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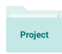
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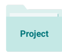
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Fathers providing kangaroo care in neonatal intensive care units: a scoping review

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ABSTRACT

Background: Kangaroo care (KC) has been used widely in neonatal care to promote bonding/attachment and neurodevelopment for preterm and term infants. However, current literature suggests that research mainly focuses on infants' and mothers' experiences. The role of fathers in caring for their infant/child is changing and evolving in many countries around the globe yet little is known about fathers' experiences of KC in neonatal units. This review, therefore, aims to scope the current evidence of father–infant KC (PKC) in neonatal intensive care units (NICUs).

Research question: What impact does KC have on fathers when their baby is cared for in an NICU?

Search method: A scoping review was conducted, guided by the Arksey & O'Malley (2005) framework. The data sources consisted of MEDLINE, Embase, the American Psychological Association (APA) PsycInfo, Emcare, Cochrane Database of Systematic Reviews (CDSR), Web of Science, Google Scholar and ProQuest.

The study inclusion criteria were: 1. studies involving fathers who had experience of KC with their baby while in NICUs and other neonatal care settings (such as Special Care Baby Nursery (SCBU), delivery/labour room and postnatal ward); 2. literature published from 2000 to 2020; 3. primary studies including qualitative, quantitative, and mixed-methods studies; 4. studies published in English.

Results: The total number of studies identified were 13. Seven studies were qualitative and six were quantitative. None were mixed-methods studies. Studies reported several positive KC benefits for fathers such as reduced stress, promotion of paternal role and enhanced father–infant bond. It was highlighted that KC could be time-consuming for fathers and challenging to practise when balancing work and family life commitments.

Conclusion: This review provides evidence that KC practice has health and wellbeing benefits for fathers and infants in NICUs and other relevant neonatal care settings. The findings of this review support the justification to promote PKC in NICU environments, and guide policies to include father involvement. Implementing PKC in NICU settings will assist fathers to care and connect with their baby. Further research is needed to explore how to facilitate and evaluate KC education for fathers from diverse backgrounds and cultures.

Keywords: kangaroo care, skin-to-skin, fathers, neonatal, NICU, Evidence Based Midwifery

Introduction

Kangaroo care (KC) is often referred to as skin-to-skin or kangaroo mother care (KMC). KC refers to a method of holding an infant, naked (except for a diaper/nappy), in an upright and prone position, skin-to-skin, on a caregiver's bared chest (Conde-Agudelo & Díaz-Rossello 2016, Chen et al 2017).

KC was originally introduced at the Instituto Materno Infantil in Santa Fede Bogotá, Colombia in 1978. The initial reason KC was introduced in this maternity unit was due to a shortage of incubators; the lack of incubators led to a study being undertaken at the hospital. Lower neonatal mortality rates and increased weight gain for low birth weight (LBW) babies (that is, babies weighing less than 2500gms, regardless of gestational age) were reported compared to newborns receiving conventional care in an incubator (Whitelaw & Liestøl 1994).

The World Health Organization (WHO) reported that KC was a cost-effective method of achieving optimised health outcomes for premature and full-term babies (WHO 2003). It was acknowledged that

KC is a fundamental method of achieving thermal control for preterm and LBW infants (WHO 2015). Additionally, KC has been shown to reduce neonate infection rates and hospitalisation length and enhance maternal–infant bonding (Conde-Agudelo & Díaz-Rossello 2016).

Babies in NICUs experience stress from numerous interventions and separation from their mothers (Stevens et al 2011). KC has been reported as a primary method for mothers and babies to complete an integral physiological process following childbirth, while providing nurturing care (Jesus et al 2015). Mothers have been recognised as the main KC provider by health professionals in the NICU environment (Jesus et al 2015). In contrast, fathers are often referred to as 'bystanders' in the engagement of maternal and neonatal care (Steen et al 2012). However, due to some societal, economic, and cultural changes, there has been a steady increase in the father's role in providing care to their infant/child (Yogman et al 2016).

Research has provided evidence that fathers have an innate biological connection to their infants similar to mothers (Yogman et al 2016). This intrinsic connection enables father–infant KC to be implemented and is beneficial during the separation of mothers and infants (Shorey et al 2016), thus promoting and increasing KC practice in fathers (Jesus et al 2015). Additionally, PKC has been found to be associated with increased paternal involvement (Jesus et al 2015) and an enhanced paternal role (Varela et al 2018). Moreover, PKC has been shown to have the same effect as KMC on preterm and term infants' physiological stability (Shorey et al 2016).

Current literature on KC mainly investigates or explores mother and infant practices and experiences. There seems to be a lack of research exploring PKC (Martel et al 2016) and therefore a clear justification to undertake a scoping review of the literature.

A scoping review examines a broad topic to identify its volume, nature, and characteristics by mapping the related evidence with the relevant time, location, and origin, and detecting possible research-based gaps (Peters et al 2015). This type of review is suited to explore a unique and complex question when research appears limited for a specific topic. Therefore, this review used a scoping review framework to guide the review approach, to identify relevant studies to answer the research question and to collect evidence in accordance with inclusion criteria that incorporated core elements of Population, Concept, Context (PCC) in a wide range of databases (Peters et al 2020).

This framework recommends that findings are mapped, synthesised, presented narratively and summarised in tables. The clinical implications associated with PKC will be reported. It is envisaged that this review will provide evidence to support the practice of PKC in NICUs.

The aim of this review is to examine the literature relating to research exploring the views and experiences of fathers providing KC to their babies while they are being cared for in NICUs.

Methods

Protocol and registration

A protocol was developed to guide the undertaking of this scoping review (Dong et al 2021); the scoping review framework described by Arksey & O'Malley (2005) was used. According to the international prospective register of systematic reviews administered by the University of York's Centre for Reviews and Dissemination (PROSPERO), scoping reviews do not meet the eligibility to be registered in the database (University of York Centre for Reviews and Dissemination n.d.). Therefore, no registration was required for this review.

Research question

What impact does KC have on fathers when their baby is cared for in an NICU?

Eligibility criteria

In this review, the search strategy approach to finding studies was sought by utilising the core components: Population, Concept, Context (PCC). The inclusion criteria were aligned with the PCC components to guide the undertaking of this review (Peters et al 2020).

Population

Fathers, including all age groups >18 years old, from all geographical locations and all cultural backgrounds were included. Infants included in this review were referred to as neonates (that is, infants under 28 days of age) from different geographical areas with diverse cultural backgrounds. Babies who were beyond the neonatal period were excluded.

Concept

The core concept examined by this review is the experience of KC.

Context

The context of this review was mainly referred to as NICUs. However, other relevant settings where PKC might be practised were included, such as a Special Care Baby Nursery (SCBU), delivery/labour room or postnatal ward. =

The types of evidence searched

Given that little is known, or published, about PKC the search timeframe was set from 2000 to 2020 (Peters et al 2020). The core content and type of

papers meeting the inclusion criteria associated with the components of PCC were searched. Primary studies using qualitative, quantitative, and mixed methods were included. Only articles in English were selected.

Information sources and search strategies

A wide range of literature searches was performed in databases, registers, and some additional sources, in October 2020. Databases involved MEDLINE, Embase, the American Psychological Association (APA), PsycInfo, Emcare. Registers include Cochrane Central Register of Controlled Trials (CENTRAL) and Clinical Trials.

The keywords and the Medical Subject Headings (MeSH) terms used in MEDLINE are listed in Table 1. The search strategy in MEDLINE is provided as an example for replicability and auditability (Peters et al 2020).

Table 1. MEDLINE search strategy (literature search)

1. Fathers/
2. Father-Child Relations/
3. (father* or dad* or paternal* or parent*).ti,ab,kw.
4. 1 or 2 or 3
5. Infant, Newborn/
6. ((preterm or premature* or term or full term or low birth weight or LBW or postnatal) adj4 (baby or babies or neonatal* or infant$1)).ti,ab,kw.
7. 5 or 6
8. Kangaroo. Mother Care Method/
9. ((Kangaroo or Skin to Skin) adj5 (care or contact or method)).ti,ab,kw.
10. 8 or 9
11. Intensive Care Units, Neonatal/
12. Postnatal Care/
13. Operating Rooms/
14. Nurseries, Hospital/
15. Delivery Rooms/
16. (NICU* or neonatal intensive care or neonatal care or intensive care units or newborn icus or neonatal or special baby care unit or SCBU or postnatal ward or delivery room or labo?r ward or theatre or operating room or recovery room or parenting room or birthing center).ti,ab,kw.
17. 1 or 12 or 13 or 14 or 15 or 16
18. 4 and 7 and 10 and 17
19. Limit 18 to yr="2000-2020"

An additional search of grey literature was conducted. The first 200 articles (Bramer et al 2017) were selected from Google Scholar under 'Father kangaroo care'. Theses and dissertations were searched in the ProQuest platform. Other searches included Web of Science, clinical guidelines, conference abstracts, hand-searching through reference lists, communication with peers or experts via media.

Study screen and selection

All the identified literature (n=1298) was exported into the bibliographic software EndNote X9.0 and duplicates were removed using the same software. The duplicating process was double-checked by an experienced librarian.

The initial selection was undertaken by screening titles and abstracts with a second reviewer. The further screening (n=38) was carried out by reading the full text to obtain the articles which meet the inclusion criteria. Clarifications were sought with a third reviewer to achieve consensus to finalise the selected articles for the scoping review (n=13). The search strategy is demonstrated using a PRISMA 2020 flow chart for transparency and reflexivity (Figure 1).

Data charting

Microsoft Excel software was used to record data extracted from the 13 articles reporting a study aligned with the research question. Data extraction fields include author/s, year of publication, title of publication, country of origin, type of study, aim/objectives, methods, population and sample size, setting, factors associated with PKC, impact of PKC, limitations and strengths, clinical implications. Three reviewers defined the extracted data, which are shown in the **Summary of included studies** table (see Supplementary information).

Results

A total of 13 studies met the inclusion criteria. Of these, seven studies were reported to undertake qualitative research (Fegran et al 2008, Blomqvist et al 2012, Helth & Jarden 2013, Magee & Nurse 2014, Jesus et al 2015, Olsson et al 2017, Günay & Coşkun Şimşek 2021).

Five of the qualitative studies used a phenomenological research approach (Fegran et al 2008, Blomqvist et al 2012, Helth & Jarden 2013, Jesus et al 2015; Günay & Coşkun Şimşek 2021). One qualitative study reported using a descriptive approach (Olsson et al 2017) and the remaining study was a case study (Magee & Nurse 2014).

Six studies were reported to conduct quantitative research (Varela et al 2014, Mörelius et al 2015, Cong et al 2015, Chen et al 2017, Varela et al 2018, Dongre et al 2020). Quantitative studies included five experimental designs, two randomised controlled trials (RCTs) (Mörelius et al 2015, Chen et al 2017), one crossover study (Cong et al 2015), one quasi-experimental study (Varela et al 2014), and one pre- and post-observational study (Varela et al 2018). No mixed methods studies were identified.

Figure 2 demonstrates an upward trend in the number of studies undertaken on PKC between 2000 and 2020. Only one included study (Fegran et al

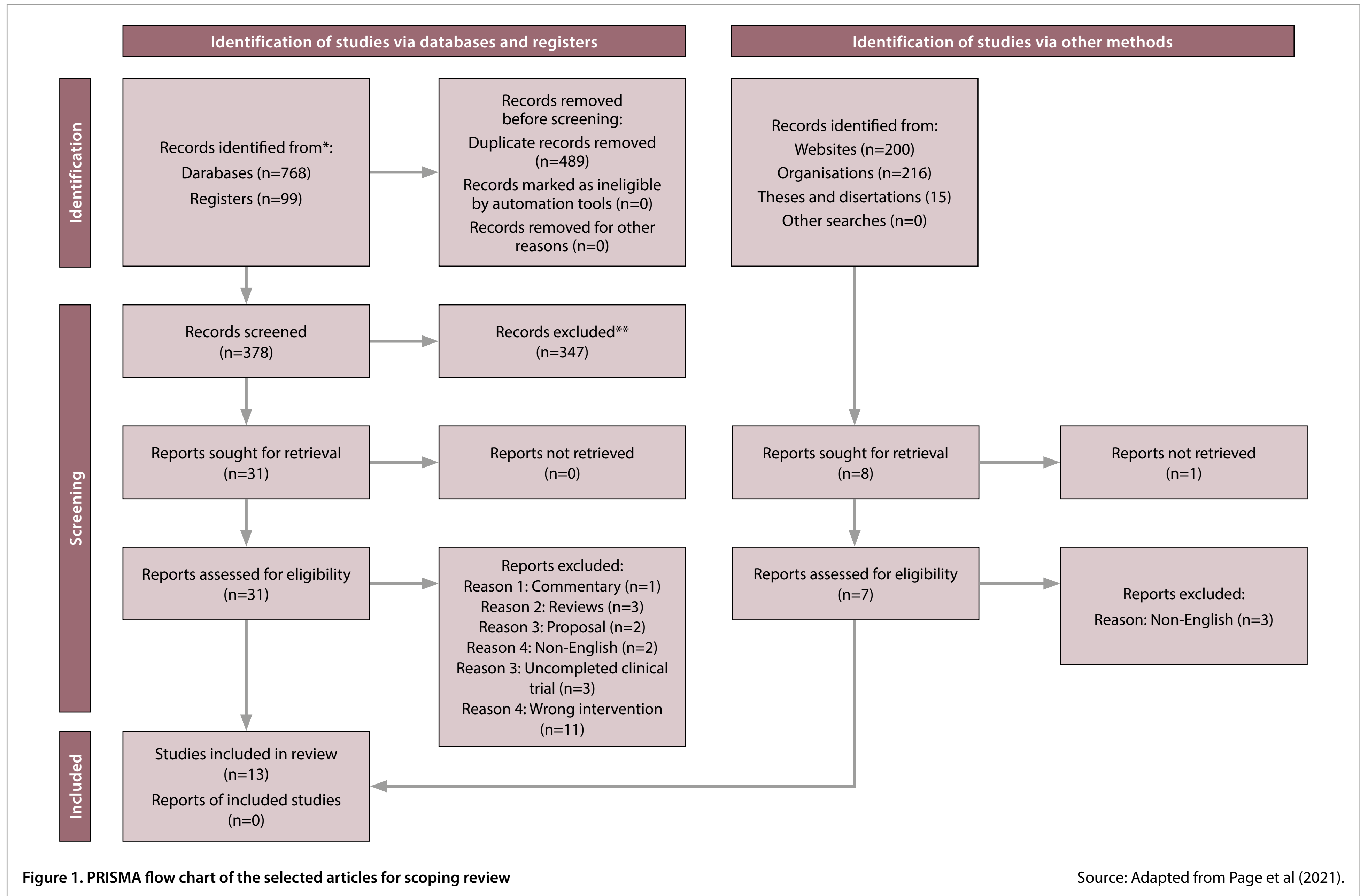

Figure 1. PRISMA flow chart of the selected articles for scoping review

Source: Adapted from Page et al (2021).

2008) was conducted between 2000 and 2009. Four studies were published during the 2011–2014 period (Blomqvist et al 2012, Helth & Jarden 2013, Magee & Nurse 2014, Varela et al 2014). Eight studies were published in the five years from 2015–2020 (Cong et al 2015, Jesus et al 2015, Mörelius et al 2015, Chen et al 2017, Olsson et al 2017, Varela et al 2018, Dongre et al 2020, Günay & Coşkun Şimşek 2021).

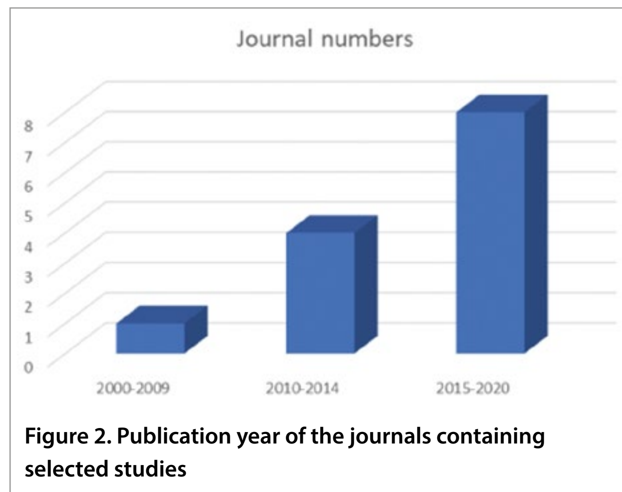

Figure 2. Publication year of the journals containing selected studies

Figure 3 highlights the geographical distribution of studies and demonstrates that northern European countries conducted more studies for PKC.

Three studies were undertaken in Sweden, one in the UK, one in Norway, and one in Denmark. Fewer studies were conducted in the Mediterranean and South East Asian regions: two in India, one in Turkey. One study was conducted in a Far East Asian country: Taiwan. Only one study was completed in Canada and one in the United States of America (USA). None have been undertaken in Australia.

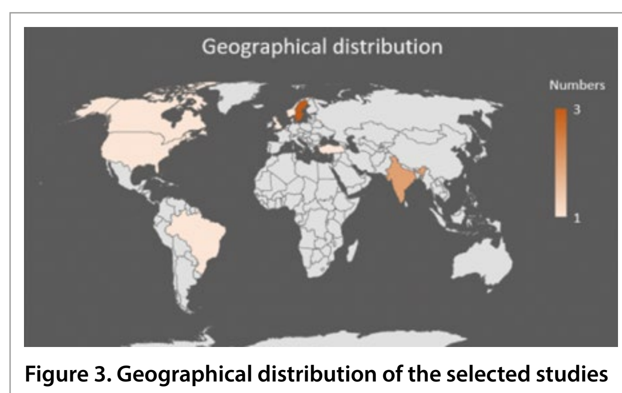

Figure 3. Geographical distribution of the selected studies

The data relevant to factors associated with PKC are detailed in the **Factors associated with father KC** table (see Supplementary information) which shows the length of KC, the facilities/aids for KC, and the cultural and policy background.

In Sweden, single-family rooms with beds were available in NICU settings. Parental leave and allowance enabled fathers to spend more time implementing KC. Blomqvist et al (2012) showed that fathers had KC with their babies for up to 24 hours a day, and 7–19.6 hours a day was reported in the study by Mörelius et al (2015).

In regions where fathers had to manage most of the family's financial responsibilities, KC duration was between 15–90 minutes (Varela et al 2014, Cong et al 2015, Chen et al 2017, Varela et al 2018, Dongre et al 2020, Günay & Coşkun Şimşek 2021). The cot-side chair provided for KC was reported in four studies (Cong et al 2015, Chen et al 2017, Varela et al 2018, Günay & Coşkun Şimşek 2021). However, three studies did not report on the provision of this aid (Helth & Jarden 2013, Magee & Nurse 2014, Jesus et al 2015).

The data related to clinical implications in the **Factors associated with father KC** table (see Supplementary information) demonstrate that five studies reported that staff educated fathers about KC (Blomqvist et al 2012, Magee & Nurse 2014, Jesus et al 2015, Chen et al 2017, Günay & Coşkun Şimşek 2021). One study (Blomqvist et al 2012) described a care plan to promote and support fathers to provide KC. One study (Fegran et al 2008) recommended mother's encouragement, and another study (Günay & Coşkun Şimşek 2021) established policies to support PKC practice. Interestingly, Varela et al (2014) reported less KC practice in a single room than in the open intensive care room.

Table 2 highlights which studies reported which impacts of PKC, including enhancement of paternal role and initiating and strengthening the father-infant bond.

An important finding was that increasing fathers' competence and affection was associated with a reduction of paternal stress and anxiety. Additionally, two studies (Jesus et al 2015, Olsson et al 2017) reported that the father's role was promoted as a primary carer in certain circumstances, when the mother was not available. Other findings included promoting the relationship between fathers and mothers; Dongre et al (2020) also showed KC to be an excellent opportunity to establish better communication between fathers and NICU staff.

Collectively, these findings indicate clear benefits associated with PKC. However, Olsson et al (2017) reported that KC was an energy-draining practice, and sometimes led to guilty feelings because of spending less time with other siblings. Helth & Jarden (2013) highlighted fathers' conflict between working and spending time with the infant. However, Jesus et al (2015) found that KC was a valuable learning experience for fathers, and this was confirmed by Olsson et al (2017).

Table 2. Categories of impact of father KC on fathers by study

The impact of father KC on fathers	Study
Initiating and strengthening father–infant bond	S1, S2, S3, S6, S7, S9, S11, S12
Enhancement of paternal role	S1, S6, S7, S8, S9, S10, S11, S12, S13
Feeling in control	S9, S10, S11
Improvement of competence as a father	S1, S6, S7, S8, S9, S12, S13
Reduction of paternal stress or anxiety	S1, S5, S6, S7, S11, S13
Affection	S1, S2, S7, S8, S11
Better communication between fathers and NICU staff	S5
Promotion of family relationships	S2, S4, S5, S10
KC information availability	S2, S11
Acting as a primary carer (motherly role)	S1, S9
Energy-draining, feeling guilty about other siblings at home	S1, S11
Conflict between working and spending time with their infant	S8

Discussion

As far as the authors are aware, this is the first scoping review undertaken to search current literature relating to fathers' experiences of providing KC to their baby in an NICU.

The 13 included studies for this review were undertaken in various geographical regions. The researchers acknowledge that clinical and cultural neonatal variations in NICUs and other neonatal care settings need to be considered. Fathers being involved in their infant's care will vary throughout the world and, generally speaking, most societies continue to recognise mothers as the primary caregiver. However, over the last few decades, there has been increasing involvement and caregiving by fathers (Steen et al 2012).

A specifically designed website (www.familyincluded.com) provides information on studies undertaken around the globe where fathers and families are being researched, and there appear to be several benefits when they are engaged in infant care. There is also a useful website for fathers to access (www.birthingdads.com.au).

Reflecting on this review, it highlights that there has been a growing interest in fathers' experiences of KC, mostly from northern European countries, but some research has also been undertaken in North America, Canada and in the Mediterranean, South East and Far East Asian regions. Nevertheless, it has been recommended that further research and studies that involve more diverse backgrounds are required (Magee & Nurse 2014).

The collective evidence from this review confirms that there are health and wellbeing benefits when PKC is undertaken, and this confirms earlier findings reported in an integrative review by Shorey et al (2016). These researchers concluded that PKC had positive effects on understanding the father's role, promoting improved paternal interaction with infants and reducing paternal stress.

Over the last few decades, fathers' involvement in childcare has been increasing and is associated with the dual-income family structure that has evolved from a transformation of the socio-economic environment (Faris 2016). The responsibilities pertaining to the father's role include involvement in childcare and influencing the child's physical and mental development (Varela et al 2014, Yogman et al 2016).

PKC can provide fathers with an opportunity to gain caregiving skills and connect with their baby, which is supported by Varela et al's (2014) study conducted in India. These researchers reported that fathers with KC experiences showed a more empathetic and emotional connection to their child. Fathers with a baby in an NICU are at increased risk of developing anxiety and depression (Givrad et al 2021): the practice of KC may assist fathers to manage anxiety and stress when caring for their newborn in an NICU (Magee & Nurse 2014, Mörelius et al 2015, Olsson et al 2017). Feeling competent as a father will also contribute to fathers' health and wellbeing (Fegran et al 2008, Blomqvist et al 2012, Helth & Jarden 2013, Magee & Nurse 2014, Varela et al 2014, Varela et al 2018, Günay & Coşkun Şimşek 2021).

Adamsons & Johnson (2013) reported that positive father involvement in a child's upbringing may enhance academic achievement, emotional wellbeing, and social behaviours. Garnica-Torres et al (2021) suggested that the attainment of fatherhood is driven by men's emotions and mental wellbeing. PKC appears to assist fathers to review their views about fatherhood and acts as a lived workshop about becoming a father, as described by Olsson et al (2017). This review found evidence to suggest that PKC supported fathers in connecting and bonding with their infants, which positively impacted fathers' confidence and self-esteem when engaging in their baby's care in an NICU environment.

These key findings confirm research by Logan & Dormire (2018) who conducted semi-structured interviews with seven fathers about the experience of caring for their premature babies in the first weeks in an NICU and reported that KC played a critical role in connecting to their infant.

According to John Bowlby's evolutionary concept of attachment theory, infants seek proximity figures that respond to their stress behaviours, such as crying, to help them survive (McLeod 2017). By acting as a caregiver, fathers could instinctively enable the father–infant attachment to be established, and

then a reciprocal interaction between them might be created. This physiological relationship between fathers and infants was also illustrated by Bloch-Salisbury et al (2014). They reported that premature infants' respiratory stability corresponded to the KC providers' cardiac rhythm during KC sessions and babies were calmer.

Interestingly, bonding between fathers and babies often occurs during pregnancy. Genesoni (2009) found that fathers psychologically bonded to their babies in the first trimester of their partner's pregnancy. However, during the childbirth continuum, fathers are often seen as a 'bystander' and receive education and information 'second-hand' (Steen et al 2012). Nevertheless, the NICU environment may provide opportunities to promote the father–infant bond and connection by supporting the practice of PKC.

Theoretically, close touch between fathers and infants through KC activates the hypothalamic-pituitary-adrenal axis stress system to produce oxytocin, which leads to decreased levels of cortisone, also referred to as a stress predictor (Cong et al 2015). This reduction in stress was clearly shown by Varela et al (2018). These researchers collected saliva samples from fathers and reported a significant reduction in cortisone level one-hour post-KC compared to before and during KC. Interestingly, Cong et al (2015) found similar results in their crossover study: fathers' oxytocin level was raised after KC and maintained at the same high level for 30 minutes after KC. Hence, the stress-free advantage produced by KC might act as a catalyst to enhance the paternal role, as highlighted by Blomqvist et al (2012). Evidence to support the promotion of PKC in NICU settings appears to be emerging over the last decade.

In some circumstances if a mother is unavailable as the result of a critical medical condition, such as following an emergency caesarean section, the father is available and can provide PKC. The benefits of PKC were also clearly shown in the case study reported by Magee & Nurse (2014). These researchers discussed how a bereaved father cared for his premature daughter in the NICU when her mother died nine days after giving birth. Therefore, health professionals may advocate KC to fathers to maximise the facilitation of KC.

Nevertheless, this review detected some negative impacts associated with PKC. Some fathers reported that providing KC to their newborn baby was time-consuming and it was perceived by some as an energy-draining task (Blomqvist et al 2012, Helth & Jarden 2013, Olsson et al 2017). The negativity reported might be related to prolonged KC events and finding time for KC from the father's multiple responsibilities: being a father and a supporter for mother or an economic provider. One issue that surfaced was that fathers' involvement in providing KC led to an imbalance between working and family life (Helth & Jarden 2013, Garnica-Torres et al 2021). Another was that fathers felt guilty about spending less time with other siblings at home when providing KC for their newborn baby in the NICU (Blomqvist et al 2012, Olsson et al 2017).

These negative impacts might be associated with socio-cultural factors and variations in health policies in different geographic areas. In some European countries, where NICU facilities/aids included single rooms with a bed and leisure equipment, parents are well-supported to offer their infants KC for up to 24 hours a day (Blomqvist et al 2012). Paternal leave enables fathers to be available for KC provision (Blomqvist et al 2012, Mörelius et al 2015). In contrast, parental leave is not provided in some countries, which impacted the availability of fathers. This finding is consistent with the studies reported by Garnica-Torres et al (2021) and Günay & Coşkun Şimşek (2021).

Mixed reports of facilities/aids and support for fathers to provide KC appears to be the current situation. Comfortable chairs and single rooms might help. Paid paternal leave could be advocated by the local government to reduce the financial burden and create more opportunities for fathers' to be available. Negative outcomes might be circumvented by designing a PKC care plan to support fathers who wish to conduct KC with their infant (Blomqvist et al 2012) and introducing a flexible approach to the length of time for which KC is provided. Care plans for PKC may promote more positive experiences for fathers while their infant is in a NICU setting and address the negative aspects raised by some fathers.

As for clinical implementation, the findings of this review have demonstrated that PKC enhances couple and family relationships (Cong et al 2015, Jesus et al 2015, Mörelius et al 2015, Dongre et al 2020) and is therefore worthy of support for the practice. This positive outcome on relationships may be explained by a pattern of an interlinked influence circle of mother to child, child to father and father to mother, where the father–child bond that emerges from the involvement in PKC plays a pivotal role in linking the relationship between family members (Lindsey & Caldera 2006). The improved interaction reported between fathers and nursing staff associated with PKC (Dongre et al 2020) provides an opportunity for nurses and midwives to understand the fathers' perspective to help them communicate more effectively. Improved communication with a father will promote better engagement in their infant's care while in the NICU (Cong et al 2015).

Some studies mentioned education for PKC, and this seems to have had a positive outcome on supporting fathers to undertake the practice (Helth & Jarden 2013, Mörelius et al 2015, Chen et al 2017, Olsson et al 2017, Günay & Coşkun Şimşek 2021). Therefore,

it appears that providing PKC education to fathers before, or shortly after, admission of their infant to an NICU would be advantageous. However, further studies on educating and mentoring fathers to provide KC in NICUs are required.

Strengths and limitations

A strength of this review is that a protocol was developed, and rigorous steps were undertaken to identify relevant quantitative and qualitative studies. A scoping of the literature was undertaken and PKC in NICU settings is a topic currently emerging as an area of interest. However, the included studies were limited to some countries and therefore, may not be generalisable to a global population. A limitation is that the reviewed articles were only written in English, and therefore studies written in other languages may have been missed.

Some quantitative studies' sample sizes were small and underpowered and further larger studies are required. No longitudinal studies were reported, and this is a limitation. Most qualitative studies used a phenomenological approach and further studies may benefit from using an ethnographic design where the NICU environment, staff and fathers may all be considered and participate in the research. Mixed-method studies may also contribute to providing further evidence for PKC in NICU settings.

Conclusion

Research evidence to support PKC in NICU settings is emerging and this review has provided and consolidated current literature evidence by answering the research question: what impact does KC have upon fathers when their baby is cared for in an NICU?

This review has shown that there are health and wellbeing benefits for fathers and their babies when PKC is undertaken in NICUs and other clinical settings. The findings from this review provide some evidence to support the implementation of PKC in NICUs and other clinical settings and will inform policies and clinical practices in countries where paternal involvement is evolving. Paid paternal leave may reduce financial burdens and create more opportunities for fathers to be available to provide PKC.

Adopting a flexible approach strategy for the length of time to provide PKC that meets individual father's and their baby's needs may enhance the experience. Care plans for PKC may promote more positive experiences for fathers while their infant is in an NICU setting and address the negative aspects raised by some fathers.

Further research is needed about how, and what, to provide to fathers in terms of KC education and the evaluation of PKC care plans. Fathers from a wide range of diverse backgrounds need to be included in further research studies to enable an international perspective to be investigated and explored in more depth.

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Conflict of interest

The authors declare that they have no conflict of interest.

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Supplementary information

Summary of included studies

	Author(s)/year/ country	Type of study	Aim/objectives	Methods	Population and sample size	Settings	Fathers' demographic profile
S1	Blomqvist et al 2012, Sweden	Qualitative descriptive study - Phenomenology	To describe fathers' experiences of providing KC to their preterm infant	Data collection: questionnaires completed by fathers while their babies were in hospital; individual semi-structured interviews at four months ± two weeks post-discharge; data analysis: using qualitative content analysis described by Grameheim & Lundman (2004)	Inclusion criteria: fathers whose babies were born at the gestational age of 28 to 33 + 6 weeks and medically stable. Sample size: x 7	Level 3 NICUs at two Swedish hospitals	Age range: 34 to 42 years old, 56.6% first-time fathers
S2	Jesus et al 2015, Brazil	Qualitative descriptive study - Phenomenology	To identify father's perceptions about KC; to explore how nurses could foster the father-child relationship	Data collection: semi-structured interviews through open and closed questions; data analysis: using content analysis	Inclusion criteria: fathers who were 1) biological parents of premature infants and/or low birth weight; 2) Fathers over 18 years of age; 3) Experiencing Kangaroo Care; 4) Interest participate Sample size: x6	Maternal hospitals x 2, Brazil, no wards specified	Not reported
S3	Chen et al 2017, Taiwan	Quantitative study - RCT	To observe the effects of KC on father-child attachment	Pilot study performed: intervention group (= 3) control group (= 3); Data collection: computer program generated a random stratified allocation. Intervention group: KC provided for at least 15 minutes/for the first three days of life; control group: received standard care, KC provided at fathers' request; Both groups received KC information on admission. Data collection: instruments used: Demographic Information Survey; Early Childcare for Fathers, Nursing Pamphlet; Father-Child Attachment Scale (FCAS) developed by Yang & Chen (2001): self-reported by fathers; Data analysis: SPSS and Windows 20.0	Inclusion criteria: 1) new fathers; 2) older than 20 years old; 3) at the hospital daily until discharge; 4) non-smokers; 5) not have an alcohol addiction or be diagnosed with a psychological disorder; 6) signed an informed consent agreement; 7) babies of gestational age ≥ 37 weeks, stable vital signs and no congenital abnormalities or diseases. Sample size: total n=83 participants: intervention group (n=41) and control group (n=42)	Postnatal ward in a teaching hospital, maternal clinic in Taiwan	Age range: 34 to 42 years old, 56.6% first-time fathers, 50.6% college education, 85.5% antenatal class attendance

S4	Cong et al 2015, USA	Quantitative study - Crossover study	To examine oxytocin mechanism in modulating parental stress and anxiety during M-KC and paternal KC (P-KC) with their preterm infants	Data collection: the mother-father-infant triad was assigned randomly by a computer-program to study sequences: M-KC on day 1 and P-KC on day 2 or vice versa. Process: parents' saliva collected using a standard unstimulated passive drool method and a validated visual-analog scale (VAS) measuring anxiety and self-reported at the end of the period of pre-KC (10mins), during-KC (30 mins) and post-KC (30 mins) phases. Data collection: measurements: salivary oxytocin assay, salivary cortisol, parental anxiety; Data analysis: Using IBM SPSS 20.0 (Armonk, NY)	Used a convenience sampling approach. Power analysis to determine the sample size. Inclusion criteria: parents were > 18 years old, with no depression history, whose babies were the gestational age of 30-34+6 weeks @ the age of 3-10 days, cared for in an incubator, NPO or on bolus feeds. Sample size: 26 triads. Sequence 1 (M-KC on day -1 and P - KC on day - 2), n=14; Sequence 2 (P-KC on day -1 and M - KC on day - 2), n=12; mothers: n=26; fathers: n=19	A level IV NICU in Connecticut, USA	68% of fathers were white, 79% with higher education, 53% had KC experience before study participation
S5	Dongre et al 2020, India	Quantitative study - Prospective observational study	To study stress in fathers after initiation of KC	Data collection: total study period: 6 months. Demographic details collected. Likert type scale was rated by participants before KC, Parental Stressor Scale: neonatal intensive unit (PSS NICU) were used to assess fathers' stress level in 5 aspects after KC X 3 on the consecutive days; Data analysis: SPSS software version 16, Wilcoxon signed rank-sum test	Inclusion criteria: fathers with no major medical and surgical illnesses, whose babies were at the gestational age of 28-35 weeks, birth weight < 1500 grams, not ventilated, no congenital abnormalities. Sample size: n =30	A tertiary level neonatal unit, India	Mean age: 28.5 years old; 63.2% of fathers were lower-middle socio-economic class
S6	Fegran et al 2008, Norway	Qualitative - descriptive Phenomenology - hermeneutic approach	To obtain in-depth knowledge of, and to compare parents' individual experiences of the attachment process immediately after a premature birth.	Data collection: interviews with mothers and fathers individually. Interview length: 40 minutes. Interview audiotaped. Demographic data collected. Data analysis: NUD*IST computer software ORS used.	A convenience sample of parents. Inclusion criteria: Parents of infants at the gestational age of 27 to 32 weeks, staying at the same hospital with their infants from birth until discharge. Sample size: 6 parents	A 13-bed NICU in a regional Norwegian hospital	Age range: 27 - 59 years old
S7	Günay & Coşkun Şimşek 2021, Turkey	Qualitative descriptive study - Phenomenology	To investigate the emotions and experiences of fathers in Eastern Anatolia region of Turkey who experienced KC in the NICU.	Data collection: face-to-face, audio-taped, individual interviews were conducted for 45-50 minutes at two weeks after experiencing KC from January to May 2019. Questions X 2, open-ended. Data analysis: inductive qualitative content analysis by Graneheim & Lundman (2004)	Inclusion criteria: Fathers whose babies were at the gestational age of 27 to 36 weeks, birth weight ≥1000 grams, who visited their babies regularly and experienced KC. Sample size: fathers x 12	NICU in a training and research hospital in the Eastern Anatolia region of Turkey	Mean age: 29.7 years old; First-time fathers x 6; education: primary to university; fathers x 5 from village

S8	Helth & Jarden 2013, Denmark	Qualitative - Phenomenology - hermeneutic approach	To explore how fathers of premature infant's experience and potentially benefit from experiencing KC during their infants' stay in NICU.	Data collection: Semi-structured interviews for 30-45 mins. Data analysis: Theoretical framework by Kvale and Brinkman (2009).	Inclusion criteria:1) Danish-speaking fathers, 2) Infants at the gestational age < 35 weeks, @ stable condition, 3) Admission to the NICU > 1 week; Sample size: Purposeful sampling, fathers x 5	Copenhagen University Hospital, Hvidovre Hospital, Denmark.	Age: range: 28-37 years old, university degree x 3, employed x 4, student x1, all first-time fathers, twins X1
S9	Magee & Nurse 2014, UK	Case study - Reflective study - Qualitative study	To explore the nurse's role acting as an effective advocate for the baby and the role of the father in the neonatal unit	Data collection: reflective study for a case of a bereaved father who cared for his premature daughter in the NICU; Data analysis:Framework Guiding Reflective Activities by Borton's model (1970)	Father x 1, a bereavement father	NICU x 1 in UK	A father whose wife passed away nine days after birth of breast cancer, carried family commitments
S10	Mörelius et al 2015, Sweden	RCT - Quantitative study	To compare the effects of almost continuous KC (CKC) on salivary cortisol, parental stress, parental depression, and breastfeeding with standard KC (SKC)	Data collection: Apr 2008-Apr 2012, An RCT between two groups of parents; one group experiencing KC and the other experiencing SKC. Continuous KC: almost 24 hours a day, baby stayed with parents since birth. Standard KC: separate from parents after the birth of a baby. Measurements were collected at discharge during home-visit at CA of 1 and 4 months. Medical data was collected from the parents' journal. Measurements included: salivary cortisol, Swedish Parenthood Stress Questionnaire (SPSQ) Edinburgh Postnatal Depression Scale (EPDS), Questions about health and breastfeeding, Ainsworth's Sensitivity scale; Data analysis: statistical software SPSS 20.0	Inclusion criteria: mothers - healthy, proficient in Swedish, give birth to a single child who is at the gestation age of 32 to 35 weeks; Sample size: families x 42, CKC: 23, SKC: 19	Level 3 NICU x 1 and Level 2 NICU x1, in Sweden	Not reported
S11	Olsson et al 2017, Sweden	Qualitative descriptive study	To describe fathers' experiences of KC with their premature infant.	Data collection: between January 2014 and June 2015, eligible fathers were interviewed using a semi-structured interview guide. Data analysis: direct qualitative content analysis by Hsieh & Shannon (2005)	Inclusion criteria: fathers of preterm infants, had provided KC for their infants on at least one occasion. Sample size: a purposeful sample. Fathers x 20	Neonatal units x 2 (one in a county hospital, the other in a university hospital) in central Sweden	Mean age: 32 years old. 6/20 fathers had more than two children

S12	Varela et al 2014, India	Quantitative study - quasi-experimental design - a pilot study	To evaluate the impact of KC on the sensitive care that fathers provided to their premature babies in 5 Kangaroo Mother Care programs in India.	Data collection: socio-demographic survey completed. The Kangaroo position adherence survey was conducted to assign participants into two groups: intervention group (KC) and control group (non-KC). Paternal sensitive behaviour and perception of paternal role assessed by two people, using a Q-Sort methodology during a 60-minute period of KC. Data analysis: SPSS 17.0 for Windows, a non-parametric statistical test: the Mann-Whitney U, T-tests, and a Cohen's d.	Inclusion criteria: fathers of preterm infants. Intervention group: n=14; Control group: n=23	Hospitals x 5 in India; No details of clinical setting/wards	Age range: 25-48 years old. Education level: up to high school. Spouse: the majority were classified as a housewife and related to both families. Not all fathers were proficient in English; for fathers who did not speak English, a local translator served as an interpreter
S13	Varela et al 2018, Canada	Quantitative study - Pre- and Post-investigation	To explore the physiological stress responses of fathers during their first KC with their new baby.	Data collection: salivary cortisol measured from 6 saliva samples and simultaneous blood pressure and heart rate measured on arrival in the room, immediately before starting KC, at 30 minutes and 60 minutes into KC, and 15 and 30 minutes after the end of KC. Data analysis: SPSS statistics version 21.0	Inclusion criteria: fathers who were in a relationship with the infant's mother, no anxiety or depression, whose babies' GA was up to 33+3 weeks, medically stable. Sample size: fathers x 49	The NICU of the University Laval Hospital Centre's pediatric department in Quebec City, Canada	Mean age: 31 years old; Mean education level: 14.1 years of education; Mean working hours/ week: 43.3

Factors associated with father KC

	Factors associated with father KC				**Findings of impact of father KC on fathers**					**Strengths and limitations**	**Clinical implications**
	KC frequency & duration	**KC facilities/aids**	**Culture and policies**	**KC education**	**Forming and strengthening father–infant bond**	**Enhancing paternal role**	**Decreasing paternal emotional and physiological stress**	**Promoting relationship between fathers and family members**	**Negative impacts**		
S1	Up to 24 hours/ day	Cot-side beds or recliners plus privacy screen; Co-care rooms containing beds	Parents post-partum allowance - Parental leave up to 480 days/ child + NICU temporary parental leave	Nil	✓	✓	✓	Not reported	✓	Adequate sample size used, rigour and trustworthiness achieved, theoretical saturation achieved	Early KC education needed. Father KC could be initiated as early as after birth. Care plan would help in increasing the frequency of Father KC

S2	Not reported	Not reported	Not reported	Nil	✓	✓	✓	Not reported	Not reported	No demographic details of participant. Transparent data collection and analysis	Nurses can promote Father KC by explaining the purpose of KC and the benefits of KC to baby, father, and mother
S3	Once a day. At least 15-min session	An armchair with a footrest, a pillow and a blanket, private screen provided	Traditional women's confinement after birth; workforce limitations; KC session provided after 2 hours of feeding and a bath	KC information (pamphlets) provided on admission	✓	Not reported	Not reported	Not reported	Not reported	Workforce limitations stopped the provision of personalised instruction to the participants.	Father KC is recommended when mother is not available. KC education should be started as early as during childbirth education and antenatal period
S4	30-min session	A La Fuma recliner chair, a footrest, a privacy screen, a hospital gown, a blanket	Study was undertaken at 1-3 pm, between feeds, after parent's lunch, and with consideration of the timing of mother's milk expression	Not reported	Not reported	Not reported	✓	✓	Not reported	Small sample size	Paternal touch will contribute to parenting development
S5	90-min KC episode for 3 consecutive days	Not reported	Not reported	The benefits and method of KC were taught by a senior registrar	Not reported	Not reported	✓	✓	✓	Limited KC application length; No consideration about other relevant paternal stress stimuli, e.g., financial, physical, and social factors; singleton context, small sample size	Not reported
S6	Not reported	Not reported	Not reported	Not reported	✓	✓	✓	Not reported	Not reported	The method of collecting demographics was not mentioned. A small sample. Triangulation of data collection	Father KC was promoted by mothers' encouragement

S7	KC x 2/day for 15 days, each KC lasted for 15 - 30 min	A comfortable chair provided next to an incubator	Turkish culture requires men to return to work early due to the traditional role of the male in this society, i.e. financial support and limited role in caring for children	PowerPoint presentation + A handbook about KC process	✓	✓	✓	Not reported	Not reported	Transparent data collection and analysis process	Health professionals should encourage father–infant KC. The hospital facilities/aids and policies need to be established to facilitate father KC
S8	Not reported	Not reported	Not reported	KC method introduced	Not reported	✓	Not reported	Not reported	✓	Small sample size. Credibility was increased by using direct quotations. Future studies on the importance of the father's presence in the early infant's life	Parents, nurses, midwives, and hospital services need to recognise that fathers can participate equally in parenthood
S9	KC practised every second day; KC duration not mentioned.	Not reported	Not reported	Not reported	✓	✓	Not reported	Not reported	Not reported	The ethical approval was unclear	No visiting restriction for NICUs. NICU nurses/midwives should give fathers education in advance about the NICU father's experience
S10	SSC: 19.6 hours/day; SC: 7.0 hours/day	Single rooms equipped with beds for parents, medical equipment. KC accessories provided such as tube tops, scarves, and blouses	KC is standard care for both parents in these NICUs; the Swedish health care system allows parents to stay in the NICU as long as they can	KC method was introduced before the study. A lesson was given about noticing and responding to their preterm baby's signals	Not reported	✓	Not reported	✓	Not reported	No comparison with a baby who has no KC from parents as KC is routine care in their NICU	If both parents engage after the birth of preterm infants, this can strengthen the relationship between the parents

S11	Median times: 18 (4-80) min	Cot-side in the intensive care room with a private screen; a bed in the family rooms; television	The Swedish parental allowance system allows fathers and mothers to stay with the infant in the NICU and provide KC to him/her while receiving financial compensation	Information about the benefits of KC was given by the NICU staff	✓	✓	✓	Not reported	✓	Trustworthiness (confirmability, credibility, transferability) was achieved. Triangulation of data collection methods (interviewers X 2)	NICU staff need to identify the father's individual KC preference to advocate equal parenthood. Less KC practised in single rooms than in the open intensive care room
S12	1 hour/day for at least 1 week.	Not reported	The father is not the primary carer in India. Fathers do not live with mothers during the first months after giving birth, mothers live with their mothers. Many Indian families have a preference for boys over girls. Well-structured KC programs + a pediatric follow-up. KC was provided by fathers once premature infants had adapted to extra-uterine life and were able to breastfeed	Not reported	✓	✓	Not reported	Not reported	Not reported	Small sample. Language interpretation bias existed during data collection due to using a language translator. Triangulation data collection	Father KC provides opportunities for fathers to increase their paternal role in a culture where this is not recognised. Fathers did not display any gender preference
S13	1 hour	The room contained less than six incubators equipped with comfortable chairs	Fathers were asked not to consume nicotine, caffeine, food, or drugs for at least one hour before their arrival to the NICU	Not reported	Not reported	Not reported	✓	Not reported	Not reported	No control group were involved in this study due to the lack of consensus from the clinical team	Not reported

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