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## ORIGINAL ARTICLE

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# *Pacifier use and its relationship with early weaning in infants born at a Child-Friendly Hospital*

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### Abstract

**Objective:** to assess the use of pacifiers and its relationship with early weaning among children born at a Child-Friendly Hospital.

**Method:** a cohort study was carried out with 250 healthy singleton babies, with birthweight  $\geq 2,500$  g, and with ongoing breastfeeding, born at Hospital de Clínicas de Porto Alegre. All mothers lived in Porto Alegre. Data were collected through interviews with the mothers, both at the maternity ward and at their homes, at the end of the first and sixth month of life; and over the phone, in the second and fourth months. Survival curves were built to compare the prevalence of breastfeeding and exclusive breastfeeding during the first six months of life among pacifier and non-pacifier users.

**Results:** among the 237 newborns contacted in the first month of life, 61.6% had been using pacifiers, most of them since the first week of life. The use of pacifiers was more frequent among male newborns and among those with poorly educated mothers; among babies who were being breastfed, the use of pacifiers was more commonly observed among non-exclusively breastfed ones. Considering the babies who were still being breastfed by the end of the first month of life, the incidence of weaning between months 1 and 6 was 22.4% for non-pacifier users and 50.8% for pacifier users ( $p < 0.001$ ). Almost 2/3 of pacifier users stopped being exclusively breastfed before the end of the second month; among non-pacifier users, this rate was 45% ( $p < 0.001$ ).

**Conclusion:** the use of pacifiers is deeply rooted in our culture, even in a population oriented towards avoiding it. The association between pacifier use and shorter duration of breastfeeding and exclusive breastfeeding was confirmed in this population.

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## Introduction

Pacifiers are widely used in many parts of the world, despite the fact that both the World Health Organization<sup>1</sup> and the American Academy of Pediatrics<sup>2</sup> advise against their use, especially with children who are being breastfed. Research carried out in Brazil into all of the state capitals with the exception of Rio de Janeiro, in October 1999, revealed that 53% of children less than one year old were using pacifiers.<sup>3</sup>

Many studies have shown an association between the use of a pacifier and a shorter duration of maternal breastfeeding.<sup>4-13</sup> The first study to be designed specifically to test this association was carried out in Pelotas, in the south of Brazil, by Victora *et al.*<sup>7</sup> In the study it was found that children who were still being breastfed at one month of life and who frequently used a pacifier had a 2.4 times greater chance of being weaned in between one and six months. This risk was reduced, but still significant (1.7 times), for children using a pacifier less often.

According to some authors,<sup>14</sup> the “suction confusion” caused by the differences in suction techniques between a pacifier and the breast can interfere with successful breastfeeding. Furthermore, children who use a pacifier feed at the breast less often,<sup>7,8,10,13</sup> which can interfere with maternal milk production.

Starting from the premise that bottles and pacifiers can be obstacles to successful breastfeeding, the World Health Organization, in conjunction with UNICEF, included not using bottles or pacifiers in maternity units with breastfed children in their “Ten Steps to Successful Breastfeeding”.<sup>1</sup> As a result, Child-Friendly Hospitals (Hospitais Amigo da Criança), in addition to not using bottles or pacifiers in their maternity units, also advise mothers to avoid these practices after hospital discharge. There are no known studies investigating the practice of pacifier use and its relationship with early weaning of children born at Child-Friendly Hospitals. This article is intended to fill that gap.

## Methods

This is a longitudinal cohort study, which involved 250 children born at the Hospital de Clínicas de Porto Alegre, a general university hospital where approximately 4,000 births take place a year. Its clientele comes from varying socioeconomic strata with a predominance of individuals who have a low level of buying power, users of the Sistema Único de Saúde (Brazilian National Health System). The hospital was recognized as a Child-Friendly Hospital in December 1997.

The sample was selected during the period from August 1999 to May 2000 and included all neonates born during the period who fulfilled the following criteria: birth weight equal to or greater than 2,500 g; were not twins; had no health problems which impeded breastfeeding or made it difficult (e.g.: HIV positive mother, congenital

malformations, conditions which made it necessary for mother and child to be in different wards/units), were breastfeeding when discharged from the maternity unit and were the children of mothers resident within the municipality of Porto Alegre.

After agreeing to participate and signing an informed consent form, the mothers were interviewed at the maternity unit in order to obtain information about their sociodemographic characteristics and on certain aspects related to pre-natal care, the birth and previous experience of breastfeeding. Information related to pacifier use and methods of feeding the child were obtained by interviews with the mothers in their homes at the end of the first and sixth months of life of the child and by telephone interviews at the end of the second and fourth months. When telephone interviews were not possible, home visits were resorted to. The children in the cohort were observed until the sixth month of their lives or until breastfeeding was interrupted if this occurred first. None of the mothers refused to take part in the study. Thirteen (5.2%) children were lost during the first month of observation. As a result data relating to pacifier use at one month relates to 237 children. Two hundred and twenty-eight children remained within the study until the end of the six-month observation period, an 8.4% sample loss due to failure to locate their families on interview dates. Both at the maternity unit and during follow-up, standardized questionnaires were used. Two of the authors (M.E.S. & A.L.B.) performed both the sample selection and the interviews at the maternity unit; home visits and telephone interviews were the responsibility of medicine students who had won Scientific Initiative scholarships and been duly trained for the task. The quality of the information obtained on the follow-up questionnaires was checked by the two authors mentioned above, and compared with a second interview in approximately 5% of cases which were selected by lots.

The maternal breastfeeding categories used in the study were those defined by the World Health Organization,<sup>15</sup> i.e. children whose only source of both nutrition and hydration was human milk were considered to be receiving *exclusive maternal breastfeeding*, children were considered to be receiving *predominant maternal breastfeeding*, if, in addition to milk, they received water, juice or teas and children who received any quantity whatsoever of maternal milk were considered to be receiving *maternal breastfeeding*, irrespective of whether they received other foods or not. *Partial breastfeeding* was the term used when children received other types of milk in addition to maternal milk and *early weaning* was used to describe the situation of children whose supply of maternal milk was interrupted during the observation period, i.e. before the end of six months.

Children were categorized as pacifier users when their mother said that they had the habit of using one and *non-users* when this habit did not exist.

Epi-Info 6.0 and SPSS *for Windows* (version 8.0) were used for the statistical analysis. Associations between pacifier

use and selected variables were tested using either the *chi-square*, the Pearson or the *chi-square* with Yates' correction tests. The sample was grouped into terciles with respect to the mother's education and *per capita* income. The least educated tercile included women who had spent less than seven years at school, the middle tercile those mothers with 7 to 8 years' study and the upper tercile mothers with more than 8 years' education. The lower, middle and upper terciles for income corresponded to  $\leq 0.57$  minimum salaries (MS),  $\leq 0.58$ -1.2 MS and  $>1.2$  MS, respectively.

Cox regression was used to calculate early weaning hazard ratios (HR), according to a number of different variables and to calculate risk of weaning for children who used pacifiers, taking into consideration the pattern of breastfeeding at one month: the only variable which was shown to be associated with both exposure (pacifier use) and with outcome (early weaning). Cox regression was also used to calculate the modifying effect of selected variables on the association between pacifier use and early weaning. The variables, sex of child, race of mother and type of birth were selected as they had been shown to exercise a modifying effect on the relationship in an earlier study,<sup>7</sup> and the variables education and birth order due to their having an association close to statistical significance with the use of pacifiers and early weaning respectively.

In order to compare the prevalence of maternal breastfeeding with that of exclusive maternal breastfeeding for users and non-users of pacifiers, maternal breastfeeding survival curves were constructed, and the log rank test employed to calculate statistical significance.

In order to avoid reverse causality distortions (weaning being the cause of pacifier use and not the other way around), only children who were being breastfed at the end of the first month were included in the Cox regression and survival curves ( $n = 219$ ).

The study was approved by the Scientific Commission and by the Commission for Research and Ethics in Health of the Hospital de Clínicas de Porto Alegre.

## Results

Of the 250 mothers who started the study, (20.4%) brought pacifiers to the maternity unit with them and three (1.2%) offered them to the newborn. During the first month, the use of a pacifier was at least attempted with 87.8% of the children, in the majority of cases by the mothers (72.2%). Fathers were responsible for offering the pacifier in 2.5% of cases and grandparents in 7.2%.

In the visit during the first month, it was found that, of the 237 children who were located, 91 (38.4%) were not using a pacifier and 146 (61.6%) were, the majority since the first week of life (34.2%).

The characteristics of the mothers and their children and also environmental factors are given in Table 1, according to use or not of pacifiers at one month. Pacifier use was most

frequent among male children and among those who were not being exclusively breastfed during the first month. The association with the lower educational group and pacifier use was very close to significance ( $p = 0.059$ ).

Table 2 shows weaning risk during the first six months according to environmental factors and the characteristics of mothers and children. Firstborn children had a 48% greater risk of being weaned early when compared with children with older siblings. This difference was very close to significance (95% CI= 0.99 - 2.22).

Simple Cox regression revealed that maternal breastfeeding patterns at one month was significantly associated with the risk of weaning between one and six months. Children who were being partially breastfed at one month had a 4.5 times greater risk (CI = 2.7 - 7.7) of having been weaned by the sixth month and those being predominant breastfed a 1.6 times greater risk (CI = 0.9 - 2.9) when compared with children being exclusively breastfed.

The survival curves (Figures 1 and 2) show that maternal breastfeeding and exclusive maternal breastfeeding frequencies among children who were not using a pacifier during the first month were greater than those of children who were. Observe that, for children who were still being breastfed at one month, the incidence of weaning between the second and sixth months was 22.4% for children who didn't use a pacifier and 50.8% for pacifier users ( $p < 0.001$ ). Seventy-three percent of the children who used a pacifier had ceased being exclusively breastfed by the end of their second month of life, whilst for children who were not using pacifiers, this figure was 44.9% ( $p < 0.001$ ).

As maternal breastfeeding patterns at one month were equally associated with both the habit of using a pacifier and with early weaning, thereby becoming a potential confusion factor, Cox regression was used to analyze the relationship between pacifier use and early weaning, controlled by this variable. The risk of early weaning between one and six months for children who were still being breastfed at one month remained significantly greater among the children who used a pacifier (Table 3).

Table 4 shows the results of the Cox regression for testing the modifying effect of certain selected variables on the association between pacifier use and early weaning. The risk of weaning as associated with pacifier use was greater for boys, for children with older siblings and for children who were born by caesarian, but these interactions were not significant.

## Discussion

This study shows how deeply rooted the practice of offering pacifiers is in local culture. Despite these children having been born in a Child-Friendly Hospital, which discourages this practice, only one in ten children was not offered a pacifier at home, and, by the end of the first month of their lives, six out of ten children were using a

**Table 1** - Characteristics of mothers and children according to the use of pacifier at one month

Characteristics	Use of pacifier		Total n (%)	p
	No n (%)	Yes n (%)		
<b>Child's sex</b>				
Female	51 (56.0)	54 (37.0)	105 (44.3)	< 0.01 *
Male	40 (44.0)	92 (63.0)	132 (55.7)	
<b>Birth weight</b>				0.51 †
2,500-2,999 g	26 (28.6)	34 (23.3)	60 (25.3)	
3,000-3,999 g	59 (64.8)	105 (71.9)	164 (69.2)	
≥ 4,000 g	6 (6.6)	7 (4.8)	13 (5.5)	
<b>Mother's age</b>				0.27 *
< 21	23 (25.3)	48 (32.9)	71 (30.0)	
≥ 21	68 (74.7)	98 (67.1)	166 (70.0)	
<b>Mother's race</b>				0.80 *
White	67 (73.6)	104 (71.2)	171 (72.2)	
Non-white	24 (26.4)	42 (28.8)	66 (27.8)	
<b>Presence of partner</b>				0.80 *
Yes	81 (89.0)	127 (87.0)	208 (87.7)	
No	10 (11.0)	19 (13.0)	29 (12.2)	
<b>Mother's educational level</b>				0.06 †
Lower tercile	26 (28.6)	62 (42.5)	88 (37.1)	
Middle tercile	28 (30.8)	43 (29.5)	71 (30.0)	
Upper tercile	37 (40.7)	41 (28.1)	78 (32.9)	
<b>Per capita income ‡ (minimum wage)</b>				0.71 †
Lower tercile	26 (29.9)	49 (35.3)	75 (33.2)	
Middle tercile	33 (37.9)	49 (35.3)	82 (36.3)	
Upper tercile	28 (32.2)	41 (29.5)	69 (30.5)	
<b>Type of delivery</b>				0.20 *
Vaginal	67 (73.6)	119 (81.5)	186 (78.5)	
Cesarean	24 (26.4)	27 (18.5)	51 (21.5)	
<b>Birth order</b>				0.56 *
First child	35 (38.5)	63 (43.2)	98 (41.4)	
Second children or later	56 (61.5)	83 (56.8)	139 (58.6)	
<b>Number of pre-natal visits</b>				0.13 *
< 5	11 (12.1)	30 (20.5)	41 (17.3)	
≥ 5	80 (87.9)	116 (79.5)	196 (82.7)	
<b>Breastfeeding period of older children ¶</b>				0.18 *
< 4 months	11 (19.6)	26 (31.3)	37 (26.6)	
≥ 4 months	45 (80.4)	57 (68.7)	102 (73.4)	
<b>Breastfeeding pattern at one month ¶¶</b>				< 0.01 †
Exclusive	62 (70.4)	63 (48.1)	125 (57.1)	
Predominant	19 (21.6)	36 (27.5)	55 (25.1)	
Partial	7 (8.0)	32 (24.4)	39 (17.8)	

\*  $\chi^2$  with Yates' correction.† Pearson's  $\chi^2$ .

‡ 11 mothers did not provide the information.

¶ Only mothers who had other children were included (n = 139).

¶¶ Only those children who were being breastfed at one month were included (n = 219).

pacifier. The prevalence of pacifier use within the population studied was similar to that found by Barros *et al.*<sup>6</sup> in Guarujá, SP (54.8%), and less than that which was observed in Pelotas, RS<sup>7</sup> (85%). It is also lower than the prevalence of pacifier use by children less than a year old for the general population of Porto Alegre (69.2%), according to a national study performed under the auspices of the Health Ministry, but greater than the average

national prevalence (53%).<sup>3</sup> According to the same research, Porto Alegre is the city with the highest prevalence of pacifier use out of all the state capitals in Brazil. It is possible that the prevalence of pacifier use within the population studied was even higher before the implementation of the Child-Friendly Hospital initiative although there is no available data with which to verify this hypothesis.

**Table 2** - Incidence density ratios for weaning between 0 and 6 months according to mothers' and children's characteristics

Characteristics	weaning% (n = 228) n (%)	Total incidence n (%)	Density ratio between 0-6 months
<b>Child's sex</b>			
Female	44 (44.0)	100 (43.9)	1.01 (0.72-1.62)
Male	50 (39.1)	128 (56.1)	1.00
<b>Birth weight</b>			
2,500-2,999 g	22 (38.6)	57 (25.0)	0.77 (0.31-1.89)
3,000-3,999 g	66 (41.8)	158 (69.3)	0.87 (0.38-2.01)
≥ 4,000 g	6 (46.2)	13 (5.7)	1.00
<b>Mother's age</b>			
< 21	33 (47.1)	70 (30.7)	1.27 (0.83-1.94)
≥ 21	61 (38.6)	158 (69.3)	1.00
<b>Mother's race</b>			
White	65 (39.6)	164 (71.9)	0.82 (0.53-1.28)
Non-white	29 (45.3)	64 (28.1)	1.00
<b>Presence of partner</b>			
No	13 (46.4)	28 (12.3)	1.16 (0.65-2.08)
Yes	81 (40.5)	200 (87.7)	1.00
<b>Mother's educational level</b>			
Lower tercile	40 (46.0)	87 (38.2)	1.35 (0.83-2.18)
Middle tercile	26 (37.7)	69 (30.3)	1.05 (0.62-1.79)
Upper tercile	28 (38.9)	72 (31.6)	1.00
<b>Per capita income* (minimum wage)</b>			
Lower tercile	27 (36.5)	74 (33.3)	0.84 (0.49-1.41)
Middle tercile	34 (42.5)	80 (36.0)	0.89 (0.53-1.47)
Upper tercile	29 (42.6)	68 (30.6)	1.00
<b>Type of delivery</b>			
Cesarean	16 (34.0)	47 (20.6)	0.75 (0.44 -1.28)
Vaginal	78 (43.1)	181 (79.4)	1.00
<b>Number of children</b>			
First child	46 (48.4)	95 (41.7)	1.48 (0.99-2.22)
Second child or later	48 (36.1)	133 (58.3)	1.00
<b>Number of pre-natal visits</b>			
< 5	17 (47.7)	38 (16.7)	1.21 (0.72-2.05)
≥ 5	77 (40.5)	190 (83.3)	1.00
<b>Breastfeeding of previous children †</b>			
< 4 months	15 (41.7)	36 (27.1)	1.36 (0.74-2.50)
≥ 4 months	33 (34.0)	97 (72.9)	1.00

\* Six mothers did not provide the information.

† 95 mothers who did not have other children were excluded.

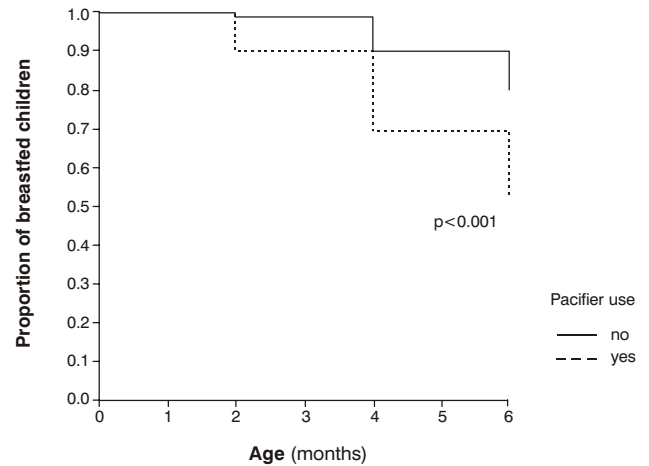
Some studies have identified characteristics of mothers, their children or their environment which favor pacifier use. Examples are: male children<sup>7,16,17</sup>; low birth weight babies<sup>7</sup>; firstborn children<sup>8,16,18</sup> those who have been exposed to cigarette smoke<sup>16,17</sup>; children of young mothers<sup>7,8,10,16</sup>; or from a family with a low socio-economic level.<sup>6,10,16</sup> In this study, pacifier use was more frequent among male children and those whose mothers were less educated. It is possible

that better educated mothers are better informed and conscious of the risks of pacifier use. It is also possible that these families have living arrangements that favor a more tranquil atmosphere, and have physical and emotional resources which better equip them to use other methods of calming their children. The fact that boys are more likely to use a pacifier still lacks an explanation. Could boys have different behavior patterns from girls and so be offered a

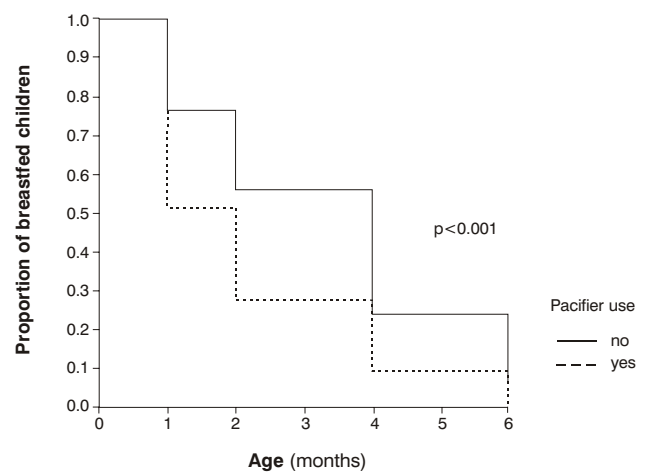
pacifier more or often, or could girls have a tendency to reject pacifiers more often? These questions would be best answered by means of ethnographic studies.

The association between pacifier use and shorter maternal breastfeeding duration, already described in other studies,<sup>4-13</sup> was confirmed. Children who were still being breastfed at the end of the first month of their lives and used a pacifier had a 2.8 times greater chance of being weaned by the sixth month. The chance of reverse causality distortion was minimized by excluding those children who were weaned during the first month of their lives. Furthermore the association continued to be significant irrespective of the pattern of breastfeeding at one month. Therefore, with respect of a child using a pacifier when one month old, it is possible to say that this child runs a considerably higher risk of being deprived of the benefits of maternal breastfeeding before the end of the sixth month than a child which does not, even if being exclusively breastfed at one month. This fact is relevant to the attention which has been given to mother/baby/family triage when attempting to prevent early weaning.

Victora *et al.*<sup>7</sup> observed that the association between pacifier use and maternal breastfeeding duration can be significantly modified by certain factors, such as the mother's race and the type of birth. These authors showed that pacifier use was only associated with maternal breastfeeding duration with Caucasian women and that this association was much stronger with women who had undergone caesarian deliveries (HR = 9.1) when compared with those who had had vaginal delivery (HR = 3.1). While the association was also stronger for girls (HR = 5.4) than for boys (HR = 2.6) this difference was not statistically significant. This study also revealed a stronger association between pacifier use and early weaning among children born by caesarian, although there was no statistical significance. In contrast with Victora *et al.*,<sup>7</sup> the association was stronger among boys - although once again without statistical significance - and there was no difference between the children of white and non-white mothers. Education and birth order of the child also had no modifying effect on the association between pacifier use and early weaning.



**Figure 1** - Survival curve of breastfeeding and use of pacifier in the first 6 months of life of children born at Hospital de Clínicas de Porto Alegre



**Figure 2** - Survival curve of exclusive breastfeeding and use of pacifiers in the first 6 months of children born at the Hospital de Clínicas de Porto Alegre

**Table 3** - Cox regression analysis of factors associated with weaning between 1 and 6 months (n = 219)\*

Variables	Raw IDR (95% IC)	Adjusted IDR† (95% IC)
<b>Use of pacifier</b>	2.8 (1.6 - 4.7)	2.2 (1.3 - 3.8)
<b>Type of breastfeeding at the 1st month</b>		
Exclusive	1.0	1.0
Predominant	1.6 (0.9 - 2.9)	1.5 (0.8 - 2.6)
Partial	4.5 (2.7 - 7.7)	3.7 (2.2 - 6.4)

\* Children who stopped being breastfed during the first month of life were excluded.

† Adjusted for use of pacifier and type of breastfeeding.

IDR = Incidence of density ratio.

IC = Confidence interval.

**Table 4** - Modifying effect of certain selected variables on the association between pacifier use and early weaning\*

Modifying effect	IDR (95% CI) for weaning according to pacifier use		p <sup>†</sup>	n of children
	Nonusers	Users		
<b>Sex</b>			0.243	
Girls	1.0	2.4 (1.2-4.8)		97
Boys	1.0	3.8 (1.5-9.8)		122
<b>Mother's race</b>			0.265	
White	1.0	2.8 (1.5-5.2)		160
Non-white	1.0	2.7 (1.1-7.5)		59
<b>Type of delivery</b>			0.166	
Vaginal	1.0	2.2 (1.2-3.9)		171
Cesarean	1.0	7.2 (1.6-32.7)		48
<b>Educational level</b>			0.65	
Lower tercile	1.0	2.9 (1.1-7.9)		81
Middle tercile	1.0	2.0 (0.8-5.3)		65
Upper tercile	1.0	3.4 (1.3-8.8)		73
<b>Birth order</b>			0.70	
First child	1.0	2.1 (1.0-4.5)		88
Second child or later	1.0	3.5 (1.6-7.7)		131

\* Cox regression including only children breastfed at one month of life.

† p = probability of hazard ratios of extracts being homogenous.

IDR = incidence density ratio.

While the association between pacifier use and a shorter maternal breastfeeding duration is already well established, the mechanisms responsible remain unknown. According to some authors,<sup>7,8,10,13</sup> the use of a pacifier reduces the number of times the child suckles per day and, consequentially, there is less stimulation of the breast and less milk production, culminating in weaning. Other authors<sup>14</sup> believe that the child who uses a pacifier has more difficulty in obtaining milk from the breast because of "suction confusion" caused by the differences in suction technique between the pacifier and the breast, also culminating in weaning. Victora et al. (1997),<sup>7</sup> using data from ethnographic research, concluded that the association between pacifier use and early weaning is complex and that the pacifier is a contributing factor to weaning among mothers who do not feel entirely comfortable with breastfeeding. It is possible, according to the authors, that the pacifier is an indication of difficulties with breastfeeding and not the direct cause of weaning. Kramer et al. (2001)<sup>11</sup> share this opinion. These and other authors<sup>19</sup> observed that pacifier use is more common when associated with breastfeeding problems. The hypothesis that the population

which does not insist that its children use pacifiers is a differentiated population, more conscious of the benefits of maternal breastfeeding and the problems related to pacifier use and also more motivated to breastfeed cannot be ruled out. The ideal method for testing this hypothesis would be randomized clinical trials, but for ethical reasons this is not possible. Ethnographic research can help reach an understanding of the complex relationship between pacifier use and early weaning.

Concluding, pacifiers are widely used, even among populations which have been advised against their use. The association between the habit of pacifier use and early weaning has been confirmed. Irrespective of the mechanisms involved in this association, children who use pacifiers run a greater risk of not receiving the benefits of maternal breastfeeding during the first 6 months of their lives. Health professionals should be alert to this fact and attempt to intervene more intensely to prevent weaning. It is also important to discuss the advantages and disadvantages of pacifier use with mothers and society in general in order that people can make conscious decisions.

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