

# Physiological and psychological outcomes of kangaroo mother care of preterm infants—An overview

## Abstract

**Background:** Neonatal care especially for premature infants may require varying periods of intensive care which may limit parental involvement. Kangaroo mother care (KMC) allows for close contact between mother and infant, widely used by Indigenous populations but now introduced into neonatal nurseries. This paper reviews the growing literature highlighting the physiological and psychological impact of its introduction in the care of preterm infants.

**Methods:** A brief introduction of current practices in the care of preterm infants is followed by discussing the rationale of KMC. The benefits or otherwise of such care is reviewed, drawing on the current literature. Future avenues of study are suggested.

**Results:** KMC has been successfully undertaken of preterm infants. Such care improved the infant's circulatory physiological parameters which included heart rate variability, oxygen saturations and temperature control. There also appeared to be a reduction in pain scores during uncomfortable neonatal procedures. An increase in successful breastfeeding, improved maternal-infant interaction and better neurodevelopmental progress has also been observed. Further study may utilise vital signs to affirm clinical outcomes. The administration of the relatively straight forward measure of the Alarm Distress Baby Scale may objectively assess infant well-being and their resultant social interactions.

**Conclusion:** The current literature suggests multiple benefits for preterm infants exposed to KMC with improvement in physiological parameters and developmental outcomes. It also empowers mothers to be more intimately involved with their infants. These reported findings encourage the safe introduction of KMC into further nurseries.

**Keywords:** kangaroo mother care, preterm infants, skin-to-skin contact, pain relief, breastfeeding, development

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**Abbreviations:** KMC, kangaroo mother care; NICU, neonatal intensive care unit; SCN, special care nursery; ADBB, alarm distress baby scale

## Introduction

### Importance of mother-infant attachment

Early experiences and in particular, the mother-infant relationship, have a lifelong impact on each individual.<sup>1</sup> Preterm infants frequently require long term hospitalisation prior to their discharge. Disorganised mother-infant attachment and ongoing social relationship problems have been reported to be more prevalent amongst very preterm or very low birth weight infants.<sup>2</sup> Of interest mothers who saw their newborn on the first day of their admission to the neonatal intensive care unit (NICU) had higher mean maternal attachment scores, compared to those who saw their baby in the subsequent days. These findings suggest that if a mother achieves early attachment and interacts with her infant shortly after delivery, a stronger sense of motherhood and a healthier relationship may eventuate.<sup>3</sup>

The terminology of kangaroo mother care (KMC) comes from the Australian kangaroo which carries her joey in her pouch located on the front of her abdomen (Figure 1). After birth, the joey weighing

approximately 2g, crawls over the mother kangaroo's fur to arrive at her pouch in approximately 3 minutes and suckles milk from the mother's teats. Feeding and growth of the joey occurs in this safe environment for an average of 235 days, after which the joey continues to develop outside the mother's pouch.<sup>4</sup> Whilst KMC is a relatively new approach, breastfeeding on demand and extensive carrying of an infant on the mother's body is an age-old practice. The custom of continuously carrying infants in a shawl or sling wearing no or minimal clothing was noted to be common in warmer climates, notable in native tribal groups of Central America and Siberia. Physical closeness was maintained during the night, with mothers and infants sleeping next to each other in the same bed. Despite the colder and harsher climates, Eskimo tribes have been observed practicing swaddling and using shawls to carry their infants on the mother's back.<sup>5</sup> Kung San hunter-gatherers in North-Western Botswana were also known to hold or carry their infants 80-90% of the time during the infant's first few months of life.<sup>6</sup> These practices by tribal groups were found to reduce stress responses and cortisol reactivity, and have a calming effect on their infants (Table 1).<sup>6</sup>

### Current care of preterm infants

Infants born before 37 weeks gestation are considered 'preterm'.<sup>7</sup> Those born at 34.0 to 36.6 weeks gestation may be allowed immediate

skin-to-skin contact with their mother with attempted feeding within the first hour of life and then again three hours later. However, due to the increased risk of hypoglycaemia, hypothermia, the early onset of respiratory distress and/or apnoea, sepsis, and the development of hyperbilirubinemia, feeding difficulties, and the potential of poor weight gain, most of these infants are admitted to the NICU or special care nursery (SCN) for observation and anticipatory management.<sup>8</sup> Preterm infants are at higher risk of heat loss due to decreased

thermal insulation from brown adipose tissue, a disproportionate ratio of body surface area to mass, laying in a posture of extension, possessing a relatively thin epidermis with reduced permeability and poorer vasomotor control.<sup>9</sup> For this reason, preterm infants need their temperature monitored, being placed in incubators or exposed to radiant warmers, which may result in prolonged separation from their mothers (Table 2).



Figure 1 Joey in the pouch of her mother kangaroo.

Table 1 Summary of physiological and developmental & psychological benefits of KMC (See Appendix)

Physiological benefits	Psychological benefits
Increased Parasympathetic Activity <sup>16–18</sup>	Improved Early Cognitive Performance <sup>47</sup>
Decreased Heart Rate	Improved Communication Performance <sup>47</sup>
Decreased Respiratory Rate	Improved Neurobehavioural Performance <sup>14,48</sup>
Increased Oxygen Saturations <sup>14</sup>	Increased Alertness and Decreased Gaze Aversion <sup>48</sup>
Increased Temperature <sup>14</sup>	Increased Mother-Infant Interaction <sup>48,49</sup>
Increased Cerebral Blood Flow <sup>18,19</sup>	Improved Maternal Affect <sup>48</sup>
Decreased Secondary Infections <sup>20</sup>	Improved Maternal Response to Infant Cues <sup>48</sup>
Decreased Salivary Oxytocin Concentrations <sup>22,23</sup>	
Pain Relief for Painful Procedures <sup>27–37</sup>	
Improved Weight Gains <sup>14,20,38,45</sup>	
Greater Success in Establishing Early Breastfeeding <sup>39–45</sup>	

Table 2 Difficulties in the introduction of KMC

Under-resourced environments
Lack of suitable facilities
Poor nursing support or training
Fear and anxiety of hurting the infant
Limited clinical staff
Separation of infant needing interventions
Cultural issues in handling of newborn infants
Limited awareness of KMC

It is estimated that there are over 15 million preterm births worldwide each year, with the great majority in developing countries.<sup>10</sup> Neonatal care of premature infants is complex. It requires expensive infrastructure and trained personnel. In many countries with limited resources NICUs and SCNs are often understaffed and/or ill-equipped.<sup>11</sup> To address some of these issues KMC was first proposed in 1978 by Edgar Rey<sup>12</sup> as an adjunct to conventional neonatal care.

### Kangaroo mother care

KMC is the practice of early, continuous and prolonged skin-to-skin contact between a mother and her newborn, exclusive breastfeeding whenever possible with the aim for an earlier discharge of low birth weight and/or preterm infants. The baby is held upright between the mother’s breasts wearing only a diaper and woollen cap, supported by a cloth wrapping around the naked torso of the mother and baby (Figure 2) to maintain ongoing contact whenever possible between mother and infant. Separation only occurs to attend to mothers’ personal needs or for interventions to the infant. If the mother and newborn are well, KMC is recommended immediately after birth once the umbilical cord is cut and the infant dried and examined.<sup>10</sup> Preterm infants requiring respiratory support via continuous positive airway pressure or endotracheal intubation, require a skilled nurse to be present at all times with regular assessments of the infant.<sup>13</sup> KMC can be performed continuously or intermittently, such as for 120 minutes daily or for 15 minutes before or during invasive procedures.<sup>14</sup> Following the introduction of KMC, more than 500 low birth weight infants in Bogota, Columbia were exposed to KMC, which was associated with a tripling in infant survival rates.<sup>15</sup> What

then are the reported physiological and psychological outcomes of KMC of preterm infants? To answer this question an extensive literature review was undertaken of studies reported in the English

language using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines.



**Figure 2** Skin-to-skin contact between mother and infant.

#### Appendix I Summary of published findings

First author	Year	Study type	Setting	Key findings
Bastani F	2017	Randomised Controlled Trial	Iran	Kangaroo mother care increased the length of time preterm infants spent in deep sleep and quiet awake states compared to in-arms holding.
Boundy E	2016	Systematic Review and Meta-Analysis	United States	Kangaroo mother care was associated with lower mortality, decreased risk of neonatal sepsis, hypothermia, hypoglycaemia, hospital readmission and increased exclusive breastfeeding compared to conventional neonatal care.  Newborns receiving kangaroo mother care had lower mean respiratory rate and pain measures, and higher oxygen saturation, temperature, and head circumference growth.
Butruille L	2017	Prospective Observational Study	United States	Skin-to-skin contact increased parasympathetic activity in preterm infants with a low basal Newborn Infant Parasympathetic Evaluation score.
Campbell-Yeo M	2019	Randomised Controlled Trial	United States	Kangaroo mother care was as effective as oral sucrose as a pain-relieving intervention for preterm neonates undergoing painful procedures.
Casper C	2018	Retrospective Cohort Study	France	Early skin-to-skin contact correlated with lower incidence of secondary infections, bronchopulmonary dysplasia and cholestasis. Duration of skin-to-skin contact was correlated with lower rates of secondary infections and better rates of breastfeeding.
Castral T	2008	Randomised Controlled Trial	United Kingdom	Preterm infants who received skin-to-skin contact were more likely to have lower pain scores throughout the heel prick procedure than those who received regular care.
Charpak N	2020	Systematic Review and Meta-Analysis	United Kingdom	Preterm infants held in kangaroo mother care for at least six hours a day gained more weight than those receiving conventional care. The effect of kangaroo mother care on growth was directly related to the duration.
Chidambaram A	2014	Crossover Trial	United Kingdom	Kangaroo mother care was effective in reducing pain due to heel prick among preterm infants.
Choudhary M	2016	Crossover Trial	England	Kangaroo mother care of preterm infants resulted in a decreased mean duration of crying and lower pain scores.
Cong X	2012	Crossover Trial	United States	Kangaroo mother care significantly reduced autonomic pain responses in preterm infants.
El-Farrash RA	2020	Randomised Controlled Trial	Egypt	Preterm infants receiving kangaroo mother care for long durations reached full enteral feeds faster; had better success with breastfeeding, and better neurobehavioural performance, thermal control and tissue oxygenation.
Forde D	2020	Randomised Controlled Trial	United States	Kangaroo mother care reduced neonatal oxidative stress processes.

Table Continued...

First author	Year	Study type	Setting	Key findings
Gonya J	2017	Retrospective Cohort Study	United States	Early and frequent skin-to-skin care of extremely preterm infants were associated with early cognitive and communication performance.
Head L	2014	Systematic Review	United States	Short-term benefits of kangaroo mother care on preterm infants included improved neurodevelopment.
Johnston C	2017	Systematic Review	United States	Skin-to-skin care was effective, as measured by composite pain indicators, and safe for a single painful procedure.
Karimi S	2020	Randomised Controlled Trial	Iran	Kangaroo mother care improved neonatal weight gain, breastfeeding and decreased the duration of hospitalisation of preterm infants.
Kashaninia Z	2015	Randomised Controlled Trial	Iran	Premature neonates who received kangaroo mother care had greater weight gain than those that did not.
Kommers D	2018	Prospective Observational Study	Netherlands	The salivary oxytocin concentration in the pooled saliva of preterm infant twins decreased during kangaroo mother care.
Korraa A	2014	Prospective Observational Study	United Kingdom	Kangaroo mother care improved cerebral blood flow in preterm and low birth weight infants.
Lyngstad L	2014	Crossover Trial	Ireland	Skin-to-skin contact of premature infants resulted in significantly lower stress levels for diaper change compared to those cared for in an incubator/bed for preterm infants.
Mekonnen A	2019	Meta-Analysis	United Kingdom	Preterm and low birth weight infants receiving kangaroo mother care initiated breastfeeding 2 days 14 hours and 24 minutes earlier than conventional care of radiant warmer/incubator method.
Moore ER	2016	Systematic Review	United Kingdom	Skin-to-skin contact can be used to promote breastfeeding.
Morelius E	2015	Randomised Controlled Trial	Ireland	Preterm infants receiving almost continuous skin-to-skin care had a decreased cortisol reactivity in response to handling, had improved concordance between mothers' and infants' salivary cortisol levels.
Mosayebi Z	2014	Randomised Controlled Trial	Iran	Kangaroo mother care of preterm infants resulted in lower pain intensity scores during the heel-lancing procedure.
Mwendwa A	2012	Randomised Controlled Trial	Kenya	Low birth weight infants received partial kangaroo mother care grew faster and were discharged earlier than those receiving standard care.
Nimbalkar S	2013	Crossover Trial	India	Short duration kangaroo mother care (15 minutes) had stress reducing benefits. Preterm infants above 32 weeks' gestational age receiving kangaroo mother care benefited from decreased pain during the heel prick procedure.
Nimbalkar S	2020	Crossover Trial	India	Skin-to-skin care and sucrose had comparable clinical efficacy for preterm neonatal pain control.
Oras P	2016	Prospective Observational Study	Sweden	A longer daily duration of skin-to-skin contact of preterm infants in the neonatal intensive care unit was associated with earlier attainment of breastfeeding.
Parsa P	2018	Randomised Controlled Trial	Iran	Kangaroo mother care of premature infants enhanced physiological indices: heart rate, respiratory rate, arterial blood oxygen saturation and temperature.
Samra N	2012	Prospective Observational Study	Egypt	Neonates who received kangaroo mother care recovered earlier from jaundice and required a shorter duration of phototherapy than the control group.
Sehgal A	2020	Prospective Observational Study	Australia	Kangaroo mother care resulted in significant circulatory benefits in preterm infants.
Sen E	2020	Randomised Controlled Trial	United States	Kangaroo mother care was more effective than oral sucrose in pain relief during heel-lancing in preterm infants.
Sharma D	2018	Randomised Controlled Trial	India	Early shifting of preterm infants to kangaroo care ward with birth weight of 1000 grams to 1100 grams led to better growth and was cost effective.
Sharma D	2016	Randomised Controlled Trial	India	Early baby care in kangaroo care ward was equally efficacious as baby care in intermediate intensive care in improving the growth outcomes of stable preterm infants reaching term gestational age.

Table Continued...

First author	Year	Study type	Setting	Key findings
Shattawi K	2019	Randomised Controlled Trial	United States	Premature infants who received skin-to-skin contact demonstrated higher weight gain from day 3-5, experienced significantly fewer episodes of apnoea and were less likely to use formula feeding at discharge.
Shukla V	2017	Randomised Controlled Trial	Netherlands	The pain reducing potential of sucrose and kangaroo mother care were comparable.
Zhang F	2012	Review Article	United Kingdom	Kangaroo mother care improved the nurturing of premature infants and reduced the risk factors of oral defects.

## Results

The search identified 173 articles in Medline (Ovid) and 277 articles in Embase (Ovid). After removal of 94 duplicate studies, 356 records remained, of which 306 were excluded following review of their abstracts. Exclusion criteria included limited clinical reports, oral and poster presentations, concerns about study design and an inability to obtain full text access. This review reports the findings of the remaining 39 full text articles.

## Physiological outcomes

### Cardiovascular and metabolic indices

KMC of preterm infants was noted to enhance physiological indices. Butruille et al.,<sup>16</sup> conducted a study analysing parasympathetic activity of mothers and preterm infants using heart rate variability analysis. They noted an activation of parasympathetic activity with skin-to-skin contact. In a quasi-experimental study of 100 preterm infants, Parsa et al.,<sup>17</sup> observed a significant decrease in heart rate and respiratory rate, and an increase in arterial blood oxygen saturation and temperature in infants who received KMC compared to standard neonatal care. A prospective study by Sehgal et al.,<sup>18</sup> of 40 stable preterm infants conducted at a quaternary centre assessed the impact of skin-to-skin parent-infant care on preterm circulatory physiology. They documented significant physiological benefits on cardiac function which included a non-significant increase in axillary temperature, a significant increase in cardiac contractility and tricuspid annular plane systolic excursion, decreased measures of pulmonary vascular resistance and an increase in systemic cardiac output. That was associated with increased cerebral blood flow and reduced middle cerebral artery resistive index. These circulatory benefits were also noted by El-Farrash et al.,<sup>14</sup> and Korraa et al.<sup>19</sup>

Additional benefits of KMC included a lower incidence of secondary infections, bronchopulmonary dysplasia and cholestasis following early commencement of skin-to-skin contact.<sup>20</sup> Furthermore there was an increased length of time spent in deep sleep and quiet awake states,<sup>21</sup> decreased salivary oxytocin concentrations<sup>22</sup> and improved salivary cortisol concordance between mother and infant.<sup>23</sup> There was a reduction in the duration of phototherapy required for the treatment of jaundice despite the KMC being intermittent.<sup>24</sup> Studies have also reported the effect of KMC on neonatal oxidative stress processes in preterm infants. Forde et al.,<sup>25</sup> utilised urinary allantoin as a biomarker for oxidative stress. They noted significant reductions in mean allantoin levels in preterm infants subjected to KMC compared to those in standard neonatal care.

### Pain relief

The value of KMC in alleviating pain experienced by preterm infants has been widely studied. Preterm infants often spend weeks

in the NICU. They undergo approximately fourteen daily painful procedures. Only one-third receive appropriate analgesic therapy. Painful procedures include blood sampling by routine heel pricks, suctioning of the oropharynx and airway, immunisations, changes in dressings and surgical procedures.<sup>26</sup> Campbell-Yeo et al.,<sup>27</sup> conducted a randomised controlled trial involving 242 stable preterm infants. They concluded that KMC was equally effective as 24% oral sucrose at reducing behavioural pain intensity scores associated with painful procedures. There was evidence that KMC has a sustained efficacy over repeated procedures, and the combination of KMC and sucrose did not provide additional benefit. Castral et al.,<sup>28</sup> conducted a randomised controlled trial of 59 stable preterm infants, comparing those who received 15 minutes of skin-to-skin contact with mother before, during and following a heel prick, compared to those receiving standard care. Preterm infants in the former group were observed to have lower neonatal facial coding system scores compared to the control group. In addition, Choudhary et al.<sup>29</sup> noted a reduction in the mean duration of crying in preterm neonates who received KMC. Cong et al.,<sup>30</sup> concluded KMC before and during heel stick procedures, stabilised the infant's heart rate, whilst longer skin-to-skin contact of 30 minutes significantly improved their autonomic pain responses compared to a shorter period of 15 minutes or being in an isolate. These findings were supported by further randomised controlled trials conducted by Chidambaram et al.,<sup>31</sup> Mosayebi et al.,<sup>32</sup> & Sen et al.<sup>33</sup> In two studies by Nimbalkar et al.,<sup>34,35</sup> skin-to-skin contact and oral sucrose were noted to have comparable clinical efficacy. Benefit was also noted even with short periods of KMC (15 minutes). Shukla et al.,<sup>36</sup> similarly concluded that there was no difference in pain reducing effects of sucrose compared to KMC. Lyngstad et al.,<sup>37</sup> additionally noted that skin-to-skin contact reduced the stress levels of preterm infants during diaper changes, compared to those that remained in an incubator or cot, as experienced by changes in the Skin Conductance Algesimeter. KMC appears to be effective in reducing pain of preterm infants with effects noted to be equal or superior to oral sucrose. While there is the ease of administration of oral sucrose, KMC may be preferable for in addition to the pain relief, there are additional beneficial effects.

### Achievement of breastfeeding and weight gains

KMC of preterm infants appear to improve their weight gains in addition to facilitating early breastfeeding. Casper et al.,<sup>20</sup> conducted a retrospective study of 26 premature infants receiving skin-to-skin contact in the NICU and SCN. There was a statistically significant increase in the rate of breastfeeding at discharge in infants who commenced skin-to-skin contact in their 1st week of life, compared to those who started a week later. The frequency of skin-to-skin contact improved the duration of breastfeeding prior to discharge, but was not statistically significant. In the randomised controlled trial conducted by El-Farrash et al.,<sup>14</sup> preterm infants who received KMC scored

significantly higher on an Infant Breastfeeding Assessment Tool and reached full enteral feeding earlier as compared to controls. The best breastfeeding improvement was noted in infants who received KMC for 120 minutes daily. A randomised controlled trial of 104 preterm infants conducted by Oras et al.,<sup>38</sup> similarly noted that longer duration of KMC in the NICU was associated with earlier attainment of exclusive breastfeeding. Improvements in the baby's weight gain with KMC were also noted in studies conducted by Karimi et al.,<sup>39</sup> Khashaninia et al.,<sup>40</sup> Mwendwa et al.,<sup>41</sup> Sharma et al.,<sup>42,43</sup> and Shattawi et al.<sup>44</sup> In a meta-analysis by Mekonnen et al.,<sup>45</sup> the aggregate mean time to initiate breastfeeding among preterm and low birth weight infants receiving KMC was 2.6 days, a full 2 days, 14 hours and 24 minutes earlier than those still being cared for in incubators or exposed to radiant warmers. The current literature suggests that early KMC of preterm infants resulted in improved breastfeeding success and weight gains compared to conventional neonatal care. Further studies are required to determine the optimal duration of KMC to achieve a positive response.

### Developmental and psychological outcomes

Preterm infants born before 30 weeks' gestation may have poorer neurodevelopmental prognoses.<sup>46</sup> Results from a retrospective cohort study by Gonya et al.,<sup>47</sup> of extremely preterm infants admitted to a NICU suggested an association between early and frequent skin-to-skin contact and early cognitive and communication performance. Preterm infants who received KMC from either their mother or father, for longer periods with an increased frequency or greater total hours of contact, performed better. El-Farrash et al.,<sup>14</sup> documented smoother movements, symmetrical responses, decreased handling requirements, and less excitability and reduced periods of lethargy amongst preterm infants who received KMC daily for at least 7 days consecutively, compared to those who received conventional neonatal care. This was partially explained by the theoretical multimodal sensory stimulation that KMC is thought to provide, accelerating neurological maturation.

The separation of mothers from their preterm infants following their admission to the NICU and the clinical interventions required, may delay opportunities for mother-infant attachment. Feldman et al.,<sup>48</sup> compared the impact of KMC and traditional care on parenting outcomes and the impact on preterm infant development. The study included 73 preterm infants who received KMC in the NICU and 73 control infants who received standard incubator care, matched for birth weight, gestational age, medical severity and demographics. The study noted that KMC positively influenced parental perceptions and behaviours, and infant development independent of the infant's medical status. Following KMC, mothers displayed a more positive affect, with improved handling of their infant being better attuned to their infant cues. The infants were more alert with less gaze aversion. The study speculated that KMC had a direct impact on infant development through improved neurophysiological organisation and indirectly through improving parental mood, perceptions and interactive behaviour. An earlier study by Ahn et al.,<sup>49</sup> also concluded that maternal attachment scores were higher among mothers involved in KMC, compared to the conventional neonatal practices in a cohort of Korean premature infants and their mothers.

Sahlén et al.,<sup>50</sup> conducted a randomised controlled trial which compared the effects of continuous versus intermittent skin-to-skin contact from birth to discharge in premature infants on mother-infant interaction. The results of this study however did not support the hypothesis that continuous skin-to-skin contact improved mother-infant interaction – there were no statistically significant differences in mother-infant interaction between the two groups. The researchers

proposed that while skin-to-skin contact creates a foundation for greater contact with the infants and increased interaction, there might be a need for more specific interventions to enhance such interactions between the mother and infant. Limitations of that study included breastfeeding as a possible confounder, as it fostered skin-to-skin contact and has been previously described to positively improve the interactions.

### Further study

The introduction of KMC is limited by the availability of suitable hospital settings that ensure comfort and privacy for mothers and their infants. The variety of those settings still need be determined. The observed improvements in physiological parameters arising from KMC may be more readily documented by analysing routinely collected vital signs of stable preterm infants, including changes in heart and breathing rates and oxygen saturations. The results may further facilitate wider adoption of KMC as the “standard care” of preterm infants.

The ability of an infant to engage with caregivers, through initiating and maintaining eye contact, vocalising, and using facial expression and body movements, emerge during the first two months of life.<sup>51,52</sup> During periods of severe stress for an infant, either due to organic disease or adverse psychological factors, a pattern of social withdrawal and inactivity can be observed. This reaction supports survival through a conservation of resources, until the perceived threat or distressing circumstances become more favourable. This phenomenon is described as conservation-withdrawal.<sup>53,54</sup> The Alarm Distress Baby Scale (ADBB), an 8-item assessment tool may be used to objectively evaluate social withdrawal of infants between 2 and 24 months.<sup>55</sup> A recent review on the use of the ADBB in assessing social withdrawal in infants with an underlying organic illness, found the ADBB to be very helpful in assessing infant well-being with serial measurements being able to determine subsequent improvement.<sup>56</sup> Infants who have experienced KMC may be further studied by carrying out an ADBB assessment to learn of its impact on their psychosocial development.

### Concerns about KMC

Despite the reported benefits of KMC, there are several barriers which limit its integration into routine neonatal care of preterm infants. In a systematic review conducted by Seidman et al.,<sup>57</sup> 4 of the top 5 barriers to KMC were resource-related. It encompassed “issues with facility environment/resources”. That included staff shortages or limited space to carry out KMC, “negative impressions of staff attitudes or interactions”, “fear/anxiety of hurting the infant” or dislodging a venous cannula or endotracheal tube. The “lack of help with [KMC] practice and other obligations”, including cultural customs, were also considered limiting factors to its introduction. There was also a “low awareness of [KMC] on infant health”. For countries with sparse resources, fatigue of the attending clinical staff working long hours was noted to be additional barriers to adoption of KMC.

### Limitations of this analysis

The non-English literature was not extensively studied. Published studies contrasting the effect of kangaroo care provided by mothers versus fathers or surrogates of preterm infants were not reviewed. Furthermore, as KMC is a relatively new approach there appears to be a preponderance of positive outcomes reported in the literature possibly arising from an evangelical fervour by its proponents. Limited information is available on the potential negative consequences.

## Conclusion

Kangaroo mother care of preterm infants has many reported physiological, developmental and psychological benefits. It tends to improve circulatory physiological parameters, facilitate pain relief comparable or better to that achieved by sucrose, increase the rates of early attainment of breastfeeding, and accelerates neonatal weight gain. It tends to foster mother-infant interactions and improves neurodevelopmental outcomes. There are no clear guidelines concerning the optimal duration of KMC, with some studies reporting greater benefits with its earlier commencement and increased daily duration. However, there remain several barriers that prevent the universal uptake of kangaroo mother care in NICUs or SCNs. Further use of routine measures of vital signs may allow for ease of analysis. The ADBB may be able to provide additional information with respect to infant well-being and social interaction arising from KMC.

To support the implementation of KMC and address potential barriers there need be further education of healthcare workers, parents and families about its application, its potential benefits, as well as the expansion of resources to deliver such care possibly routinely for preterm infants. There also is the need for additional resources and the development of suitable supportive environments. Such additional resources and training may be well compensated by the improved wellbeing of the infant, allowing for earlier discharge into the care of a more confident mother.

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## Conflicts of interest

Authors declare that there is no conflict of interest.

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