

Feeding practices of infants through the first year of life in Italy

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Aim: To investigate infant feeding practices through the first year of life in Italy, and to identify factors associated with the duration of breastfeeding and early introduction of solid foods. **Methods:** Structured phone interviews on feeding practices were conducted with 2450 Italian-speaking mothers randomly selected among women who delivered a healthy-term singleton infant in November 1999 in Italy. Interviews were performed 30 d after delivery and when the infants were aged 3, 6, 9 and 12 mo. Type of breastfeeding was classified according to the WHO criteria. **Results:** Breastfeeding started in 91.1% of infants. At the age of 6 and 12 mo, respectively, 46.8% and 11.8% of the infants was still breastfed, 68.4% and 27.7% received formula, and 18.3% and 65.2% were given cow's milk. Solids were introduced at the mean age of 4.3 mo (range 1.6–6.5 mo). Introduction of solids occurred before age 3 and 4 mo in 5.6% and 34.2% of infants, respectively. The first solids introduced were fruit (73.1%) and cereals (63.9%). The main factors (negatively) associated with the duration of breastfeeding were pacifier use ($p < 0.0001$), early introduction of formula ($p < 0.0001$), lower mother's age ($p < 0.01$) and early introduction of solids ($p = 0.05$). Factors (negatively) associated with the introduction of solids foods before the age of 3 mo were mother not having breastfed ($p < 0.01$), early introduction of formula ($p < 0.01$), lower infant bodyweight at the age of 1 mo ($p = 0.05$) and mother smoking ($p = 0.05$).

Conclusion: The duration of breastfeeding in Italy is still inadequate, as well as compliance with international recommendations for timing of introduction of complementary foods. National guidelines, public messages and educational campaigns should be promoted in Italy.

Key words: Breastfeeding, complementary feeding, cow's milk, solid foods

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Adequate nutrition in the early years of life has an important role in determining infants' growth and development, and in preventing later adult diseases (1, 2). Breastfeeding is commonly considered the best milk-feeding method for the infant in the first year of life (3–7). International guidelines for infant feeding recommend exclusive breastfeeding until 4 to 6 mo of age, and continuing breastfeeding throughout the period of complementary feeding (3, 5–9). Use of cow's milk is discouraged during the first year of life (6), also because it provides little iron, linoleic acid and vitamin E, while supplying excessive intakes of sodium, potassium and protein (10, 11). While American and European Committees on Nutrition have recommended that complementary foods should not be introduced before 3 to 4 mo of age (3, 12), it is now believed that the most appropriate time for their introduction is between 4 and 6 mo (6, 13, 14).

Little is known in Europe about current feeding practices of infants and adherence to international recommendations (15–19). Non-homogeneity in definitions and assessed populations, and differences in

sampling methods and data collection procedures, may have further led to controversial and possibly misleading results. It is therefore necessary to conduct accurate population-based surveys to provide reliable data on feeding practices of infants, using internationally standardized definitions.

In Italy, there are no national guidelines on infant feeding methods; only breastfeeding practices have been partially investigated (20, 21), and it is unknown whether and to what extent international recommendations on feeding are met.

This study aimed to investigate the feeding practices of infants through the first 12 mo of life in Italy, and to identify factors associated with the duration of breastfeeding and the early introduction of solid foods.

Methods

This study is a part of an epidemiological survey conducted in 1999–2000 to evaluate the health status and feeding habits of infants through the first year of life

in Italy. Details of the study design and sampling methods have been described previously (21). In brief, 3500 babies born in November 1999 in Italy were randomly selected to proportionally represent the distribution of annual births with respect to the 20 national administrative regions. We were able to contact 2771 (79.2%) Italian-speaking mothers. A total of 2450 eligible (i.e., being healthy at term and singleton, and having birth bodyweight ≥ 2500 g) infants participated in the study. Well-trained people from a private agency performed phone interviews with mothers at the following infant ages: 1, 3, 6, 9 and 12 mo. Interviews were based on a sequence of questions tested previously. At the first interview, mothers were requested to provide socio-demographical data of family, anthropometrical data of infants, information on pregnancy, routines at the maternity ward and feeding methods during hospital stay. At the end of the first interview, mothers were instructed to record in a diary the age (d) of the infant at the introduction of cow's milk, complementary foods and related items.

Breastfeeding practices described in this article were classified according to the WHO's definitions (4, 9), under the following headings: exclusive breastfeeding; predominant breastfeeding; complementary breastfeeding; breastfeeding; non-breastfeeding. Assessment of milk-feeding practices included use of any human or non-human milk. Complementary non-milk foods were classified as fluids (water, water-based drinks, fruit juice) or solid foods. In the present analysis, solid foods were categorized in the following groups: fruit; vegetables; legumes (peas, beans); gluten-free cereals; cereals with gluten; meat/poultry; milk products (yoghurt, cheese); eggs; fish. Breastfeeding "at birth" (initiation of breastfeeding) was defined as mother starting breastfeeding within 48 h after delivery (21). The type of feeding "at discharge" was the type of feeding practiced during the last 24 h of hospital stay. Early introduction of solid foods was defined as mother introducing solid foods within the first 3 mo.

The survey population

The sample of participating infants consisted of 1221 (49.8%) males and 1229 (50.2%) females. Participating and non-participating samples did not differ with respect to geographical distribution, infant's gender, weight and length at birth, and type of delivery. The socio-demographic characteristics of participating mothers were: age (y): ≤ 25 , 7.8%; 26–30, 39.6%; > 30 , 52.6%; mean (standard deviation [SD]), 31.1 (4.2). Pre-pregnancy body mass index (BMI) (kg/m^2): < 25 , 88.1%; 25–30, 10.2%; ≥ 30 , 1.7%; mean (SD), 21.6 (2.9). Education level (y): low (≤ 8), 29.8%; medium (9–13), 57.3%; high (> 13), 12.9%. Social class (Italian census): low, 3.6%; medium, 75.7%; high, 10.2%. Smoking during pregnancy: 22.9%; primiparous: 67.8%; Caesarean delivery: 25.6%. At the age of 12 mo, 2034 infants continued to participate. There were no differences between participants and non-participants at 12 mo with respect to geographical distribution or socio-demographic characteristics of the mothers.

Statistical analysis

Descriptive data are reported as number of observations or percentage. Comparison between groups was performed by means of the Student's *t*-test or the χ^2 test. Univariate analysis was performed for variables identified from the literature as having a possible association with stopping breastfeeding and/or early introduction of solid foods. They included maternal characteristics (age, BMI, education, social class, smoking habits, type of delivery, mothers having been breastfed themselves), infant's characteristics (gender, bodyweight and length at birth, parity, bodyweight at 1 mo of age) and the WHO's ten steps to successful breastfeeding. Geographical area was considered a potential confounder. Cox regression analysis was performed, also adjusting for confounding variables, to identify factors associated with the duration of breastfeeding. A multiple logistic

Table 1. Milk feeding during the first 12 mo of life in Italy (percentage of infants).

Age (completed mo)	Breast milk			Any milk ^a		
	Exclusive	Predominant	Complementary	Breast milk	Formula	Cow's milk
At birth ^b	38.7	28.9	23.5	91.1	32.4	0.0
At discharge	76.8	1.2	11.0	89.0	22.0	0.0
1	56.6	5.0	19.5	81.1	38.3	0.0
2	52.1	2.5	17.5	72.1	42.2	0.7
3	47.0	1.4	17.3	65.7	47.4	1.7
4	30.9	1.2	26.5	58.6	54.6	4.9
5	19.9	0.5	33.5	53.9	61.1	11.8
6	4.7	0.3	41.8	46.8	68.4	18.3
9	0.0	0.0	25.2	25.2	53.1	43.7
12	0.0	0.0	11.8	11.8	27.7	65.2

^aTotal percentage greater than 100 due to combined used of milk.

^bDuring the first 48 h after birth.

regression model was used to determine factors associated with early introduction of solid foods. The odds ratio, hazard ratio and related 95% confidence intervals were calculated where appropriate. A significance level of 0.05 was used and all the statistical tests are two-tailed. The SPSS package version 11.5 for Windows (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis.

Results

Milk feeding

Milk-feeding practices during the first year of life are shown in Table 1. Within 48 h of delivery, 91.1% of mothers started breastfeeding. At the age of 6 and 12 mo, 46.8% and 11.8% of the infants, respectively, were still breastfed. 76.8% of the mothers exclusively breastfed at hospital discharge. At 4 mo the rate of exclusive breastfeeding was 30.9%. During the first 12 mo, formula was used in 68.4% of the infants. At birth, 8.9% of the infants were formula fed only, and 23.5% formula supplemented. Formula was more common than breastfeeding from the age of 5 mo. The median age of introduction of cow's milk was 9.3 mo. Cow's milk was introduced before 3 mo in less than 2% of the infants. At the age of 12 mo, the percentage of infants who consumed cow's milk as the only milk beverage was 57.9%; the percentage of infants who did not receive any type of milk was 14.4%.

Duration of breastfeeding

The median duration of breastfeeding was 5.3 mo. In mothers who exclusively breastfed, median duration of exclusive breastfeeding was 3.1 mo, and median duration of breastfeeding was 6.1 mo. Multivariate Cox regression analysis identified slightly different variables independently associated with the duration of breastfeeding or with exclusive breastfeeding (Table 3). The use of a pacifier within age 1 mo and early introduction of solid foods were major factors negatively associated with the duration of both breastfeeding and exclusive breastfeeding ($p < 0.0001$). The median duration of breastfeeding in infants who used or did not use a pacifier within 1 mo was 3.2 and 6.3 mo, respectively; the median duration of breastfeeding in infants who were or were not introduced early to solid foods was 3.1 and 5.8 mo, respectively. Young mothers and mothers introducing formula early breastfed their infant for a shorter period ($p < 0.01$); the median duration of breastfeeding in mothers aged (y) ≤ 25 , 26–30 and > 30 , was 3.6, 3.9 and 6.2 mo, respectively; the median duration of breastfeeding in mothers introducing formula before or after 1 mo was 1.6 and 6.6 mo, respectively. Mothers having higher body mass index exclusively breastfed for a shorter period ($p < 0.05$); the median duration of exclusive breastfeeding in mothers having BMI (kg/m^2) < 25 or ≥ 25 was 3.3 and 1.7 mo,

respectively. The infant's bodyweight at 1 mo was also independently associated with the duration of exclusive breastfeeding ($p < 0.05$). At univariate analysis, further variables associated ($p < 0.05$) with stopping breastfeeding (bf) and/or exclusive breastfeeding (ex) were: mother smoking (bf/ex), mother having a lower educational level (bf/ex), promotion of formula at hospital discharge (bf), using a pacifier during hospital stay (bf), mother starting breastfeeding later than 1 h after delivery (bf) and mother primiparous (ex).

Introduction of fluids

Fluids were introduced at the median age of 2.2 mo (range 0–6.2 mo). During the first 48 h fluids were supplied to 31.6% of the infants; 27.8% received water with added sugar, 2.7% water and water-based drinks, and 1.1% water alone. The median age at the introduction of fruit juice was 4.9 mo (range 1.6–9 mo). At the age of 6 mo, 81.3% of infants consumed fruit juice.

Introduction of solid foods

Table 2 reports the age of introduction of solid foods. Median age at introduction of solid foods was 4.3 mo (range 1.6–6.5 mo). Solid foods were introduced before the age of 3 mo in 5.6% of infants. At 4 and 6 mo of age, 34.2% and 85.5% of infants, respectively, had solids introduced. All infants received solid foods by the age of 9 mo. In breastfed and non-breastfed infants, solids were introduced before the age of 3 mo in 5.1% and 10.1% ($p < 0.0001$), respectively.

Multiple logistic regression analysis identified early introduction of formula ($p < 0.001$), mother not having breastfed ($p < 0.01$), infant's body weight at 1 mo and mother smoking ($p < 0.05$) as factors independently associated with early introduction of solid foods. In breastfed infants, early introduction of solid foods occurred in 6.3% and 3.0% of infants having formula introduced within or after age 1 mo, respectively. Early introduction of solid foods occurred in 4.4% and 9.6% of mothers having or not having breastfed, respectively.

At univariate analysis only, early introduction of solid foods occurred significantly mostly in younger

Table 2. Age (completed mo) at introduction of solid foods.

Food group	Mean	SD	Median	Min.	Max.
Fruit	4.3	1.3	4.3	1.6	7.7
Vegetables	4.9	1.4	5.0	2.3	8.1
Legumes	7.3	1.8	7.5	2.9	11.2
Gluten-free cereals	5.1	1.6	5.2	2.3	8.4
Cereals with gluten	5.5	1.7	5.7	3.3	9.5
Meat	5.6	2.1	5.5	2.7	11.8
Milk products	6.5	2.4	6.2	3.0	12
Eggs	8.3	2.6	8.5	5.2	12
Fish	9.0	1.5	9.1	6.0	12
Any solid	4.3	1.3	4.3	1.6	6.5

mothers, in mothers having higher BMI and in infants using a pacifier within 1 mo of age.

First solid foods

Fruit (73.1%) and cereals (63.9%; gluten free 52.2%, with gluten 11.7%) were the first solid foods used for most infants. Vegetables, meat/poultry and milk products were introduced as first solids in 40.3%, 13.7% and 9.2% of infants, respectively. Age at introduction of specified groups of solid foods is presented in Table 2. No infants had eggs or fish given as first solid foods.

Discussion

This survey investigated the feeding practices of infants during the first 12 mo of life in Italy, and factors associated with the duration of breastfeeding or early introduction of solids foods. The reference population was clearly identified and included a representative randomized sample of healthy-at-term infants. Participants (70% of the selected sample) remained representative for geographical area, and infants' birth characteristics. However, given the relatively low participation rate, we cannot exclude the possibility of a biased selection of participants. From an epidemiological perspective, such a bias would be a limitation of the present study. Caution should therefore be exercised in drawing definitive conclusions from the present

results. Breastfeeding definitions were strictly defined in accordance with the WHO criteria (5, 9). Also in accordance with the WHO (6), the term "weaning" was avoided in this paper, but it should be intended as the introduction of any food besides human milk or infant formula or both.

It is difficult to compare rates of breastfeeding between different studies, owing to different definitions, methods of sampling and data collection. The results of the present survey show that the current national rate of breastfeeding initiation in Italy (91%) seems to be satisfactory compared to international standards. It is higher than in other Western countries (e.g., 17, 22), but it is still below that of Scandinavia (e.g., 15, 16). The duration of breastfeeding rapidly decreases in Italy. About 50% of mothers stop breastfeeding before 6 mo, and only about 30% of them exclusively breastfeed 4 mo after delivery. Factors mainly associated with stopping breastfeeding were the use of a pacifier, early introduction of formula or solids foods, and mother's age. These factors have also been described in other studies (15, 20, 23, 24), but the association between the duration of breastfeeding and timing at introduction of solids is controversial (25). Moreover, as pointed out by other authors (20, 23), it should be noticed once more that it remains unclear whether use of a pacifier or the early introduction of formula directly influence breastfeeding or reflect feeding difficulties or reduced motivation of mothers to breastfeed. The observation that young mothers breastfed for a shorter period confirms that breastfeeding practices may be associated with socio-cultural environment. In accordance with the literature (e.g., 15, 20, 22), the association of the duration of breastfeeding and exclusive breastfeeding with the mother's educational level and smoking habits

Table 3. Variables significantly associated with stopping breastfeeding (multiple Cox regression analysis†).

	Adjusted hazard ratio (95% confidence interval) for stopping breastfeeding
Mother's age	0.98 (0.97–0.99)**
Pacifier use within 1 mo of life ^a	1.30 (1.15–1.46)***
Early introduction of solid foods ^a	1.34 (1.03–1.75)*
Introduction of formula ^b	
Within 1 mo	4.39 (3.84–5.03)***
1–3 mo	3.30 (2.7–3.9)***
>3 mo	2.38 (1.5–3.3)**
	Adjusted hazard ratio (95% confidence interval) for stopping exclusive breastfeeding
Mother's body mass index	1.02 (1.00–1.04)*
Pacifier use within 1 mo of life ^a	1.28 (1.13–1.45)***
Infant's bodyweight at age 1 mo	0.99 (0.98–1.00)*
Early introduction of solid foods ^a	2.31 (1.70–3.14)***

†Variables assessed to be included in the model were: mother's age, BMI, education level, social class, smoking habits, type of delivery, mothers having been breastfed themselves; infant's gender, bodyweight and length at birth, bodyweight at age 1 mo, pacifier use at hospital ward, pacifier use within 1 mo of life, parity; time at introduction of formula or solid foods; formula promotion at discharge, time at initiation of breastfeeding.

^aYes versus no.

^bReference category: infants not supplied with formula.

p* < 0.05, *p* < 0.001, ****p* < 0.0001

Table 4. Variables significantly associated with early introduction of solid foods (multiple logistic regression analysis†).

	Odds ratio (95% confidence interval) for early introduction of solid foods
Smoking mother ^a	1.15 (1.00–1.30)*
Infant's bodyweight at age 1 mo	0.99 (0.98–1.00)*
Mother not having breastfed infant ^a	2.18 (1.12–4.20)**
Introduction of formula ^b	
Within 1 mo	2.71 (1.37–5.33)**
1–3 mo	2.69 (1.15–6.13)*
>3 mo	2.41 (1.01–5.74)*

†Variables assessed to be included in model were: mother's age, BMI, education level, social class, smoking habits, type of delivery, mothers having been breastfed themselves; infant's gender, bodyweight and length at birth, bodyweight at age 1 mo, pacifier use at hospital ward, pacifier use within 1 month of life, parity; time at introduction of formula or solid foods; formula promotion at discharge, time at initiation of breastfeeding.

^aYes versus no.

^bFor mothers having breastfed. Reference category: infants not supplied with formula.

p* < 0.05, *p* < 0.01.

supports this conclusion. Interestingly, higher mother BMI and lower infant bodyweight at 1 mo of age were associated with shorter duration of exclusive breastfeeding, also after adjusting for maternal socio-cultural characteristics. While maternal pre-pregnancy obesity has recently been recognized as having a negative effect on breastfeeding practices (26), the association with the infant's body at the age of 1 mo suggests that the attitude of mothers to exclusively breastfeed may be influenced by their subjective perception of their infant's health status. This point should be assessed accurately, given its potential relevance on infant nutritional status and growth.

Compliance with international recommendations on cow's milk was poor. In fact, even if most infants were introduced to cow's milk after age 9 mo, 18% and 65% of mothers had given cow's milk to infants before 6 and 12 mo, respectively. Because early introduction of cow's milk can increase the risk of iron deficiency and provides an inadequate source of energy for infants (10, 11), reasons for non-compliance with current international recommendations should be further investigated in Italy, and preferably removed.

The international recommendation for the introduction of complementary foods is that the most appropriate time for their introduction is between 4 and 6 mo (6, 13, 14). In the present study, most of the infants (51.3%) had been introduced to solids in this period, but 6% had been given solids before the age of 3 mo. Although this percentage is lower than in other Western countries, it is still unsatisfactory. In agreement with the literature, mothers not having breastfed or smoking during pregnancy, early introduction of formula, and infant bodyweight at 1 mo of age were factors associated with early introduction of solid foods (18, 27–29). After adjusting for confounders, pacifier use was not associated with early introduction of solids. This is in agreement with the recent suggestion by Kramer et al. (30) that use of a pacifier may not be a real cause for early introduction of solids.

On the whole, within the limitations of this study, it can be concluded that the current rate of breastfeeding initiation in Italy is fairly acceptable, but that the duration of breastfeeding and practices of complementary feeding are still inadequate. While inter-relationships between different feeding practices may not be unexpected, feeding practices of infants appear to be sensitive to maternal socio-cultural environment and perception of the infant's health status. Mothers should be encouraged to adopt favourable attitudes towards breastfeeding, and should be instructed correctly on complementary feeding. National guidelines for feeding infants, in accordance with international recommendations, should be promoted in Italy, together with educational programmes.

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