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*J Hum Lact* 2007; 23; 269

DOI: 10.1177/0890334407304235

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# Feeding Patterns of Brazilian Preterm Infants During the First 6 Months of Life, Londrina, Paraná, Brazil

Márcia Maríá Benevenuto de Oliveira, MSc, Zuleika Thomson, PhD, Marli Terezinha Oliveira Vannuchi, PhD, and Tiemi Matsuo, PhD

## Abstract

The present study evaluated the breastfeeding practice of 278 preterm infants born at the University Hospital of Londrina, Paraná, Brazil, during hospitalization and in the first 6 months of life. Data were obtained from the hospital records, and the mothers were interviewed by home visit (75.5%) or by telephone (24.5%) when the children were 6 months old. Data were analyzed statistically using the Kaplan-Meier survival method and Cox's multivariate regression model. During hospitalization, 100% of the preterm infants received human milk and 31% received exclusive breastfeeding. The median duration of exclusive breastfeeding and breastfeeding was 63.5 and > 180 days, respectively. The prevalence of breastfeeding in the sixth month was 54.7%, and 6.8% of the infants were still exclusively breastfed. Pacifiers were used (currently using or ever used) by 127 (45.7%) preterm infants and were associated with a 1.67 times higher risk of interruption of exclusive breastfeeding. *J Hum Lact.* 23(3):269-274.

**Keywords:** exclusive breastfeeding, breastfeeding, preterm infants, Brazil

Breastfeeding is the ideal feeding method to promote adequate growth and development and provide protection against diarrhea and other diseases and against death attributable to infectious diseases in the first year of life.<sup>1,2</sup> Considering these benefits of human milk, the World Health Organization (WHO) recommends that mothers exclusively breastfeed their children until the sixth month of life. After this period, complementary foods rich in iron, vitamins, and other nutrients are

necessary, with human milk being preferentially continued up to 24 months or more.<sup>3</sup>

The advantages of human milk extend to premature and low birth weight infants who require hospitalization in neonatal intensive care units, with the mother's own milk representing the best option for feeding these children.<sup>4,5</sup> The milk of mothers who deliver preterm is higher in protein content, energy, calcium, and phosphorus than that of mothers who deliver full-term infants although it contains similar fat in quality and quantity.<sup>6-8</sup> The mean concentration of immunoglobulin A, lysozyme, lactoferrin, macrophage, lymphocytes, and neutrophils is significantly higher than in full-term colostrums.<sup>9</sup>

Some factors may impair breastfeeding of preterm neonates, including prolonged hospitalization and separation of the mother from the child, with the breastfeeding period being shortened compared with term newborns.<sup>10</sup> In the United States, a study on the patterns of breastfeeding of preterm infants after discharge showed an exclusive breastfeeding initiation rate of only 54%, with 19% of these infants being switched to milk formula 4 weeks after birth.<sup>11</sup> In view of the difficulties of maintaining breastfeeding in these children and the need to obtain data for this population, the objective of the present study was to determine the prevalence of breastfeeding and exclusive breastfeeding in preterm infants during hospitalization and in the first 6 months of life.

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Received for review January 23, 2006; revised manuscript accepted for publication February 13, 2007.

No reported competing interests.

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*J Hum Lact* 23(3), 2007

DOI: 10.1177/0890334407304235

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## Methods

A longitudinal study was conducted on preterm infants born at the University Hospital of Londrina, Paraná, between May 2002 and April 2003. Londrina is a city located in the south of Brazil, with approximately 450 000 inhabitants and an infant mortality rate of 8.99/1000 live births. The city has a 30-year history of efforts in the promotion, protection, and support of breastfeeding.<sup>12</sup>

The University Hospital is a public tertiary-care hospital with 294 beds. It is a regional referral center, and the 17 beds of the maternity unit are mainly occupied by high-risk patients. The hospital neonatal intensive care unit with 7 beds and the neonatal intermediate care unit with 10 beds have monthly occupation rates frequently exceeding the capacity of the units. The hospital maintains Baby-Friendly Hospital status, as granted by the Brazilian Ministry of Health.

During the study period, 953 children were born at this hospital, including 399 (41.9%) preterm neonates (< 37 weeks gestation) as classified by the WHO.<sup>13</sup> Fifty infants were excluded because of death and 11 because of other exclusion factors (HIV seropositivity of the mother, severe maternal disease, maternal death, and adoption); 26 second twins were excluded because only the first twin was considered in the present study. Thirty-four infants were lost because it was not possible to contact the mothers by telephone or because their address had changed, with only 2 mothers refusing to participate in the study. A total of 278 mothers were interviewed, 210 (75%) by home visit and 68 (24.5%) by telephone. The survey instrument was written based on the authors' previous experience and was reviewed by 2 outside experts, both of whom held a master's degree in public health. The authors tested the survey instrument in 25 mothers of premature babies born at the same hospital before the study began. Written consent was obtained, and the study was approved by the Research Ethics Committee of the State University of Londrina.

Primary and secondary data sources were used in the present study, consisting of data obtained by home interviews during visits to all mothers living in Londrina and nearby towns or by telephone interview of mothers of more distant towns. Data were collected from the records of the mothers (mother's age, type of delivery), records of preterm infants (sex, gestational age, birth weight, duration of hospitalization, feeding patterns during hospitalization, and discharge orientation), and interviews (parity, educational level, occupation, per capita income,

previous breastfeeding experience, feeding patterns, and currently using or ever used a pacifier). During the interviews, 2 questions were asked to the mothers concerning pacifier use: "Does your baby use a pacifier?" and, "If so, when did he or she start using it?"

The duration of breastfeeding was defined according to the criteria of the WHO: *exclusive breastfeeding* means no other liquid or solid from any other source enters the infant's mouths, and *breastfeeding* means the child has received breast milk, direct from the breast or expressed.<sup>14</sup> To determine the duration of breastfeeding, mothers were asked these questions: "How long did you breastfeed without offering water and tea?" "Are you giving other milk?" "Is the child still breastfeeding?" "If not, when did he or she stop?"

The data collected were categorized and entered into a database using Epi Info version 6.04 (Centers for Disease Control and Prevention, Atlanta, Ga).<sup>15</sup> Kaplan-Meier survival curves were constructed to estimate the duration of exclusive breastfeeding and breastfeeding in the first 6 months of life using Statistica for Windows version 6.0 (Stat Soft, Tulsa, Okla). Variables showing significant associations were reevaluated by Cox's multivariate regression model using SAS version 8.2 (SAS Institute, Cary, NC).<sup>16</sup> All steps of the study received financial support from a governmental foundation for research (Fundação Araucária).

## Results

Table 1 shows the characteristics of the mothers and the preterm infants studied. Maternal age ranged from 13 to 51 years, with one fourth of the mothers being adolescents. A total of 115 (41.4%) mothers had only one child, a fact explaining the high percentage (57.9%) of mothers with no previous breastfeeding experience. Regarding maternal work, more than two thirds were housewives, and the per capita income was less than the standard minimal wage (US\$75 per month) for most women interviewed (85.6%).

The percentage of preterm infants who were female was 51.4%; the median gestational age was 34 weeks (range 26-36 weeks); and birth weight was normally distributed, with median 2170 g,  $\bar{x}$  2152.9  $\pm$  637.6, and range 735 to 3850 (the latter was a child of a diabetic mother). The percentage of infants weighing more than 2500 g was 28.8%. The median duration of hospitalization was 9 days (range, 1-118), with the majority of the preterm infants (54%) being hospitalized for 1 week or longer.

Table 1. Characteristics of the Population of the University Hospital of Londrina, Paraná, Brazil, Studied Between May 2002 and April 2003\*

	No. (%)
<b>Mothers</b>	
Age, y	
< 20	70 (25.2)
≥ 20	208 (74.8)
Type of delivery	
Cesarean	166 (59.7)
Vaginal	112 (40.3)
Parity	
1	115 (41.4)
≥ 2	163 (58.6)
Educational level	
None + incomplete primary school	129 (46.4)
Complete primary + incomplete secondary school	83 (29.9)
Complete secondary school + high school	66 (23.7)
Occupation	
Unpaid domestic work	192 (69.1)
Paid informal work at home	20 (7.2)
Paid work outside the home	66 (23.7)
Per capita income	
< 1 minimal wage**	238 (85.6)
≥ 1 minimal wage	34 (12.2)
No information	6 (2.2)
Previous breastfeeding experience	
No experience	161 (57.9)
Experience	117 (42.1)
<b>Preterm infants</b>	
Sex	
Female	143 (51.4)
Male	135 (48.6)
Gestational age, wk	
< 30	16 (5.7)
≥ 30	261 (93.9)
No record	1 (0.4)
Birth weight, g	
< 1500	47 (16.9)
≥ 1500	230 (82.7)
No record	1 (0.4)
Hospitalization duration, d	
< 7	128 (46.0)
≥ 7	150 (54.0)

\*Total N = 278.

\*\*Minimal wage = US\$75 per month.

Regarding the type of feeding received during hospitalization, among the 278 preterm neonates studied, excluding 1 case for which no record was available, 86 (31.0%) were exclusively breastfed, 191 (69.0%) received breast milk and infant formula, and none of the infants was fed exclusively infant formula during this period. The human milk received by these babies was from their own mother or was banked human milk, preferably from preterm mothers. All human

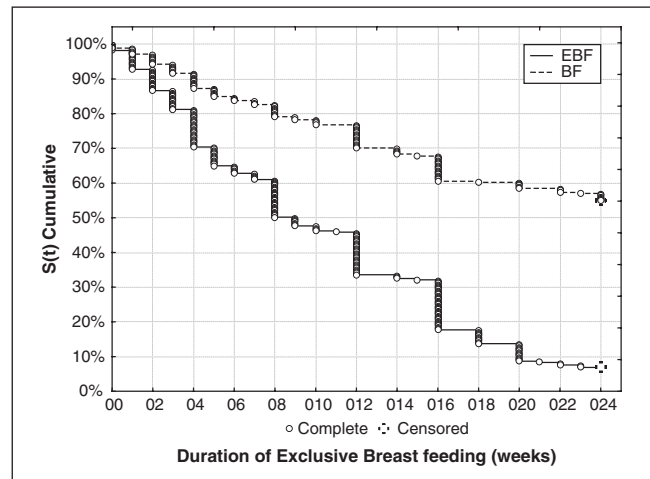


Figure 1. Comparison of the survival curves of exclusive breastfeeding (EBF) and breastfeeding (BF).

milk used for these babies was fortified with 5% of powder multicomponent fortifier (calcium, proteins, zinc, lipids, carbohydrates, phosphorus, magnesium, sodium, copper, vitamins; 85 kcal/100 mL).

With respect to the feeding of preterm infants after hospital discharge, Figure 1 shows the comparison of the survival curves of exclusive breastfeeding and breastfeeding during the first 6 months of life.

The median duration of exclusive breastfeeding among the preterm infants studied was 63.5 days, with the prevalence of exclusive breastfeeding being 70.4% at the end of the first month. At the end of the third month, the prevalence of exclusive breastfeeding was 33.6% and fell to 17.7% by the fourth month. At the sixth month, 19 (6.8%) children continued to be exclusively breastfed.

The median duration of breastfeeding was much higher than that of exclusive breastfeeding (> 180 days). At the end of the first month, the prevalence of breastfeeding among the preterm infants studied was 87.3%, falling to 60.6% by the fourth month. This decline was slower between the fourth and sixth months, with 54.7% of the infants receiving breastfeeding at the time of the interview.

Water and tea were introduced during the first 6 months of life for almost all (95.7%) preterm neonates studied, with the introduction of water being considered late for Brazilian patterns, because 160 (60.2%) of the infants received water between the second and fourth month of life (median of 12 weeks). There is a difference between the 95.7% who received water and tea during the first 6 months of life and the 6.8% who were exclusively breastfeeding at the sixth month. The number

Table 2. Cox Regression and Hazard Ratio for Risk of Exclusive Breastfeeding

Variables	Exclusive Breastfeeding, No. (%)		Total, No. (%)	Parameter Estimate	Standard Error	$\chi^2$	$P > \chi^2$	Hazard Ratio	95% Hazard Ratio Confidence Limits
	Yes	No							
Mother's age, y									
< 20	2 (3.1)	62 (96.9)	64 (23.1)	-0.172	0.174	0.980	.322	0.84	0.60-1.18
≥ 20	17 (8.0)	196 (92.0)	213 (76.9)						
Parity									
< 2	6 (5.2)	109 (94.8)	115 (41.5)	-0.087	0.201	0.188	.664	0.92	0.62-1.36
≥ 2	13 (8.0)	149 (92.0)	162 (58.5)						
Previous breastfeeding experience									
No	11 (6.8)	150 (93.2)	161 (58.1)	-0.093	0.187	0.248	.619	0.91	0.63-1.31
Yes	8 (6.9)	108 (93.1)	116 (41.9)						
Birth weight, g									
735-2170	9 (6.5)	130 (93.5)	139 (50.2)	0.032	0.168	0.036	.849	1.03	0.74-1.44
2171-3850	10 (7.3)	128 (92.8)	138 (49.8)						
Gestational age, wk									
26-34	10 (7.0)	133 (93.0)	143 (51.6)	-0.075	0.149	0.250	.617	0.93	0.69-1.24
35-36	9 (6.7)	125 (93.3)	134 (48.4)						
Hospitalization duration, d									
< 7	12 (9.8)	110 (90.2)	122 (44.0)	0.056	0.167	0.113	.737	1.06	0.76-1.47
≥ 7	7 (4.5)	148 (95.5)	155 (56.0)						
Pacifier use									
Yes	2 (1.6)	125 (98.4)	127 (45.8)	-0.515	0.129	15.915	< .001	0.60	0.46-0.77
No	17 (11.3)	133 (88.7)	150 (54.2)						
Total	19 (6.9)	258 (93.1)	277 (100.0)						

6.8% is an estimate obtained by Kaplan-Meier curve, with final outcome and censored data taken into account. An important advantage of the Kaplan-Meier curve is that the method can include "censored" data; sample losses are considered before the final outcome.

With respect to the time of introduction of other types of milk, a large number of infants (78.4%) were receiving another type of milk by 6 months of life. Regarding the type of milk, 123 (56.4%) mothers introduced infant formula to their premature babies and 95 (43.5%) diluted cow's milk. The hospital follow-up routine is to prescribe formula, if necessary, but most mothers in Brazil cannot afford infant formulas because of their high price, which is approximately US\$7 per can. The per capita income of most mothers (85.6%) is less than US\$75 per month.

Kaplan-Meier survival curves of the duration of exclusive breastfeeding according to maternal age demonstrated a median of 8 weeks for adolescent mothers and 9 weeks for mothers aged 20 years or more, with no significant difference in the duration of exclusive breastfeeding between these 2 categories ( $P = .28$ ). Parity did not interfere with the duration of exclusive breastfeeding. The median duration of exclusive breastfeeding was 8 weeks for mothers with no previous breastfeeding experience and 12 weeks for those with previous experience. This

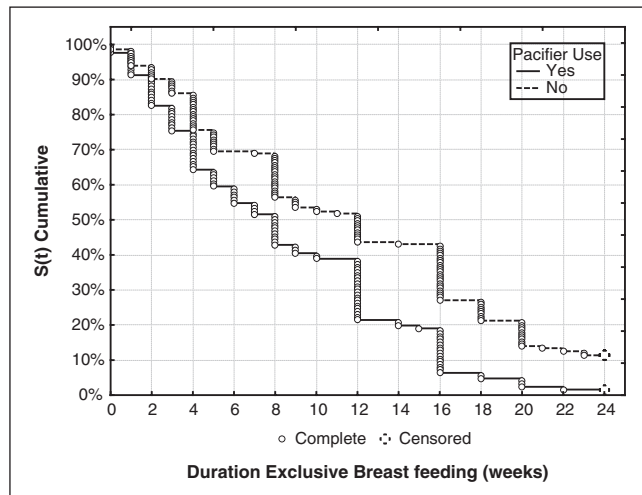
difference was significant in a bivariate analysis ( $P = .00954$ ) but was no longer significant after Cox multivariate regression analysis. Birth weight, gestational age, and duration of hospitalization of the preterm infant also showed no significant associations with the duration of exclusive breastfeeding after univariate, Kaplan-Meier survival, and Cox multivariate regression analysis (Table 2).

Figure 2 shows the Kaplan-Meier survival curves of exclusive breastfeeding according to pacifier use. A pacifier was offered to 127 (45.7%) of the 278 preterm infants studied. A significant difference ( $P < .00013$ ) was observed in the duration of exclusive breastfeeding between infants who used a pacifier and those who did not. Analysis of the duration of exclusive breastfeeding using the Cox regression model showed that the use of a pacifier increased the risk for the termination of exclusive breastfeeding (odds ratio = 1.670, 95% confidence interval 1.296-2.151).

### Discussion

Few studies monitoring preterm infants in the first 6 months of life are available. The evaluation of breastfeeding status of preterm infants born in the University of Londrina during hospitalization and the first 6





**Figure 2.** Survival curves of exclusive breastfeeding and pacifier use.

months of life showed that all of them received human milk in the hospital. The study demonstrates that breastfeeding these babies is possible, because almost one third were exclusively breastfed during hospitalization. As pointed out by Nascimento and Issler,<sup>17</sup> breastfeeding preterm infants is challenging in the face of preterm characteristics and the many obstacles in hospitals that make exclusive breastfeeding for these children a difficult task.

Nevertheless, at 6 months of age, the median duration of exclusive breastfeeding and breastfeeding was 63.5 and > 180 days, respectively, values considered to be high when compared with other similar investigations<sup>18-20</sup> and in view of the characteristics of the study population. However, these figures are still far from those recommended by WHO.<sup>3</sup> A similar investigation in Londrina in 1998, in the same hospital, conducted by Vannuchi et al<sup>21</sup> studying preterm (69%) and term babies, showed a median duration of exclusive breastfeeding of 45 days. In Brazil, a countrywide study (although not specific to preterm infants) showed a lower duration of exclusive breastfeeding ( $\bar{x}$  23.4 days) than that observed in the present study.<sup>22</sup> In 2002, a study of 2000 children, 0 to 12 months of life, in the city of Londrina showed a median of 11.9 days for exclusive breastfeeding and 257.3 days for breastfeeding.<sup>23</sup>

The early introduction of water or tea has been reported in several studies<sup>24,25</sup> as a common practice in several countries, including Brazil. In this study, the introduction of water or tea at the sixth month of life of the premature babies was almost unanimous (95.7%). Investigating feeding habits of preterm and term children

in maternities of the southeast part of the country in 1998, Toma and Monteiro<sup>26</sup> found out that water and glucose were introduced to 65% of children.

As for the introduction of other types of milk, this research verified that a large number of premature infants were being fed with milk other than human milk at the time of this interview. An investigation conducted in the south of Brazil demonstrated that the relative risk of breastfeeding interruption in the first month was 3.7 times higher when infant formula was introduced in the first week compared with children who did not receive formula.<sup>27</sup>

Various Brazilian and international studies carried out with full-term children have shown that the frequent use of a pacifier is associated with a reduction in the duration of exclusive breastfeeding, with children using a pacifier being more likely to be weaned.<sup>23,28-31</sup> This study shows that the use of a pacifier is significantly associated with the breastfeeding rates of premature infants, with a chance 1.67 higher for early interruption of exclusive breastfeeding. The duration of the use of a pacifier was not studied in this research.

## Conclusions

All preterm infants in the present study received human milk during hospitalization, with 31% being exclusively breastfed. None of them were exclusively receiving infant formula, which was possibly because the University Hospital has a team of professionals trained in the counseling course on breastfeeding. In addition, a human milk bank is available that seeks to guarantee pasteurized human milk to hospitalized preterm infants in the absence or deficiency of the mother's own milk.

With respect to the duration of breastfeeding after hospital discharge, the median duration of exclusive breastfeeding and breastfeeding was 63.5 and > 180 days, respectively, values considered to be high when compared with other similar investigations and in view of the characteristics of the study population.

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## Resumen

Este estudio evaluó las prácticas de lactancia materna de 278 recién nacidos pretermino en el Hospital Universitario de Londrina, Paraná, Brasil, durante la hospitalización y en los primeros 6 meses de vida. Los datos se obtuvieron de las historias clínicas del hospital y las entrevistas a las madres durante visita domiciliar (75.5%) o llamada telefónica (24.5%) cuando los niños cumplieron 6 meses de edad. Se analizaron los datos utilizando el método de supervivencia de Kaplan-Meier y el modelo de regresión multivariada de Cox. Durante la hospitalización el 100% de los recién nacidos pretermino recibieron leche materna y 31% recibieron lactancia materna exclusiva. La duración mediana de lactancia materna exclusiva y lactancia fue de 63.5 y > 180 días, respectivamente. La prevalencia de lactancia materna en los 6 meses fue de 54.7% y 6.8% de los bebés todavía recibían lactancia materna exclusiva. 126 (45.7%) de los recién nacidos pretermino usaron chupetes (actualmente o en algún momento) y se asoció con un riesgo de 1.67 veces más alto para la interrupción de la lactancia materna exclusiva.