

# Breastfeeding to 24 Months of Age in the Northeast of Italy: A Cohort Study

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## Abstract

**Aim:** This study assessed the prevalence and duration of breastfeeding up to 24 months and the associated socioeconomic determinants in a birth cohort of children.

**Methods:** Four hundred infants born in a hospital in the north east of Italy were enrolled at birth and followed up for 36 months. Data on infant feeding were gathered through a feeding diary compiled at fixed intervals. Data were also gathered on type of delivery and weight, length, and health status at birth, as well as on selected socioeconomic indicators of the mothers. A multivariate logistic regression analysis was used to determine any association that exclusivity and duration of breastfeeding may have with selected socioeconomic variables and with health conditions of the infants at birth.

**Results:** Ninety-eight percent of mothers initiated breastfeeding, 69% of them exclusively. This rate, however, had declined to 6% by 6 months. There was a remarkable endurance of breastfeeding at 24 months (12%). The variables significantly associated with exclusive breastfeeding at 3 months and any form of breastfeeding at 12 months are mother's age ( $p = 0.007$  at 3 months,  $p = 0.026$  at 12 months) and postdischarge hospital admission ( $p = 0.029$  at 3 months).

**Conclusions:** In this population, breastfeeding rates are higher than previously reported, but lower than recommended, especially as far as exclusivity is concerned. Full implementation of the World Health Organization-UNICEF Baby Friendly Initiatives in hospitals and communities is needed to improve them further. Monitoring systems should include the collection of data on breastfeeding beyond 12 months of age.

## Introduction

THE WORLD HEALTH ORGANIZATION (WHO) and UNICEF recommend exclusive breastfeeding for 6 months and continued breastfeeding thereafter, with the gradual introduction of solid foods, up to 2 years of age and beyond as a global public health recommendation.<sup>1</sup> Many governments in Europe, including the Italian one, have issued national policies and guidelines that comply with these recommendations, at least in part.<sup>2,3</sup> However, data collected in Europe and worldwide show that rates of breastfeeding exclusivity and duration fall short of these recommendations. In Italy, the latest available national data show that the prevalence of any form of breastfeeding is about 56% at 6 months and 13% at 12 months of age.<sup>4</sup> Very little national data on breastfeeding at 12 months of age are available in Europe.<sup>2</sup> Those that are available show that only between 11% and 36% of infants continue to be breastfed beyond the first year. Despite the evidence

supporting the advantages of prolonged breastfeeding,<sup>5–7</sup> there is almost no research in Europe on breastfeeding beyond 12 months of age and on factors associated with it. Recent data from local surveys conducted in Italy confirm that the duration of breastfeeding is shorter than recommended.<sup>8</sup>

The present study was started in 2006 and aimed at investigating the transition from breastfeeding or bottle feeding to family foods, and its association with overweight, in a birth subcohort of 400 children followed up for 36 months. This subcohort was part of a larger cohort of 900 mothers enrolled to study the effect of exposure to heavy metals during pregnancy on the neuro- and psychological development of infants in the first 18 months of life (PHIME European research project [www.phime.org/]). The present article discusses the prevalence and duration of breastfeeding, and associated socioeconomic determinants, using data collected from the subcohort during the first 24 months of life of the infants. The study is still ongoing.

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## Subjects and Methods

A total of 400 infants born at the Institute for Maternal and Child Health, Trieste, Italy, between July 2007 and July 2008 were enrolled at birth. Infants were eligible if their birth weight was 2,000 g or more, gestational age was 36 completed weeks or more, if they were not affected by severe diseases or congenital malformations that required hospital admission, and if their mothers were resident in the province of Trieste. The sample size was estimated using as the main variable the overweight prevalence at 6 years of age in breastfed children versus non-breastfed children,<sup>9</sup> with a precision of 95% and a power of 80%. The study was approved by the ethics committee of the Institute. Upon enrollment, mothers were checked for eligibility criteria and asked to give their informed consent to participate in the study.

During the first contact, mothers were given a feeding diary with instructions on how to record type, quantity, and method of feeding over a 24-hour period on three separate nonconsecutive days at 3, 6, 9, 12, 18, 24, and 36 months of age of the infant. The range for inclusion of the data was  $\pm 15$  days at 3 and 6 months,  $\pm 30$  days at 9 and 12 months, and  $\pm 45$  days at 18, 24, and 36 months of age. Mothers were also given a "food introduction timing table" in which they were asked to record information on the characteristics, the method of preparation, and the date of introduction of the first food type of each category. The selected categories of foods were fruit, vegetable, pulses, meat, fish, eggs, cereals and tubers, milk, milk products, sugar, and sweets. For each food category, mothers were asked to record the date of the first tasting and the date from which the food type was fully incorporated in the child's diet, if different from the date of the first tasting.

In accordance with the study protocol, mothers were contacted by telephone at fixed intervals, to remind them of the forthcoming scheduled diary entry and of the compilation instructions. Meetings with small groups of mothers (five to 10) were organized when their children were about 6, 18, and 24 months old, to motivate them to continue the study and to discuss how the feeding diary should be adapted to the evolving eating patterns and habits of their children. The anthropometric data of the infants were recorded at 1, 3, 5–6, 8, 12, 18, 24, and 36 months of age on the occasion of the periodic health checks. Additional demographic, educational, social, and anthropometric data on the mother, the father, and the infant were obtained from a questionnaire designed by PHIME, which also collected information on the mother's diet during pregnancy and on feeding practices after birth, during hospital stay, and for the first 6 weeks of the infant's life.

Data were analyzed with Intercooled Stata version 9.0 (StataCorp LP, College Station, TX) statistical software, and statistical associations were tested with Fisher's exact test. Data extracted from the feeding diaries were analyzed using Microdiet software (Downlee Systems Ltd., High, Peak, UK) and processed using a logistic regression multivariate analysis.

## Results

The characteristics of the participants are shown in Tables 1 and 2. The differences in sample size reported in the tables for each variable are due to missing data in the PHIME questionnaires. Forty-one percent of the mothers were in the 30–

TABLE 1. CHARACTERISTICS OF MOTHERS AT ENROLLMENT

	%	n
Age ( <i>n</i> = 399)		
≤29 years	23	90
30–34 years	40	160
≥35 years	37	149
Born in Italy ( <i>n</i> = 400)		
Yes	88	351
No	12	49
Marital status ( <i>n</i> = 349)		
Married/living with partner	91	318
Separated/divorced	4	13
Single/not living with partner	5	18
Level of education ( <i>n</i> = 348)		
None	0	1
Completed primary school	2	6
Completed secondary school	15	52
Completed high school or equivalent	44	154
Bachelor degree or higher	39	135
Number of children ( <i>n</i> = 395)		
1	62	246
2	33	129
≥3	5	20
Employment ( <i>n</i> = 323)		
Yes	95	306
No	5	17
Back to work after delivery ( <i>n</i> = 204)		
0–3 months	10	21
4–6 months	32	66
>6 months	57	117
Breastfed previous child ( <i>n</i> = 148)		
No breastfeeding	9	14
1–3 months	8	12
4–6 months	16	24
7–12 months	39	58
12–36 months	27	40

34-year-old age group, 88% were born in Italy, 91% were married or living with the father of the child, and 83% had a medium–high level of education. Most women were employed (95%) and returned to work 6 months after delivery (57%). Sixty-two percent of the mothers were primiparae; the remaining 38% had two or more children. Ninety-one percent of the multiparae had breastfed their previous child. Most of the children were born between 38 and 42 weeks of gestation (91%) with vaginal delivery (80%). Only 17 children (5%) weighed more than 4,200 g at birth, and 54 (16%) were longer than 53 cm, with these values being the WHO cutoffs of the 97<sup>th</sup> percentile. Seventy-seven children (20%) were affected by jaundice, 35 (12%) underwent medical treatment, and 29 (8%) were hospitalized after discharge.

The starting subcohort comprised 400 infants, but this number fell rapidly during the study. After only 3 months 34% (135 of 400) of mothers had withdrawn from the study or were untraceable. The participation rate fell to 59% (235 of 400) at 6 months, 43% (173 of 400) at 9 months, and 41% (165 of 400) at 12 months. At the 24-month recall, the study cohort had been reduced by 67%: only 132 of the 400 mothers initially recruited were still in the study. Selected socioeconomic characteristics of mothers who were still in the study

TABLE 2. CHARACTERISTICS OF CHILDREN AT BIRTH, CLINICAL CONDITIONS AT AND AFTER BIRTH, AND TYPE OF DELIVERY

	%	n
Gestational age ( <i>n</i> = 339)		
36–37 weeks	9	29
38–42 weeks	91	310
Delivery type ( <i>n</i> = 346)		
Vaginal	80	276
Cesarean section	20	70
Infant gender ( <i>n</i> = 345)		
Male	50	173
Female	50	172
Weight at birth ( <i>n</i> = 344)		
<2,500 g	1	3
2,500–4,199	94	324
≥4,200	5	17
Length at birth ( <i>n</i> = 342)		
<46 cm	1	5
46–52.9 cm	83	283
≥53 cm	16	54
Clinical conditions at birth (yes)		
Jaundice ( <i>n</i> = 335)	20	67
Infection ( <i>n</i> = 315)	2	6
Breathing difficulty ( <i>n</i> = 318)	5	15
Convulsions ( <i>n</i> = 314)	0	0
Hospital admission after discharge ( <i>n</i> = 343)	8	29
Medical treatment ( <i>n</i> = 302)	12	35

at the 24-month recall were compared with those of mothers who had dropped out of the study at 3, 6, 12, and 18 months. Significant differences were found between mothers who were lost to follow-up and those who were still in the study at 24 months. The latter had higher level of education and were more likely to be Italian; at 12 and 18 months, the percentage of mothers who were employed was higher than in the original subcohort. The factors significantly associated with dropout had no significant association with either exclusive breastfeeding at 3 months or any form of breastfeeding at 12 months.

Figure 1 shows the cumulative percentage, at each interval, of infants and children receiving breastmilk, infant formula, and complementary foods. Ninety-eight percent of the infants received breastmilk at birth. Of these, 69% were breastfed exclusively; this rate remained constant up to 1.5 months, gradually decreasing to 66% at 3 months and falling steeply thereafter: 6% at 6 months and 2% at 9 months. The rates of breastfeeding, exclusive or in combination with infant formula, complementary foods, or both, were 91% at 1 month, 82% at 3 months, 70% at 6 months, 56% at 9 months, 39% at 12 months, 20% at 18 months, and 12% at 24 months.

At discharge, 2% of infants were fed on formula only. The rate of exclusive formula feeding increased to 9% after 1 month and to 14% at 3 months; by 6 months, only 1% of the infants were exclusively formula fed. However, formula feeding in association with complementary feeding or breastmilk was still high at 12 months (21%) and continued up to 24 months of age (2%). Regarding complementary feeding, our results show that at 6 months, 93% of infants were receiving complementary foods. Of these infants, 49% were also receiving breastmilk, 28% were also receiving infant formula, and 15% were receiving breastmilk and infant formula in addition to complementary foods; only 1% of infants were being fed exclusively complementary foods. By 9 months the percentage of children receiving complementary foods without the addition of breastmilk or infant formula had reached 9%. This rate increased steadily thereafter. At 24 months, 114 infants (86%) were no longer receiving either breastmilk or infant formula. Between 9 and 24 months the rates of formula feeding gradually decreased, falling to 20% at 12 months, 6% at 18 months, and 2% at 24 months.

A multivariate logistic regression analysis was used to study the association that exclusivity and duration of breastfeeding may have with selected socioeconomic determinants and health conditions of the infants at birth. The variables included in the model and those significantly associated with exclusive breastfeeding at 3 months and any form of breastfeeding at 12 months are shown in Tables 3 and 4, respectively. Hospital admission of the infant after discharge was significantly associated with a lower rate of exclusive breastfeeding at 3 months of age, whereas jaundice at birth resulted in a positive association. Medical treatment at birth was also

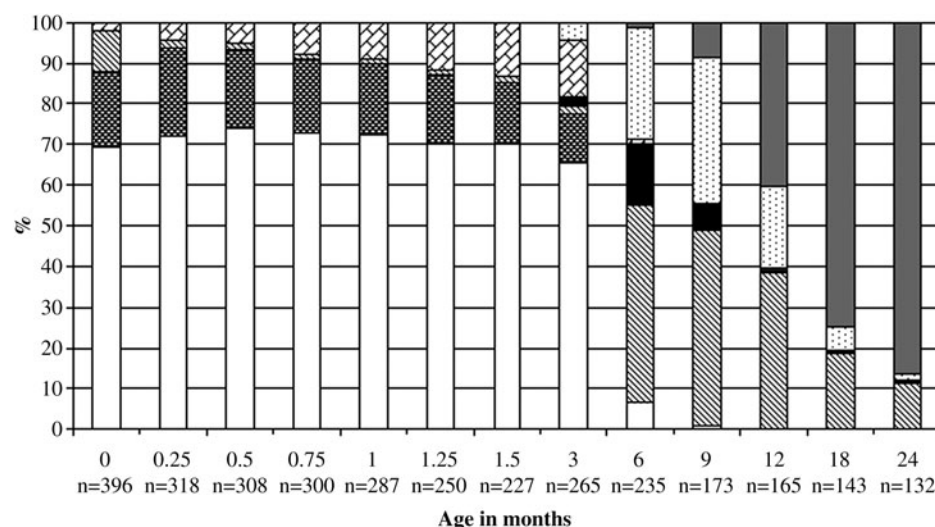


FIG. 1. Feeding practices during the first 24 months of life (cumulative percentage of infants by age): exclusive breastfeeding (□), breastfeeding plus infant formula plus complementary feeding (▨), breastfeeding plus complementary feeding (▤), breastfeeding plus infant formula (▩), infant formula only (■), infant formula plus complementary feeding (▧), and complementary feeding (▦). In infants up to 3 months CF indicates giving the infant non-nutritive liquids.

TABLE 3. ASSOCIATION BETWEEN EXCLUSIVE BREASTFEEDING AT 3 MONTHS AND SELECTED VARIABLES BY MULTIVARIATE ANALYSIS, BASED ON NUMBER OF OBSERVATIONS = 124

	<i>Odds ratio</i>	<i>P</i>	<i>95% confidence interval</i>
Maternal age (years)			
30–34	Reference		
<30	1.42	0.589	0.40, 5.01
>34	4.06	0.007	1.46, 11.26
Nationality			
Italian	Reference		
Foreign	2.87	0.306	0.38, 21.57
Marital status			
Married/living with partner	Reference		
Single/divorced	6.58	0.054	0.97, 44.82
Level of education			
None/primary	Reference		
Secondary/higher	2.53	0.475	0.20, 32.55
Occupation			
Unemployed	Reference		
Employed	10.83	0.183	0.33, 361.10
Back to work			
After 4 months or more	Reference		
0–3 months	1.97	0.395	0.41, 9.45
Type of delivery			
Vaginal	Reference		
Cesarean section	1.94	0.277	0.59, 6.42
Weight at birth			
≥4,200 g	Reference		
<4,200 g	2.87	0.350	0.31, 26.27
Length at birth			
<53 cm	Reference		
≥53 cm	1.95	0.382	0.44, 8.77
Jaundice at birth			
No	Reference		
Yes	8.46	0.032	1.20, 59.70
Infections			
Yes	Reference		
No	3.90	0.436	0.13, 119.74
Breathing difficulties			
No	Reference		
Yes	1.65	0.797	0.04, 74.24
Hospital admission after discharge			
Yes	Reference		
No	9.28	0.029	1.25, 68.80
Medical treatment			
No	Reference		
Yes	1.01	0.990	0.21, 4.74
Other children			
No	Reference		
Yes	1.05	0.957	0.17, 6.41
Breastfed previous child			
No or <4 months	Reference		
For ≥4 months	1.40	0.730	0.20, 9.63

TABLE 4. ASSOCIATION BETWEEN BREASTFEEDING AT 12 MONTHS AND SELECTED VARIABLES BY MULTIVARIATE ANALYSIS BASED ON NUMBER OF OBSERVATIONS = 93

	<i>Odds ratio</i>	<i>P</i>	<i>95% confidence interval</i>
Maternal age (years)			
30–34	Reference		
<30	2.96	0.159	0.65, 13.38
>34	3.50	0.026	1.16, 10.51
Nationality			
Italian	Reference		
Foreign	1.81	0.535	0.28, 11.89
Marital status			
Single/divorced	Reference		
Married/living with partner	1.65	0.578	0.28, 9.78
Level of education			
None/primary	Reference		
Secondary/higher	2.29	0.612	0.09, 56.14
Occupation			
Employed	Reference		
Unemployed	3.18	0.507	0.10, 96.69
Back to work			
After 4 months or more	Reference		
0–3 months	1.45	0.641	0.30, 6.99
Gestational age			
38–42 weeks	Reference		
36–37 weeks	1.61	0.650	0.20, 12.80
Type of delivery			
Vaginal	Reference		
Cesarean section	2.19	0.243	0.59, 8.22
Weight at birth			
≥4,200 g	Reference		
<4,200 g	1.37	0.770	0.17, 11.13
Length at birth			
<53 cm	Reference		
≥53 cm	2.31	0.324	0.44, 12.20
Jaundice at birth			
No	Reference		
Yes	1.33	0.701	0.31, 5.82
Breathing difficulties			
No	Reference		
Yes	3.31	0.342	0.28, 39.22
Hospital admission after discharge			
Yes	Reference		
No	3.11	0.236	0.47, 20.36
Other children			
Yes	Reference		
No	2.57	0.490	0.18, 37.28
Breastfed previous child			
No or <4 months	Reference		
For ≥4 months	5.12	0.242	0.33, 78.96



associated with a lower rate of breastfeeding at 3 and 12 months, although significant differences were found only in the bivariate analysis. The age of the mother was also a factor associated with the rates of exclusive breastfeeding at 3 months and the duration of breastfeeding up to 12 months: younger mothers (<35 years) showed higher rates of exclusive breastfeeding (recorded at 3 months) and longer duration of any breastfeeding (recorded at 12 months) than older mothers (>35 years). No associations were found between exclusivity and duration of breastfeeding and the other variables included in the model.

## Discussion

To our knowledge, this is the first study reporting on breastfeeding rates up to 24 months of age in Italy, although limited to the northeastern region. The results show that 98% of mothers initiate breastfeeding, 69% of them exclusively. These rates are higher than those reported in previous regional and national surveys,<sup>4,10</sup> although still lower than recommended as far as exclusivity is concerned. These low rates are due to the use of non-nutritive liquids, such as water or glucose solution (in 10% of cases), and of infant formula (19%). More encouraging are the rates of any form of breastfeeding at 6 and 12 months (70% and 39%, respectively). These are comparable to those reported for the northwest of Italy<sup>8</sup> and for Norway and Sweden,<sup>2</sup> and certainly higher than the national rates and those reported for southern Italy,<sup>4,10</sup> thus confirming the north/south divide. The encouraging rates may be the result of several initiatives, recently implemented in the region, aimed at supporting prolonged breastfeeding. This is further supported by the data on the survival of breastfeeding at 24 months (12%) reported in this study. The higher rates of breastfeeding may also account for the lower rates of use of formula compared with those reported nationally (21% vs. 28% at 12 months).<sup>11</sup> The use of formula continues up to 24 months, although at a very low level (2%). This may be due to the recent introduction on the market of the so-called grow-up formula.<sup>12</sup> There is, however, no evidence supporting the need for infant formula after 12 months of age and no national recommendations to extend its use beyond the first year of life. At 6 months most infants (93%) are receiving solid foods. According to the findings of a national survey,<sup>11</sup> solid foods are probably introduced in the diet between 4 and 6 months. A detailed analysis of the types of food introduced at each month of age has yet to be carried out.

The multivariate analysis shows that the only factor negatively associated with exclusive breastfeeding at 3 months and any form of breastfeeding at 12 months is maternal age over 35 years; hospital admission of the infant after discharge is negatively associated only with exclusive breastfeeding at 3 months. Regarding the positive association between jaundice at birth and exclusive breastfeeding at three months, it must be noted that the PHIME questionnaire, administered at hospital discharge, did not specify the degree of severity and the causes of jaundice, nor whether it required ultraviolet light treatment or prolonged hospitalization. Medical treatment at birth is significantly associated with both exclusive breastfeeding at 3 months and any breastfeeding at 12 months, but only in the bivariate analysis. The negative association between breastfeeding and medical treatment and hospital admission may be due to

hospital practices that are scarcely supportive of breastfeeding when newborns have medical problems. If so, these practices should be changed, in the light of the protection afforded by breastmilk against the onset of chronic diseases later in life.<sup>13,14</sup>

The major limitations of our study are the loss to follow-up and the lack of complete data on the characteristics of the sample deriving from the fact that the PHIME questionnaires were not always adequately compiled. The reference population was clearly identified using enrollment criteria that were based on the health status of the infant at birth and on the mother's place of residence. Attrition over the study period, however, may have introduced a bias because data from only 132 mothers were available for analysis at 24 months. The characteristics of the mothers who completed the 24 months of follow-up and of those who were lost to follow-up at the various intervals differed, however, only in terms of education, with 92% of the former subgroup having a high level of education, from secondary school diploma upward. However, no association between education and breastfeeding exclusivity and duration was found at multivariate analysis.

To conclude, our findings highlight the need to protect, promote, and support exclusive and prolonged breastfeeding. To reach this goal we believe that the WHO-UNICEF Baby Friendly Initiatives for hospitals and communities should be implemented.<sup>15,16</sup> We also believe that the monitoring systems and periodic surveys of national breastfeeding programs should include the collection of data on breastfeeding beyond 12 months of age.

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## Disclosure Statement

No competing financial interests exist.

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