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Impact of Kangaroo Care on Caregivers in the NICU: An Integrative Review

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Introduction

Prematurity is associated with roughly one-third of all infant deaths in the United States, with infants born at or before twenty-five weeks only having a fifty-percent chance of survival (Murphy, Mathews, Martin, et al., 2017). If they do survive, their deficits are immense and they are often severely impaired (Murphy et al., 2017). Kangaroo care (KC) has been shown to decrease mortality and promote vital sign stabilization in premature infants (Arzani et al., 2012; Boundy et al., 2016; Cho et al., 2016; Dehghani et al., 2015; Jeffries, 2012). Kangaroo care is defined as skin-to-skin contact between a caregiver and their newborn (Chan, 2016). Implementation of KC in the Neonatal Intensive Care Unit (NICU) can be limited, because of the many stressors present and chaos of the NICU environment.

Caregivers in the NICU are under immense stress, whatever unforeseen illness or tragedy brought them in, has placed their child's life at risk. Many caregivers find themselves anxious, confused, overwhelmed, depressed, and spiraling downward (Hunt et al., 2018; Fowler et al., 2019). The strain placed on families in the NICU makes it a tense environment in which the healthcare staff must not only focus on supporting and caring for the baby but also the entire family. Healthcare providers are called to find ways to support these families in their time of need, through interventions that can decrease the stress and/or negative psychological effects of the NICU stay. Kangaroo care is one of the interventions available for mitigating the psychological impact of NICU stays on caregivers (Cho et al., 2016; Jones & Santamaria, 2018; Lee & Bang, 2020). Though KC shows promise in its benefits, there is a gap in the literature regarding the impact of KC on caregiver psychological stress. This integrative review explores the impact of KC on the psychological health of caregivers with newborns in the NICU.

Background

Psychological Health of Caregiver

Many stressors are present in the NICU environment that can affect caregivers and alter their psychological health. Caregivers have concerns about the long-term outcome of their baby, they experience the distress of being separated from their baby, the loss of the "normal" way to bring their newborn home, feelings of hopelessness, a loss of control, and a constantly changing environment, to name a few (Fowler et al., 2019; Hunt et al., 2018; Tahirkheli et al., 2014). The highly medicalized environment in the NICU can exacerbate caregiver stress as parents attempt to understand and process information regarding their infant in an unfamiliar chaotic atmosphere. As caregivers in the NICU environment try to grasp the reality of the situation and work to participate in their baby's recovery, they can easily become overwhelmed by their baby's care. Almost all mothers of NICU babies, and the vast majority of fathers of NICU babies, experienced symptoms of posttraumatic stress disorder (PTSD) during or following admission in the NICU (Al Maghaireh et al., 2016).

These stressors contribute to parents of preterm children reporting significantly higher levels of anxiety, depression, dysfunctional family functioning, and personal medical issues than their peers (Karli et al., 2014). Other emotions commonly felt by parents in the NICU include anger, grief, fear, uselessness, and despair (Hunt et al., 2018). Behavioral manifestations of these emotions can cause impaired social and occupational functioning, as well as irritability, angry outbursts, reckless behavior, hypervigilance, and other uncharacteristic behaviors (Porter, 2018).

As a result of the environment and multitude of stressors present, NICU mothers are 40% more likely to develop postpartum depression (PPD) compared to the general population, and 60% of NICU fathers demonstrate elevated depressive symptoms (Tahirkheli et al., 2014)

(Lefkowitz, 2010). Mothers who suffer from PPD are significantly more likely to exhibit hostile, anxious, and depressed behavior especially when interacting with staff, and this behavior is exacerbated when other risk factors are present such as lack of social support, previous history of depression, marital conflict, or other stressful life events (Tahirkheli et al., 2014). If present during the hospital admission, these behaviors could cause issues with other parents or NICU staff. This can lead to verbal, or even at times, physical altercations between staff members and parents, increased stress for all involved, and inevitably a less optimal healing environment for the baby. These multitude of stressors altogether can significantly alter the psychological health of caregivers with newborns in the NICU.

Kangaroo Care

Kangaroo care has powerful benefits for the baby, including stabilizing vital signs, enhancing feeding, mitigating pain, and reducing stress (Jeffries, 2012; Cho et al., 2016). Kangaroo care was developed in Bogota, Colombia as a response to a high death rate in premature babies. Researchers found that babies who were held closely to their mothers' bodies for extended periods of time not only displayed higher instances of survival but medically improved quicker (Cleveland Clinic, 2020). Benefits of kangaroo care to the baby include stabilizing heart rate, improving breathing pattern, more rapid weight gain, improved sleep time, raising oxygen saturation levels, lessened crying, and earlier hospital discharge (Arzani et al., 2012; Boundy et al., 2016; Cho et al., 2016; Dehghani et al., 2015; Jeffries, 2012). When a caregiver is practicing kangaroo care, the infant gets assistance regulating body temperature and conserves energy, which redirects these caloric expenditures towards growth and healing (Cleveland Clinic, 2020).

Because of this evidence, numerous international, federal, and professional health organizations recommend KC to promote the development of sick and premature newborns (National Association of Neonatal Nurses, 2019). Kangaroo care is recognized as a critical and fundamental component of developmental care of a newborn in the NICU. However, the psychological impacts of KC on caregivers have yet to be summarized and sufficiently explored.

Methods

Search Strategy

A systematic review of CINAHL, OVID, and MEDLINE was performed. Google Scholar was used to explore further using the search terms kangaroo care, NICU caregiver psychological stress, parent psychological factors, neonatal nursing, and premature infant. Inclusion criteria for studies encompassed primary research on the effects of kangaroo care on caregiver psychological stress, studies published between 2005-2020, and written in English. Exclusion criteria included studies published outside of the defined date range, not available in English, studies that portrayed nurses' perceptions or other secondary assessments of caregiver stress, studies that only examined the impact of KC on the infant, and studies that examined caregiver stress independent of KC.

Analysis

All articles were retrieved through the online databases and according to the inclusion criteria described earlier. Both qualitative and quantitative studies were included, as well as systematic and integrative reviews pertinent to the topic. The initial search yielded fifty-five articles from the databases listed. Fifty-two remained once duplicates were removed. In RefWorks, the articles were screened for eligibility and significance using their titles and abstracts first, and then using full-text papers when additional information was needed. The articles were then analyzed for relevance, and exclusions were made. Articles were excluded if

they did not assess the relationship between kangaroo care and caregiver experience, if they did not address kangaroo care at all, or if they assessed the effect of kangaroo care on the infant only. Articles were also excluded if they portrayed nurse's evaluations or assessments of caregivers rather than firsthand evidence from caregivers, due to the subjective and potentially biased nature of this kind of data. All caregiver types were included, yielding articles that addressed mothers, fathers, siblings, and other types of caregivers. After these exclusions, twenty-three articles were left in the final count. A PRISMA chart was populated and can be found in Appendix A.

An evidence summary table was compiled that included pertinent information for each article. The evidence summary table included each artifact's author(s), publication year, journal of publication, evidence type, population, key concepts, and any pertinent limitations. These key components were compared across the final twenty-three articles in Table 1.

Data Comparison

Of the 24 studies included, three were systematic reviews, five were open interviews, six were randomized control trials, five were organized cohort studies, and four were quasi-experimental studies. Data collection methods varied across the studies and included semi-structured interviews, questionnaires, observations, salivary cortisol, caregiver heart rate and blood pressure, various depression scales, maternal attachment scales, and surveys. Data were collected at varied locations, such as in the NICU, delivery suite, postnatal units, and participants' homes. The caregivers evaluated within the studies were both mothers and fathers, with five studies including data on fathers. Of the five studies that evaluated fathers, four included samples of both mothers and fathers and one solely examined fathers. This is one noted limitation of the review, there is minimal evidence for fathers and other caregiver types and therefore overall generalizability of results may be limited.

Discussion

After thorough analysis of the articles gathered, four major themes emerged: Impact on Self-Esteem, Impact on Mental Status and/or Mood, Decrease in Salivary Cortisol, and Enhanced Bonding. These themes will be discussed in further detail in the paragraphs to come.

Impact of Self-Esteem

Research in five of the studies included in this review assessed the impact of kangaroo care on caregiver self-esteem. All five of these studies found that kangaroo care had a positive impact on caregiver self-esteem, and was associated with increased confidence in the caregiver's ability to care for their baby (Arzani et al., 2012; Lee et al., 2020; Leonard et al., 2008; Ludington-Hoe, 2011; Sweeny et al., 2017). Specifically, the evidence revealed that mothers who participated in kangaroo care described an increase in maternal self-esteem compared to those who did not participate in KC (Arzani et al., 2012; Lee et al., 2020; Sweeny et al., 2017). Kangaroo care is also associated with greater confidence in parenting skills, lower parental anxiety level, and higher breastfeeding rates. Sweeney et al. (2017) found that 91% of parents performing kangaroo care versus 66% of parents not performing KC reported being very confident or extremely confident in their ability to care for their infant at discharge, as reported on a parental readiness survey.

When interviewed, parents of preterm infants described their experiences of providing kangaroo care in and outside of the NICU. Parents interviewed reported that kangaroo care empowered them and helped them gain confidence in their ability to care for their child (Leonard et al., 2008). Specifically, parents reported that kangaroo care improved their connection, fought their anxiety with feelings of empowerment, and tempered their adjustment to an abnormal

parent role. All of these combined effects manifested as an increase in their self-esteem and assurance that they could care for their infant (Leonard et al., 2008).

Kangaroo care has the potential to create an important shift in neonatal care: the replacement of clinicians by parents as the primary care provider of the infant, when appropriate (Ludington-Hoe, 2011). During KC, mothers expressed interest and ability to increase their involvement in their infant's care by assuming more responsibilities related to the care of their infant. This shift is a result of the impact of KC on caregiver self-esteem, as KC provides the caregiver with an opportunity to actively participate in their infant's care and have a positive effect on their health and wellbeing.

Impact on Mental Status and Mood

Thirteen of the studies included in this review addressed the impact of kangaroo care on caregiver mental status and mood. These studies assessed caregivers' psychological state, and instance of depression, anxiety, and overall stress. All thirteen of the studies analyzed concluded that KC has the potential to make a positive impact on caregiver mental status and mood, measured by mental health questionnaires (Badiee et al., 2014), self-reported emotional inventory (Bigelow et al., 2012; Holditch-Davis et al., 2014; Jones et al., 2018; Leonard et al., 2008; and various depression, anxiety, and stress scales (Athanasopoulou et al., 2014; Eun et al., 2017; Coskun et al., 2020; Herizchi et al., 2017; Jeffries, 2012; Ludington-Hoe, 2011; Nimbalkar et al., 2014; Samra et al., 2015).

A systematic review published by Athanasopoulou et al. (2014) examined the impact of KC on parental mood and caregiver-infant interaction. The results showed inconclusive findings overall, but there was some evidence to suggest that KC can make a positive impact on the psychological strain endured by caregivers (Athanasopoulou et al., 2014). Conversely, other

systematic reviews conducted found that KC improved maternal satisfaction and overall mental status, as well as decreased maternal depression and anxiety, decreased infant mortality, instance of infection, and length of hospital stay (Jeffries, 2012; Ludington-Hoe, 2011).

When evaluating mental health scores of mothers who provided KC versus those who did not, results showed that kangaroo care had a positive effect on maternal mental health scores (Badiee et al., 2014). Similarly, parental stressor scale scores of mothers who participated in KC were found to be lower than stressor scale scores of mothers who did not perform KC (Coskun et al., 2020; Cho et al., 2016). Even when evaluating kangaroo care compared to other interventions aimed at reducing caregiver stress, caregivers who participated in kangaroo care showed a more rapid decline in worry and maternal stress, though any intervention was associated with lower parental stress (Holditch-David et al., 2014).

In opposition, another randomized control trial compared maternal stress between mother/infant pairs participating in kangaroo care and pairs in the control group using the Parental Stressor: Neonatal Intensive Care Unit Scale (PSS: NICU). Results revealed that maternal stress was highest before kangaroo care, though it did decrease after the KC. This implies that mothers who provide KC may experience less stress related to the progression of their mother-infant relationship (Samra et al., 2015).

When assessing the impact of kangaroo care on maternal depression, it was found that mothers who participated in kangaroo care had lower depression scales when the infants were 1 week old, and exponentially lower depression scales when the infants were 1 month old. However, at 2 months and 3 months, there were no differences between the control and intervention groups' depression scale scores (Bigelow et al., 2012). Similarly, Herizchi et al. (2017) evaluated both KC and standard care mothers' depression using the Edinbug Postnatal

Depression Scale, at 10, 20, and 30 days following delivery. Results revealed no obvious difference between the two groups depression scales on the 10th day. However, on the 20th and 30th days the mothers who participated in kangaroo care had markedly lower depression scale scores (Herzchi et al., 2017). However, when comparing caregiver depression in those who participate in KC and those who do not, caregivers who participate in KC demonstrate lower instances of depression (Jones et al., 2018).

When interviewed, in a study by Leonard et al (2008), caregivers in the NICU described their emotional experiences with their infant and themes emerged and were analyzed. The eight themes that emerged were: Unforeseen, Unprepared and Uncertain - The Experience of Birth; Anxiety and Barriers; An Intimate Connection; Adjustments, Roles and Responsibilities; Measuring Success; A Network of Encouragement and Support; Living-in Challenges; and Living with the Infant Outside of Hospital. These themes and their exploration by parents and interviewers revealed that kangaroo care can ease the intense stress, anxiety, and uncertainty felt by caregivers with a premature infant (Leonard et al., 2008).

When evaluating parental vital signs before and after KC, there were statistically significant differences between parents' initial heart rate, respiratory rate, and blood pressure to the measurements taken during KC (Jones et al., 2018; Nimbalkar et al., 2014). Blood pressure, respiratory rate, and heart rate all decreased during and after kangaroo care; these results imply that KC can be physiologically beneficial to caregivers and may have stress and anxiety-reducing effects.

Decrease in Salivary Cortisol

Three of the studies identified in this review assessed the effect of kangaroo care on caregiver salivary cortisol levels. Cortisol is a hormone of the adrenal cortex that can be used as

a measurement of activity of the hypothalamus; cortisol levels rise in both the plasma and saliva in response to stressors (Kalman & Grahn, 2004). All three studies found that kangaroo care was associated with a decrease in caregiver salivary cortisol, indicating a decrease in caregiver stress as a result of KC (Janevski et al., 2016; Morelius et al., 2015; Vittner et al., 2018).

When evaluating salivary cortisol before and after kangaroo care, results revealed that salivary cortisol levels in mothers decreased after kangaroo care. The highest levels of salivary cortisol were measured before KC, and the lowest after the KC session (Janevski et al., 2016; Vittner et al., 2018). This reduction in salivary cortisol following KC implies it has a powerful stress-reducing effect. When evaluating salivary oxytocin in association with KC, caregiver salivary oxytocin levels increased significantly following KC (Vittner et al., 2018).

Similarly, when comparing salivary cortisol levels of families who participate in KC versus those who participate in standard care, the families that participated in kangaroo care displayed lower salivary cortisol levels (Morelius et al., 2015). Not only did KC decrease caregiver salivary cortisol levels, but also improved salivary cortisol concordance between the caregiver and the infant. KC was also associated with lower reported spousal relationship problems compared to standard care, with more prominent results seen when both caregivers were participating in the continuous kangaroo care (Morelius et al., 2015).

Enhanced Caregiver-Infant Bonding

Seven articles identified in this review addressed the impact of kangaroo care on caregiver-infant bonding. In these seven articles, kangaroo care was found to be associated with increased bonding and/or reported levels of attachment (Cho et al., 2016; Eun et al., 2017; Jeffries, 2012; Jones et al., 2018; Kurt et al., 2020; Potgieter et al., 2019; Valizadeh et al., 2013).

Within these studies, bonding was measured using maternal or paternal attachment score, self-reporting, and interviewing.

Mothers who participated in kangaroo care displayed higher maternal attachment scores (MAS), and lower levels of self-reported maternal stress than mothers who participated in standard care (Cho et al., 2016; Kurt et al., 2020; Jeffries, 2012). Similarly, fathers who participated in KC sessions displayed stronger paternal attachment than their counterparts who did not (Eun et al., 2017). Valizadeh et al. (2013) utilized the Avant Maternal Attachment Behavior Scale to analyze the effect of KC on maternal-infant attachment. The information was self-reported and compared between the experimental group who participated in KC, and the control group who did not. The mother-infant attachment scores reported using the scale were significantly higher in the experimental group than in the control group (Valizadeh et al., 2013). These results imply that KC has an overall positive impact on caregiver bonding with their infant.

When evaluating parental heart rate, blood pressure, and self-reported emotions before, during, and after kangaroo care sessions, statistically significant differences were found between the initial parental heart rate and blood pressure and the measurements taken during KC (Jones et al. 2018). Also, emotional inventories revealed that KC was associated with a decrease in anxiety, depression, and increased feelings of bonding with the infant (Jones et al., 2018).

However, Potgieter et al. (2019) found no correlation between increased bonding and longer duration of KC in NICU mothers at one week postpartum. When bonding was assessed again at 6-8 weeks postpartum, there was a noted positive correlation between more time spent performing KC and higher ratings of affectionate touch and mother-infant bonding (Potgieter et al., 2019).

Implications

Having an infant hospitalized is a highly stressful experience for caregivers, and the alteration of the parent role that is experienced can be one of the most detrimental stressors. The results of this review indicate that KC has a positive impact on caregiver' confidence and self-esteem, as well as is associated with an increase in caregiver initiative in actively participating in the infant's care. This implies the potential for a shift in neonatal care, in that caregivers could become the primary caregiver to the infant in the NICU setting, and that this shift could be mutually beneficial for both the infant as well as the caregiver. The active participation in the infant's care both empowers the caregiver and nurtures the bond between the caregiver and the infant. This enhanced bonding has impactful psychological benefits for the caregiver, as they cultivate their sense of attachment and closeness with their new baby.

When examining the overall evidence related to the impact of kangaroo care on caregiver mental status and mood, there were some conflicting results. Overall the analysis of the studies discussed points to the therapeutic impact of kangaroo care on caregiver mood and mental status. There were many tools of evaluation used throughout the studies, so overall comparison and generalization is difficult, however it is implied that kangaroo care can decrease caregiver depression, anxiety, and stress levels as well as have physiologic benefits for the caregiver.

These results also address the mechanism that may link the caregiver-infant contact during kangaroo care to their associated biobehavioral responses. The closeness and intimacy provided during kangaroo care seems to have a positive biological response on both the caregiver and infant as it relates to the hypothalamic stress response. Kangaroo care may also improve the co-regulation of caregiver-infant salivary cortisol, mediating stress reactivity. Though it is important to note that due to the small collection of evidence, more research is necessary to truly

analyze the relationship between kangaroo care and salivary cortisol levels in both caregivers and infants.

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Appendix A

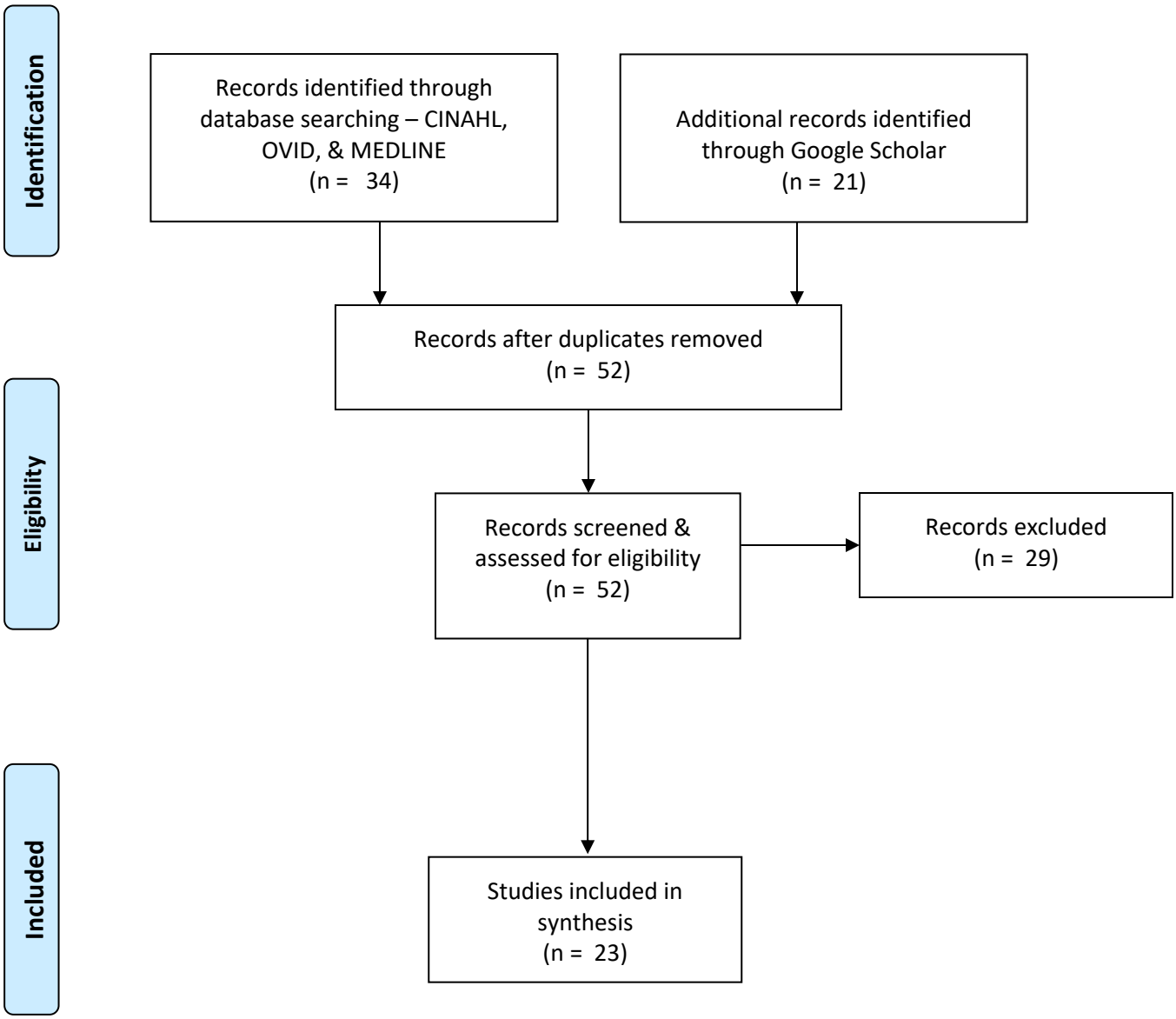

Table 1

#	Author, Journal, Date	Purpose/Design	Sample/Setting	Methods/interventions/tools	Results	Conclusions	Limitations
1	A. Arzani, Y. Zahedpasha, M Ahmadpour-Kacho, S. Khafri, F. Khairkhah and P. Aziznejad, Journal of Babol University of Medical Sciences 2012	Quasi-experimental	Experimental group of 17 infants, and a control group of 17 infants selected by convenience sampling. Kangaroo Care was given to the infants one time a day for 30 minutes after feeding for two weeks.	Infant weight was measured in terms of: body temperature, respiratory rate, heart rate, oxygen saturation, and stability of the cardio-respiratory system in premature infants(SCRIP) score, as physiological responses at every 10 minutes during the intervention. Maternal self-esteem was assessed by a maternal self-	The experimental group showed significant increase in the self-esteem of mothers. Also, KC was effective on physiological stabilization of preterm infants.	Kangaroo care (KC) has a positive impact on maternal self-esteem and the growth and physiological stability of premature infants hospitalized in the NICU.	Maternal self esteem evidence was self reported Small sample size

2	Eirini Athanasopoulou, John R. E. Fox Infant Mental Health Journal 2014	Systematic Review	A total of 13 randomized and nonrandomized controlled trials examining the effects of Kangaroo Care on maternal mood and/or parent– preterm infant interaction were identified and retrieved.	For studies to be eligible for inclusion in the review, researchers had to have used quantifiable, standardized assessment measures. These assessment measures varied throughout the review.	The results showed that although findings of studies were inconclusive, there is some evidence to suggest that Kangaroo Care can make a positive difference on the psychological strain on caregivers.	Kangaroo Care can improve negative maternal mood (e.g., anxiety or depression) and promote more positive parent-child interactions.	Complex processes of human interaction cannot be captured in standardized measures Qualitative studies not included
3	Zohreh Badiee, Salar Faramarzi and Tahereh MiriZadeh Advanced Biomedical Research 2014	Randomized Control trial	50 infant/mother pairs: 25 control and 25 intervention. The control group received standard caring in the incubator. The experimental group received 60 min Kangaroo Care	Mental health scores of the mothers were evaluated by using the 28-item General Health Questionnaire.	Kangaroo care had a positive effect on the rate of maternal mental health scores.	Kangaroo care is a useful method that can be recommended for improving the mental health of mothers.	Qualitative data - subjective

4	Ann Bigelow, Michelle Power, Janis MacLellan-Peters, Marion Alex and Claudette McDonald Journal of Obstetric, Gynecologic & Neonatal Nursing 2012	Longitudinal Quasi-Experiment	Mothers in the Kangaroo Care (KC) group (n = 30) provided approximately 5 hours per day of KC with their infants in the infants' first week and then more than 2 hours per day until the infants were age one month. Mothers in the control group (n = 60) provided little or no KC. All mothers had full-term infants	Mothers completed self-report depression scales when infants were 1 week, 1 month, 2 months, and 3 months of age. Salivary Cortisol was also measured	Mothers in the Kangaroo Care group had lower scores on the depression scales when the infants were one week and marginally lower scores when the infants were one month; when the infants were age 2 and 3 months, there were no differences between groups in the mothers' depression scores. Mothers in the Kangaroo Care group had a greater reduction in their salivary cortisol.	Kangaroo Care benefits mothers by reducing their depressive symptoms and physiological stress in the postpartum period.	Mothers were not randomized into groups Mothers in the Kangaroo Care and control groups were from a homogeneous community sample Mothers in the Kangaroo Care and control groups did not differ on any of the measured demographics except age. The mothers' Kangaroo Care time with their infants was based on their own records.

5	Cho Eun-Sook, Shin-Jeong Kim, Myung Soon Kwon, Haeryun Cho, Eun Hye Kim, Eun Mi Jun and Sunhee Lee Journal of Pediatric Nursing 2016	A quasi-experiment design with a nonequivalent control group, and a pre- and post-test.	Data were collected from preterm infants with corrected gestational ages of ≥ 33 weeks; 20 in intervention and 20 in control group	Respiratory rate, maternal-infant attachment scores, maternal stress scores.	Kangaroo care showed significantly positive effects on stabilizing infant physiological functions such as respiration rate, increasing maternal–infant attachment, and reducing maternal stress	Kangaroo care can be used to promote emotional bonding and support between mothers and their babies, and to stabilize the physiological functions of premature babies.	Small sample size Infants were not randomly assigned to the groups

6	Didem Coşkun, Ulviye Günay Journal of Pediatric Nursing 2020	Open-label, multicentre, randomized controlled trial	Preterm infants not breastfed by their mothers and the mothers of the infants, randomized control group (N=24) and intervention groups (N= 24).	Parental Stressor Scale, amount of breastmilk	The mothers in the kangaroo care group had higher breast milk production averages than the standard care group in all measurements. The mothers who applied kangaroo care had lower Parental Stressor Scale scores than the mothers in the standard care group.	Kangaroo care is effective at stimulating breast milk production and decreasing maternal stress levels. Kangaroo care has many advantages for both mothers and premature infants. Kangaroo care decreases maternal stress levels.	Small sample size Specific population: not generalizable
7	Sook Kim Eun, Yong Ae Cho Journal of Korean Critical Care Nursing 2017	Randomized control trial	The study subjects were 34 fathers (17 experimental group subjects, 17 control group subjects) of premature babies.	Paternal-attachment scale	The results were as follows: 1) There were no between-group differences in the general characteristics of babies and their fathers. 2) The Kangaroo care fathers showed higher scores of paternal attachment than the control group	Fathers who attended the Kangaroo care sessions showed stronger paternal attachment than those who did not.	Sample only included fathers Small sample size Unknown variability in the sample

8	Sepideh Herizchi, Mohammad Bagher Hosseini and Mahsa Ghoreishizadeh International Journal of Women's Health & Reproductive Science 2017	Prospective cohort study	60 mothers of premature infants hospitalized in the NICU, all mothers completed Kangaroo Care (KC). They were divided into 2 groups: mothers with 3+ times of KC per day, and those with less KC per day.	Edinburg Postnatal Depression Scale	There was no obvious difference between the 2 groups in terms of EPDS scores on the 10th day. However, there was significant difference on the 20th and 30th days.	Depression in mothers with Kangaroo Care (KC) decreased during follow-up time. Kangaroo Care is associated with a predictive effect on postpartum depression.	Groups not randomly divided No control group Qualitative data is subjective

9	Diane Holditch-Davis, Rosemary White-Traut, Janet A. Levy, T Michael O'Shea, Victoria Geraldo and Richard J. David Infant Behavior and Development 2014	Randomized Qualitative Study	240 mothers from four hospitals were randomly assigned to the three groups: ATVV (auditory-tactile-visual-vestibular), Kangaroo Care, and Control.	45-min videotapes of mother–infant interactions were made, and the HOME Inventory was scored	Kangaroo care mothers showed a more rapid decline in worry than the other mothers. When mothers reported on the interventions they performed, regardless of group assignment, massage (any form including ATVV) was associated with a more rapid decline in depressive symptoms. Performing either intervention was associated with lower parenting stress. interventions.	These findings suggest that as short-term interventions, KC and ATVV have important effects on mothers and their preterm infants, especially in the first half of the first year.	Qulitative data is subjective Minimal comparison of the interventions
10	Milica Ranković Janevski, Ana Đorđević Vujičić and Svjetlana Maglajić Đukić Journal of Medical Biochemistry 2016	Prospective cohort study	Salivary cortisol was measured in 35 mother-infant pairs before and after the first and the fifth Kangaroo Care in small saliva samples (50 µL) for low cortisol levels detection. Samples were collected with eye sponge during 3 to 5 minutes.	Salivary Cortisol Levels	Cortisol level in mothers decreased after Kangaroo care - the highest levels were measured before and the lowest after.	Cortisol level decrease in mothers proves the stress reduction during Kangaroo Care.	No control group Efficacy of the samples is questionable Only one type of data/information gathering

11	Ann L. Jefferies Journal of Pediatrics and Child Health 2012	Systematic Review	16 studies (2518 infants)	Systematic review of Cochrane	Kangaroo Care reduced not only mortality at discharge but also severe illness, infections and length of hospital stay, as well as improved mother-infant bonding, breastfeeding and maternal satisfaction.	Kangaroo Care is an important intervention that can decrease morbidity and mortality for low-birthweight infants in developing countries, as well as increase maternal-infant bonding, maternal satisfaction, and enhance breastfeeding	Small sample size
12	Hannah Jones, Nick Santamaria Scandinavian Journal of Caring Sciences 2018	Observational Cohort Study	26 parent & neonate pairs: 4 fathers and 22 mothers	Parent heart rate and blood pressure, self-reported emotionally inventory	The study found statistically significant differences between the parent's initial HR and BP, to measurements taken during the Kangaroo Care (KC). Also found decrease in reported anxiety, depression, and increased bonding with neonate.	Parents' find KC with their neonate to be a stress-reducing intervention. This may in turn promote associated benefits, such as a decrease in parental depression and anxiety & physical health benefits, as well as increased feelings of bonding between parent and their neonate.	Small sample size No true control group

13	F. Y. Kurt, S. Kucukoglu, A. A. Ozdemir and Z. Ozcan Nigerian Journal of Clinical Practice 2020	quasi-experimental	60 mothers and babies - Experimental and control group. Kangaroo care (n = 30) was provided to the infants in the experimental group by their mothers. No intervention was applied to the infants in the control group (n = 30) other than the routine practice.	Maternal attachment score	In the study, the mean maternal attachment scale score (MAS) of the group in which the kangaroo care was provided was higher than the control group with a statistically significant difference between the groups.	It was concluded that kangaroo care positively affects maternal attachment.	1- The major limitations include a small sample groups and delivery of short-term kangaroo care. 2- As another limitation, it can be said that the study should be conducted in the east and west of Turkey, which has cultural differences. We believe mothers in the eastern region are more reluctant to perform KC practice because of this cultural difference. 3- Since the size of the impact is not reported in randomized controlled studies, experimental, and quasi-experimental studies, which is needed to determine the evidence level; the discussion was carried on the basis of the MAS averages and statistical significance in the studies. 4- The effect of kangaroo care on maternal attachment is mostly concentrated on the term infants in the literature. Our study results confirm the limited number of studies

14	Jihye Lee, Kyung-Sook Bang Korean Journal of Womens Health Nursing 2020	quasi-experimental	The experiment was conducted with an experimental group of 17 infants, and a control group of 17 infants selected by convenience sampling.	Maternal self-report inventory	The experimental group showed significant increase in the self-esteem of mothers.	Kangaroo care is associated with an increase in maternal self-esteem	One of the limitations of this study was small sample size. Also, generalization can be limited because the study was performed in one hospital.
15	A. Leonard, P. Mayers Health SA Gesondheid 2008	Phenomenological study	In-depth interviews were conducted with six parents: four mothers and two fathers.	Interviewing, self-reporting	The eight themes that emerged are described: unforeseen, unprepared and uncertain - the experience of birth; anxiety and barriers; an intimate connection; adjustments, roles and responsibilities; measuring success; a network of encouragement and support; living-in challenges; and living with the infant outside of hospital.	Kangaroo care can ease the stress, anxiety, and uncertaintly felt by caregivers with a premature neonate.	The study findings are limited in that purposive sampling was done of a naturally occurring group from only one hospital. Since interviews were conducted in English there is a risk that, despite being fluent in the language, participants whose home language was not English may have had difficulty in expressing their thoughts and feelings. Parents with preterm infants who depend on staff to support them and care for their infants in either the NICU or the KC ward may have been reluctant to express negative feelings.

16	Susan M Ludington-Hoe Current Women's Health Reviews 2011	Systematic Review	18 articles	Systematic review	Kangaroo Care is therapeutic formaternal depression, decreasing maternal anxiety, decreasing the number of preterm birth mothers with clinically-manifested depression, decreasing the severity of anxiety and depression inmothers, and showing promise in prevention of depression altogether. Maternal and neonatal stress levels also synchronously decrease during Kangaroo Care.	Kangaroo care shows promise in easing many of the stressful aspects and pscyhological factors that impact caregivers of preterm infants.	Evaluated lots of factors: both maternal and infant Small sample size

17	Evalotte Mörelius, Annika Örtenstrand, Elvar Theodorsson and Anneli Frostell Early Human Development 2015	Randomized Control Trial	37 families from two different neonatal care units in Sweden, randomised to either almost continuous Kangaroo Care or standard care (SC).	Salivary Cortisol Levels, reported relational problems	Kangaroo Care (KC) decreased salivary cortisol reactivity and improved salivary cortisol concordance between mother and infant. Fathers in KC scored lower spouse relationship problems compared to fathers in standard care. In order to succeed with almost continuous Kangaroo Care both parents need to be involved in the care of the infant.	Kangaroo care lowers caregiver stress as evidence by lower salivary cortisol levels, and also is associated with lower spouse relationship problems. Enhanced results are attained when both caregivers are involved in continurous Kangaroo Care.	Subjective data Small sample size Minimum diversity in sample

18	A. Nimbalkar, D. Patel, A. Sethi and S. Nimbalkar Indian journal of physiology and pharmacology 2014	Observational Cohort Study	Kangaroo Care was provided by 52 mothers for a total of 127 times and parameters were recorded at starting of Kangaroo Care, at 15 min, at 30 min, at 60 min of Kangaroo Care and at 5 min rest after stopping Kangaroo Care.	Maternal pulse, SPO2, blood pressure, & respiratory rate.	There were no significant changes in pulse rate and SPO2 but blood pressure and respiratory rate reduced significantly during Kangaroo Care as compared to rest after stopping Kangaroo Care.	Thus Kangaroo Care is physiologically beneficial to mothers.	No control group Efficacy of the samples is questionable Only one type of data/information gathering

19	Karen Louise Potgieter, Fasloen Adams South African Journal of Occupational Therapy 2019	Quantitative Correlational Study	41 mother & baby pairs	Maternal self-reported bonding	No correlation was found between a longer duration of skin-to-skin contact and bonding within one week postpartum. A positive correlation was identified between two hours or more of skin-to-skin contact and bonding as well as a higher rating of affectionate touch during feeding at six to eight weeks postpartum.	Early skin-to-skin contact positively influences mother-infant bonding and touch at six to eight weeks postpartum.	No control group Efficacy of the samples is questionable Only one type of data/information gathering

20	Susan Sweeney, Rachel Rothstein, Paul Visintainer, Robert Rothstein and Rachana Singh Journal of Neonatal Nursing 2017	Observational, prospective, pre-post interventional study.	15 parents in the NICU ; State–Trait Anxiety Inventory (STAI) surveys pre-post successful Kangaroo Care sessions and parental readiness survey were administered to eligible parents of preterm infants as well as breastfeeding data was collected.	State-Trait Anxiety Inventory Surveys	91% of parents performing KC vs 66% of parents NOT performing KC reported being very or extremely confident in caring for their infant at discharge. 81% of mothers initiated breastfeeding in NICU with 76% continuing at discharge.	Kangaroo Care (KC) is associated with a lower parental anxiety level, greater confidence in parenting skills and higher breastfeeding rates.	Small sample size No true control group - only comparison to parents not performing Kangaroo Care with questions
21	Leila Valizadeh, Najmeh Ajoodaniyan, Mahboobeh Namnabati and Vahid Zamanzadeh Journal of Neonatal Nursing 2013	Descriptive Study	Data were collected through self-report method (Avant Maternal Attachment Behavior Scale) and analyzed	Avant Maternal Attachment Behavior Scale	Self-reported maternal attachment scores were higher with kangaroo care than with those who did not perform kangaroo care. Once results were analyzed, they were found to be statistically significant.	Mother–infant attachment behavior are strengthened by applying the Kangaroo Mother Care.	View comes from nurses not from caregivers Opinion-based and therefore biased Small sample size

22	Dorothy Vittner, Jacqueline McGrath, JoAnn Robinson, Gretchen Lawhon, Regina Cusson, Leonard Eisenfeld, Stephen Walsh, Erin Young and Xiaomei Cong Biological Research for Nursing 2018	Randomized Crossover study	Sample = 28 stable preterm infants and their parents. Saliva samples were collected from infants, mothers, and fathers on Days 1 and 2 (1/parent) for Oxytocin and cortisol measurement pre-Kangaroo Care (KC), during a 60-min KC session, and a 45-min post-KC. Parental anxiety was measured at the same time points.	Salivary Cortisol Levels, salivary oxytocin levels	Kangaroo Care activated oxytocin release and decreased infant salivary cortisol levels.	Kangaroo Care alleviates parental stress and anxiety while also supporting mother–father–infant relationships.Facilitation of Kangaroo Care may be an effective intervention to reduce parent and infant stress in the NICU.	small sample size Research with a larger sample size is needed, however, to generalize these findings sample was primarily Caucasian with college-educated parents, which may have influenced the findings. Another limitation was the crossover study design, which does not allow for a clear definition of causality. Our convenience sampling techniques may have influenced the findings as well: Although Kangaroo Care was a standard of practice in all recruiting NICUs, parents may have declined to participate because they did not want to practice Kangaroo Care with their infants.

23	Haifa (Abou) Samra, Janet Dutcher, Jacqueline M. McGrath, Meghan Foster, Linda Klein, Gemechis Djira, Julie Hansen and Deborah Wallenburg Advances in Neonatal Care 2015	Longitudinal 2-group randomized controlled trial	40 infant-mother dyads recruited from a level 3 neonatal intensive care unit in the upper Midwest	Maternal stress was measured using the Parental Stressor: Neonatal Intensive Care Unit (PSS: NICU) scale pre- and post-Kangaroo Care intervention.	Maternal stress scores decreased following the kangaroo care intervention. Maternal stress scores were higher before kangaroo care, and lower after the intervention.	Mothers who provide Kangaroo Care may experience more stress related to a more facilitated progression in the mother and infant relationship, but Kangaroo care is therapeuic for decreasing maternal stress.	The PSS: NICU scale does not take into account other sources of stress as they related to parents' daily hassles, other responsibilities, trauma related to pregnancy and delivery, development of the parent role, and sensitivity to the infant. Followed a modified version of the Ludington guidelines for infant positioning, assessment for tolerance, and documentation. Timing and duration of the SSC sessions was determined by the mother.