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INTEGRATIVE LITERATURE REVIEW

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Benefits of the Kangaroo Method: An Integrative Literature Review

Benefícios do Método Canguru: Uma Revisão Integrativa

Método Benefícios Canguro: Una Revisión Integradora

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ABSTRACT

Objective: This study aims to identify existing research in the literature that addresses the benefits of the kangaroo mother care. **Methods:** This is an integrative review of the literature. The search in MEDLINE, LILACS, BDNF and SCIELO databases were performed using the descriptors: “kangaroo mother care”, “benefit” and “low birth weight” obeying the six steps of the method considering the inclusion criteria. **Results:** Initially, 385 articles were found in the databases, and 19 of them were selected. The benefits of the kangaroo mother care to newborns were addressed in 58% of the selected papers, 16% discussed the benefits for the mother and newborn relationship and 16% analyzed the benefits of the method for the medical institution. **Conclusion:** The kangaroo mother care brings benefits to the medical institution, mothers, and newborns. The need for further studies evaluating other benefits of the kangaroo as a standard health care method is here emphasized aiming to expand this health technology that goes beyond physiological needs.

Descriptors: Kangaroo Mother Care, Newborn, Low Weight.

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RESUMO

Objetivo: Identificar pesquisas existentes na literatura que abordem os benefícios do método canguru. **Método:** Trata-se de uma revisão integrativa da literatura. As buscas nas bases de dados MEDLINE, LILACS, BDNF e SCIELO foram realizadas utilizando os descritores: “método canguru”, “benefício” e “recém-nascido de baixo peso” obedecendo as seis etapas do método considerando os critérios de inclusão. **Resultados:** Inicialmente foram encontrados 385 artigos nas bases de dados após seleção restaram 19. Do total de artigos analisados 58% abordaram os benefícios no método canguru para o recém-nascido, 16% discutiram os benefícios para a relação mãe e recém-nascido e 16% analisaram os benefícios do método para a instituição. **Conclusão:** Pode-se perceber que o Método Canguru traz benefícios para instituição, mãe e recém-nascido. Destaca-se a necessidade de novos estudos que avaliem outros benefícios do método canguru como padrão de cuidados a fim de expandir essa tecnologia em saúde que vai além das necessidades fisiológicas.

Descritores: Método Canguru, Recém-Nascido, Baixo Peso.

RESUMEN

Objetivo: Identificar investigaciones existentes en la literatura que aborden los beneficios del método canguro. **Método:** Se trata de una revisión integrativa de la literatura. Las investigaciones en las bases de datos MEDLINE, LILACS, BDNF y SCIELO se realizaron utilizando los descriptores: “método canguro”, “beneficio” y “recién nacido de bajo peso” obedeciendo las seis etapas del método considerando los criterios de inclusión. los **Resultados:** Obtenidos en las bases de datos después de la selección quedaron 19. Del total de artículos analizados 58% abordaron los beneficios en el método canguro para el recién nacido, el 16% discutieron los beneficios para la relación madre y recién nacido y 16 % analizaron los beneficios del método para la institución. **Conclusión:** Se puede percibir que el Método Canguru trae beneficios para institución, madre y recién nacido. Se destaca la necesidad de nuevos estudios que evalúen otros beneficios del método canguro como patrón de cuidados a fin de expandir esa tecnología en salud que va más allá de las necesidades fisiológicas.

Descritores: Método Canguro, Recién Nacido, Bajo Peso.

INTRODUCTION

Twenty million premature low-weight newborns (under 2.5 kg) born annually worldwide. A third of them die before reaching one year of life. The Kangaroo Mother Care (KMC) - Humanized Attention to Low-Weight Newborn - is a strategy that seeks to change this reality.^{1,2} KMC is a type of care provided to low-weight newborns by placing them in a ventral position, vertical against the mother's chest. This skin-to-skin contact promotes thermal stability, stimulates breastfeeding, increases the bond between mother and child, and decreases the need to use incubators. It was created in 1979 by Héctor Martínez and Edgar Rey Sandria, in Colombia, in order to reduce the overcrowding of neonatal units.³

This is a government policy regulated by the Health Ministry through Ordinance No. 693 of July 5th, 2000, and updated by Ordinance No. 1683, of July 12th, 2007.⁴

One of the pillars of the KMC is the breastfeeding stimulation: the daily milk production is higher in mothers

who perform skin-to-skin contact with their newborns in addition to maintaining the breastfeeding practice for longer periods.

The KMC has three stages: the first step happens after the birth of a low-weight baby in the Neonatal Intensive Care Unit (NICU): the mother receives all the information about the health condition of her baby, the routines and the functioning of the NICU and how to start skin-to-skin contact with the baby. The second stage occurs when the newborn is already in a stable health condition and starts to gain weight. At this moment the newborn is transferred from the NICU to a joint accommodation and the KMC is introduced (this is considered the pre-hospital discharge period). And the third stage corresponds to the period in which the baby is discharged and the mother continues to apply the KMC at home. During this state, the baby still should be periodically followed up until reaching 2,500 g.⁶

Mother and baby are benefited by KMC and the formation of affective bonds is concordant in the existence of a sensitive period, which is significant for the experience of attachment.⁷ Early skin-to-skin contact between mother and baby helps to control thermal temperature, encourages breastfeeding, and increases the effective bond between mother and child.⁷

The KMC does not require the use of equipment. The costs of caring for premature infants of the Kangaroo Mother Program are considerably low with the increase of the care provided to the baby beyond its biological needs.⁸

Given this context, the following guiding question appeared: “What are the KMC benefits already described in the literature?” Hence, this study's objective has been to provide scientific knowledge regarding the KMC for categorically detailing its benefits.

METHODS

This is an integrative review of the literature, which allows the synthesis of several studies already published and allows the obtaining of general conclusions regarding a particular research field. The following steps were followed: a) Delimitation of the guiding question; b) Establishment of inclusion and exclusion criteria; c) Search and selection of publications in databases; d) Categorization of the selected publications; e) Analysis and interpretation of results; f) Synthesis of the study.

Therefore, the following guiding questions were sought to be answered: “What are the KMC benefits to the mother and her baby?” and “What are the KMC benefits for the institution?”. The search in the literature was conducted from November 02nd to 17th, 2016, in the research site of the Virtual Health Library (VHL) using the keywords: “benefit”, “kangaroo mother care” and “low-weight newborn”. The databases used were: Scientific Electronic Library Online (SCIELO), *Literatura Científica e Técnica da*

América Latina e Caribe (LILACS) [Technical and Scientific Literature of Latin America and the Caribbean], National Library of Medicine (MEDLINE), and Base de *Dados em Enfermagem (BDENF)* [Nursing Database].

The selection of publications respected the inclusion criteria, corresponding to studies published between 2006 to 2016 in Portuguese and English. The exclusion criteria used were: non-free articles that were not in full, articles in other languages other than Portuguese or English, and studies that do not belong to the subject of this work.

The articles were further filtered by title and abstract, followed by careful reading and analysis of the selected studies. The articles were presented in tables and ordered according to the following examples: study 1 (S1), study 2 (S2), etc. All selected articles participated in this review.

Table 1 – Selection of publications from the databases.

Publications	BDENF	LILACS	MEDLINE	SCIELO	Total
Found	30	74	187	54	345
Excluded for not being free	00	03	73	00	76
Excluded for not being in full	04	61	89	15	169
Excluded because they are repeated in another	26	01	16	38	81

Source: research data, 2017.

RESULTS AND DISCUSSION

A total of 345 articles were found, most of them belonging to the MEDLINE database. At the end of the filtering process, 19 studies were selected and maintained as participants of this review. Nonetheless, regarding the year of publication, different dates were found: two in 2006, one in 2007, one in 2009, one in 2010, two in 2011, three in 2012, five in 2013, three in 2014, and in 2015.

We have also identified publication sites from different countries: Brazil (10), England (03), United States of America (02), Italy (01), Netherlands (01), Pakistan (01), and Kenya (01). **Table 2** shows the journals to which the studies were submitted.

Table 2 – Selected articles classified by study (represented by letter “S”), study type, journal, location, and year of publication.

S	Study type	Journal	Location/Year
S1	Long-term prospective cohort study	<i>Caderno de Saúde Pública</i>	Rio de Janeiro, Rio de Janeiro State, Brazil. 2013
S2	Long-term cohort study	<i>Revista de Saúde Pública</i>	São Paulo, São Paulo State, Brazil. 2013
S3	Descriptive and exploratory study	<i>Revista Latino Americana de Enfermagem</i>	Ribeirão Preto, São Paulo State, Brazil. 2012
S4	Prospective cohort study	<i>Revista Brasileira de Saúde Infantil</i>	Recife, Pernambuco State, Brazil. 2012
S5	Quasi-experimental study	<i>Revista Brasileira de Materno Infantil</i>	Recife, Pernambuco State, Brazil. 2011
S6	Prospective study	<i>Jornal de Pediatría</i>	Porto Alegre, Rio Grande do Sul State, Brazil. 2010
S7	Qualitative research	<i>Psicologia em Estudo</i>	Maringá, Paraná State, Brazil. 2009
S8	Quantitative descriptive research	<i>Jornal de Pediatría</i>	Rio de Janeiro, Rio de Janeiro State, Brazil. 2006
S9	Quantitative descriptive research	<i>Revista Brasileira de Fisioterapia</i>	São Carlos, SP, Brazil. 2007
S10	Randomized clinical trial	<i>BMC Pregnancy and Childbirth</i>	Rockville Pike, Bethesda, United States of America. 2015
S11	Randomized clinical trial	<i>BMC Pediatrics</i>	London, Great Britain. 2013
S12	Randomized clinical trial	<i>BMC Pediatrics</i>	London, Great Britain. 2013

S13	Prospective, pre-post test without control group study	<i>Italian Journal of Pediatrics</i>	Italy. 2014
S14	Randomized Control Assay	<i>Early Human Development</i>	Amsterdam, Netherlands. 2014
S15	A cohort study	<i>BMJ Open</i>	London, Great Britain. 2014
S16	Randomized trial	<i>The American journal of maternal/child nursing</i>	Nova York, United States of America. 2013
S17	Clinical, non-blind, randomized controlled trial	<i>Middle East African Journal of Ophthalmology</i>	Nairobi, Kenya. 2012
S18	Randomized and controlled study.	<i>Journal of the College of Physicians & Surgeons Pakistan</i>	Karachi, Pakistani. 2011
S19	Descriptive study	<i>Jornal de Pediatría</i>	Porto Alegre, Rio Grande do Sul State, Brazil. 2006

Source: research data, 2017.

The publications found were divided into three categories: benefit of the KMC for the medical institution, for the newborn and for the mother-newborn dyad.

Table 3 presents benefits of the KMC for the medical institution, selected according to study (S), title, objectives, as well as presenting the results in a broad way. The financial impact of the KMC in the health care network, hospitalization time, and the comparison of costs between health care units were evaluated in 16% of the studies.

Table 3 – Benefits of KMC for the medical institution according to study (S), title, objective, and results.

Benefits of KMC for the medical institution			
S	Title	Objective	Results
S1	Cost analysis of hospital care for newborns at risk: a comparison between a Conventional Intermediate Unit and a Kangaroo Unit.	To carry out a comparative analysis of the cost of the Kangaroo Unit and the Conventional Intermediate Unit and a Kangaroo Unit.	The daily cost was R\$ 343.53 for the second stage of the Kangaroo Unit and R\$ 394.22 for the Conventional Intermediate Unit. The cost for the hypothetical cohort was R\$ 5,710,281.66 for assistance in the 2nd and 3rd stages of the Kangaroo Unit, and R\$ 7,199,865.61 for the Conventional Intermediate Unit. The Conventional Intermediate Unit presented costs 25% higher than those of the Kangaroo Unit.
S2	The financial impact of the use of the kangaroo mother care in neonatal care.	To estimate the financial impact of the use of the kangaroo mother care in the municipal health network.	The use of the kangaroo mother care should decrease the costs by 16% in one year if all eligible newborns were assisted by this method.
S17	Impact of partial kangaroo mother care on growth rates and duration of hospital stay of low birth weight infants at the Kenyatta national hospital, Nairobi.	To determine the effect of the partial kangaroo mother care on the growth rates and length of hospitalization period of low-weight newborns.	Low-weight newborns in this cohort achieved growth rates within the recommended intrauterine growth, but infants given the partial kangaroo mother care grew faster and therefore were discharged earlier.

Source: research data, 2017.

The benefits of the KMC for the newborn were highlighted in 58% of the articles analyzed.

Table 4 classifies the studies related to the benefits of the KMC for newborns, selected according to study (S), title, and objectives. To evaluate the KMC benefits to the baby, the following variable were considered: electromyographic activity, heart, and respiratory rate, mean arterial pressure, temperature and peripheral oxygen saturation. Some studies have analyzed behavioral status including early behavioral organization and development in addition to the impact on breastfeeding.

Table 4 – Benefits of the KMC for newborns according to study (S), title, and results.

Benefits of the KMC for newborns			
S	Title	Objective	Results
S4	Electromyographic activity of the brachial biceps muscle of preterm newborns submitted to	To evaluate the profile of electromyographic activity of the brachial biceps muscle of preterm newborns	The electromyographic activity differed statistically among the intervals [F (3,67) = 6.01, p = 0.005], and only after 48 h of

	the kangaroo position.	before receiving KMC and up to 48 hours after receiving it.	receiving KMC it was higher.
S5	Kangaroo mother care in preterm newborns under ventilatory support: evaluation of behavioral states.	To describe the behavioral states of newborns before, during, and after receiving KMC.	Sleep was favored, mainly deep sleep (52.3%), when compared to the periods before (6.8%) and after (13.6%) receiving KMC.
S6	Impact of the kangaroo mother care on exclusive breastfeeding rates in low-weight newborns.	To evaluate the impact of KMC on exclusive breastfeeding in the first six months of life.	The exclusive rates of breastfeeding were higher in the group that received KMC at hospital discharge (82.6 vs. 0%, p = 0.00) and at 6 months (22.7 vs. 5.9%, p = 0.20).
S8	The relationship between preterm positioning in the kangaroo mother care and early neuropsychomotor development.	To analyze premature newborns in ventral and lateral decubitus while receiving KMC.	Babies in lateral decubitus showed greater bending and a more torqued trunk posture. Thirteen of the 16 items evaluated by the Dubowitz exam were improved.
S9	Effects of the kangaroo mother care on the vital signs of low birth weight preterm newborns.	To evaluate the heart and respiratory rate, mean arterial pressure, temperature and peripheral oxygen saturation of preterm newborns.	The results did not show significant changes in mean arterial pressure and heart rate (p > 0.05) after the application of kangaroo mother care; on the other hand, there was a significant increase in axillary temperature (peripheral oxygen saturation (p < 0.05) and decreased respiratory rate (p < 0.05).
S10	Effect of maternal skin-to-skin contact on decolonization of Methicillin-Oxacillin-Resistant Staphylococcus in neonatal intensive care units: a randomized controlled trial.	To determine if the skin-to-skin contact of colonized newborns with their mothers could be an effective alternative to promote bacterial decolonization of nostrils.	The contact remained strongly associated to the decolonization of the MRSA/MRSA bacteria (p = 0.007) from the newborn's nostrils. There was no need to interrupt the trial due to security reasons.
S11	Effect of the kangaroo position on the electromyographic activity of preterm children: a follow-up study.	To evaluate the effect of KMC on the electromyographic activity of premature infants.	Correlations between corrected age and values for electromyographic activity did not show statistical significance.
S12	The trial of repeated analgesia with Kangaroo Mother Care (TRAKC Trial).	To examine the efficacy of KMC during hospitalization in the Neonatal Intensive Care Unit (NICU) for all painful procedures.	KMC is expected to be a preferred standard of care. The results will have important implications for the guidelines and practices related to pain management.
S13	Impact of kangaroo mother care on cerebral blood flow of preterm infants.	To assess changes in cerebral blood flow (CBF) in stable preterm infants.	KMC improves cerebral blood flow.
S15	Electromyographic activity of preterm newborns in the kangaroo position: a cohort study.	To compare the electromyographic activity of preterm newborns receiving KMC with the activity of those not receiving it.	KMC increases the electromyographic activity in the brachial biceps of the preterm newborns and those who reached the equivalent age be considered a full-term infant.
S16	Influence of holding practice on preterm infant development.	To determine whether maintaining the KMC practice during the first 8 weeks of the child's life facilitates early behavioral organization and development.	KMC provides early behavioral organization and developmental benefits to the infant.
S19	A descriptive study of the clinical-nutritional profile and the outpatient follow-up of preterm newborns seen in the Mother Kangaroo Program.	To describe the profile of preterm newborns who participated in the Mother Kangaroo Program.	The Mother Kangaroo Program has proved to be an instrument that facilitates breastfeeding.

Source: research data, 2017.

Some studies show the KMC benefits for the mother and newborn relationship. The mothers' stress and the co-regulation of salivary cortisol between mother and baby were the parameters evaluated to relate pain and premature stress response.

Table 5 classifies the studies related to the KMC benefits to the mother and her newborn, selected according to study (S), title, and objectives. The KMC benefits for the connection between mother and premature newborn were identified in 16% of the analyzed articles, highlighting the strengthening of this dyad by KMC.

Table 5 – Benefits of KMC for mothers and their newborns according to study (S), title, objective and results.

Benefits of KMC for mothers and their newborns			
S	Title	Objective	Results

S3	Maternal factors influence the response to pain and stress of newborns receiving KMC.	To investigate the association between maternal factors and premature response.	The ability of mothers to regulate their own stress contributed to the pain and stress response of newborns.
S7	Mother Kangaroo Program and the mother-baby relationship: a qualitative study in the public network of the municipality of Betim.	To investigate the effects of KMC on the relationship between mother and premature baby.	The Mother Kangaroo Program effectively enables the mother-preterm infant connection, strengthening it.
S14	Effect of holding on co-regulation in preterm infants: a randomized controlled trial.	To determine if applying KMC on healthy preterm infants during their first eight weeks facilitates the co-regulation of salivary cortisol between them and their mother.	Co-regulation was conceptualized as a progressive reduction in the absolute difference between maternal and infant cortisol levels in 60 min of waiting in each waiting session. Maternal and infant cortisol levels were measured before the waiting and at 30 and 60 min of waiting.

Source: research data, 2017.

The effectiveness of KMC was confirmed by the publications analyzed. However, some of them used validated questionnaires and scales, which allows some biases.

The selected publications presented the analysis of the KMC effectiveness with regard to different types of benefits. Those related to the reduction of the pain and stress of low-weight infants undergoing painful procedures, shortening of hospitalization time, reduction of the costs of human and material resources, increased prevalence of exclusive breastfeeding, an increase of motor activity, and regulation of physiological parameters were highlighted.

It is possible to observe a comparative cost analysis in S1 using a decision model (decision tree) that presents outcomes and costs related to the 2nd and 3rd stages of the Kangaroo Unit and the Conventional Intermediate Unit. The newborns advanced to the second stage met the following criteria: clinical stability, weight >1,250 g, complete enteral nutrition, and stay in the ambient air without apnea requiring oxygen resuscitation and positive pressure for the last five days. Capital costs and human resources were quantified. The costs of the 2nd and 3rd stages of the Kangaroo Unit together were R\$ 5,710,281.66 and those of the Conventional Intermediate Unit were R\$ 7,199,865.61.9

When comparing the costs of a Kangaroo Unit relative to the 2nd and 3rd stages and the costs of the Conventional Intermediate Unit, it was observed that the daily cost in the second stage of the KMC presented a 13% lower value in relation to the Intermediate Unit. The results show that the adoption of the KMC in clinically stable newborns generates savings for the health system.¹⁰

In a study that aimed to investigate the association between maternal factors (behavior, depression, stress, and/or anxiety) and the response to pain and stress of newborns undergoing calcaneal puncture for neonatal screening while receiving KMC, the following neonatal variables were evaluated in a sample composed of 42 mother-newborn pairs: facial mimics, sleep and wakefulness, crying, serum and salivary cortisol. Furthermore, the studied maternal variables were: behavior, salivary cortisol, and depression and/or anxiety. The results showed that the KMC might have

mitigated the negative effect of depression and anxiety on the response and regulation of the newborn. The prevalence of postpartum depression in mothers who performed KMC during the hospitalization of their child in a neonatal unit decreased by 37.3% at admission and 16.9% at hospital discharge.¹¹

The publications S4, S11, and S15 analyzed the brachial biceps muscle activity of preterm newborns before and after receiving KMC by placing adhesive electrodes and transmitting data through electromyograph equipment. The biceps brachii is a biarticular muscle, having the combination of elbow flexion and shoulder extension as a mechanical advantage for elbow flexor force production since the maximum force of a muscle is greater when the contraction velocity is close to zero.¹² These studies showed that psychomotor and sensory stimuli improve the motor performance of the preterm newborn.

When assessing 20 preterm newborns with gestational age between 27 and 34 weeks and clinical stability at three moments (immediately before (0h) receiving KMC, and then after 24 and 48 h of receiving it every day at the same time, the results showed an increase in electromyographic activity in the biceps brachii after 48 h.¹³

Another study, which evaluated 30 newborns with gestational age between 27 and 34 weeks and weighing between 1407.3 g and 1432.1 g, the electromyographic readings were taken immediately before (0 h) and after 24 h, 48 h, 72 h, and 96 h of the application of KMC. After 96 h of stimulation, the results showed a significant increase in the electromyographic activity of the biceps brachii of the newborns that received KMC.¹⁴

The daily monitoring of the preterm newborns' weight until hospital discharge is important, since it can be an efficient method to follow up their hydration. Weight loss greater than 7% to 10% of birth weight is a sign indicating that the child may not be receiving enough water. This condition requires special attention, and the discharge of the child should be postponed until there is certainty about their health condition.¹⁵

The study S15 compared the electromyographic activity of the preterm newborns' biceps brachii that received KMC with the electromyographic activity of those who not received it. Preterm newborns with gestational age between 27-34 weeks and full-term newborns of 39 weeks participated in this study. Three groups were created: (1) preterm newborns receiving KMC, in which the newborn remains upright lying on the stomach, with bent limbs, dressed in light clothing, maintaining skin-to-skin contact with his mother; (2) preterm newborns not receiving KMC; and (03) full-term newborns not receiving KMC. According to the results, both preterm infants and those that became full-term infants had an increase in the electromyographic activity of the brachial biceps after receiving KMC.¹⁶

Behavioral states of newborns weighing <1,500 g in mechanical ventilation before, during and after receiving

KMC were analyzed in 44 preterm newborns with a gestational age of 29 weeks. It was found that the newborns' sleep was improved, especially the deep sleep, due to receiving KMC. Thus, KMC can be considered as a favorable strategy for neurobehavioral development.¹⁷

In order to assess the relationship between KMC and exclusive breastfeeding, two groups of low-weight newborns were followed. KMC were applied one group and the other received standard care, but all mothers were instructed to perform exclusive breastfeeding until the 6th month. Both groups were followed up for 6 months, and comparative studies were carried out. Seventy percent of the 40-week gestational age infants who received KMC were exclusively breastfed. After 3 months, 5% of the infants from the second group were still being breastfed, while over 40% of the infants from the first group were breastfed for up to 6 months.¹⁸

The effects of KMC on the relationship between mothers participating in the Kangaroo Mother Program and their premature infant were investigated. It was concluded that motherhood during the preterm period is very complex because of the experience of trauma from the guilt and fear of losing the baby due his fragility, but despite this damage, the program does allow the connection between mother and baby happen.¹⁹

Article S8 analyzed the lateral decubitus and ventral decubitus positions adopted by low-weight infants receiving KMC in order to know which position offers the greatest benefits to them. Eighty infants participated in this study; 40 were placed in lateral decubitus and 40 in ventral decubitus. The positions were evaluated by biomechanical procedures and Dubowitz neurobehavioral examination. The results showed that the lateral decubitus position provided greater benefits for early neuromotor development, probably due to the extension of the extensor muscles, because this favors the contraction with the development of the active extension and active flexion.²⁰

The heart and respiratory rates, mean arterial pressure, temperature, and peripheral oxygen saturation were evaluated in 22 low-weight preterm newborns before and after receiving KMC. They were healthy, clinically stable males and females having a gestational age from 28 to 33 weeks, weighing between 1,050 g and 1,500 g, and not suffering from respiratory, cardiac and/or neurological disorders. The results revealed a significant increase in temperature, peripheral oxygen saturation and significant decrease in respiratory rate. The temperature before receiving KMC was 36.4 °C and after 30 min it was 36.65 °C. The peripheral oxygen saturation was 93.8% before receiving KMC, and after 30 min it increased to 97.3%. The respiratory rate was 41.35 rpm before receiving KMC and 36.8 rpm after it was finished. No significant changes were observed in blood pressure and heart rate.²¹

It was observed that skin-to-skin contact may be an effective and safe method to promote decolonization of the newborns' nostrils colonized by *Staphylococcus*

aureus. In a study of 102 infants that tried to investigate the effect of skin-to-skin contact between mother and newborn colonized with *Staphylococcus aureus* resistant to methicillin, oxacillin could be an effective alternative to promote bacterial colonization of the newborns' nostrils. Some infections by *Staphylococcus aureus* are acute and can spread to different tissues and cause metastatic foci. More severe episodes, such as bacteremia, pneumonia, osteomyelitis, endocarditis, myocarditis, pericarditis and meningitis, may also occur.²³

In the publication S12, the effectiveness of KMC during painful routine procedures. KMC was compared to three procedures: 1) the use of KMC; 2) the combination of the use of sucrose and KMC; and 3) the use of sucrose.²⁴

In a study of 60 stable preterm infants with gestational age of 32 weeks and weighing 2,080 g, the changes in cerebral blood flow in the median artery before and after 30 min of receiving KMC were evaluated. It was concluded that KMC improves cerebral blood flow, thus influencing the structure and promoting brain development.²⁵

When analyzing KMC as a facilitator for salivary cortisol regulation between a healthy mother and her newborn during the first eight weeks of his life, there was a decrease in cortisol levels in both mothers and in infants from the control group, which received no guidance. In this study, 79 infants born between 32 and 35 weeks of gestational age were evaluated.²⁶

KMC supported by nurses qualified for working with healthy preterm infants during their first eight weeks of life facilitates early behavioral organization and development, as evidenced by a study with 87 babies born between 32 and 35 weeks. They were divided into three groups: (1) group that received KMC; (2) group that received standard care with a blanket; and (3) group that received KMC with a blanket. The results concluded that the group that received KMC with a blanket had better scores than the control group, the group that receive only standard care with a blanket.²⁷

The effects of partial KMC on growth rates and duration of hospital stay of low-weight infants were analyzed. One hundred and sixty-six infants weighing between 1,000 g and 1,750 g and divided into two groups were studied: 1) group receiving KMC and 2) control group who received conventional care. The KMC group had significantly higher growth rates, greater weight gain, higher head circumference, and higher arm circumference. Regarding the average duration of hospitalization, the KMC group had a stay of 8.6 days in relation to 12.7 days for the control group.²⁸

The impact of KMC on infant breastfeeding was analyzed. The following variables were studied: time required for starting the first breastfeeding section, time for establish an effective breastfeeding, maternal satisfaction in delivering care, preference for delivering care in the future, and level of exclusive breastfeeding for 1-month newborns. One hundred and eighty-three mother-infant pairs were studied and divided into two groups to analyze the behavior of

breastfeeding: 92 of them formed the KMC group and 91 formed the conventional care group. As a result, KMC significantly increased the success of the first breastfeeding, promoting the exclusive breastfeeding practice up to one month. It also reduced the time for starting the first breastfeeding section and the time for establishing an effective breastfeeding.²⁹

The profile of the preterm newborns who received KMC and their follow-up at the outpatient level was analyzed and it was identified that birth weight, gestational age and Apgar scores were determinant for the best clinical, nutritional and motor evolution of the preterm newborns receiving KMC. Hence, it is possible to infer that KMC proved to be an instrument that facilitates breastfeeding.³⁰

CONCLUSIONS

The publications here analyzed proved the benefits of KMC to mothers, newborns, and for institutions. It increases the electromyographic activity of preterm newborns, and favors sleep (especially deep sleep) and the practice of exclusive breastfeeding up to six months. KMC in lateral decubitus position presented benefits for early neuromotor development, increasing growth, rate weight gain, head circumference, arm circumference, and decreasing the time for hospital discharge.

It is important to emphasize the need for new studies aiming to evaluate other benefits of KMC as a standard of care for low-weight newborns, thus spreading this technique across medical institutions.

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