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Breastfeeding of preterm newborns in a neonate hospitalization unit

Aleitamento materno de recém-nascido prematuro em unidade de internação neonatal

Lactancia del recién nacidoprematuro en la unidad de admisión neonatal

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ABSTRACT

Objective: To analyze the factors associated with breastfeeding of preterm infants at discharge.

Method: Cross-sectional study with newborns with gestational age <37 weeks, admitted to a university hospital. Data obtained from the medical records of 180 participants, from August/2019 to August/2020. To assess an association between categorical variables, Pearson's chi-square and Fisher's exact tests were used. The significance level adopted was 5% ($p \leq 0.05$).

Results: Mean gestational age was 32.8 ± 2.7 weeks and mean birth weight was 1,890 grams ± 682 grams. During hospitalization, (n=166) 28.3% received predominantly breast milk. At discharge, (n=164) 84.1% received breast milk and, of these, 2.4% were exclusively breastfed. Breastfeeding at discharge was associated with gestational age ≥ 33.5 weeks, higher weight at birth, and shorter hospitalization.

Conclusion: The study showed that during hospitalization, about a third of the participants were breastfed. However, at the time of discharge, there was a predominance of breastfeeding in most cases, and the associated factors were higher weight at birth and shorter hospital stay.

Keywords: Neonatology. Breast feeding. Infant, premature.

RESUMO

Objetivo: Analisar os fatores associados ao aleitamento materno do pré-termo na alta.

Método: Estudo transversal composto por recém-nascidos de idade gestacional menor que 37 semanas, internados em hospital universitário. Dados obtidos dos prontuários dos180

participantes, incluídos de agosto/2019 a agosto/2020. To evaluate the association between categorical variables, Pearson's chi-squared and Fisher's exact were used. The significance level was 5% ($p \leq 0,05$).
Resultados: A idade gestacional média foi de 32,8 ± 2,7 semanas e peso ao nascer médio de 1.890 gramas ± 682 gramas. Na internação, (n=166) 28,3% receberam leite materno predominantemente. Na alta, (n=164) 84,1% recebiam leite materno e, desses, 2,4% estavam em aleitamento materno exclusivo. O aleitamento materno na alta foi associado à idade gestacional maior/igual a 33,5 semanas, maior peso ao nascer e menor tempo de internação.
Conclusão: O estudo evidenciou que durante a internação, cerca de um terço dos participantes foram alimentados com leite materno. Entretanto, no momento da alta, houve prevalência de alimentação com leite materno na maioria dos casos, sendo que os fatores associados foram maior peso ao nascer e menor tempo de hospitalização.
Palavras-chave: Neonatologia. Aleitamento materno. Recém-nascido prematuro.

RESUMEN
Objetivo: Analizar los factores asociados a la lactancia materna de prematuros al alta.
Método: Estudio transversal compuesto por recién nacidos con edad gestacional <37 semanas, internados en un hospital universitario. Datos obtenidos de las historias clínicas de 180 participantes, entre agosto/2019 y agosto/2020. Para evaluar una asociación entre las variables categóricas, se utilizaron las pruebas de chi-cuadrado de Pearson o exacta de Fisher. El nivel de significación adoptado fue del 5% ($p \leq 0,05$).
Resultados: La edad gestacional media fue de 32,8 ± 2,7 semanas y el peso medio al nacer fue de 1.890 gramos ± 682 gramos. Durante la hospitalización, (n=166) 28,3% los niños recibieron predominantemente leche materna. Al alta, (n=164) 84,1% recibieron leche materna y, de estos, 2,4% estaban en lactancia materna exclusiva. La lactancia materna al alta se asoció con una edad gestacional ≥ 33,5 semanas; mayor peso al nacer y hospitalización más corta.
Conclusión: El estudio mostró que, durante la hospitalización, alrededor de un tercio de los participantes recibieron leche materna. Sin embargo, al momento del alta prevaleció la lactancia materna en la mayoría de los casos, y los factores asociados fueron mayor peso al nacer y menor estancia hospitalaria.
Palabras clave: Neonatología. Lactancia materna. Recién nacido prematuro.

INTRODUCTION

Preterm birth is a global health challenge considering its potential complications, which are responsible for most neonate deaths. Brazil is the ninth country in the world considering the number of births that take place before a pregnancy reaches 37 weeks. Therefore, a precise organization of interventions in neonate units can provide specialized and integral care to the preterm newborn (PTN), which is essential to reduce child morbidity and mortality rates[1].

Providing nutrition for hospitalized PTNs, especially during their first hours of life, is a challenge in neonatology. The gastrointestinal immaturity of PTNs makes it difficult to provide nutrients using enteral accesses. Nonetheless, trophic feeding should start as soon as possible, to stimulate gastrointestinal motility[2]. PTNs have unique characteristics and special

nutritional needs due to the immaturity and lack of coordination in their mechanisms of sucking, swallowing, and breathing. These alterations make it difficult to feed them orally, including breastfeeding[3].

Maternal milk is the ideal choice to start feeding PTNs. Consistence evidence indicate a precocious start in breastfeeding reduces the risk of necrotizing enterocolitis (NEC)[4]. Infant formulas are used when there is no breast milk available; however, their use can increase the risk of NEC development[5].

The milk produced by PTN mothers have special characteristics to attend to the nutritional needs of the newborn, favoring and reducing complications from prematurity, such as gastrointestinal infections, and neonate sepsis[6].

Due to physiological, environmental, and psychological changes caused by premature birth, continuing breastfeeding during hospitalization and discharge is a challenge for the mother, the family, and the health workers[7]. The rates of breastfeeding in hospitalized preterm neonates are low, reducing their chances of being fed with breast milk (BM), when compared with term newborns[8]. A study with PTNs in a Brazilian neonate ICU found an incidence of 5.5% exclusive breastfeeding at time of discharge[9].

In case of premature birth, lactation may be delayed, and the volume of milk produced may be lower. Furthermore, many underlying causes of premature birth are associated with delayed lactation[10]. In order to increase breastfeeding rates, mothers need to receive support and guidance from the health team in order to maintain lactation, using strategies such as the early stimulation of the breasts[11].

This work is justified by the need of analyzing the nutrition types and paths used by PTNs, from birth to discharge from the neonate unit, in an attempt to identify factors related with breastfeeding. Considering the increase in the number of premature births, the difficulties in continuing the breastfeeding of these newborns, and the importance of providing adequate nutrition for the growth and development of these children, this research aims to provide evidence concerning the importance of providing adequate nutrition to PTNs, with repercussions that go far beyond the neonate period.

The relevance of this study is based on updating and raising the awareness of researchers and workers in the field of health, regarding how essential is an adequate care with the nutrition of the premature newborn.

The goal of this study was to analyze factors related with breastfeeding of PTNs during the discharge from neonate units.

METHOD

This article is an excerpt of the research named "Factors Associated with the Nutrition of Preterm Newborns", which is a cross-sectional research carried out with PTNs hospitalized immediately after birth in the neonate unit of the neonatology service of a university hospital in Rio Grande do Sul, Brazil. The neonate unit has 20 exclusive beds for Neonate Intensive Care Unit (NICU) level III, to attend to high-complexity patients, as well as 20 beds for conventional care, and 10 beds for kangaroo method care.

The participants were included sequentially and selected according with the following criteria: newborns with gestational age under 37 weeks, born in the obstetric center and hospitalized in the neonate unit of the hospital being studied. The study excluded newborn with congenital malformation; children of mothers who could not breastfeed temporarily or permanently due to some contraindication; and of mothers who died after birth.

The sample was consecutive, formed by 180 premature children in accordance with the inclusion criteria, born from Augusto 2019 to Augusto 2020. Investigators collected data from computerized patient records using a data collection instrument they elaborated, which included variables associated with pregnancy, delivery, and birth, characteristics of participants, type of feeding provided during their permanence in the unit, type of feeding at hospital discharge, and time of hospitalization in the unit.

For categorization, we adopted the definition of breastfeeding proposed by the WHO and internationally recognized. Breastfeeding: when the child receives mother's milk (from the breast itself or previously milked); Exclusive Breastfeeding (EB): when the child receives only mother's milk as nourishment, directly from the breast or milked, or human milk from another source; Mixed or partial breastfeeding: when the child is fed breast milk in addition to other types of milk[12].

We considered mixed or exclusive breastfeeding in our outcome. The predictor variables are associated with data on mother's history, conditions of birth, and conditions related with the hospitalization of the newborn, until discharge.

To analyze breastfeeding in participants during hospitalization, the daily volume of breast milk and formula were accounted for. Thus, it was possible to determine what was the predominant type of nourishment, breast milk or formula. To investigate breastfeeding at discharge, we checked whether participants received breast milk in any proportion, that is, regardless of whether breastfeeding was exclusive or complemented by formula. Also, to determine the status of breastfeeding at discharge, we verified whether breastfeeding was exclusive, mixed, or the babies received only formula.

Data collected was tabulated, organized in a database in the Microsoft Excel software (version 365) and double-checked. Then, it was transferred into the software SPSS (Statistical Package for the Social Sciences) version 21.0, where it was analyzed. The quantitative variables were described by mean and standard deviation or median and interquartile range. Categorical variables were described using absolute and relative frequencies. To evaluate the association between categorical variables, we used Pearson's chi-squared and Fisher's exact. To compare means, Student's t was used. In asymmetric cases, we applied Mann-Whitney's U test. The significance level was 5% ($p \leq 0,05$). To check the normality of data, Kolmogorov-Smirnov's test was used.

The study was approved by the institution's Research Ethics Committee in 09/14/2018, receiving a Certificate for Submission to Ethical Appreciation (CAAE: 94030318.8.0000.5327).

To use data from the records of the newborns, we used the Term for the Use of Medical Record Data, according with the research protocol of the institution. Our research also attended to the requirements of Resolution 466/2012 from the National Council of Health.

RESULTS

The study included 180 PTNs born from August 24, 2019, to August 31, 2020, with no losses. We followed 174 of these children until discharge from the neonate unit, while 6 died during follow up. The mean gestational age of the population was 32.8 ± 2.7 weeks, weighing 1,890 grams ± 682 at birth. The median hospitalization time in the neonate unit was 18 days (10 - 40 days). Most participants (156; 86.7%) required hospitalization in NICU beds, with a median permanence of 8 days (3-19 days).

Further characteristics of our sample are described in Table 1.

Table 1 - Characteristics of PTNs hospitalized in the neonate unit from August/2019 to August/2020 (n=180). Porto Alegre, Rio Grande do Sul, Brazil, 2021

Variables	**n (%)**
Single live birth	126 (70.0)
Sex	
Male	93 (51.7)
GA (weeks) Mean (SD)	32.8 ± 2.7*
Degree of prematurity	
< 28 weeks	6 (3.3)
28 to 31	35 (19.4)
32 to 33	53 (29.4)
34 to 36	86 (47.8)
Weight/GA ratio	
Adequate for Gestational Age (AGA)	119 (66.1)
Small for Gestational Age (SGA)	59 (32.8)
Large for Gestational Age (LGA)	2 (1.1)
Weight at birth (grams) Mean (SD)	1.890 ± 682*
Classification of the weight at birth	
Extremely low weight < 1,000g	18 (10.0)
Very low weight 1,000 to 1,499 g	29 (16.1)
Low weight 1,500 to 2,500 g	101 (56.1)
> 2.500 g	32 (17.8)
Apgar Score	
1º min.	7.5 (6 – 8)**
5º min.	9 (8 – 9)**
Main reasons for hospitalization	
RDN	90 (50.0)
Prematurity	44 (24.4)
Low weight	23 (12.8)
Low weight + RDN	9 (5.0)

Source: Research data, 2021.
n: number of individuals
*Mean**Median
GA: Gestational age
RDN: Respiratory distress of newborn

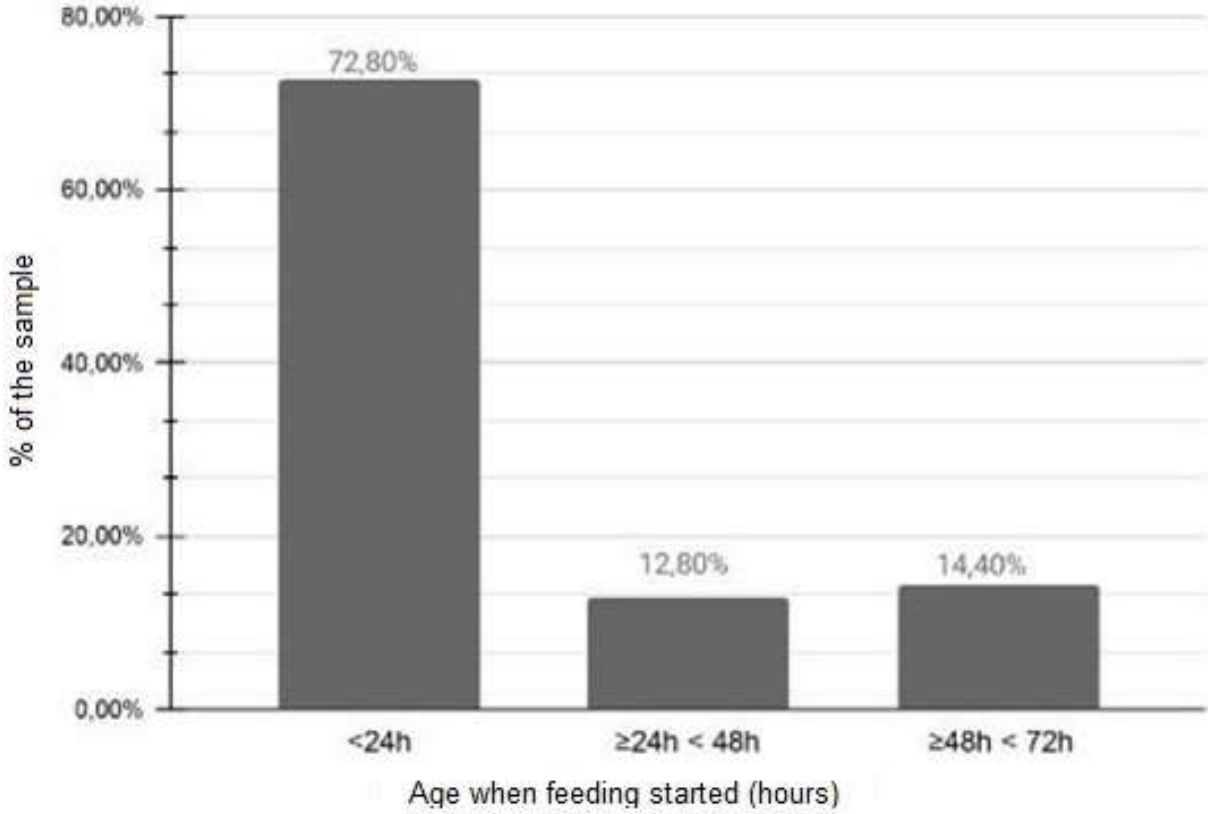
It was found that, in the prenatal, 80 (44.4%) of PTN mothers used antibiotics, the reasons for which were, mostly: urinary tract infection in 40 (50%); syphilis for 12 (15%); and upper respiratory tract for 11 (13.8%). The babies were mostly born from c-sections (128; 71.1%); in 121 (67.2%) cases it was necessary to use a forceps; and it was found that the membrane had been ruptured for more than 18 hours in 24 (13.3%) cases. In 22 (12.2%)

cases, the mother-baby dyad experiences the practice of skin-to-skin contact in the first minutes after birth. Regarding the extrauterine adaptation of the newborns: 144 (80%) needed reanimation maneuvers at birth, with 22 (12.2%) required orotracheal intubation in the delivery room.

10 (5.5%) participants presented allergies to cow's milk protein and were prescribed exclusive formula feeding during hospitalization and at discharge. These participants, as a result, were not part of our analysis of factors associated with breastfeeding. There were 4 deaths in the sample before breastfeeding started. As a result, only 166 babies were prescribed breastfeeding.

From these 166 preterm newborns, 121 (72.8%) started breastfeeding before completing 24 hours of life (Figure 1). In the first day the babies were fed, 52 (29.5%) received breast milk, and the median of the start of the use of mother's milk was 48 hours (24-72) of life.

Figure 1 - Age when the infants started being fed (n=166). Porto Alegre, Rio Grande do Sul, Brazil, 2021



Source: Research data, 2021.

Regarding breastfeeding during the permanence in the unit, from the 166 PTNs evaluated, 47 (28.3%) were fed mostly mother's milk, as opposed to those who received

formula. Nonetheless, from the 166 newborns followed up during the study, two passed away before discharge.

As a result, the analysis of breastfeeding at discharge was carried out for 164 neonates, 138 (84.1%) of whom received some amount of breast milk, regardless of being fed it exclusively or coupled with formula. 4 (2.4%) babies received exclusive breastfeeding. On the other hand, 26 (15.9%) participants received formula exclusively. All PTNs who were mostly breastfed during hospitalization, received some portion of breast milk at discharge.

Breastfeeding during discharge, as well as exclusive breastfeeding and mixed breastfeeding, were associated with a gestational age ≥ 33.5 weeks at birth, higher weight at birth, and less time in the unit (Table 2).

Table 2 - Factors associated with breastfeeding continuation at discharge (n=164). Porto Alegre, Rio Grande do Sul, Brazil, 2021

Variables	**Breastfeeding (138)**	**Formula (26)**	**p-value**
Twin – n(%)	36 (26.1)	11 (42.3)	0.149*
GA (weeks) - Mean ± SD	33.5 ± 2.1	31.8 ± 2.6	0.004**
Weight at birth (g) - Mean ± SD	2.044 ± 643	1.544 ± 471	<0.001**
Hospitalization in NICU bed = n (%)	116 (84.1)	25 (96.2)	0.130***
Hospitalization time (days) - median	16 (10-25)	42 (2571)	<0.001#

Source: Research data, 2021.
n: number of individuals
GA: Gestational age
SD: standard deviation.
NICU: Neonate Intensive Care Unit
**Pearson's chi-squared; ** Student's t test; ** Fisher's exact; # Mann-Whitney's U

The incidence of NEC in the sample was 3.9%; the seven PTNs that developed this infection were mostly fed by formula during NICU hospitalization.

DISCUSSION

Most preterm children (121; 72.8%) started to be fed before 24 complete hours of life, which could have a positive effect on neonate health. The early start of enteral nutrition has proven benefits, such as gastrointestinal stimulation and prevention of complications[5].

After a premature birth, the amount of mother milk is not always sufficient to attend to the requirements of PTNs. Studies have shown how difficult it is for PTN mothers to

provide continuous breastfeeding during hospitalization and after discharge[9,13]. The evaluation of the volume and type of milk used in feeding the participants showed that, during permanence in the neonate unit, the diet of only 28.3% consisted predominantly of breastmilk. All PTNs who were fed mostly breast milk were receiving at least some portion of it at discharge.

We found that only 2.4% of children were exclusively breastfed at discharge, with 81.7% being mixed breastfed, while 15.9% were fed only by formula. A study developed in a NICU in Rio de Janeiro, Brazil, with 258 newborns of gestational age below 33 weeks, found that 5.5% of their sample were being exclusively breastfed at discharge, with 65.8% of the sample being partially breastfed, and 28.6% being fed only formula[9]. Recently, a cohort study conducted in the NICU of a private hospital in Porto Alegre, RS, showed an incidence of 16.1% of breastfeeding at discharge, with 77.3% of mixed feeding, in a research including 335 PTNs whose weight at birth was ≤ 1,500 g, GA ≤ 30 weeks[14].

In this study we could not evaluate the beginning of postpartum expression; however, in the first day of feeding, only 52 neonates (29.5%) received breast milk. The median age for the start of breastfeeding was 2 days. Evidence shows that, when the birth is premature, the start of lactation is delayed, and the volume of milk produced is lower[10]. The early start of breast milk feeding in PTN has been associated with higher rates of exclusive breastfeeding in NICU[15]. The late start of breast milk use, as well as long periods of PTN hospitalization, have been associated with weaning before six months of life[13].

A research carried out with the mothers of very low-weight PTNs revealed that early expression of breast milk, especially during the first hour of life, is associated with more production of milk, when compared to the beginning of full expression from one to six hours after birth[10]. Early full expression, before 12 hours from birth, can increase the rates of breastfeeding at discharge. Therefore, a full expression should be carried out as fast as possible after a premature birth. Starting expression after 48 hours of birth is related with failures in establishing exclusive breastfeeding[16]. In this study, the rates of breast milk use during hospitalization and of breastfeeding at discharge show how challenging it is to provide exclusive breastfeeding to hospitalized PTNs.

Being breastfed at discharge was associated with GA ≥ 33.5 weeks, higher weight at birth, and low time of total permanence in the unit. Similar findings to those described in 2020, in a Brazilian study that pointed at the association between breastfeeding at birth and GA ≥ 28 weeks, higher weight at birth, and less time in a NICU[14]. A study carried out in the United States showed that being breastfed at discharge from NICU, regardless of the breast

milk/formula ratio, was associated with a higher GA and with a lower time of permanence in the unit[17]. The association between less time in the NICU and breastfeeding at discharge reflects how hard it is to continue lactating for a long hospitalization period.

Implementing certain strategies can aid in providing breast milk to the PTN during hospitalization and discharge. These include: providing guidance during high-risk prenatals regarding the importance of expressing milk early after a premature birth, and the benefits of using human milk in baby feeding; establishing a routine in the institution that can help full milk expression within the first hour after birth; prioritizing the provision of mother milk as the first choice in the feeding of the baby; training the team to encourage breastfeeding and instructing the mother about the importance of routinely expressing milk fully; giving support to the permanence of the parents in the unit and involving them in the care for the baby; providing a personalized channel for support to mothers, considering the doubts and difficulties that may emerge after discharge, such as the use of remote technology, which should preferably be done by a nurse breastfeeding consultant. Another recommendation is participating in breastfeeding groups with mothers, coordinated by the multidisciplinary team.

A broad level of NEC incidence has been reported in literature in a multicentric cohort study carried out with 2957 PTNs whose weight at birth was 1,500 or less, from five continents (Oceania, Europe, North America, Asia, and Africa). It was found that the incidence of NEC varied from 1% to 13%[18]. In this study, the incidence of NEC in the PTNs was 3.9%.

The seven PTNs in our sample who developed NEC had received formula as their main form of nourishment during their hospitalization. There is a proven association between exposure to maternal milk and lower incidence of NEC for PTNs[19]. In addition, mother milk has a been shown to have a protective effect in PTNs in regard to NEC, when compared to mixed feeding[20].

Since this study used data from electronic records, its main limitation is the fact that it depended on the availability and quality of the records of the institutions involved.

CONCLUSION

The evaluation of breastfeeding during the permanence in the neonate unit showed that 28.3% of premature children were mostly fed using breast milk, when compared to those that were fed mostly by formula.

At hospital discharge, only 2.4% of neonates were being exclusively breastfed, with most receiving mixed feeding. Continuing breastfeeding at discharge was associated with

gestational age of 33.5 weeks or more, higher weight at birth, and lower hospitalization time at the unit. Finally, the incidence of NEC was 3.9%.

Breastfeeding rates during hospitalization and at time of discharge reflect how challenging it is to provide continuous, exclusive breastfeeding for hospitalized premature children. The low incidence of exclusive breastfeeding at discharge shows how necessary is an intervention during hospitalization.

Therefore, interventions targeted at supporting and maintaining breastfeeding are paramount, especially those carried out by the nursing team. We suggest the establishment of a specific protocol to promote and support exclusive breastfeeding for hospitalized newborns.

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