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THE EFFECTS OF USING THE HUMAN BREAST MILK FORTIFIER IN PRE-TERM OF VERY LOW WEIGHT NEWLY BORN

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ABSTRACT
Breast milk is the ideal food for any newborn regarding the balanced nutritional composition and its ability to generate immunity. Its use has been greatly encouraged in intensive care units and Intermediate Unit, both the milk extracted directly from the mother's womb, as the one from the milk bank. The purpose of the study was to monitor and to compare infants with and without use of breast milk fortifier in neonatal intensive care unit. It was an observational cohort study with a control group, performed in a public hospital, in intensive care units and neonatal intermediate unit. They were followed 26 preterm infants, divided into two groups consisting of 13 preterm infants in exclusively breastfed (control group) and 13 preterm infants in use of breast milk fortifier with additive added. The average weight gain was significantly higher in the group receiving breast milk containing additive. In relation to the length and head circumference, significant differences were not observed. For data analysis, we used simple descriptive statistics by calculating frequency distributions, calculation of averages, standard deviation and achievements of the statistical tests. The average weight gain during the study period was significantly higher in the group receiving breast milk with additives. Regarding the length and head circumference, statistical differences were not significant between groups. It appears that the additive used in raw or processed human breast milk provides better weight gain, facilitating recovery of nutritional status.

Keywords: Infant Nutrition Sciences. Preterm Infants.Neonatal Intensive Care.

INTRODUCTION

Breast milk is the ideal food for any newborn (NB) in relation to its balanced nutritional composition and its ability to generate immunity. It provides nutrition and immunization of newborns, and allows the formation and strengthening the emotional bond between mother and baby. Its use has been greatly encouraged in the Intensive Care Unit (ICU) and Intermediate Units (IU), which can be either extracted milk directly from the breast and offered immediately to the newborn, as from human milk banks (Pasteurized Expressed Human Milk - LHOP)[(1)].

The consensus is the use of human milk (LH) in feeding the newborn preterm with very low birth weight, preferably maternal milk due to better physiological adaptation to meet the nutritional needs and immune modulation, endocrine, growth and development of these children, not only in the early postnatal life, but over the first year of life. Qualities such as for newly born preterm become more important for presenting initial conditions of the most vulnerable life[(2)].

Preterm Infants (PTN) are those who were born before 37 weeks of gestation. And the term infants (RNT) are those who were born in the interval between the beginning of the first day of the 37th week of pregnancy and the end of the last day of the 42nd week of pregnancy (3).

The survival rate of newborns with very low weight has increased in recent decades. This fact is due to scientific advances incorporated in the care of these children, particularly with respect to postnatal nutritional status immediately, given the characteristics of rapid growth and maturation of this period, which requires better supply of nutrients in quality and quantity, to ensure an appropriate weight-height development, without the risk of metabolic overload and deficiency iatrogenic[(4)].

The fact that the child is born prematurely put in a condition of high nutritional risk because the gastrointestinal tract is still immature, especially when treated in the Neonatal Intensive Care Unit

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(NICU), they present a great risk of developing nutritional and growth problem[5]. This is due to metabolic changes caused by various pathological processes and physiological factors inherent prematurity, including rapid growth rate, high metabolic rate and large biochemical immaturity, which affect all metabolic functions of premature baby. The magnitude of these factors occurs in inverse proportion to the gestational age at birth. During the last trimester of pregnancy, the fetus acquires 80% of the amounts of calcium, phosphorus and magnesium present at birth. These high concentrations are necessary for an appropriate degree of growth and bone mineralization[6,7].

To ensure the ideal post-natal growth, nutritional conditions equivalents to intrauterine must be guaranteed at the same time. So after birth, proper nutrition should address the nutritional needs in order to meet the normal physiological functions, looking to adequate supply of protein, calories, vitamins and minerals in order to maintain growth as close to the expected intrauterine means[8,9].

The concern to provide nutrients to preterm infants is justified by the need to promote growth and physical development similar to intrauterine gestational age. Due to increased caloric concentrations of nutrients and electrolytes, and protective functions against infections and maintaining gastrointestinal function, the raw human milk, milked from the mother and without manipulation, is considered the best option to feed the newborn preterm (PTN)[7].

The milk of mothers of premature infants have higher concentrations of calories, lipids, protein and sodium, which remain increased during the first weeks of lactation. However, after the first month of lactation, protein concentration and various other nutrients of preterm human milk are insufficient for most premature infants. Several metabolic complications have been described with the exclusive use of human milk in premature as hyponatremia, hypoproteinemia, osteopenia and zinc deficiency[8].

Despite the numerous benefits already cited in the literature on exclusive breastfeeding, several authors have shown that preterm infants fed exclusively on human milk had lower growth rates than those observed during intrauterine life[8].

The human milk fortifiers for premature increase the protein content, carbohydrates, vitamins and minerals preventing thus nutritional deficiencies and providing growth rates similar to those of premature infants fed with infant formula, while maintaining the immunological benefits of breast milk supply[10].

The exclusive feeding with non-enriched human milk for newborn preterm, weighing less than 1,500g, results in lower growth and lower levels of phosphorus and calcium, when it is compared to infants who are fed with fortified human milk nutrients. For this reason, several authors have recommended the fortification of human milk, in order to meet the nutritional needs and prevent bone demineralization in these children[10,11].

The body composition at birth and during early childhood may indicate the risk of chronic diseases in adulthood. Low weightat birth is associated with hypertension, glucose intolerance and heart disease in adulthood[12].

The nutrition of preterm infants with very low weight at birth is a challenge to the professional staff involved in their care due to unstable metabolic conditions, decreased organic reserves and hyper metabolism, and the high risk of complications associated with immaturity of the digestive system[2].

Given the above, this study aimed to monitor and to evaluate the nutritional prognosis of premature infants with very low weight, with and without the use of fortifying additive in human breast milk.

METHODOLOGY

This is an observational study, of cohort type with the control group. The sample was constituted from the group of PTN with very low weightat birth, hospitalized in Intensive and Intermediate Care Units, at Public Maternity Hospital Dona Regina Siqueira Campos (HMPDR) in Palmas, in the State of Tocantins, Brazil.

They were followed 26 preterm infants divided into two groups: Group 1, consisting of 13 preterm infants in exclusive breastfeeding (control group); and group 2 comprised 13

preterm infants in use of breast milk fortifier with additive. Newborns in both groups were matched for sex, age and weight range at birth. In group 2 an additive of milk fortifier (FM85®, Nestlé) was used at a concentration of 1g / 20 ml of breast milk until the neonate reached 1,800g.

All the preterm infants evaluated met the inclusion criteria in the sample that were clinically stable, feeding by orogastric tube with a minimum volume of 100 ml/day, being the 15th day of postnatal life and birth weight less than 1,500 g.

We did not include preterm infants who showed any acute or chronic disease process, including birth defects, neurological disorders, inborn error of metabolism, or who were taking medications that could interfere with growth, than those who never received a milk volume breast of 100 ml / day, 15 days of life postnatal.

The variables weight, length and head circumference were obtained at birth and accompanied during the trial period.

The period of comparison between the two groups began on the 15th day of postnatal life and ended at the end of treatment and discharge from the inpatient unit.

Every day, we registered enteral volume offered and body weight. The preterm infants were weighed unclothed in the digital pediatric scale Welmy with scale of10 grams. The length and head circumference were obtained at birth and at the end of the experiment, by requiring from the PTN the minimal handling. The length was measured with the PTN lied, with head fixed by the hand of an assistant and leg fixed by other, with the use of a child anthropometer. Head circumference was obtained from the most prominent point of the occiput, using a tape measure.

The variables were plotted on Growth Curves for Premature Infants, from Weight to Age Fixed, from Length to Age Fixed and from Cephalic perimeter to Age Fixed[13] for the nutritional status.

Data were collected by the researcher, for direct obtaining of anthropometric measurements and information from medical records. Then they were tabulated, stored and processed in BioStat software version 5.3, to obtain the frequency distributions, the mean calculation, standard deviation and achievements of the statistical tests.

The nonparametric test of Mann-Whitney was used to compare the evolution of weight gain, head circumference and lengthevolution. In all tests for the error Type I we adopted $p<0.05$.

The study proposed was approved by the Research Ethics Committee of the Federal University of Tocantins, under the protocol 024/2014.

RESULTS AND DISCUSSION

After applying the selection criteria we did not include in the study 3PTNs (one with necrotizing enterocolitis; one who uses infant formula; and one in total parenteral nutrition), and we distributed the other ones in two groups.

By Mann-Whitney test, the average weight gain was significantly higher in the group who receive breast milk containing additive ($p <0.05$). As for the head circumference and length, statistically significant differences were observed ($p> 0.05$), as shown in Table 1.

Table 1. Average Daily Weight Gain (g), Increase of Daily Cephalic Perimeter (cm) and Increment of length throughout the experimental period (cm) in the group who receive breast milk with additives (LMA) and exclusive breastfeeding (LME)

Average Daily Weight Gain (g)		
	LMA	**LME**
Average ± DP	18.29± 8.63	11.34 ±12.10
Median	17.10	10.53
Value of *p*	0.0038	
Increase of Daily Cephalic Perimeter (cm)		
	LMA	**LME**
Average ± DP	0.713 ±0.255	0.710 ±0.293
Median	0.750	0.583
Value of *p*	0.49	
Increment of length (cm)		
	LMA	**LME**
Average ± DP	2.40 ± 1.03	2.20 ± 0.67
Median	2.07	2.08
Value of *p*	0.008	

In relation to weight gain in premature infants who received breast milk additive, there was an average weight gain significantly higher than the group that only received exclusive breastfeeding.

The additive use in raw or processed human

milk, in milk banks, provides greater weight gain and preventing bone metabolic disease[7]. Data also evidenced in the current study, the best daily weight gain.

In relation to height gain, studies have shown that premature newborns, using breast milk additive, obtained more significant height gain over those who only used the breast milk. These results may be attributed to the fact that human breast milk has less mineral absorption when it is addicted, despite the high mineral content present in the additive. Minerals form insoluble soaps with fatty acids and are precipitated in the feces[10.2].

Another survey of preterm infants fed exclusively breast milk and additive found growth rates and weight gain similar to those in this study (14).

The averages ofenteral volume offered to groups are shown in Table 2.

Table 2. Daily averages of enteral volume (mL) offered to groups who received breast milk with additives (LMA) and exclusive breastfeeding (LME).

GROUP	LMA - volume	LME – volume
1	29,1	29,4
2	27,8	29
3	28,8	29,5
4	27,2	30,5
5	27,1	27,7
6	27,5	27,8
7	24,3	29,7
8	36,7	29,1
9	33	30,2
10	23,1	24,6
11	24,2	28,5
12	30,4	31,6
13	30,2	32,7
Total	28,4	29,3

The daily averages of volume of diet offered between groups were not statistically different (Mann-Whitney test) even after the additive addition. The group with exclusive breast milk received higher dietary offer, but showed higher daily weight gain. And the group receiving breast milk additive showed higher daily weight gain, getting smaller volumes of diet.

The daily average of enteral volume offered were higher in the group receiving exclusive breast milk (LME), however, this group did not show greater weight gain. In contrast, the group receiving breast milk additive (AML), despite the lower volume ingested, obtained better weight gain.

In the early neonatal period, there is a reduction in weight, caused by loss of extracellular fluid, and a degree of catabolism of tissues as a result of changing the intrauterine environment for postnatal. In premature newborns, this loss is smaller and cannot occur[3].

However, the loss of intracellular volume of premature infants in the late neonatal period is directly correlated to the energy support, which is low when these children are clinically unstable. In children with higher energy intake in the diet, there is increase in the intracellular compartment, suggesting that premature infants needs an adequate supply of energy and fluids to prevent severe weight loss, from the second week of old[15].

In agreement with the results of this study, another group of researchers also found that small amounts are able to produce the beneficial effects of diet, and the nutrient density is determinant and the diluted diet does not necessarily entail adequate nutritional response. It is noteworthy that inadequate nutritional support certainly prolongs hospitalization for these premature infants[16,17].

Preterm newborns selected and matched to be part of this study had similar weights in the beginning of the experiment, which did not occur at the end of the experiment, as shown by the standard deviation.

The results demonstrate that the group who receive breast milk containing additive obtained rapid weight gain, which may be due to the higher amount of protein and calories offered and the best energy-protein balance, which reflected recovery of nutritional status. The group that received only exclusive breast milk showed an increase in weight gain, but slowly.

Agreeing with the results of this study, a study showed that supplementation with human milk additive promoted better energy, protein addition, calcium and phosphorus, which was reflected in higher growth and weight gain at short time[10]. Another study also showed that supplementing breast milk with FM-85*

promoted improvement in bone mineralization in premature infants with very low birth weight[18].

Table 3. .Initial and final weights of pairs of newborns studied, Palmas-TO.

	Initial weight				Final weight			
	Human Milk with addictive	**Exclusive human milk**	**Human Milk with addictive**	**Exclusive human milk**	**Human Milk with addictive**	**Exclusive human milk**	**Média (g)**	**Desvio padrão (DP)**
Pair 01	1.170	1.150	1.160	±14,1	1.450	1.125	1.288	±229,8
Pair 02	850	800	825	±35,4	1.325	1.100	1.213	±159,1
Pair 03	1.400	1.405	1.403	±3,5	1.790	1.730	1.760	±42,4
Pair 04	1.053	1.000	1.027	±37,5	1.560	1.330	1.445	±162,6
Pair 05	1.440	1.455	1.448	±10,6	1.620	1.420	1.520	±141,4
Pair 06	1.060	1.070	1.065	±7,1	1.535	1.375	1.455	±113,1
Pair 07	900	890	895	±7,1	1.115	1.070	1.093	±31,8
Pair 08	1.400	1.480	1.440	±56,6	1770	1570	1.670	±141,4
Pair 09	1.450	1.435	1.443	±10,6	1590	1589	1.590	±0,7
Pair 10	1.260	1.190	1.225	±49,5	1605	1570	1.588	±24,7
Pair 11	1.160	1.100	1.130	±42,4	1351	1320	1.336	±21,9
Pair 12	1.360	1.355	1.358	±3,5	1480	1435	1.458	±31,8
Pair 13	1.210	1.215	1.213	±3,5	1355	1245	1.300	±77,8

The increase of protein in the diet of the preterm newborn with very low weigh at birth must be accompanied by a power density that provides approximately 30 Kcal for each gram of protein, preventing the progression to the catabolic state[19]. Such caloric ratio was also guaranteed in the present study, which may have influenced the nutritional profile of thepreterm newborn with very low weigh at birth studied, providing the highest weight gainobserved.

According to Bhatia[20], the protein content of mature human milk is usually insufficient to meet the nutritional needs of preterm infants in fast growing.

Whereas recent studies have emphasized the importance of growth in the first year of life and the risk that low weight at birth may pose to the preterm newborn, it is essential to evaluate the correlation between weight gain, evolution height and weight and the correct management of nutritional intervention. The additive increase in the human breast milk in the diet of preterm infants may be of great importance for the recovery and improvement in nutritional status at short time, since its use provides greater energy intake, protein and micro-nutrient, contributing to the prevention of metabolic bone disease and catabolic state.

Therefore, the safe use of additives ofhuman breast milkshould be well discussed by the multidisciplinary team, attending the use of protocol and assessing the need for each newborn.

FINAL CONSIDERATIONS

Advances in neonatal intensive care have increased significantly the survival and reduced morbidity among newborns admitted in Neonatal Intensive Care Units, especially premature babies.

However, despite the results of this study are favorable for the use of breast milk additive, relative to the preterm newborn with very low weigh at birth, no differences were observed in increments of head circumference and length.

In this sense, more studies are suggested to improve a betterindividualized nutritional therapy to the nutritional needs of each newborn.

EFEITOS DO USO DE FORTIFICANTE DO LEITE HUMANO EM RECÉM-NASCIDOS PRÉ-TERMO DE MUITO BAIXO PESO

RESUMO

O leite materno é o alimento ideal para qualquer recém-nascido devido à sua composição nutricional balanceada e à sua capacidade de gerar imunidade. Seu uso tem sido muito incentivado nas Unidades de Terapia Intensiva (UTI) e Unidades Intermediárias (UI), sendo ofertados tanto o leite materno extraído diretamente do seio materno, quanto o proveniente de bancos de leite humano.Dessa forma, este estudo teve como propósito acompanhar e comparar recém-nascidos com e sem o uso de aditivo fortificante do leite materno, em UTI neonatal. O estudo foi observacional do tipo coorte, com grupo controle, realizado em uma maternidade pública, nas unidades de terapia intensiva e terapia intermediária neonatais. Foram acompanhados 26 recém-nascidos pré-termo, divididos em dois grupos, um deles constituído por 13 recém-nascidos em aleitamento materno exclusivo (grupo controle) e outro composto por 13 recém-nascidos em uso de leite materno, com aditivo fortificante. Para a análise de dados, foi utilizada estatística descritiva simples, calculando-se distribuições de frequências, cálculo das médias, desvio-padrão e realizações dos testes estatísticos.O ganho de peso médio no período do estudo foi significativamente maior no grupo que recebeu leite materno com aditivo. Em relação ao comprimento e ao perímetro, cefálico não foram observadas diferenças estatísticas significativas entre os grupos. Constata-se que o uso de aditivo no leite materno humano cru ou processado proporciona melhor ganho de peso, favorecendo a recuperação do estado nutricional.

Palavras-chave: Nutrição Infantil. Prematuro. Terapia Intensiva Neonatal.

EFECTOS DEL USO DE FORTIFICANTE DE LA LECHE HUMANA EN RECIÉN NACIDOS PRETÉRMINO DE MUY BAJO PESO

RESUMEN

La leche materna es el alimento ideal para cualquier recién nacido debido a su composición nutricional balanceada y a su capacidad de generar inmunidad. Su uso ha sido muy fomentado en las Unidades de Cuidados Intensivos y Unidades Intermediarias, siendo ofertadas, tanto la leche materna, extraída directamente del seno materno, como la proveniente de bancos de leche humana. El propósito del estudio fue el de acompañar y comparar a los recién nacidos con y sin el uso de aditivo fortificante de la leche materna, en UCI neonatal. Este estudio fue observacional del tipo cohorte, con grupo control, realizado en una maternidad pública, en las unidades de cuidados intensivos y cuidados intermediarios neonatales. Fueron acompañados 26 recién nacidos pretérmino, divididos en dos grupos, uno de ellos constituido por 13 recién nacidos en lactancia materna exclusiva (grupo control) y otro compuesto por 13 recién nacidos en uso de leche materna, añadido de aditivo fortificante. Para el análisis de datos fue utilizada estadística descriptiva simple calculando distribuciones de frecuencias, cálculo de los promedios, desviación típica y realizaciones de las pruebas estadísticas. El aumento de peso promedio en el período del estudio fue significativamente mayor en el grupo que recibió leche materna con aditivo. En relación a la longitud y al perímetro cefálico no fueron observadas diferencias estadísticas significativas entre los grupos. Se constata que el uso de aditivo en la leche materna humana cruda o procesada proporciona mejor aumento de peso, favoreciendo la recuperación del estado nutricional.

Palabras clave: Nutrición Infantil. Prematuro. Cuidados Intensivos Neonatal.

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