	1.0 (median)
Whitelaw et al. (1988) (40) (n = 71)	United Kingdom; neonatal intensive care unit of a university or tertiary care hospital	16 days (1–66) for KMC (n = 35) and control (n = 36) groups	Incubator	0.6 (0–1.5)
Blaymore Bier et al. (1996) (41) (n = 50)	United States; special care nursery of a tertiary care hospital	29 days in KMC group (n = 25); 30 days in control group (n = 25)	Incubator	0.2

*Conde-Agudelo and Díaz-Rossello JL (7).

obtain consent. Thus, continuous observation of infants began as soon as possible after birth and continued until the end of day of life seven, discharge or death, whichever came first. The lead researcher was present in the newborn unit during daytime hours, and trained study personnel were responsible for the data collection at night. The unit was small, so it was possible to monitor multiple subjects simultaneously. The characteristics of the mothers and infants were documented using hospital records or by asking the mother when information was not documented.

For each day of life, the total duration of hours spent in SSC was calculated by adding together the duration of all individual SSC sessions on that day. If an infant received at least 20 hours of SSC, it was considered continuous KMC, and any fewer hours of SSC per day was documented as intermittent KMC (7). If the practice was intermittent, one of the following reasons was recorded: mother ill, infant unstable, caregiver not available or environmental challenges.

The date and time of birth and of the first SSC session in the newborn unit were recorded and, from this, the age in hours at SSC initiation was determined. We recorded the hours spent in SSC, the caregiver providing SSC, the infant position and infant clothing for every session of SSC.

A well-positioned infant was defined as an infant meeting four of the following five criteria: upright, between the mother's breasts, abdomen and chest touching the mother's bare chest, head turned to one side, legs flexed and abducted. Appropriate clothing meant the infant's chest and abdomen were exposed and the infant was wearing a hat.

Data analysis

All the data collected on written data collection forms were entered using EpiData 3.1 (EpiData Association, Odense, Denmark). Data were double-entered, checked for any incongruence and exported to Stata 14 (Stata Corp, College Station, TX, USA) for analysis. The primary outcome was the cumulative daily duration of SSC over the first week of life. This was compared to the WHO recommendations using a *t*-test. The secondary outcomes were age at SSC initiation, the duration of individual SSC sessions, the reason for intermittent KMC, the SSC provider, the infant's position and infant's clothing. Descriptive statistics for continuous variables included the means, standard deviations (SD) and ranges. Categorical variables were analysed and presented as frequencies and proportions. We considered conducting a survival analysis of KMC per day per baby still in hospital, but we decided against this given the small sample size.

RESULTS

Sample

Of the 68 newborn infants admitted to the unit during the study period, 12 met the inclusion criteria. None of the parents who were approached refused to participate. The average age of the mothers was 24 ± 5 years; the enrolled infants had a mean birthweight of 1664 ± 300 g and a mean completed gestational age of 31 ± 3 weeks determined by last menstrual period. Half of enrolled infants were male, and 67% were delivered vaginally.

Of the 12 participants, eight were observed for the entire first week of life, one died on day of life two and one left against medical advice on day of life four. In total, 117 individual SSC sessions were observed, and information on daily totals was gathered 76 times.

Outcomes

The mean daily duration of SSC over the first week of life was 3.0 ± 2.1 hours (range 0–9). When compared to the WHO recommendation for at least 20 hours of SSC per day, the resulting p value was <0.0001. This was evidence of a significant difference between the practice at this facility and the WHO recommendations.

We found that the mean daily duration of SSC, age at SSC initiation and total number of SSC sessions varied by participant and was not related to birthweight (Table 3). The mean age at SSC initiation in the newborn unit was 21.6 ± 9.8 hours (range 5.5–44.5). The mean duration of individual SSC episodes was 1.9 ± 0.5 hours (range 1.0–3.5).

None of the infants received continuous KMC. We explored reasons for the lack of KMC continuity. The mother was ill 23.7% of the time, and the infant was considered too unstable for KMC 1.3% of the time. Most of the time (75.0%), however, the reason for intermittent SSC was environmental challenges, such as overcrowding, lack of privacy or shortage of chairs for caregivers. Although a small KMC room exists just outside the newborn unit, it was not used frequently. Caregivers sat in plastic chairs or on the floor of the crowded unit while providing SSC and privacy screens were not available.

Skin-to-skin contact was mainly provided by mothers (73.5%), but other family members also took part, especially on the day of birth (Fig. 1). Newborn infants were well-positioned and wearing appropriate clothing during all SSC sessions.

DISCUSSION

The most SSC occurred on the second day of life and this was the only day where every infant received at least one session of SSC. Infants received the least SSC on the day of birth. Infants who received the greatest number of SSC sessions over the first week had higher mean daily durations of SSC compared to infants receiving fewer sessions. Unfortunately, the duration of SSC did not increase over the first week, as some literature has suggested (8,11). The shortest SSC sessions were one hour and the longest were 3.5 hours. While many studies on KMC conclude that SSC should be practiced for no less than one hour (7), two hours is ideal (8).

Most the time, both the mother and the infant were stable enough for KMC and a potential SSC provider was nearby and available. Once they were discharged from the labour ward, most mothers spent the day in the outdoor area adjacent to the newborn unit and other family members frequently visited.

Previous research suggests that many physical and cultural barriers to KMC exist. Physical barriers include issues such as lack of space, overcrowding, lack of privacy, absence of chairs or beds and the time needed to provide SSC (8,42–46). Existing customs, such as carrying the infant on the back, stigma surrounding the birth of a preterm infant and general poor involvement and support from the community may affect KMC. Beliefs that incubator care is more effective than SSC and ambivalence by medical staff may also influence the duration of SSC (12,43,45).

Mothers provided the most SSC, but grandmothers and aunts played an important role on the day of birth, while the mother was recovering from labour. One father participated in KMC and this infant had one of the highest mean daily durations of SSC. This finding must be interpreted with caution, as this infant was only observed for two days, but it presents an interesting argument for whether paternal involvement in KMC significantly affects the duration of SSC. Very little data regarding fathers and KMC exist from both low-income and high-income countries, and one of the key barriers to KMC adoption for men is lack of opportunity to practice (42). Men could have a significant direct impact on KMC initiation, by providing SSC themselves,

Table 3 Duration, timing and frequency of skin-to-skin contact (SSC) over first 7 days, by birthweight

Participant birthweight in grams	Mean daily hours of SSC (SD)	Age in hours at SSC initiation	Total number of SSC sessions
1200	2.8 (1.1)	20	9
1490	5.4 (1.6)	22.3	19
1500	2.6 (1.8)	26.5	9
1600	3.0 (2.4)	27.5	10
1680	4.0 (2.9)	5.5	15
1800	2.8 (2.0)	26.4	10
1800	1.9 (0.9)	44.5	7
2000	4.3 (1.5)	11.3	16
2000	0.9 (1.6)	20	3
2000	2.2 (1.5)	24.3	8
Sub-total	3.0 (2.1)		
Observed for less than 7 days			
1100 (2 days)	5.0 (2.8)	14.3	6
1800 (4 days)	2.0 (1.4)	17	5
Total	3.0 (2.1)	21.6 (12)	117

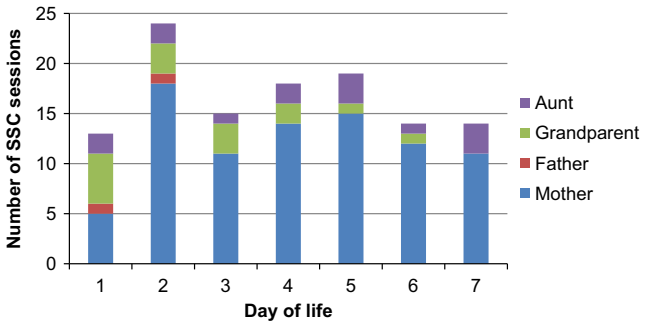

Figure 1 Various family members provided skin-to-skin contact (SSC) to low-birthweight infants over the first week of life.

and indirectly, by supporting the mother practically and emotionally (12).

STRENGTHS AND LIMITATIONS

The main strength of our study is that this was one of the few studies to examine KMC continuity and SSC in detail. Through direct observation, our study provided a description of numerous episodes of SSC at a low-resource facility in Uganda, where KMC is often poorly documented.

During the discussion of the study objectives and procedures, parents were provided with a brief description of KMC and its benefits. In some instances, they were hearing about KMC for the first time. Parents' awareness of the study objectives and the presence of an observer in the newborn unit could have had an impact on SSC practices, but the results do not suggest that these factors played a significant role.

The data collection tool was not piloted or tested prior to use, but the newborn unit paediatrician provided feedback during the protocol and tool development.

Another study of KMC (46) was occurring at the facility while our data were being collected for this study. The purpose, outcomes and data collected for these studies differed, but it is possible that one study may have influenced the other.

Studies evaluating routine KMC practice in resource-limited newborn units are scarce. Although the WHO endorses intermittent KMC, little is known about the dose–response relationship between the duration of SSC and clinical outcomes such as mortality, length of hospitalisation and feeding practices (3,9,11,42). More studies are needed to determine whether intermittent KMC, without conventional thermal care, confers the mortality impact described in a Cochrane Review (7). If a threshold for KMC is determined, recommendations could be more precise (42) and the demand placed on caregivers may be reduced (43).

CONCLUSION

Kangaroo mother care is a safe and effective way to decrease neonatal mortality, and there is increasing global attention being paid to KMC programmes. Our study found a disappointingly low daily duration of SSC and demonstrated that SSC was not practiced according to the current WHO recommendations in this Ugandan newborn unit. However, the nurses and midwives provided excellent education to caregivers on proper SSC techniques, as all the infants were positioned and clothed appropriately. While the mothers provided the most SSC, other family members, including one father, also participated. Further advocacy and community education on the care of preterm infants with SSC may help decrease the stigma of KMC, improve its overall acceptance and reduce the age at SSC initiation.

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CONFLICTS OF INTEREST

We have no conflict of interest to declare.

FINANCE

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References

1. Lui L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet* 2016; 388: 3027–35.

2. World Health Organization. *Kangaroo mother care: a practical guide [Internet]*. Geneva: World Health Organization, 2003.
3. Chan GJ, Valsangkar B, Kajeepeta S, Boundy EO, Wall S. What is kangaroo mother care? Systematic review of the literature. *J Glob Health* 2016; 6: 010701.
4. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: When? Where? Why? *Lancet* 2005; 365: 891–900.
5. Edmond K, Bahl R. *Optimal feeding of low-birth-weight infants: technical review [Internet]*. Geneva: World Health Organization, 2006.
6. Lawn JE, Blencowe H, Oza S, You D, Lee A, Waiswa P, et al. Every newborn: progress, priorities, and potential beyond survival. *Lancet* 2014; 384: 189–205.
7. Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev* 2016; 8: CD002771
8. Charpak N, Ruiz JG, Zupan J, Cattaneo A, Figueroa Z, Tessier R, et al. Kangaroo mother care: 25 years after. *Acta Paediatr* 2005; 94: 514–22.
9. Boundy EO, Dastjerdi R, Spiegelman D, Fawzi WW, Missmer SA, Lieberman E, et al. Kangaroo mother care and neonatal outcomes: a meta-analysis. *Pediatr* 2016; 137: e20152238.
10. Lawn JE, Mwansa-Kambafwile J, Horta BL, Barros FC, Cousens S. 'Kangaroo mother care' to prevent neonatal deaths due to preterm birth complications. *Int J Epidemiol* 2010; 39: i144–54.
11. World Health Organization. *WHO recommendations on interventions to improve preterm birth outcomes [Internet]*. Geneva: World Health Organization, 2015.
12. Vesel L, Bergh AM, Kerber KJ, Valsangkar B, Mazia G, Moxon SG, et al. Kangaroo mother care: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Preg Childbirth* 2015; 15(Suppl 2): S5.
13. 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. *Pan Afr Med J* 2014; 19: 37.
14. Blencowe H, Kerac M, Molyneux E. Safety, effectiveness and barriers to follow-up using an 'early discharge' kangaroo care policy in a resource poor setting. *J Trop Pediatr* 2009; 55: 244–8.
15. Kambarami RA, Chidede O, Pereira N. Long-term outcome of preterm infants discharged home on kangaroo care in a developing country. *Ann Trop Paediatr* 2003; 23: 55–9.
16. Namazzi G, Waiswa P, Nakakeeto M, Nakibuuka VK, Namutamba S, Najjemba M, et al. Strengthening health facilities for maternal and newborn care: experiences from rural eastern Uganda. *Glob Health Action* 2015; 8: 24271.
17. Ndelema B, Van den Bergh R, Manzi M, van den Boogaard W, Kosgei RJ, Zuniga I, et al. Low-tech, high impact: care for premature neonates in a district hospital in Burundi: a way forward to decrease neonatal mortality. *BMC Res Notes* 2016; 9: 28.
18. Sylla M, Kassogue D, Traore I, Diall H, Charpak N, Dicko-Traore F, et al. Towards better care for preterm infants in Bamako. *Mali. Curr Womens Health Rev* 2011; 7: 302–9.
19. Waiswa P, Nyanzi S, Namusoko-Kalungi S, Peterson S, Tomson G, Pariyo GW. 'I never thought that this baby would survive; I thought that it would die any time': perceptions and care for preterm babies in eastern Uganda. *Trop Med Int Health* 2010; 15: 1140–7.
20. Mondlane RP, de Graca AMP, Ebrahim GJ. Skin-to-skin contact as a method of body warmth for infants of low birth weight. *J Trop Pediatr* 1989; 35: 321–6.
21. Lincetto O, Nazir AI, Cattaneo A. Kangaroo mother care with limited resources. *J Trop Pediatr* 2000; 46: 293–5.
22. USAID. *Strengthening Uganda's systems for treating AIDS Nationally: Jinja Regional Referral Hospital Profile [Internet]*. Kampala: University Research Co., LLC; 2015.
23. Cattaneo A, Davanzo R, Worku B, Surjono A, Echeverria M, Bedri A, et al. Kangaroo mother care for low birthweight infants: a randomized controlled trial in different settings. *Acta Paediatr* 1998; 87: 976–85.
24. Charpak N, Ruiz-Peláez JG, de Figueroa CZ, Charpak Y. Kangaroo mother versus traditional care for newborn infants ≤2000 grams: a randomized, controlled trial. *Pediatr* 1997; 100: 682–8.
25. Sloan NL, Camacho LW, Rojas EP, Stern C. Kangaroo mother method: randomised controlled trial of an alternative method of care for stabilised low-birthweight infants. *Lancet* 1994; 344: 782–5.
26. Nimbalkar SM, Patel VK, Patel DV, Nimbalkar AS, Sethi A, Phatak A. Effect of early skin-to-skin contact following normal delivery on incidence of hypothermia in neonates more than 1800 g: randomized control trial. *J Perinatol* 2014; 34: 364–8.
27. Suman RP, Udani R, Nanavati R. Kangaroo mother care for low birth weight infants: a randomized controlled trial. *Indian Pediatr* 2008; 45: 17–23.
28. Kumbhojkar S, Mokase Y, Sarawade S. Kangaroo mother care (KMC): an alternative to conventional method of care for low birth weight babies. *Int J Health Sci Res* 2016; 6: 36–42.
29. Gathwala G, Singh B, Balhara B. KMC facilitates mother baby attachment in low birth weight infants. *Indian J Pediatr* 2008; 75: 43–7.
30. Eka Pratiwi IGAP, Soetjiningsih S, Made Kardane I. Effect of kangaroo method on the risk of hypothermia and duration of birth weight regain in low birth weight infants: a randomized controlled trial. *Paediatr Indones* 2009; 49: 253–8.
31. Kadam S, Binoy S, Kanbur W, Mondkar JA, Fernandez A. Feasibility of kangaroo mother care in Mumbai. *Indian J Pediatr* 2005; 72: 35–8.
32. Ghavane S, Murki S, Subramanian S, Gaddam P, Kandraju H, Thumalla S. Kangaroo Mother Care in Kangaroo ward for improving the growth and breastfeeding outcomes when reaching term gestational age in very low birth weight infants. *Acta Paediatr* 2012; 101: e545–9.
33. Ali SM, Sharma J, Sharma R, Alam S. Kangaroo mother care as compared to conventional care for low birth weight babies. *Dicle Med J* 2009; 36: 155–60.
34. Acharya N, Singh RR, Bhatta NK, Poudel P. Randomized control trial of Kangaroo Mother Care in low birth weight babies at a tertiary level hospital. *J Nepal Paediatr Soc* 2014; 34: 18–23.
35. Neu M, Robinson J. Maternal holding of preterm infants during the early weeks after birth and dyad interaction at six months. *J Obstet Gynecol Neonatal Nurs* 2010; 39: 401–14.
36. Ramanathan K, Paul VK, Deorari AK, Taneja U, George G. Kangaroo Mother Care in very low birth weight infants. *Indian J Pediatr* 2001; 68: 1019–23.
37. Roberts KL, Paynter C, McEwan B. A comparison of kangaroo mother care and conventional cuddling care. *Neonatal Netw* 2000; 19: 31–5.
38. Rojas MA, Kaplan M, Quevedo M, Sherwonit E, Foster LB, Ehrenkranz RA, et al. Somatic growth of preterm infants during skin-to-skin care versus traditional holding: a randomized, controlled trial. *J Dev Behav Pediatr* 2003; 24: 163–8.
39. Boo NY, Jamli FM. Short duration of skin-to-skin contact: effects on growth and breastfeeding. *J Paediatr Child Health* 2007; 43: 831–6.
40. Whitelaw A, Heisterkamp G, Sleath K, Acolet D, Richards M. Skin to skin contact for very low birthweight infants and their mothers. *Arch Dis Child* 1988; 63: 1377–81.

41. Blaymore Bier JA, Ferguson AE, Morales Y, Liebling JA, Archer D, Oh W, et al. Comparison of skin-to-skin contact with standard contact in low-birth-weight infants who are breast-fed. *Arch Pediatr Adolesc Med* 1996; 150: 1265–9.
42. Seidman G, Unnikrishnan S, Kenny E, Myslinski S, Cairns-Smith S, Mulligan B, et al. Barriers and enablers of kangaroo mother care practice: a systematic review. *PLoS One* 2015; 10: e0125643.
43. 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: 35.
44. Nguah SB, Wobil PN, Obeng R, Yakubu A, Kerber KJ, Lawn JE, et al. Perception and practice of kangaroo mother care after discharge from hospital in Kumasi, Ghana: a longitudinal study. *BMC Pregn Childbirth* 2011; 11: 99.
45. Vesel L, ten Asbroek AH, Manu A, Soremekun S, Tawiah Agyemang C, Okyere E, et al. Promoting skin-to-skin care for low birthweight babies: findings from the Ghana Newhints cluster-randomised trial. *Trop Med Int Health* 2013; 18: 952–61.
46. Morgan MC, Nambuya H, Waiswa P, Tann C, Elbourne D, Seeley J, et al. Kangaroo mother care for clinically unstable neonates weighing 2000 grams: is it feasible at a hospital in Uganda? *J Glob Health* 2018; 8: 010701.

