

Original articles

Weight gain in newborns submitted to skin-to-skin contact

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ABSTRACT

Purpose: to compare the weight gain among newborns submitted to the kangaroo method and those not submitted to it, and to analyze the factors that may influence this gain: length of hospital stay, gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, duration of gastric tube feeding, duration of oral feeding, and type of diet.

Methods: a cross-sectional, quantitative study, with 86 newborns divided into two groups: group 1, with 48 neonates undergoing skin-to-skin contact and Group 2, 38 newborns who did not have this contact. Weights were recorded until hospital discharge.

Results: a greater weight gain in Group 1, a longer time of hospitalization in Group 2, and a significant difference in weight gain related to the type of diet in Group 2.

Conclusion: skin-to-skin contact has a positive influence on weight gain and length of hospital stay of newborns. The use of an infant formula does not influence weight gain for dyads who experienced skin-to-skin contact. Gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, duration of gastric tube feeding, duration of oral feeding are not correlated with weight gain.

Keywords: Infant, Newborn; Infant; Premature; Kangaroo-Mother Care Method; Weight Gain; Breast Feeding

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INTRODUCTION

Prematurity, defined as birth prior to 37 weeks' gestation, is a complex public health problem, given the great number of triggering factors leading to this event¹. Preterm newborns lack the last trimester of intrauterine life, the stage of maximum intrauterine development. Thus, they have low birth weight (below 2,500 g) and are at greater risk of neuropsychomotor development delay, sensory malformation, learning difficulties, and respiratory diseases².

The establishment of modern neonatal units increased the chance of survival of smaller neonates and thus contributed to a considerable decrease in mortality rates³. Conversely, the provision of health care increased the onset of possible sequelae resulting from newborn immaturity and requiring special intensive care, often for long periods, which involves high costs with professionals, facilities, and equipment usually unavailable in developing countries⁴.

With the purpose of changing professionals' attitude and making newborn care more humane, the Ordinance no. 693 of the Brazilian Ministry of Health (MS), dated July 5, 2000, implemented the Humanized Care Norm for the Low Weight Infant – Kangaroo Mother Care (KMC) (Norma de Atenção Humanizada ao Recém-Nascido de Baixo Peso – Método Canguru), subsequently updated by Ordinance no. 1,683 of the Health Care Secretariat (SAS)/MS, dated July 12, 2007⁵.

This norm provides for the humanized care of preterm newborns and/or low birth weight infants (LBWIs), strengthening the bond between parents, babies, and health professionals, in order to minimize the negative effects of neonatal admission on newborns and their families and to represent an alternative to traditional treatment⁶. KMC is a model of humanized perinatal care comprising a set of neonatal care actions that do not compromise newborns' survival and growth^{7,8}.

This technique has shown to be considerably effective in preterm neonates⁹. After clinical stabilization, it allows for a closer contact between infants and their mothers, thus stimulating weight gain¹⁰.

KMC consists basically of skin-to-skin contact, is easy to perform, and promotes feelings such as happiness and calmness both in the health care team and in the mother-child dyad¹¹. Skin-to-skin contact is achieved by positioning infants, who are not wearing anything but diapers, in a vertical position close to mother's chest, in order to make mothers experience motherhood and improve baby care skills even before

hospital discharge, in addition to increasing mother-child bond and improving the relationship between the mother and her family^{12,13}.

The benefits of the KMC go beyond weight gain, because it conveys feelings of calmness, tranquility, and safety, strengthening the mother-child bond¹⁴. Moreover, it reduces hospital length of stay and the risk of hospital-acquired infection, and is an alternative for developing countries, because it facilitates the mother-child relationship, contributing to the effectiveness of feeding and breastfeeding^{15,16}.

KMC requires individualized care, and mothers should be encouraged to use this method as soon as their baby has clinical conditions to undergo the technique and should be informed about the importance of KMC to their baby with regard to psychological and psychological aspects and to treatment response. Considering a different perspective, one should not disregard mother's desire and family and personal issues involved in participating in KMC. Hence, it is very important to take into account mother's willingness and the existence of a social support network¹⁷.

Therefore, this study aimed to compare weight gain between newborns who received skin-to-skin contact with their mothers and those who did not and to analyze the factors that may have influenced weight gain, such as length of stay, gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, duration of gastric tube feeding, duration of oral feeding, and type of diet.

METHODS

This quantitative, cross-sectional study was conducted at the neonatal unit of Hospital de Base Dr. Ary Pinheiro, because this was the only referral public health unit in the state of Rondônia that treats high-risk pregnant women, LBWIs, and preterm newborns.

The study was submitted and approved by the Research Ethics Committee of Centro Universitário São Lucas, under number 31627/12.

Data collection was carried out over 4 months. Mothers were informed on the research objective and methods, and those who agreed to participate signed an informed consent form.

The study sample included infants of both sexes with a corrected gestational age of 34 weeks or more who had been orally fed for at least 2 days. Additionally, they should be clinically stable, have minimal ability to control and maintain physiological functions, and be responsive to environmental stimuli. Moreover, mothers

should express their willingness to remain in skin-to-skin contact with their child for at least 8 hours per day.

Newborns requiring cardiorespiratory hemodynamic monitoring or presenting with any chronic neurological or pulmonary abnormalities, congenital heart defects, craniofacial malformations, and positive human immunodeficiency virus were excluded from the study.

According to the IT Department of the Brazilian Unified Health System (DATASUS), the number of preterm births in Porto Velho, northern Brazil, is estimated at 814 per year. The sample was estimated based on monthly statistical data from the study hospital showing that there are, on average, 50 preterm births at the institution per month. Hence, throughout 4 months, infants meeting inclusion criteria were selected for the study by convenience or consecutive sampling, totaling 86 preterm neonates.

Another inclusion criterion was mother's willingness and availability to participate in KMC, in order to allow families to freely choose to participate in the technique for as long as it was considered pleasurable and enough, which justifies the sampling strategy.

The 86 participating newborns were divided into two groups: Group 1 (G1), consisting of 48 infants who had skin-to-skin contact for at least 8 hours per day; and Group 2 (G2), consisting of 38 infants who did not have such contact because of mother's unwillingness or unavailability.

Newborns' medical records were reviewed to collect data on gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, days of life, duration of oral feeding, and duration of gastric tube feeding.

Mothers were instructed on skin-to-skin contact (based on KMC⁵) with the child wearing only diapers (which is what infants wear at the neonatal unit of the study hospital) in direct contact with mother's chest and abdomen. Hence, there are no clothes between mother and child, allowing for the infant to feel mother's warmth, heartbeat, and rhythm of breathing. However, mothers do not remain completely naked, because they can use sheets to hold the baby, thus covering child and mother's body, or wear loose clothes with an opening in the front that allow to cover the mother-child dyad.

Mothers were questioned on their willingness and availability to have skin-to-skin contact with their child. Those who agreed were included in G1, and those not willing to participate in KMC or unable to visit the neonatal unit every day were included in G2.

In Hospital de Base Dr. Ary Pinheiro, mothers are instructed on hygiene practices, including those related with clothes, purses, and cell phones, which may be foci of infection, and hand washing. These instructions were reinforced to participating mothers so that there is no possibility of contamination when handling the infant.

Mothers who remained in skin-to-skin contact with their child were also instructed on how to handle the newborn and to be attentive to signs of discomfort in the newborn, such as: changes in skin color or respiratory characteristics and gastroesophageal reflux disease.

The purpose of the study was not to assess feeding transition; therefore, all infants had already been receiving exclusive oral feeding for at least 2 days before the beginning of the study. All preterm newborns admitted to the study unit are seen by speech therapists; hence, participating infants had previously undergone a specific intervention for feeding transition according to hospital routine. This intervention includes assessment of oral ability and readiness for oral feeding and specific stimuli to improve these aspects in preterm neonates, as well as guidance and promotion of breastfeeding.

In both groups, priority was given to breastfeeding. However, if required, supplementary feeding with infant formula was offered in 50 mL disposable cups, as recommended by the World Health Organization¹⁸.

Nonetheless, all mothers were encouraged to exclusively breastfeed, and newborns were assessed by a multidisciplinary team that investigated the need for supplementary feeding.

Therefore, all participating infants had their weight recorded daily, from the beginning of follow-up (which occurred after at least 2 days of oral feeding) to hospital discharge.

After data collection, the following analyses were performed: (1) comparison of weight gain and length of stay between newborns who received skin-to-skin contact and those who did not, and influence of type of diet on these two variables; (2) correlation between weight gain and the following variables in both groups: days of life, gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, length of stay, duration of gastric tube feeding, and duration of oral feeding.

Data were analyzed using the ANOVA and Pearson correlation tests, with statistical significance set at 5%.

RESULTS

A greater weight gain and a shorter length of stay were observed in G1 (Table 1).

There was a significant negative correlation between daily weight gain and weight on the first day of follow-up in the two groups. However, correlation was considered

to be poor, according to the classification scale based on the Pearson's correlation coefficient (Table 2).

In the group that did not receive skin-to-skin contact, there was a difference in weight gain associated with type of diet between infants who were always given an infant formula and those who received it only when the mother was absent.

Table 1. Comparison of weight gain and length of hospital stay between groups submitted and not submitted to skin-to-skin contact

Group	Weight gain (grams)		Length of hospital stay (days)	
	G1	G2	G1	G2
Mean	24.78	12.82	6.25	24.78
Median	24.58	11.81	6.0	24.58
SD	10.19	11.56	3.80	10.19
CV	41%	90%	61%	41%
Minimum	5.0	-17.5	2.0	5.0
Maximum	55.0	36.25	15.0	55.0
N	48	38	48	38
CI	2.88	3.67	1.08	2.88
p-value	<0.001*		0.002*	

Abbreviations: SD: standard deviation; CV: coefficient of variation; N: number of study subjects; CI: confidence interval; G1: group submitted to skin-to-skin contact; G2: group not submitted to skin-to-skin contact; *: statistically significant value.

Statistical test: ANOVA

p-value < 0.05

Table 2. Correlation between some gestational and neonatal variables and daily weight gain in the groups submitted and not submitted to skin-to-skin contact

Variables	G1		G2	
	Correlation	p-value	Correlation	p-value
Days of life	-4.4%	0.765	22.5%	0.174
Gestational age (weeks)	-6.7%	0.649	-27.4%	0.096
Corrected gestational age (weeks)	-0.1%	0.992	-12.7%	0.446
Birth weight (grams)	-17.7%	0.229	-28.8%	0.079
Weight on the first day of follow-up (grams)	-37.2%	0.009*	-38.2%	0.018*
Duration of gastric tube feeding (days)	-6.4%	0.668	26.4%	0.110
Duration of oral feeding (days)	21.1%	0.150	2.7%	0.870

Abbreviations: *: statistically significant value; G1: group submitted to skin-to-skin contact; G2: group not submitted to skin-to-skin contact.

Statistical test: Pearson's correlation

p-value < 0.05

Table 3. Comparison between weight gain and type of diet in each group (submitted and not submitted to skin-to-skin contact)

Type of diet	G1		G2	
	Breastfeeding + infant formula only in mother's absence	Breastfeeding + infant formula even when the mother is present	Breastfeeding + infant formula only in mother's absence	Breastfeeding + infant formula even when the mother is present
Mean	23.95	27.27	9.37	18.10
Median	21.55	27.92	10.00	17.50
SD	10.98	7.18	10.98	10.67
CV	46%	26%	117%	59%
Min	5.0	14.2	-17.5	2.5
Max	55.00	40.00	36.25	31.43
N	36	12	23	15
CI	3.59	4.06	4.49	5.40
P-value	0.333		0.021*	

Abbreviations: SD: standard deviation; CV: coefficient of variation; Min: maximum; Max: minimum; N: number of study subjects; CI: confidence interval; G1: group submitted to skin-to-skin contact; G2: group not submitted to skin-to-skin contact; *: statistically significant value.

Statistical test: ANOVA

p-value < 0.05

DISCUSSION

The present results show that children who had skin-to-skin contact with their mother exhibited greater weight gain compared with those who did not have such contact (Table 1). The literature has shown that skin-to-skin contact between mothers and high-risk infants accelerates weight gain by improving feeding effectiveness, favoring breastfeeding and thus sucking and swallowing, and reducing length of hospital stay^{3,19}. KMC is a health care model that benefits LBWIs and their families, favoring care in the family setting²⁰.

Physical contact between children and mothers establishes an affective bond between both of them, which is associated with improved development of preterm neonates²¹. By enabling skin-to-skin contact between mothers and infants, KMC aims to promote breastfeeding and increase mother's confidence in caring her child⁵.

Additionally, children who did not have skin-to-skin contact had a longer length of stay (Table 1). This finding differs from that of a study aiming to assess whether KMC interfered with weight gain and length of stay of LBWIs, divided into KMC group and routine care group, which found a slight increase in length of stay and weight gain with KMC. Since this increase was not significant, the authors of the study concluded that KMC did not interfere with weight gain and length of stay in any of the groups²².

In another study conducted to assess neonatal findings for KMC in Brazil by comparing kangaroo and

control units did not find any difference in length of stay between the two units²³.

Because of the scarcity of studies in the Brazilian literature analyzing the influence of KMC on weight gain and early discharge of newborns, the relationship between these variables has not been confirmed yet²⁴.

A literature review on KMC assessed the positive results of the technique. The authors concluded that breastfeeding has a key role in promoting mother-child bond and thus, newborn's well-being, contributing to weight gain and intellectual development¹⁵.

Another review that correlated scientific evidence on the benefits of KMC with breastfeeding in premature neonates found scientific evidence indicating that this technique promotes adherence to exclusive breastfeeding and reduces costs and length of hospital stay²⁵.

In the present study, a significant, but poor, correlation was found only between weight gain and weight on the first day of follow-up in the two groups (Table 2). Therefore, the lower the weight on the first day of follow-up, the greater daily weight gain. It is assumed that small, low weight babies are less handled by the health care team and thus would remain quieter and their organism would overcome the need for greater weight gain²⁶.

Hence, the smaller the baby, the greater the benefits of KMC to preterm neonates and LBWIs, because mother's body is able to shelter her maturing infant²⁷. Thus, despite being poor, the correlation found in the present study may confirm the benefits of KMC in terms of weight gain.

Our findings revealed that, in the group receiving skin-to-skin contact, there was a difference in weight gain associated with type of diet between infants who were always given an infant formula and those who received it only when the mother was absent (Table 3). It can be inferred that a long admission to the neonatal unit increases stress levels and impairs exclusive breastfeeding, in which case there is the alternative of using more concentrated infant formula²⁸.

In this study, newborns received infant formula to supplement breastfeeding. It is worth noting that, at the time of the study, our hospital had not been accredited yet by the Child-Friendly Hospital Initiative, which supports, encourages, and promotes breastfeeding by means of its Ten Steps to Successful Breastfeeding

Nonetheless, all mothers were encouraged to exclusively breastfeed, and neonates were assessed by a multidisciplinary team to investigate the need for supplementary feeding.

Therefore, Table 3 shows that weight gain was influenced by formula feeding in G2 but not in G1. That is, infants of G2 who were given formula even when their mother was present had a greater weight gain. According to these data, we can infer that weight gain is promoted by skin-to-skin contact, rather than by breastfeeding supplementation.

The limitations of this study included the lack of control of how long infants remained in skin-to-skin contact with their mothers, since this would be a potential confounding variable for our results. Moreover, a study comparing duration of feeding transition between the two groups would also provide additional information on the benefits of KMC to high-risk newborns.

We observed that there was a scarcity of studies in the literature assessing the influence of KMC on weight gain and reduced length of hospital stay in newborns. In addition, further research is needed on the association between KMC and length of stay, considering factors that may influence this association, such as gestational age, corrected gestational age, birth weight, birth on the first day of follow-up, duration of gastric tube feeding, duration of oral feeding, and type of diet.

CONCLUSION

Based on study results, we found that skin-to-skin contact has a positive influence on weight gain and length of hospital stay among newborns. We also demonstrated that the use of an infant formula does not influence weight gain in dyads who experienced

skin-to-skin contact. Finally, we concluded that gestational age, corrected gestational age, birth weight, weight on the first day of follow-up, duration of gastric tube feeding, and duration of oral feeding are not correlated with weight gain.

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