Systematic Review of Kangaroo Care

Hannah Payne, Thao Nguyen, and Jackie Cavner

University of Arkansas-Fort Smith
Abstract

This paper explores the research surrounding kangaroo care, also known as kangaroo mother care (KMC) or skin to skin contact (SSC). Kangaroo care consists of prolonged skin to skin contact, and usually breastfeeding if applicable, between the newborn and participating parent right after the birth of the newborn. Components of this systematic review involve and detail the benefits of kangaroo care in regards to newborn vital signs, weight gain, analgesic effects, bonding, mortality rates, psychological and behavioral effects, and paternal kangaroo care. Various sources and studies, all published within the last five years, were compiled to complete this systematic review. Several sources in this systematic review give an international perspective of kangaroo care and were used in order to demonstrate the widespread use of this inexpensive, nonpharmacological intervention for newborns post-delivery. Further recommendations for research are also included in this paper. Recommendations were made based on current research results, conflicting research results, or complete lack thereof.
Systematic Review of Kangaroo Care

Patient-centered care and reducing cost has been a leading goal of recent research. An example of such research is the introduction of Kangaroo care for newborns. Introduced in 1978, kangaroo care became an alternative method for incubators for infants. Kangaroo Mother Care (KMC) consists of four components: “early, continuous, and pronged skin-to-skin contact (SSC) between the newborn and mother, exclusive breastfeeding, early discharge from the health facility, and close follow-up at home” (Boundy, Dastjerdi, Spiegelman, Fawzi, Missmer, Lieberman, Kajeepeta, Wall, & Chan, 2016). The same concept can be applied to paternal kangaroo care where the father is the provider of the same four components. This intervention is derived from the kangaroo’s method of nurturing their newborn, which consists of carrying them in the maternal pouches to keep them warm and provide easy access to the breasts for breastfeeding. Various research studies have been carried out to test the efficacy of the technique. This systematic review will examine the effects of kangaroo care on infants in terms of vital signs, weight gain, analgesic effects, maternal-newborn bonding, mortality rates, and psychological and behavioral effects. This review will also discuss the effectiveness of paternal kangaroo care on newborns, which is often less discussed.

**Vital Signs**

Vital signs are important to determine the current condition of the neonate and often is used to detect any changes in the baby’s condition. Components such as respiration rates, body temperature, heart rate, and oxygen saturation are often measured. Evidence shows that kangaroo care yielded favorable vital signs.

A study conducted in Odisha showed that by using kangaroo care, the infants showed regular respirations during the intervention and often fell asleep (Pahantasingh, Behera, Samal,
Furthermore, no infants developed any signs of apnea during kangaroo care (Pahantasingh et al., 2018). An analysis done by Boundy et al. (2018) and Gunjana, Deveshwar, & Palak (2017) also showed that newborns who received kangaroo care had a lower mean respiratory rate. This could be a result of the infant’s upright position which allows for a decrease in the compression of the diaphragm and maximal ventilation and perfusion which are often gravity dependent (Verma, P., & Verma, V., 2014).

Along with improved respiration rates, oxygen saturation also increased. According to Pahantasingh et al. (2018), the mean oxygen saturation after kangaroo care was 96.9 ± 1.89; furthermore, infants that had a saturation below 90% at the start of the kangaroo care sessions all recovered following the session. It was also shown that during a three-day period, SpO2 increased by five percent following kangaroo care sessions (Bera, Ghosh, Singh, Hazra, Som, & Munian, 2014). Furthermore, Gunjana et al. (2017) also concluded that there was an increase in oxygen saturation on all the three days of KMC session.

Similarly, kangaroo care also improved the newborns’ heart rates. It was shown that during kangaroo care sessions, all infants achieved a desirable and stable heart rates between 100-170 beats per minute (Pahantasingh et al., 2018; Bera et al., 2014). In another study, the infants’ heart rates were either increased by five beats or decreased by eight beats per minute within normal limits (Verma, P., & Verma, V., 2014). Skin-to-skin contact have shown to decrease crying in infants by stimulating the release of oxytocin which calms and stabilizes the cardio-respiratory patterns, which can explain the decrease in the infants’ heart rates (Verma, P., & Verma, V., 2014). In contrast, the increase in heart rate by five to ten beats per minute could be due to the baby’s position changing from a supine position to an upright position.
Regarding the temperature of the infants, kangaroo care has shown to decrease the risk of hypothermia. According to Pahantasingh et al. (2018) and Bera et al. (2014), the mean body temperature increased significantly following kangaroo care sessions. Another study conducted by Gunjana et al. (2017) compared the mean temperature before and after kangaroo care. The three-day mean temperatures were 97.26 ± 0.68, 97.32 ± 0.66, and 97.36 ± 0.65 respectively before kangaroo care sessions; after the sessions, the mean temperature improved to 98.04 ± 0.56, 98.29 ± 0.47, 98.53 ± 0.38 respectively (Gunjana et al., 2017). Kangaroo care also decreases the risk of infant hypothermia by 78% (Boundy et al., 2016). When the infant is placed in skin-to-skin contact with the mother, thermal synchrony occurs. Thermal synchrony is described as the change in the mother’s breasts temperature to accommodate the baby’s temperature. Furthermore, infants often assume a flexed position when placed upon the mother’s chest; this position allows for optimal heat conservation as opposed to the flat position when placed in an incubator (Verma, P., & Verma, V., 2014).

**Weight Gain**

A component of kangaroo care is exclusive breastfeeding, which is a practice that promotes bonding and weight gain for the infant. A study conducted in Brazil showed that mean weight-gain velocity increased significantly over a course of three months from 0.12 ± 11.11 grams/kilogram/day in the first phase to 13.47 ± 4.84 grams/kilogram/day; similarly, roughly six percent of newborns were classified as gaining adequate weight in the first 20 days of the kangaroo care intervention and increased to 44.9% by the end of the study (Nobre, Azevedo, Almeida, Almeida, & Feitosa, 2017).

Furthermore, Archarya, Singh, Bhatta, & Poudel (2014), showed that infants who received kangaroo care had a mean weight gain of 12.11 ± 9.04 grams as compared to 3.29 ±
15.81 grams in those that did not receive kangaroo care interventions. This is similar to results found in a study conducted by Jafari, Bayat, & Kermansaravi (2014) which compared the mean weight gain between those who received kangaroo care and those who did not; results revealed a mean weight gain of fifteen grams and four grams, respectively. Another study showed that there was a significant increase in weight gain in infants who received kangaroo of 24.4 ± 6.9 grams compared to 21.5 ± 5.4 grams in those who did not receive kangaroo care (Sharma, Murki, & Pratap, 2016).

According to Boundy et al. (2016), KMC increased the likelihood of breastfeeding at hospital discharge and continued to increase the likelihood by 39% at one to four months follow-up. This could explain why infants who received kangaroo care are correlated with better weight gain rates.

**Analgesic Effects**

Various studies have been conducted to explore the relationship between kangaroo care and reduction of pain in infants. A study conducted in China revealed that duration of crying, duration of facial grimacing, and heart rate in response to heel-sticks were significantly lower in infants who received kangaroo care as opposed to those who stayed in incubators (Gao, H., Xu, G., Gao, H., Dong, R., Fu, H., Wang, D., Zhang, H., & Zhang, H., 2014). This correlates with results found in another study conducted previously by Choudhary, Dogiyal, Sharma, Gupta, & Madabhavi (2014) which showed that infants who received kangaroo care had a smaller drop in pulse oximetry readings and shorter duration of cry.

Similarly, it was found that infants who received kangaroo care scored lower on pain scales as opposed to those in incubators (Mosayebi, Javidpour, Rahmati, Hagani, & Movahedian, 2014). When using the pain profile of preterm infants (PIPP) scale after a heel-stick, it was found
that the PIPP score was 4.9 ± 2.92 in kangaroo care as opposed to 11 ± 4.22 in incubators (Sarparast, Farhadi, Sarparast, & Shafai, 2015). The study conducted by Choudhary et. al. (2015) also showed a lower PIPP score after a heel-stick in those who received kangaroo care. This reduction in pain could be due to the release of oxytocin which calms the baby and subsequently, decrease stress hormones such as cortisol (Verma, P. & Verma, V., 2014).

**Maternal-Newborn Bonding**

Maternal-newborn bonding is an important aspect of the parent-child relationship that starts as soon as the infant is born. The bond relationship formed will impact the rest of the mother and child’s life. There are several aspects of kangaroo care that contribute to the development of the mother-infant bond. Oxytocin release, physical contact, and breastfeeding, which are all things that occur during kangaroo care, play a role in facilitating the bonding process.

Oxytocin release is stimulated by labor and close contact with the infant following birth (Johnson, 2013). Oxytocin release in the mother and infant stimulate feelings of love and euphoria (Johnson, 2013). This makes the mother want to hold the infant closer (skin to skin contact) which in turn releases even more oxytocin (Johnson, 2013). Specifically, “Oxytocin is significant in the initiation of bonding because of its role in decreasing stress, increasing trust, and integrating psychological and physiological states to aid in calmness and approach” (Johnson, 2013).

Kangaroo care also directly facilitates breastfeeding, which in turn helps to develop the maternal-newborn bond. According to Johnson, “The physical contact and affectionate behaviors and interactions that occur during breastfeeding improve the emotional bond between mother and infant” (2013). According to one study, breastfeeding mothers were more in tune to the physical
and emotional needs of their infant compared to mothers who were bottle feeding (Johnson, 2013). Meeting the needs of a child helps to develop their sense of trust that they will be taken care of, which also further develops the maternal-infant bond. In addition, a study was done comparing infants who received skin to skin contact for two hours after birth to infants who did not receive skin to skin contact. The results revealed that the mother-infant interaction was better, the mothers were more sensitive towards the infant, and the infant seemed more content during the first year of life in the group that participated in skin to skin contact (Johnson, 2013).

**Mortality Rates**

According to the World Health Organization (WHO), about 4.1 million infants died globally in 2017 during their first year of life (2018). The global infant mortality rate for 2017 was twenty nine deaths per one thousand live births (WHO, 2018). Unfortunately, infant deaths are not as uncommon as one would hope. However, there is research that suggests kangaroo care can decrease infant mortality rates.

A meta-analysis published by the Official Journal of the American Academy of Pediatrics gathered several studies and compared the findings of the effect of kangaroo care on newborn mortality rates (Boundy et al., 2016). One of the most significant findings this study revealed was that among low birth weight newborns (less than two thousand grams at birth) mortality was decreased by thirty six percent if the newborn received kangaroo care compared to the control group that received conventional care (Boundy et al., 2016). When the studies that were used for the meta-analysis were followed up on, kangaroo care showed an overall twenty three percent decreased mortality risk compared to control groups (Boundy et al, 2016). This decrease can be explained in part by the effect kangaroo care has on newborn vital signs, as is explained in detail previously.
Specifically, kangaroo care reduces the risk of hypothermia, improves weight gain, stabilizes heart rate and oxygen saturation, lowers pain scores, and is associated with higher breastfeeding rates and milder cases of infection (Sarparast et al., 2015). These benefits have an overall effect on the newborn or infant’s health and gives them a better chance of survival compared to infants who received conventional care.

**Psychological and Behavioral Effects**

Kangaroo care is usually initiated immediately following birth if the infant and mother are stable. Studies have shown that skin to skin contact right after birth leads to improved infant behavior, such as less crying and fussing, and provides a sense of protection for the infant, especially during painful procedures, like heel sticks and injections (Cooijmans, Beijers, Rovers, & de Weerth, 2017). Infant sleep behavior is also improved—infants fell asleep faster and slept for longer periods of time while held in the skin to skin contact position compared to infants who fell asleep in cribs (Cooijmans et al., 2017). Maternal psychological benefits from kangaroo care also exist. Studies have shown that daily skin to skin contact with the full term infant can decrease postpartum depressive symptoms, which in turn can affect the infant’s care (Cooijmans et al., 2017). Mothers may also experience benefits like decreased anxiety and stress and improved sleep (Cooijmans et al., 2017).

In addition, kangaroo care has an impact far beyond the first year of an infant’s life and extends further than physiological advantages. A twenty year follow up study of infants who received kangaroo care has shown that positive effects on the child’s psychological and behavioral state can be seen years later, even into adulthood (Charpak et al., 2016). Specifically, “the Conners’ scores for aggressiveness and hyperactivity and for externalization in the Adult Behavior Checklist (ABCL) test were consistently lower in the KMC group...and these children
were perceived as having less antisocial behavior” (Charpak et al., 2016). Overall, twenty years later, the children who had experienced kangaroo care at birth were less aggressive, less hyperactive, and less antisocial than children who did not have kangaroo care. This study also notes that kangaroo care may have also affected the mothers psychologically as well by enhancing their sensitivity to their children’s needs (Charpak et al., 2016).

Additionally, Erikson’s stages of development states that the trust versus mistrust psychosocial crisis occurs from birth to eighteen months (Simply Psychology, 2018). According to Erikson, the infant must be able to trust that they will be cared for to ensure proper psychosocial development. If this stage proves successful then the infant develops the virtue of hope (Simply Psychology, 2018). Specifically, “By developing a sense of trust, the infant can have hope that as new crises arise, there is a real possibility that other people will be there as a source of support. Failing to acquire the virtue of hope will lead to the development of fear.” (Simply Psychology, 2018). Kangaroo care can help to ensure proper psychosocial development of the infant by increasing mothers’ sensitivity to their child’s needs as mentioned previously.

**Paternal Kangaroo Care**

Typically, the focus remains steady on the mother and baby post-delivery to ensure their well-being. It is also usually mothers and infants that participate in kangaroo care with one another. However, fathers can also participate using the same approach a mother would. This practice is not as commonly implemented, but does still provide immense benefits for both father and baby.

According to Family Included, maternal and paternal kangaroo care have very similar benefits for the infant (2016). As with maternal benefits, paternal benefits manifested in the infant include a rise in temperature, a higher blood glucose level, decreased signs of stress, and
overall increased comfort compared to infants placed in an incubator (Family Included, 2016). Fathers also reap benefits from this practice as well. Fathers were shown to display more caring and sensitive attitudes toward the infant, be more engaged once in the home setting, and felt more in control of any unexpected situations (Family Included, 2016). Hormonally, paternal oxytocin increased and cortisol levels decreased, which in turn, increased the feeling of love, decreased any anxiety, and helped facilitate the relationship with the mother (Family Included, 2016).

Paternal kangaroo care is a great option due to the benefits for both father and infant, but it also an important intervention if the mother is unavailable to do so herself. Examples of this situation would include post-cesarean section maternal complications (shaking from anesthesia, closure of the wound) or complications from vaginal delivery that require more intensive interventions by health care professionals, like hemorrhage. It is at this point paternal kangaroo care becomes especially beneficial as maternal kangaroo care is not easily accessible.

**Recommendations**

One recommendation for further research is to explore if or how kangaroo care affects the length of newborn hospitalization. Data gathered regarding this subject are contradictory. There are studies that exist that state kangaroo care decreases the length of hospitalization, but other studies state that it has no effect on length of hospitalization based on experimental and control group results (Boundy et al., 2016). If vital signs and weight gain are improved for infants that receive kangaroo care, it would seem that length of hospitalization would also be affected.

Furthermore, the application of kangaroo care have not been implemented in high-acuity newborns. Although found to be an effective and cost-effective intervention for stable newborns, little research has been done to explore how kangaroo care affects high-risk newborns. Perhaps
more research can be done to see if this simple intervention can yield favorable results for high-acuity baby, in a safe and effective way.

Based on the results of the research gathered, parents and newborns both benefit vastly from participation in kangaroo care. A recommendation based on these results is to encourage healthcare providers to complete standard pre-delivery education regarding kangaroo care. This education would be best completed at a pre-labor doctor or midwife appointment. Parents should be taught the correct position to hold an infant to participate in skin to skin contact and understand the benefits that can be reaped simply by holding their newborn close. Fathers need to be encouraged to participate in kangaroo care also.

In addition, healthcare providers, specifically those in the patient room at the time of the newborn birth, need to be informed of the benefits and importance of kangaroo care. These providers need to allow kangaroo care to be a priority if the mother and newborn are physiologically stable. Ways to encourage this would be to complete APGAR scores, immunizations, footprints, any cleaning while the newborn is on the mother’s chest immediately following birth.

Conclusion

In conclusion, kangaroo care directly affects vital signs, weight gain, analgesic effects, maternal-newborn bonding, mortality rates, and psychological and behavioral effects. While gathering research, the effect of kangaroo care has only proved beneficial for both newborn and the parent participating in the intervention. It has shown to improve vital signs such as respirations, oxygenation, heart rate, and temperature. Furthermore, the weight gain velocity in newborns who received kangaroo care are greatly accelerated. By using natural oxytocin, kangaroo care serves as a cost-effective analgesic. The bonding process is easily facilitated
through skin to skin contact and subsequent release of oxytocin. Infant mortality rates have proved to be lower through contribution of kangaroo care to improved vital signs and weight gain. Lasting impacts of kangaroo care can be seen throughout the infant’s life and can improve infant and maternal behavior. Paternal participation is encouraged as fathers can contribute positively to the parental and newborn-paternal bond and are an important resource if the mother is unable to participate herself.

Although further studies can be conducted to confirm the efficacy of this intervention, enough evidence is present to determine that kangaroo care has profound benefits for both the parents and newborn. This intervention has proven to be a sufficient substitute for incubators, especially in areas of low-economic status. Similarly, kangaroo care can also be implemented across all settings since it is a cost-free intervention that can be done by anyone at any time in any location. Furthermore, no preparations or set ups are needed such as in the case of expensive equipment like incubators. In a society where the search for inexpensive and effective health-care interventions have been the center of focus, kangaroo care serves as a great alternative to reduce costs while promoting patient-centered care.
References


