Literature Review

The influence of the Kangaroo Method on the time of hospitalization of the premature infant in hospital units: na integrative review

A influência do Método Canguru no tempo de internação do recém-nascido prematuro em unidades hospitalares: uma revisão integrativa

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ABSTRACT | INTRODUCTION: Prematurity in Brazil corresponds to 12.4% of live births and is defined as birth less than 37 weeks of gestation. Due to the immaturity of organs and systems, the newborn can present several complications and, consequently, a longer stay in hospital units, leading to greater morbidity and mortality in this population. The hospitalization period makes it difficult to establish a bond between newborns and their parents. For this reason, techniques such as the kangaroo method that aims to strengthen this bond are increasingly studied and applied in these units. The present study aims to assess, through a literature review, whether the kangaroo method influences the length of hospital stay of premature newborns in hospital units. **METHOD:** This is an integrative literature review study with the search for articles in the electronic databases Regional Portal of the Virtual Health Library (VHL), PubMed, Cochrane, Physiotherapy Evidence Database (PEDro), and EBSCO host with the crossing of four descriptors in English and Portuguese indexed respectively in the Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS). Studies published from 2008 to 2020 were included. **RESULTS:** 22 articles were included with a total of 7.564patients and seven parameters related to hospital discharge. The results showed an improvement in vital signs, pain, sleep, growth rates, hormonal regulation, and neurobehavioral facilitation. **CONCLUSION:** The findings indicated that the kangaroo method influences the improvement of the clinical condition of the premature newborn, contributing to better stabilization of the condition and consequent reduction in the period of hospitalization.

KEYWORDS: Kangaroomethod. Prematurity. Time of hospitalization.

RESUMO | INTRODUÇÃO: A prematuridade no Brasil corresponde a 12,4% dos nascidos vivos e é definida como o nascimento inferior a 37 semanas de gestação. Por conta da imaturidade de órgãos e sistemas, o recém-nascido pode apresentar diversas complicações e consequentemente maior tempo de internação nas unidades hospitalares, levando à uma maior morbidade e mortalidade nesta população. O período de internação dificulta o estabelecimento do vínculo entre os recém-nascidos e os seus pais. Por isso, técnicas como o método canguru que visam fortalecer esse vínculo são cada vez mais estudadas e aplicadas nestas unidades. O objetivo do presente trabalho é avaliar através de uma revisão de literatura se o método canguru influencia no tempo de internação do recém-nascido prematuro em unidades hospitalares. **MÉTODO:** Trata-se de um estudo de revisão integrativa de literatura com busca de artigos nas bases de dados eletrônicas Portal Regional da Biblioteca Virtual em Saúde (BVS), PubMed, Cochrane, *Physiotherapy Evidence Database* (PEDro) e EBSCO host com a utilização do cruzamento de quatro descritores em inglês e português indexados respectivamente no *Medical Subject Headings* (MeSH) e Descritores em Ciências da Saúde (DeCS). Foram inclusos estudos publicados no período 2008 a 2020. **RESULTADOS:** Foram incluídos 22 artigos com um total de 7.564 pacientes e sete parâmetros relacionados à alta hospitalar. Os resultados evidenciaram melhora nos sinais vitais, quadro álgico, sono, taxas de crescimento, regulação hormonal e facilitação neurocomportamental. **CONCLUSÃO:** Os achados indicaram que o método canguru influencia na melhora do quadro clínico do recém-nascido prematuro, contribuindo para uma melhor estabilização do quadro e consequente redução no período de internamento.

PALAVRAS-CHAVE: Método Canguru. Prematuridade. Tempo de hospitalização.

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Introduction

The term prematurity is defined, according to the World Health Organization (WHO), as birth below 37 weeks of gestation. It can be classified depending on the gestational age[1]. The etiology of premature birth is multifactorial and can be caused by several situations that lead the patient to have uterine contractions before the expected time, such as multiple pregnancies, drug use, recurrent abortions, arterial hypertension, fetal distress, pregnancy in adolescence, among others. The incidence of prematurity varies according to the region and the population's socioeconomic condition[2].

Due to the immaturity of organs and systems, the NB can present several complications resulting from the difficulty of adapting to extrauterine life, leading to higher mortality and morbidity in this population, and consequent expenses as premature delivery demand assistance and care with a higher level of complexity[2].

Hospital discharge is a time of great expectation. However, these newborns, due to a large number of complications, have an extended length of stay in hospital units, when compared to full-term newborns. Associated with this, several factors, such as weight, vital signs, and difficulty in sucking, interfere in this discharge[3]. However, technological advances in health are evident and the new approaches bring changes in neonatal intensive care units (NICUs) and other hospital units that lead to increased survival of newborns who are increasingly premature and with weights lower birth rates[4].

The length of stay in the NICU and other hospital units makes it difficult to establish the bond and attachment with the parents, in particular, in the essential relationship with the mother. Therefore, techniques that also aim to strengthen these bonds are increasingly studied and applied in these units, such as the kangaroo method[5].

The kangaroo method was created in 1979 in Colombia to reduce perinatal costs and promote greater affective bond, greater thermal stability, and better development through skin-to-skin contact. The method is developed in three stages: the first starts in the prenatal period of pregnancy. In this stage, priority is given to welcoming parents and families, supporting the woman's companion during childbirth, and in gestational care. Besides, this step also involves the admission of the newly - born in the neonatal ICU and/or UCINCo. The second stage is carried out at UCINCa, with special attention to breastfeeding. The third stage is when the newborns are discharged and will be monitored in a shared way by the hospital team and the basic care of the kangaroo method[6].

Therefore, reviewing how the kangaroo method can influence this population is extremely important since it is a low-cost and easy-to-follow practice. Thus, the objective of the present study is to evaluate through a literature review whether the kangaroo method influences the length of hospital stay for premature newborns in hospitals.

Material and methods

Search strategy

This article is an integrative review, where some of the rules of TransparentReportingof System Reviews and Meta analyzes-PRISMA were applied for its elaboration. The following steps were outlined: identification of the theme; selection of the research question; establishment of criteria for inclusion and exclusion of studies; definition of the information to be extracted from the selected studies, evaluation of the studies included in the review; interpretation and presentation of results in table format; presentation of the review and synthesis of knowledge[38].

A search was performed on the literature published in the last 12 years, using the following databases: Regional Portal of the Virtual Health Library (VHL), PubMed, Cochrane, PhysiotherapyEvidenceDatabase (PEDro) and EBSCOhost.

Descriptors

To define the search strategy, Decs (Descriptors of Science and Health) and MESH (Medical SubjectHeadings) were used, the same descriptors were found and the search for the articles was done by crossing the descriptors and the Boolean operators AND and OR. The following descriptors were used to search for articles: kangaroo method, length of stay, hospital units, prematurity and their correlates in English: kangaroo - mothercaremethod, lenghtofstay, hospital units and prematurity. For the term kangaroo - mothercaremethod, the kangaroomethod variation was used.

The search strategy was defined as follows: kangaroo - mother care method OR kangaroo method AND hospital units AND length of stay; kangaroo - mother care method OR kangaroo method AND length of stay; kangaroo - mother care method AND length of stay AND hospital units AND prematurity; kangaroo - mother care method OR kangaroo method AND length of stay AND prematurity; kangaroo - mother care method OR kangaroo method AND prematurity in Pubmed, VHL Regional Portal, Cochrane and Scielo databases . In the PeDro database, an asterisk was used after each descriptor as a truncation tool.

Inclusion criteria

This study included randomized clinical trials, published between 2008 and 2020, whose sample consisted of individuals of both sexes, preterm newborns, and who had been treated with the kangaroo method in isolation or association.

Exclusion criteria

Studies that did not use human beings, non-clinical studies, those that do not include a detailed description of the adopted methodology or that obtained a rating lower than 5/10 on the PEDro scale were excluded.

Internal validity

The analysis of the internal validity of the selected articles was performed using the PEDro scale available at http://www.pedro.fhs.usyd.edu.au. PEDro is a specific database for studies that investigate the effectiveness of interventions in physical therapy[39]. This is a scale that has 11 items that were designed to assess the reliability and methodological quality of randomized clinical trials[39].

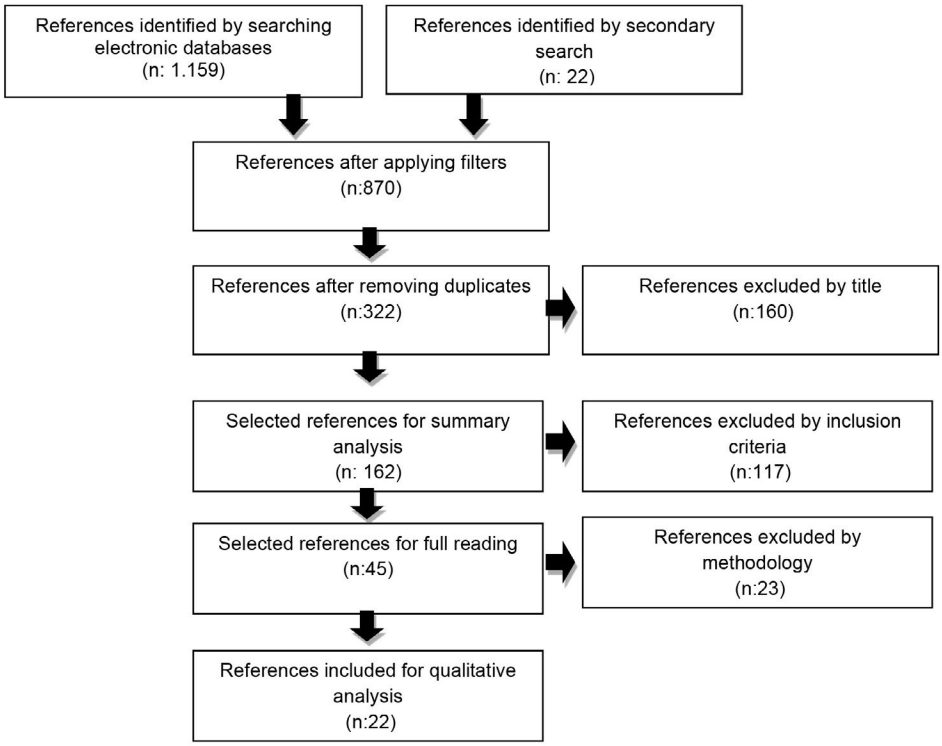
"Yes" should be assigned to each item if it has been contemplated or not if it has not been contemplated. The final score is obtained by the sum of all positive responses[39]. Each positive answer is equivalent to a value of one point, less that of the first item, which differs from the others because it is related to the external validity of the study. Thus, the scale score can vary from 0 to 10[39].

The analyzed outcomes: weight gain, vital signs, growth rate, suction, analgesia, need for greater support in the NICU, length of stay and the use of the kangaroo position.

Results

Initially, 1,159 scientific articles were found in the databases, and 22 through a secondary search in other sources. Of these, 311 were excluded after applying the filters (year of publication, age, sex, and research with humans). Of the 870 articles selected, 548 were excluded due to duplication; 160 the title did not correlate the kangaroo method and the length of stay in hospital units. The remaining 162 went on to the summary analysis stage. Of these, 117 were excluded because they did not meet the inclusion criteria or were not related to the subject studied. For complete evaluation remaining 45 articles, of which 23 did not have the criteria for eligibility, as 18 included newborns terms and five were treated literature review, resulting in 22 articles for this review, as described in Figure 1.

Figure 1. Flow of article selection using the kangaroo method of premature newborns in hospital units. 2008 - 2020



These 22 studies were found in the VHL Regional Portal, PubMed, Cochrane, Physiotherapy Evidence Database (PEDro) and EBSCO host databases, which are quantitative and experimental, from 2008 to 2020, pertinent to the researched theme. The initial samples of the selected articles ranged from 20 to 5242 preterm newborns and the studied outcomes were: growth rate, length of stay, vital signs, analgesia, weight gain, cardiorespiratory system, sleep and hormonal regulation. The evaluation of vital signs was the most used parameter, being seen in thirteen of the 22 studies.

The organization and tabulation of the data extracted from the 22 articles are described in tables 1 and 2 according to the following characteristics: authors, year of publication, study population and design (Table 1) and objectives, assessment instruments and the main findings (Table 2). The general data found in the studies can be seen in Table 3 and the qualitative analysis of the studies presented in Table 4.

Table 1. Characterization of articles that address the use of the kangaroo method of premature newborns in hospital units . 2008 - 2020

Author	Year	Study population (n)	Research Outline
Freire, Garcia, Lamy	*2008*	95 patients	Randomized, single-blind clinical trial
Johnston et al.	2008	61 patients	Double-blind crossover test
Mwendwa, Musoke, Wamalwa	2012	166 patients	Controlled, randomized, unblinded clinical trial
Olmedo et al.	2012	20 patients	Randomized clinical trial
Neu, Robinson, Schmiege	2013	87 patients	Randomized, controlled study
Acharya et al.	2014	126 patients	Randomized, randomized clinical trial
Mosayebi et	2014	64 patients	Cross-sectional clinical trial
Bera et al.	2014	500 patients	Controlled clinical trial
Neu et al.	2014	80 patients	Randomized clinical trial
Gathwala, Singh, Singh	2014	100 patients	Randomized controlled study
Luong et al.	2015	100 patients	Randomized controlled trial
Gao et al.	2015	80 patients	Controlled and randomized assay
Dehghaniet al.	2016	53 patients	Randomized double-blind clinical trial
Gavhane et al.	2016	91 patients	Randomized controlled trial
Dezhdar et al	2016	82 patients	Randomized Clinical Trial
Sharma, Murki, Pratap	2016	141 patients	Randomized controlled trial
Bastani et al.	2017	70 patients	Randomized controlled study
Aldana Acosta et al.	2018	66 patients	Randomized clinical trial
Shukla et al.	2018	100 patients	Blind randomized clinical trial
Parsa et al.	2018	100 patients	Quasi-experimental essay
M. Campbell-Yeo et al.	2019	5242 patients	Randomized, single-blind clinical trial
MO Rehman et al.	2020	140 patients	Randomized clinical trial

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (to be continued)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Freire, Garcia, Lamy, 2008	To evaluate the analgesic effect of KMC compared to oral glucose on the response of premature newborns.	In the CG, the newborn was in the prone position in the incubator during heel lancing and did not receive analgesia. The IG was performed KMC for 10 minutes before and during the heel lancing procedure. And in the GG the newborn was in the prone position in the incubator and received oral glucose2 min before lancing the heel	A smaller variation in HR and SpO_2 and a shorter duration of facial activity were observed in the IG.	Skin-to-skin contact has an analgesic effect on premature newborns during the heel lancing.
Johnston et al., 2008	Determine whether KMC would also be effective in very premature newborns in decreasing the pain response to heel puncture	KMC was performed in the IG for 15 minutes before and during the heel puncture procedure. In the CG, the child was in a prone position wrapped in a blanket in the incubator. The premature newborn's pain profile (PIPP) was assessed.	PIPP scores at 90 seconds post lance were significantly lower in the state of KMC, Recovery time was significantly shorter, facial actions Were significantly lower at all points and HR was significantly lower throughout the first 90 seconds in the KMC condition.	Premature newborns appear to have endogenous mechanisms caused by maternal skin-to-skin contact that decrease the response to pain, but not as powerful as in older preterm infants. The shortest recovery time in KMC is clinically important in helping to maintain homeostasis.
Mwendwa, Musoke, Wamalwa, 2012	To determine the effect of partial MMC on growth rates and length of hospital stay for babies with LBW.	MMC was practiced for eight hours a day for the IG, while the GC remained in incubators or cribs. Weight, head circumference and arm circumference were monitored for all babies.	Of the 166 infants, 157 were followed up for discharge. The MMC group had significantly higher growth rates as shown by the greater average weight gain, head circumference and arm circumference. Although the total length of stay was similar	Low birth weight children in this cohort achieved growth rates, the recommended intrauterine growth, but babies managed using partial MMC grew faster and were therefore discharged earlier than those in the standard of care.
Olmedo et al., 2012	Evaluate and compare the physiological responses between MMC and PP, in PTNB.	In the IG, the mother remained seated in an armchair with her chest bare; then, the newborn was placed in a vertical and fetal position on his chest in skin-to-skin contact, wrapped in a mesh band for 60 min. As for the CG, the newborns were positioned only in diapers in the heated incubator, in a fetal position with an abdominal torso support.	The measurements were made for three consecutive days, before and 60 min after the application of the techniques. In the CG, the RF measured before was significantly higher than that measured after the intervention, on the 1st and 3rd days. While, in the CG, the FR showed a significant difference only on the 3rd day. HR showed a reduction between the moments on the 3rd day in both groups.	There were no changes in FR, HR, T and $SatO_2$ with the application of MMC and PP, with no better performance in relation to the groups.

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (continuation)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Neu, Robinson, Schmiege, 2013	To determine whether the use of the kangaroo method in healthy premature infants in the first eight emanations of life of the newborn facilitates early behavioral organization and development.	In G1 we ask mothers to keep their children for at least an hour a day for 8 weeks using the kangaroo method. The G2 children dressed, wrapped in a blanket, and in their mothers' arms. And the G3 without retention restrictions	The average total retention time was 4 to 5h / day and did not differ between groups. Mothers performing the kangaroo method for an average of 59min / day in G1, and 5 and 9 min / day in G2 AND G3. Babies G1 and G2 had more satisfactory scores than the control group.	The kangaroo method is compared to involving the newborn in the blanket. Both methods can provide equal early behavioral organization and developmental benefit for the child.
Acharya et al., 2014	To compare the effect of MMC and conventional methods on weight gain, occurrence of hypothermia, apnea and length of hospital stay among babies.	The IG was submitted to KMC for at least six hours a day, and did not exceed more than four sessions. In the CG, the babies were properly dressed, covered and kept with the mother and, if necessary, kept under a heater. The temperature measurement in the IG was made before, during and after KMC. In the GC, the temperature was measured every 4 hours.	The average weight gain was higher in the IG and the incidence of hypothermia was lower in the IG. The length of hospital stay was shorter in the CG.	Babies weighing less than 2000 grams who receive KMC show better weight gain and have a lower incidence of hypothermia than those who do not receive KMC.
Mosayebi et al., 2014	To evaluate the effect of MMC for a short duration of 15 minutes on the intensity of pain from heel puncture in premature newborns admitted to neonatal intensive care units.	In the IG, newborns received MMC 15 minutes before, during, and two minutes after the first heel puncture process. In the CG, newborns were kept in PP in the incubator 15 minutes before lancing. For second heel lancing, the neonates of the GI were placed in incubators and GC received CMC.	The mean intensity and pain score during the intervention was significantly lower in the KMC position. The average pain intensity count in two minutes after the intervention was also significantly lower in the KMC position	MMC before and during heel lancing is a natural, easy-to-use, and cost-effective method for reducing pain in PTNN. It is consistent with the modern family-centered care strategy in neonatal units.

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (continuation)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Bera et al., 2014	To evaluate the effect of KMC sustained on the growth and development of low-birth-weight infants up to 12 months.	The IG performed the KMC, while the CG received conventional care. For babies in the intervention group, KMC was performed until the child completed 40 weeks of corrected pregnancy. Head, thorax and arm weight, length and circumferences were assessed at birth and at the corrected ages of 0, 3, 6, 9 and 12 months.	KMC babies quickly reached similar physical growth parameters for babies in the CG at 40 weeks of corrected age. But after that, they surpassed those parameters.	Infants in the KMC group showed better growth and physical development than the conventional care group.
Neu et al., 2014	To determine whether the kangaroo method in healthy premature infants over the first eight weeks of a baby's life, facilitates the co-regulation of salivary cortisol between mother and baby	The measures evaluated in both groups were behavioral indicators (duration of crying and duration of grimaces) and physiological indicators (HR). The interventions were initiated 30 min before the evaluations that were carried out 30 and 60 min after the beginning of the interventions.	The HR was significantly lower and the duration of crying and facial faces were shorter in the KMC.	Reduction in the level of cortisol in mothers and children suggests that the achievement promoted the expected drop in hormone levels in the stress.
Gathwala, Singh, Singh, 2014	Assess the benefits of KMC and its acceptability by mothers and staff	The IG performed the KMC for at least 6 hours a day, while the CG received standard treatment. Weight, length and head circumference were monitored daily and breastfeeding rates were calculated based on the history obtained from the mothers. All babies were followed up to three months.	The average temperature recorded during MMC was significantly higher higher than in the routine treatment group. Hypothermia episodes occurred more frequently in the CG. The average weight and length gain in the IG were significantly higher than in the CG.	We concluded that KMC resulted in an improvement in the growth rate and breastfeeding, and was well accepted by both mothers and nurses on the team.
Luong et al., 2015	A previous study suggested that skin-to-skin contact achieves better physiological stability in the transition period, when compared to the incubator. The aim of this study was to replicate the old study with a larger sample.	In the CG, the child was then covered with a blanket and transferred to the neonatal department about 30 minutes after birth. Incubators set at 33 ° C or cribs were used. The GI was placed on a cloth over the mother's abdomen, gently cleaned and covered with a new cloth allowing skin-to-skin contact.	The GI showed a better transition to extrauterine life. At KMC, children had significantly less need for respiratory support, intravenous fluids and use of antibiotics during rest of the hospital stay.	It was seen that KMC was likely to be an ideal environment for newborns weighing 1500 - 2500 g at birth, preventing hemodynamic instability. Ideal to be performed in low-income countries.

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (continuation)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Gao et al., 2015	To test the effectiveness of the Kangaroo Mother Method (MMC) on the pain of heel puncture in premature newborns.	In the first procedure, the NB in both groups received no intervention during the next three procedures, the children of the IG received the Kangaroo Mother Method, while children in the CG remained in the incubator. Crying, grimacing and CF were evaluated at all stages.	AFC of premature infants was significantly shorter, and the duration of crying and facial grimaces were significantly shorter in the Kangaroo Mother Method group, than the CG from the blood collection phase to the recovery phase during the procedure.	In the next studies, a tool could be used with the PrematureInfantPain Profile (PIPP), the pain profile of the premature newborn and, in addition, the comparison of pain relief between the Kangaroo Mother Method and other non-pharmacological interventions can be examined during painful procedures.
Dehghaniet al., 2016	To determine the impact of the KMC method on newborns' vital signs and arterial oxygen saturation compared to the incubator care method in order to facilitate this method.	KMC was performed on newborns in the study group for one hour each day for 3 consecutive days. Vital signs, including temperature, HR, RR per minute, and SpO_2 were measured and recorded before, during and after the care process in both groups, and then were compared and analyzed.	The results showed that the average temperature variations and the oxygen saturation rate between the two groups showed significant differences in 3 days of examination. But there were no significant differences in HR and RF.	In general, the results of this study showed that KMC can contribute to the increase in the arterial oxygen saturation rate, temperature and cardiovascular and respiratory stability in newborns.
Gavhane et al., 2016	To analyze the long-term effects of KMC for relatively stable MBP children on nutritional indicators and feeding conditions of 6-12 months of corrected age.	The newborns were randomized to the KMC group or incubator group. The evaluation included measuring the parameters of weight, length and head circumference growth.	There was no difference between groups in the incidence of malnutrition and stunting. Although babies in GI had better development, weight and length compared to GC.	KMC group did not differ significantly with the KMC group in terms of long-term growth and in the pattern of feeding from 6 to 12 months of corrected age.
Dezhdar et al., 2016	Compare the effect of KMC and that of retaining newborns in blankets in pain during venous sampling in PTNB	The three groups were group A (blankets), group B (KMC), and group C (control). In all three groups, arterial oxygen saturation, heart rate and PIPP were measured and recorded at 30-second time intervals before, during, and 30, 60, 90, and 120 seconds after blood sampling.	The findings revealed that pain was reduced to a great extent in both G1 and G2 compared to the control group. However, there was no significant difference between G1 and G2.	In the present study, it was demonstrated that, in the two groups of eKMC cloths, the physiological changes were similar to each other and less than in the control group .

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (continuation)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Sharma, Murki, Pratap, 2016	Compare the effectiveness of baby care in the MMC with baby care in the ICU in stable premature infants	The GI children were kept in skin-to-skin contact, firmly attached to the mother with the dresses open. The babies in the GC were treated in the incubator in the humidity control mode for thermoregulation. Mothers were encouraged to visit the baby as often as possible.	The length and head circumference at the time of discharge were similar in both groups. Not there was a significant reduction in hospital stay. There was a significant increase in weight gain in the MMC group. There was a significant increase in the incidence of apnea in the ICU group.	MMC is equally effective as an IIC in improving the results of stable preterm growth (weight <1100 g)
Bastani et al., 2017	Compare the effects of the kangaroo position with the retention in the mother's arms and evaluate the sleep and awakening of premature infants.	In the pre-intervention phase, all children remained in DD in their incubator for 20 min. Then, the children of the IG were placed on their mothers and in the CG the children were wrapped in the mothers' arms. The intervention period lasted 70 minutes.	In the IG they had longer periods in deep sleep and a quiet awakening during the intervention phase and less time in light sleep or sleepy state and in the active awake state than in the CG.	The kangaroo method seems to increase the amount of time that premature infants spend in deep sleep and when awake they remain in a more peaceful state, compared to simply having restraint in their mothers' arms.
Aldana Acosta et al., 2018	Evaluation of the initial growth of preterm infants receiving kinesthetic stimulation with massage in a kangaroo position or in an incubator.	The newborns were randomized to the KMC group or incubator group. In the incubator group, parents applied kinesthetic stimulation in the incubator with the baby in the supine position and then in the prone position. In the KMC group, the infant was removed from the incubator, with diaper, cap and socks, and placed in the prone position on the chest of the mother or father in the kangaroo position.	Daily weight gain was significantly greater with kinesthetic stimulation in the kangaroo position.	Early kinesthetic stimulation in the kangaroo position reduces initial weight loss in babies between 30 - 33 weeks of birth without major health problems.
Shukla et al., 2018	Compare the effectiveness of KMC with oral sucrose in pain management in premature neonates	In the KMC group, KMC was provided at least 10 minutes before and was continued according to the unit's protocol after the heel puncture procedure. In the Sucrose group, 0.2 ml of 24% sucrose was supplied 2 min before the procedure. The premature newborn's pain profile (PIPP) was assessed.	The PIPP score was lower in the KMC vs. Sucrose, but failed to achieve statistical significance.	KMC and sucrose have comparable effects on the effectiveness of pain management in premature neonates.

Table 2. Presentation of articles according to the objectives and main findings regarding the use of the kangaroo method of premature newborns in hospital units. 2008 - 2020 (conclusion)

Author / Year	Objective of the study	Intervention	Results	Conclusion
Parsa et al., 2018	To evaluate the effect of the Kangaroo Mother Method (MMC) on the physiological parameters of premature babies at the Fatemiyeh Hospital in Hamadan in 2016	They were randomly divided into two groups (experimental group, n = 50 and control group, n = 50). In the experimental group, newborns were taken KMC daily for one hour for 7 days. In the control group, routine care was performed in the incubator.	After the intervention, there was a significant difference between the two groups regarding the infants' physiological indices (heart rate, respiratory rate, arterial blood oxygen and temperature)	The results of this study indicate the effect of KMC in increasing physiological indices. Therefore, it is recommended that MMC be taken as one of the routine care of premature babies.
M. Campbell-Yeo et al., 2019	Determine the relative sustained effectiveness of maternal KMC, administered alone or in combination with sucrose 24%, to reduce the intensity of behavioral pain associated with routine neonatal procedures, compared to sucrose 24% alone.	RNs were randomized to receive KMC and water (G1), KMC and sucrose 24% (G2) or sucrose 24% (G3) before all routine painful procedures. The intensity of the pain was determined using the Pain Profile of the Premature Baby, in 30, 60 or 90 seconds after the heel puncture.	The results of the study demonstrated that not only K M C provides pain reducers similar to oral sucrose 24%, but also the combination of KCmaterno and sucrose does not appear to provide additional benefits in reducing pain.	Maternal KMC appears to remain effective over time and repeated procedures. Kangaroo care seems to be effective in reducing pain compared to oral sucrose for repeated procedures during hospitalization. The combined use of KMC and sucrose does not appear to bring additional benefits
MO Rehman et al., 2020	To measure the impact of intermittent care of the kangaroo mother on the weight gain of neonates in a neonatal intensive care unit.	The subjects were randomized into case and control groups. Intermittent mother-kangaroo care was provided in the case group for seven days. And the control group received what was called conventional care.	In the case group, the average weight gain was greater compared to the control group. The average length of stay in the case group was significantly low compared to the control group. Multivariate analysis determined the effect of kangaroo mother therapy as effective (p <0.0001).	Care with intermittent kangaroo proved to be effective in improving weight gain in neonates, in addition to conventional treatment.

MMC: kangaroo mother method; LBW: low birth weight; N: number; CG: control group; IG: intervention group; KMC: kangaroo mother care; HR: heart rate; FR: respiratory rate; SpO^2: arterial oxygen saturation; GG: glucose group; Newborn: newborn; PP: prone position; PTNB: premature newborn; T: temperature; ICU: intermediate care unit; SCRIP: cardiorespiratory system in premature infants; PIPP: premature infantile pain profile; CI: incubator care; HR: heart rate; HF: high frequency energy; LF: low frequency energy; MBP: very low weight; CMC: conventional medical care ; DD: supine position

Table 3. General data found in studies analyzes n of the use of the premature newborn kangaroo care in hospitals. 2008 - 2020

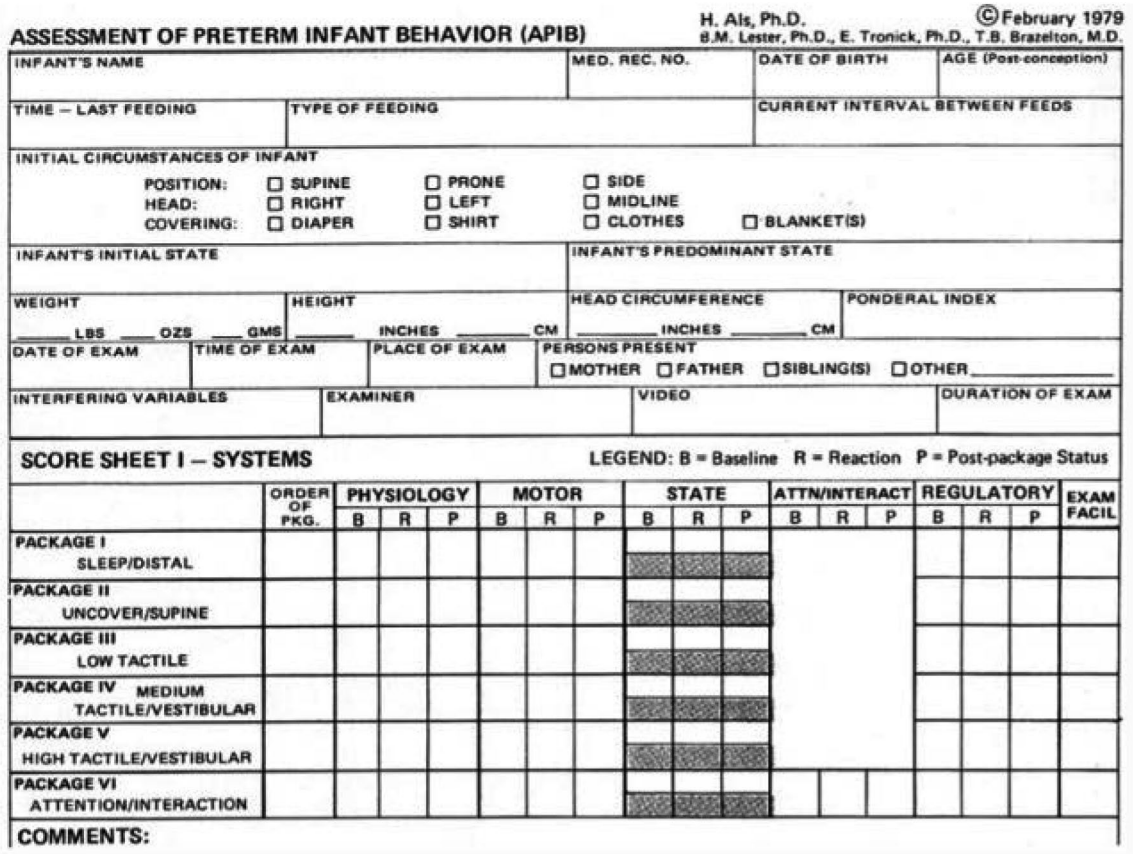
EVALUATED PARAMETER	NUMBER OF STUDIES	NUMBER OF PATIENTS
Vital signs	13	1048
Growth rate	9	1,354
Analgesia	8	5,804
Length of hospital stay	4	573
Sleep	1	70
Hormonal regulation	1	80
Behavioral facilitation and development	1	87

Table 4. Methodological quality according to the PEDro scale

	Criteria *											
Author / Year	**1**	**two**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Total Score**
Freire, Garcia, Lamy, 2008	1	1	1	1	-	-	1	1	1	1	1	8
Johnston et al., 2008	1	1	1	1	1	1	-	1	1	1	1	9
Mwendwa, Musoke, Wamalwa, 2012	1	1	-	1	-	-	-	1	1	1	1	6
Olmedo et al., 2012	1	1	1	1	-	-	-	1	1	1	-	6
Neu; Robinson; Schmiege, 2013	1	1	1	1	-	-	-	1	1	1	1	7
Acharya et al., 2014	1	1	1	1	-	-	-	1	1	1	1	7
Mosayebi et, 2014	1	1	1	1	1	1	-	1	1	1	1	9
Bera et al., 2014	1	1	-	1	-	-	-	1	1	1	1	6
Neu et al., 2014	1	1	-	1	-	-	-	1	1	1	1	6
Gathwala, Singh, Singh, 2014	1	1	1	1	-	-	-	1	1	1	1	7
Luong et al., 2015	1	1	1	1	-	-	-	1	1	1	1	6
Gao et al., 2015	1	1	1	1	-	-	-	1	1	1	1	7
Dehghaniet al., 2016	1	1	1	1	1	1	-	1	1	1	-	7
Gavhane et al., 2016	1	1	1	1	-	-	-	1	1	1	1	7
Dezhdar et al., 2016	1	1	1	1	-	-	-	1	1	1	1	7
Sharma, Murki, Pratap, 2016	1	1	1	1	-	-	-	1	1	1	1	7
Bastani et al., 2017	1	1	1	1	-	-	-	1	1	1	-	6
Aldana Acosta et al., 2018	1	1	1	1	1	-	-	1	1	1	1	8
Shukla et al., 2018	1	1	1	1	1	-	-	1	1	1	1	8
Parsa et al., 2018	1	1	-	1	-	-	-	1	1	1	1	6
M. Campbell-Yeo et al., 2019	1	1	1	1	1	-	1	1	1	1	1	9
MO Rehman et al., 2020	1	1	1	1	1	-	-	1	1	1	1	8

* Criterion 1, referring to eligibility, is not added to the final score. The other criteria are: 2) The subjects were randomly assigned to groups; 3) Blinding distribution; 4) Comparison of the baseline; 5) Blinding of the participants; 6) Blinding of therapists; 7) Blinding of the evaluators; 8) Adequate monitoring; 9) Analysis of intention to treat; 10) Comparisons between groups; 11) Point estimates and variability. Each positive answer is assigned 1 point, with the total ranging from 0 to 10 points.

Figure 2. APIB – Assessment of preterm infant behavior



ASSESSMENT OF PRETERM INFANT BEHAVIOR (APIB)

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INFANT'S NAME | MED. REC. NO. | DATE OF BIRTH | AGE (Post-conception)

TIME – LAST FEEDING | TYPE OF FEEDING | CURRENT INTERVAL BETWEEN FEEDS

INITIAL CIRCUMSTANCES OF INFANT

POSITION: ☐ SUPINE ☐ PRONE ☐ SIDE

HEAD: ☐ RIGHT ☐ LEFT ☐ MIDLINE

COVERING: ☐ DIAPER ☐ SHIRT ☐ CLOTHES ☐ BLANKET(S)

INFANT'S INITIAL STATE | INFANT'S PREDOMINANT STATE

WEIGHT ____ LBS ____ OZS ____ GMS | HEIGHT ____ INCHES ____ CM | HEAD CIRCUMFERENCE ____ INCHES ____ CM | PONDERAL INDEX

DATE OF EXAM | TIME OF EXAM | PLACE OF EXAM | PERSONS PRESENT ☐ MOTHER ☐ FATHER ☐ SIBLING(S) ☐ OTHER ____

INTERFERING VARIABLES | EXAMINER | VIDEO | DURATION OF EXAM

SCORE SHEET I – SYSTEMS

LEGEND: B = Baseline R = Reaction P = Post-package Status

	ORDER OF PKG.	PHYSIOLOGY B	PHYSIOLOGY R	PHYSIOLOGY P	MOTOR B	MOTOR R	MOTOR P	STATE B	STATE R	STATE P	ATTN/INTERACT B	ATTN/INTERACT R	ATTN/INTERACT P	REGULATORY B	REGULATORY R	REGULATORY P	EXAM FACIL
PACKAGE I SLEEP/DISTAL																	
PACKAGE II UNCOVER/SUPINE																	
PACKAGE III LOW TACTILE																	
PACKAGE IV MEDIUM TACTILE/VESTIBULAR																	
PACKAGE V HIGH TACTILE/VESTIBULAR																	
PACKAGE VI ATTENTION/INTERACTION																	

COMMENTS:

APIB - Evaluation of the behavior of premature babies: appropriate for preterm babies, at term and at risk of developmental delays. This focuses on assessing the interactions of subsystems with the environment, which are expressed by the baby's behavior. The six scores of the system (Physiology, Motor, State, Attention / Interaction, Regulation, Examiner Facilitation) range from 1 to 9. Low scores (1 to 3) denote degrees of well-modulated and well-organized behavioral regulation and high scores (7-9) denote a disorganized and poorly modulated behavioral regulation (ALS, DUFFY, MCANULTY, 1988, p.319).

Table 5. Premature Infant Pain Profile (PIPP)

Indicators	0	1	2	3
GA in weeks	≥ 36 weeks	32 to 35 weeks and 6 days	28 to 31 weeks and 6 days	< 28 weeks
Observe the NB for 15sec				
Alertness	Active Awake Opened eyes Facial movements present	Quiet Awake Opened eyes No facial movements	Active Sleep Closed eyes Facial movements present	Quiet Sleeping Closed eyes No facial movements
Record HR and SpO_2				
Maximal HR	↑ 0 to 4 bpm	↑ 5 to 14 bpm	↑ 15 to 24 bpm	↑ ≥ 25 bpm
Minimal Saturation	↓ 0 to 2.4%	↓ 2.5 to 4.9%	↓ 5 to 7.4%	↓ ≥ 7.5%
Observe NB for 30 sec				
Frowned forehead	Absent	Minimal	Moderate	Maximal
Eyes squeezed	Absent	Minimal	Moderate	Maximal
Nasolabial furrow	Absent	Minimal	Moderate	Maximal

Absent is defined as 0 to 9% of the observation time; minimal, 10% to 39% of the time; moderate, 40% to 69% of the time; and maximal as 70% or more of the observation time. In this scale, scores vary from zero to 21 points. Scores equal or lower than 6 indicate absence of pain or minimal pain; scores above 12 indicate the presence of moderate to severe pain.
GA – Gestational Age. NB – Newborn.

PIPP - Premature Pain Profile Scale: it is the most suitable scale for preterm infants because it takes into account the alterations specific to this group of patients. It consists of seven parameters, including gestational age (ranging from less than 28 weeks to over 36 weeks), wakefulness, heart rate, blood oxygen saturation rate and facial expression (frowning, squeezed eyes and nasolabial fold)). Each indicator receives scores between zero and three. For any gestational age, values equal to or less than 6 indicate the absence of pain or the presence of minimal pain and values equal to or greater than 12 indicate the presence of moderate or severe pain (SILVA et al ., 2007, p. 565).

Figura 3. SCRIP – Score rating scale

TABLE 1. SCRIP Score Rating Scale[a]

Variables[b]	Score 2	1	0
Heart rate	Between 120 and 160 BPM Does not exceed 200 BPM	Deceleration between 80 and 100 BPM	Bradycardia <80 BPM Tachycardia >200 BPM
Respiratory rate	Between 30 and 60 BrPM Does not exceed 100 BrPM	Periodic respiratory pauses (apneas <10s, regular breathing <20/s 3 times)	Apnea >10 s or tachypnea >100 RPM
Blood oxygen saturation level (Spo_2), %	Spo_2>85%	Spo_2 period(s) between 85% and 80%	Spo_2 period(s) <80%

Abbreviations: BPM, beats per minute; BrPM, breaths per minute; SCRIP, Stability of the Cardiorespiratory System in Premature Infants.
[a]Adapted from Fischer et al.[41]
[b]Scores attributed every 15 minutes for each variable.

SCRIP - Cardiorespiratory system stability in preterm infants: this score allows the assessment of heart rate, respiratory rate and saturation levels. A score of zero to two points is assigned to each of these parameters and the final scores can range from zero to six. The higher the score, the greater cardiorespiratory stabilization is presented by this patient (BATTIN et al ., 1998, p. 101).

Discussion

The literature refers to some important factors and that influence the discharge of premature newborns. In this study, seven parameters were found among the 22 studies analyzed. They are vital signs, growth rate, analgesia, length of stay, sleep, hormonal regulation, and behavioral facilitation and development. Vital signs were the parameters most observed in the studies, being found in 13 of the 22 studies. These signs are essential for assessing the newborn, especially in the intensive care unit, as they are indicators of his health status.

Dehghani et al.[7], Luong et al.[8], and Parsa et al.[33] compared the kangaroo method with care in the incubator, and the three studies obtained similar results concerning the vital signs of newborns. In the three studies, the intervention group showed an improvement in their vital signs, especially in terms of temperature, arterial saturation rates, and respiratory rate.

Dehghani et al.[7] randomized 53 patients in two groups, with parents being instructed in the intervention group, followed by the method for one hour on three consecutive days, with skin-to-skin contact. Vital signs and saturation were measured five minutes before the procedure, 30 minutes after the beginning, and at the end of the process.

In the study by Luong et al.[8] 100 patients were randomized, and the method was applied for six hours, every day, until discharge. Associated with the method, mothers were instructed to breastfeed for 30 minutes, three and five hours after birth. Vital signs were measured continuously throughout the procedure.

In the study by Parsa et al.[33], 100 patients were randomly divided into two groups, experimental and control. In the experimental group, the position of the kangaroo method was performed for one hour for seven days, and the physiological indicators were recorded 15 minutes before the intervention, 15 minutes after the start of the intervention, and after the conclusion of the position. These records are being held on the first, third, fifth, and seventh day of the intervention.

In the three studies, the mean temperature increased in the intervention group compared to the control group, as did arterial oxygen saturation, in addition to cardiovascular and respiratory stability. In the study by Luong et al.[8] cardiorespiratory stability was assessed by scoring the stability scale of the cardiorespiratory system in preterm infants (SCRIP). The results of both studies corroborate Bergman's finding; Linley; Fawcus[9]. Do not study by Bergman; Linley; Fawcus[9] observed that individuals who underwent the kangaroo method had a significantly higher mean in the SCRIP scores, in addition to remaining more stable over the time of application of the method.

However, in the study by Olmedo et al.[10] the physiological responses between the kangaroo method and the prone position were evaluated and compared, no changes were observed in respiratory rate, heart rate, temperature and arterial oxygen saturation, in any of the groups studied, in relation to the initial data, nor when compared variables between groups. These divergent results compared to the other studies included in this review can be justified by the adoption of a different methodology. In the study by Olmedo et al.[10], there was no guidance or supervision for parents, which does not give us certainty regarding the implementation of the method proposed in the study, in addition to one of the inclusion criteria being the hemodynamic stability of newborns.

Another fundamental parameter that can decrease the length of hospitalization of newborns is the growth rates. The kangaroo method was compared with the so-called "conventional care" by five studies, and it was found that the group that performed the intervention obtained significantly higher results regarding weight gain, length, head circumference, chest and arm[11-14,34]. In the study by Mwendwa; Musoke; Wamalwa[11] during the first session the mothers were instructed to perform the method correctly, and all were supervised during the sessions, which lasted eight hours a day. Weight was assessed three times a week, while perimeters were assessed once.

In the study by Acharya et al.[12], 126 newborns were randomized and mothers were instructed. The position was performed for at least six hours a day. The weighing was performed twice a day, as the length and head circumference was evaluated at admission and discharge from the patients. In the study by Gathwala, Singh, Singh[13], patients in the intervention group performed a minimum of six hours a day in the kangaroo position. The babies were monitored for weight gain, length, and head circumference. Weight was recorded daily; length and head circumference were recorded weekly.

While in the study by Bera et al.[14] 500 newborns were randomized, in which the mothers of the intervention group received guidance and demonstrations on breastfeeding and on the method. On the first day, the kangaroo position was performed for one hour, on the second day for two hours and on the third day for three hours, and they were also instructed to continue to perform the position even after discharge. In the study by Rehman et al.[34], 140 patients were randomized into an intervention and control group . In the intervention group, the mothers performed the position of the method for one hour every four hours for seven days. In these five studies, higher growth rates were obtained in the group that performed the kangaroo method, mainly in weight gain.

In addition to the studies found comparing the kangaroo method entitled "conventional care", Acosta et al.[35], Comp plowed the evaluation of the initial growth of preterm infants receiving kinesthetic stimulation or posiçãocanguru incubator. 66 NBs were randomized, where the kangaroo position group performed kinesthetic stimulation in the prone position on the mother or father's chest in the kangaroo position. It was seen that the daily weight gain was significantly greater with the kinesthetic stimulation in the kangaroo position than in the incubator group.

These results corroborate the findings by Souza et al.[15] who stated that skin-to-skin contact leads to greater weight and length gain in these newborns, with a significant difference in relation to the group that did not perform the method.

However, in Sharma's studies; Murki; Pratap[16] and Gavhane; Eklare; Mohammad[17], the authors compared the kangaroo method with care in the incubator. Both studies obtained similar results in relation to the growth rates. The two studies cited, show that the kangaroo method does not differ significantly from care in the incubator. Sharma; Murki; Pratap[16] randomized 139 patients, in which mothers were encouraged to perform the method position as long as possible, ensuring a minimum of six hours a day. They also evaluated weight, from randomization until the newborn completed 40 weeks of corrected age, length and perimeter were evaluated once a week.

Gavhane, Eklare e Mohammad[17] randomized 91 patients, in which mothers allocated to the kangaroo method group were encouraged to perform the method position for a minimum of eight hours a day. All assessments were made and recorded over a period of six to twelve months. It is believed that these divergent results in both studies, when compared to those present in this review, were due to the applied methodology. In Sharma, Murki e Pratap[16] study the control group also performed the kangaroo method, making it impossible to compare the method and conventional care. In the study by Gavhane, Eklare e Mohammad[17] the control group did not make skin-to-skin contact, but mothers were instructed to massage and hold the newborns in their arms for as long as possible, which may have interfered with the results of the study.

The third most observed parameter in this review is the assessment of pain in newborns, who suffer repeated painful procedures that can lead to changes in neurobehavioral, motor and cognitive decline. In addition, changes at the brain level, which can generate an increase in hospital stay[18]. In the studies by Johnston et al.[19], Mosayebi et al.[20], Gao et al.[21] compared the effectiveness of the kangaroo method with care in the incubator. Johnston et al.[19] randomized 61 patients and the newborns allocated to the intervention group performed a heel puncture 15 minutes after starting the method. While in the study by Mosayebi et al.[20] 64 patients were randomized and initially the intervention group performed the position of the method that started 15 minutes before the heel puncture and later that same group was allocated to the control group where the newborns remained in the incubator during the puncture.

In the study, Gao et al.[21], 80 newborns were randomized and the mothers were allocated to the intervention group, started the position of the kangaroo method 30 minutes before the puncture procedure and were instructed by the unit's nurses.

In the three studies, pain was assessed using the PrematureInfantPain Profile (PIPP), Premature Newborn Pain Profile Scale, and in all studies, the average pain intensity score during the intervention was significantly lower in the group that performed the position of the kangaroo method, mainly in the 90 seconds after starting the puncture.

The findings of the three studies corroborate the result found by Akcan, Yiğit e Atıcı[22], who evaluated and recorded physiological responses to pain through PIPP and found that the position of the kangaroo method starting 30 minutes before and continuing 10 minutes after an invasive procedure has a positive effect on decreasing pain. These effects were observed during and after a painful procedure in premature infants, since the premature infant pain scores were significantly lower in each measurement during, or shortly after the invasive procedure in infants in the intervention group, when compared to the control group.

Freire; Garcia; Lamy[23], Dezhdar et al.[24], Campbell-Yeo et al.[36] and Shuklaet al.[37] also evaluated the pain of newborns during the kangaroo method. However, Freire, Garcia e Lamy[23], Campbell-Yeo et al.[36] and Shukla et al.[37] compared the effect of the method with the use of oral glucose. In Freire's study, Garcia e Lamy[23] randomized 95 preterm infants into three groups, one group remained in the incubator during the painful procedure, another group performed the position of the KMC, and the third group received oral glucose. Regarding the physiological parameters, a significant difference was observed between the groups, where better parameters were seen in the group that performed the position of the kangaroo method, as well as in the results obtained through the PIPP.

In the study by Campbell-Yeo et al.[36], the 5,242 newborns were randomized into three groups. The first performed the position of the kangaroo method associated with water, the second group performed the position of the kangaroo method associated with oral glucose while the third group performed only the use of oral glucose. The results of the study demonstrated that not only does the position of the method provide pain-reducing effects, but these effects remain long-term compared to the other groups, but also the combination of the position of the method and sucrose does not appear to provide additional benefits in reducing pain.

However, in the study by Shuklaet al.[37] 100 newborns were randomized into two groups, one performed the position of the kangaroo method and the other the use of oral glucose. In both groups the intervention, both the position of the method as glucose, were started are at least 10 minutes before the painful procedure and continued for the entire performance of the procedure. It was observed that the PIPP scores associated with heart rate, eyebrow bulge, eye compression and nasolabial fold were lower in the group that performed the position, however it did not reach a statistically significant difference. This lack of statistical difference is justified since the gestational age and the scores related to the behavioral state were higher in the group that performed the position of the method compared to the oral glucose group.

However, these results are not in agreement with those obtained in the study by Chermont et al.[25], where 640 patients were randomized and evaluated the analgesic effect on the position of the kangaroo method in comparison to the use of Dextrose. The patients were divided into four groups, the first remained in the incubator, the second underwent oral treatment with 25% dextrose, the third group performed the method position and the fourth a combination of oral dextrose treatment with skin-to-skin contact, in the position of the method. It was found that the non-pharmacological analgesic measures were effective for the treatment of pain during the procedure, however, the combination of oral treatment, with 25% dextrose and skin-to-skin contact in the position of the kangaroo method obtained significantly better results than other groups.

These divergent results in the study by Chermont et al. 26 compared to Freire's study; Garcia; Lamy[23], Campbell-Yeo et al.[36] and Shukla et al.[37] can be justified by the adoption of a different methodology, since in Freire's study; Garcia; Lamy[23] term newborns were used and, in addition, the position of the method was performed only for two minutes before performing the painful procedure.

Dezhdar et al.[24] evaluated the analgesic effect on the position of the kangaroo method compared to keeping the newborn wrapped in a blanket and leaving it in the incubator. They randomized 90 premature newborns and divided into three groups. One group remained surrounded by a blanket in the incubator, the second group held the position of the method and the third group only remained in the incubator. It was seen that the group that practiced the position of the kangaroo method and the one that remained wrapped in a blanket in the incubator obtained significantly better results than the control group, however there were no significant differences between the group that performed the position of the kangaroo method and what remained wrapped in a blanket.

This result found by Dezhdar et al.[24] diverges from what we found in the study by Riddell et al.[26], where it was observed that containing the newborn with the aid of a blanket can help inhibit pain, but it cannot be considered more effective than the position of the CM. In this study[26], the position was performed only 10 minutes before the procedure and remained only two minutes after the puncture was performed, which may justify these divergent results. In addition, most studies included in the review refer to heel puncture. In the study by Dezhdar et al.[24] the procedure performed on newborns was venipuncture, which may have contributed to the divergence between the results.

Mwendwa, Musoke e Wamalwa[11] also evaluated the length of hospital stay, in addition to the growth rate of newborns as described above, the authors observed that the length of hospital stay was shorter in two days in the group that performed the kangaroo method than in the control group. When comparing the length of hospital stay intragroup stratified by birth weight, children submitted to the kangaroo

method had a significantly shorter duration of hospital stay, reducing by five days. These results are in agreement with the finding by Ramanathan et al.[27] who saw that, individuals who were submitted to the MC position, reduced the hospital stay time by seven days and were discharged early.

In Sharma's studies; Murki; Pratap[16] and Acharya et al.[12] one of the items evaluated was the length of hospital stay, where the findings did not corroborate with the studies already seen in this review. Sharma, Murki e Pratap[16] found that there was no significant reduction in the length of hospital stay. This result can be justified by the fact that the mothers of both groups, held the position of the kangaroo method, which may have influenced the results. Acharya et al.[12] shows in his study that hospital stay was shorter in the control group than in the group that performed the method position, this can be justified by the heterogeneity between the groups, especially in relation to weight.

Other factors, such as sleep and the behavioral facilitation of PTNB, were found in this review as influencing the length of hospital stay. Bastani et al.[28] randomized 70 patients, and compared the position of the kangaroo method with what they called “arm restraint”, which would be the newborn to remain in the mother's lap. Sleep was assessed through the New born Individualized Developmental Care and Assessment Program (NIDCAP)[a], the Care and Individualized Assessment of the newborn that requires observation of children for 20 minutes before and after the intervention. The intervention period lasted 70 minutes after completion. The infants were returned to their incubators, placed in a supine position and observed again for 20 minutes. In this study it was seen that the position of the kangaroo method significantly increases the states of deep sleep and while awake, they remain active and peaceful, in addition to significantly decreasing the states of light sleep and drowsiness compared to the control group.

Neu, Robinson e Schmiege 30 evaluated that the position of the method facilitates early behavioral organization and assists in the development of newborns. 87 newborns were randomized into three groups, the first of which held the position of the kangaroo method, the second group remained contained by a blanket in the mother's arms and the third remained in the incubator. Behavioral organization was assessed through the assessment of preterm child behavior (APIB). The mothers randomized in the first and second groups were encouraged to perform a minimum of one hour a day for eight weeks. The authors found that infants who performed the position of the kangaroo method and those who remained on the mother's lap had better scores than those who remained in the incubator and the APIB score was similar in patients who were born at term.

The results of both studies corroborate Ferber's findings; Makhoul[30], who evaluated the neurobehavioral responses of premature newborns. During an hour-long observation, starting at 4 hours after birth, newborns who performed the kangaroo position slept more, were in a calmer state of sleep, exhibited more movement and flexing postures and showed less extensor movement.

Neu et al.[31] evaluated whether the position of the kangaroo method facilitates the co-regulation of salivary cortisol, reducing the stress level of these newborns. 79 preterm infants were randomized into three groups, where one group performed the position of the method, the second remained contained by a blanket in the mother's arms and the third remained in the incubator. The interventions of each group lasted 60 minutes for eight weeks and the mothers allocated to the group in the position of the kangaroo method were instructed on the method. It was seen that maternal and infantile cortisol levels decreased during the interventions; however, they did not vary between the groups of the position of the kangaroo method and those who remained in the mother's arms. The lack of statistically significant differences between the groups can be explained,

[a] NIDCAP - Program for Assessment and Individualized Care for the Development of the Neonate: The approach focuses on a detailed reading of the individual behavioral signs of each baby. The environment and care are adapted in order to highlight the positive points of each baby and their self-regulation, through collaboration between the baby and his parents, who are primarily responsible for the daily care of the newborn and help him to build The aim of NIDCAP is to avoid unexpected sensory loads and pain, and to emphasize the positive aspects and skills of the newborn. This program adapts intensive medical care and the environment to the individuality of each child's neurodevelopment, thus responding to their clinical and developmental needs (ALS H, 1986).

since the mothers of the intervention groups, with the exception of the control group, were all encouraged to perform the method position.

These results are consistent with the finding by Mitchell et al.[32], who state that the position of the kangaroo method did not affect the levels of salivary cortisol in premature newborns. These divergent results can be justified by the different methodology applied, since in the study by Mitchell et al.[32] cortisol was evaluated after five days of starting the method position. In the study by Neu et al.[31] newborns were followed up and evaluated after eight weeks.

It is observed in this study, that despite all the factors described contribute to high newborns, few studies correlacion am directly to the hospital stay. In addition, there is a lack of standardization regarding the position of the method and its time of application. Therefore, there is a need for more controlled, randomized, blind studies with greater statistical power, in order to elucidate in a more conscious and specific way, the impact of the position of the kangaroo method on the length of hospitalization of hospital units, clarifying its form of execution.

Conclusion

Based on most of the articles included in this review, it is concluded that the use of the position of the kangaroo method improves the condition of premature newborns, consequently decreases the length of hospital stay and brings significant results. It was seen that the position of the method contributed to the improvement of vital signs, pain and growth rates, while improving the stabilization of these patients.

It can be seen from this study that, despite all the factors described, will contribute to the discharge of newborns, few studies correlate specifically with the length of hospital stay.

In addition, there is a lack of standardization regarding the position of the method and its time of application. Therefore, there is a need for more controlled, randomized, blind studies with greater statistical power, in order to elucidate in a more conscious and specific way, the impact of the position of the kangaroo method on the length of hospitalization of hospital units, clarifying its form of execution.

Author contributions

Both authors participated in all stages, from conception to writing the article.

Competing interests

No financial, legal or political conflicts involving third parties (government, companies and private foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to, grants and funding, participation in advisory council, study design, preparation of manuscript, statistical analysis, etc.).

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