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Exclusive vs. Predominant Breastfeeding in Italian Maternity Wards and Feeding Practices through the First Year of Life

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1 **Abstract**

2 This survey investigated determinants of exclusive vs. predominant breastfeeding in the
3 maternity ward and evaluated the relationship of exclusive vs. predominant breastfeeding with
4 later feeding practices. A total of 1656 Italian-speaking mothers of healthy full-term infants, who
5 had breastfed exclusively or predominantly in the maternity ward, were interviewed through 12
6 months of delivery about feeding practices. Information about the WHO's ten steps to successful
7 breastfeeding was also collected. During the postpartum hospital stay breastfeeding was
8 predominant in 43% of infants. Caesarian section (odds ratio [OR], OR=1.75), mother's
9 overweight (OR=1.74), non compliance with the WHO's step 6 (OR=1.58), step 7 (OR=1.43)
10 and step 8 (OR=1.76) were major determinants of predominant, as opposed to exclusive,
11 breastfeeding. Significant differences between exclusive and predominant breastfeeding during
12 the hospital stay were found for duration of full breastfeeding (mean, 3.6 vs. 3.1 months) and age
13 at introduction of formula (3.8 vs. 3.3 months). Incidence of introducing formula before 1 month
14 was higher among predominantly breastfed infants (30% vs. 23%). The hospitals need to be
15 compliant with the WHO's steps and training for baby friendly hospital initiative should be
16 promoted.

17

18 **Keywords:** Duration of breastfeeding, exclusive breastfeeding, predominant breastfeeding,
19 formula milk, solid foods.

1 **Introduction**

2 Breastfeeding is considered the best infant's feeding method through the first year of life (1-5).
3 International guidelines recommend exclusive breastfeeding up to 6 months of age, and
4 prolonged breastfeeding during the complementary feeding period (1, 3-9). The World Health
5 Organization (WHO) has developed the WHO's ten steps to successful breastfeeding, a strategy
6 to support and improve breastfeeding (10, 11). In particular, step 6 advises to give newborns no
7 food or drink unless "medically" indicated. The lack of adherence to these recommendations
8 might lead to unsatisfactory feeding practices during the postpartum hospital stay and negatively
9 influence later feeding through the first months of life.

10 Investigations evaluating infant feeding in the maternity ward could be of relevance for both
11 clinical and social implications. While studies have examined influence of formula
12 supplementation during the first days of life on duration of breastfeeding (e.g., 12-19), the
13 relationship between predominant breastfeeding (i.e., breast milk with supplementation of water
14 and/or water based drinks) during the first days of life on subsequent feeding practices has been
15 scantily investigated (20-23). Indeed, in smaller studies it has been found that supplementation
16 with glucose water during the first days of life may be associated with shorter duration of
17 breastfeeding (22, 23) and early introduction of formula (23). However, because no population-
18 based studies have been performed, little is known about the epidemiology of this issue.
19 Therefore, there is a need to conduct surveys based on large representative samples, clearly
20 identified eligibility criteria and internationally accepted standardized definitions.

21 The primary aims of this study were to identify determinants of predominant breastfeeding
22 in the maternity ward, and to evaluate possible association of exclusive vs. predominant

1 breastfeeding with duration of breastfeeding, and age at introduction of formula milk or solid
2 foods.

3

4 **Methods**

5 This study is a part of an epidemiologic self-reported (telephone interviews and diaries)
6 longitudinal survey conducted in 1999-2000 to assess the health status and feeding practices of
7 infants through the first year of life in Italy. The study design and sampling procedures have
8 been previously described (24). In brief, 3500 mother-infant pairs were selected among births in
9 Italy during November 1-30 1999, to proportionally represent the distribution of annual births
10 with respect to the 20 national administrative regions. Mothers of infants being healthy,
11 singleton, with gestational age 37-42 weeks inclusive, and having birth weight ≥ 2500 g were
12 considered eligible for the study. The institutional ethics committee approved the study. At the
13 first telephone interview, mothers were checked for eligibility criteria, and eligible, willing
14 mothers gave their verbal consent to participate in the survey. Seven hundred and nine mothers
15 (20%) could not be contacted (mother not responding to 3 telephone calls on consecutive
16 days=403; errors in telephone number=158; mother moved residence=78; mother not having a
17 phone=67; mother died=3). Infants of 271 contacted mothers did not fulfill the eligibility
18 criteria, and 70 mothers of eligible infants refused to participate. The overall participation rate at
19 the first interview was 76% (n=2450). Trained interviewers from a private agency performed the
20 phone interviews at $\leq 1, 3, 6, 9$ and 12 months post birth. Interviews were based on a sequence of
21 questions pilot tested previously. At the first interview, mothers were requested to provide
22 information on routines in the maternity ward, and feeding methods during hospital stay.
23 Information about the WHO's ten steps to successful breastfeeding was also collected; the

1 related questions were designed to elicit a yes or no answer, and adapted from the WHO (10-11).
2 Assessing compliance with the WHO's ten steps by interviewing mothers may be vulnerable to
3 recall bias indeed, and the accurate unit of analysis should be hospital. In this study the
4 participating mothers were distributed over 371 hospitals widespread on national territory. Mean
5 percentage of exact agreement among mothers within the same hospital was 84% for the WHO's
6 ten steps. Large number of hospitals involved and reasonable comparability of inter-mothers
7 judgment were deemed to yield trustworthy data about hospital's adherence to the WHO's steps.
8 In addition, interviewing mothers allowed helpful information to be collected, given the current
9 lack of national data in Italy.

10 Breastfeeding practices described in this article were classified according to the WHO's
11 definitions (2, 7, 10) as follows: exclusive breastfeeding (required that the infant received breast
12 milk only, and allowed supplementation of drops and syrups [vitamins, minerals and
13 medicines]); predominant breastfeeding (required that the infant received breast milk only, and
14 allowed supplementation of non-milk liquids [water or water-based drinks, including sweetened
15 and flavoured water, teas, infusions], fruit juice, oral rehydration salts, drops and syrups);
16 complementary feeding (required that the infant received breast milk and solid or semi-solid
17 foods, and allowed supplementation of any food or liquid including non-human milk);
18 breastfeeding (required that the infant received breast milk, and allowed supplementation of any
19 food or liquid including non-human milk or breast milk by bottle); non-breastfeeding (required
20 that the infant did not receive breast milk). Exclusive breastfeeding and predominant
21 breastfeeding together constitute full breastfeeding.

22 Early introduction of formula was defined as mother introduced formula within the first
23 month of delivery (23).

1 In the maternity ward, 32.4% of participating infants received formula (8.9% were non-
2 breastfeeding and 23.5 % complementary fed). The present secondary data analysis included the
3 sub-sample of infants (n=1656, 67.6%) who were exclusively or predominantly breastfed in the
4 maternity ward. At the age of 3, 6, 9 and 12 months, respectively 97%, 95%, 91% and 86% of
5 mothers were still participating. There was no difference between participants and non-
6 participants at 12 months with respect to geographical distribution, maternal socio-demographic
7 characteristics, parity, and type of delivery. Mean (standard deviation [SD]; median) duration of
8 postpartum hospital stay of mothers was 3.2 (1.3; 3) days.

9 *Statistical analysis*

10 Comparison between infant-feeding groups (exclusive vs. predominant) was performed by
11 means of the Student's *t*-test or the chi-square test. Geographical area and variables identified
12 from the literature as having possible association with infant's feeding practices were
13 considered as potential confounders. They included maternal characteristics (age, pre-pregnancy
14 body mass index [BMI], education, social class, smoking habits, type of delivery, parity,
15 mothers being herself breastfed), infant's characteristics (gender, body weight and length at
16 birth), and hospital's adherence to the WHO's ten steps to successful breastfeeding. Multiple
17 logistic regression analysis was used to identify determinants of predominant breastfeeding.
18 Differences between infant-feeding groups in the overall duration of breastfeeding, and age at
19 introduction of formula or solid foods were tested by the log-rank test, and adjusted using
20 multiple Cox regression analysis. A significance level of 0.05 was used and all the statistical
21 tests are two-tailed. The SPSS package version 11.5 for Windows (SPSS Inc., Chicago, IL, USA)
22 was used for the statistical analysis.

23

1 **Results**

2 In this sub-sample of breastfeeding mothers, breastfeeding during postpartum hospital stay was
3 exclusive in 948 cases (57.2%) and predominant in 708 (42.8%). Predominantly breastfed infants
4 received: water alone (3.4%), glucose water (88.5%), water and water-based drinks (8.1%).
5 During the first 48 h of life glucose water was supplied to 48.1% and 34.2% of infants born,
6 respectively, after caesarian section or normal delivery ($P<0.0001$).

7 *Determinants of exclusive vs. predominant breastfeeding*

8 Table 1 shows maternal and infant characteristics by feeding group. Mothers who breastfed
9 predominantly during the postpartum hospital stay were older (31.5 vs. 30.8 years), had a higher
10 pre-pregnancy BMI (22.9 vs. 22.6 kg/m²), and a higher incidence of caesarian section delivery
11 (26.7% vs. 16.9%). Prevalence of overweight was higher in mothers who predominantly
12 breastfed (13.0% vs. 7.9%), as well prevalence of obesity (3.2% vs. 1.4%).

13 Table 2 shows the rate of adherence to the WHO's ten steps. Mothers who breastfed
14 predominantly were less likely to report having been helped to initiate breastfeeding in the first
15 half an hour (WHO 4), more likely to report having been promoted and/or allowed by nurses to
16 provide the infants with supplementation of liquids (WHO 6), less likely to have practiced
17 rooming in (WHO 7), and less likely to have breastfed on demand (WHO 8).

18 Table 3 reports multiple logistic regression analysis results. Caesarian section (odds ratio [OR],
19 OR=1.75), maternal overweight (OR=1.74), non adherence to WHO's step 6 (OR=1.58), step 7
20 (OR=1.43) or step 8 (OR=1.76) were independently associated with increased odds of
21 predominant breastfeeding, as compared to exclusive breastfeeding.

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23

1 *Duration of breastfeeding and full breastfeeding*

2 Feeding practices through the first year of life are shown in Table 4. None of mothers stopped
3 breastfeeding in the maternity ward. The percentage of mothers exclusively vs. predominantly
4 breastfeeding in the hospital that were still breastfeeding at 1, 3, 6, and 12 months of delivery
5 were 93.0 vs. 91.1%, 77.5 vs. 74.2%, 56.3 vs. 51.3% and 13.3 vs. 14.3%, respectively; median
6 (mean; SD) duration of breastfeeding was, respectively, 6.3 (6.5; 3.5) and 6.1 (6.1; 3.4) months
7 ($P=0.058$; log-rank test). Incidence of stopping breastfeeding within 3 or 6 months was higher in
8 the predominant group ($P<0.01$). Mean (SD) duration of full breastfeeding in infants exclusively
9 or predominantly breastfed was, respectively, 3.6 (1.7) and 3.1 (1.8) months. Difference in
10 overall duration of full breastfeeding was significant at univariate analysis ($P=0.027$) but not
11 after adjustment for confounders ($P= 0.237$). Incidence of stopping full breastfeeding within 1, 2
12 or 6 months was higher the in the predominant group ($P<0.01$).

13 *Introduction of formula milk*

14 Through the first year of life 1373 (80.9%) infants received formula, representing 80.3% and
15 81.8% of infants exclusively or predominantly breastfed respectively ($P=0.846$) (Table 4). Mean
16 (SD) age at the first introduction of formula in infants exclusively or predominantly breastfed
17 was, respectively, 3.8 (1.2) and 3.3 (1.3) months. Difference in the age at introduction of formula
18 was significant at univariate analysis ($P=0.013$) but not after adjustment for confounders
19 ($P=0.138$). Incidence of introduction of formula within 1, 2 or 4 months was higher in infants
20 predominantly, rather than exclusively, breastfed ($P<0.01$). The adjusted odds ratio of early
21 introduction of formula was 1.54 (95%CI, 1.14-2.09).

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23

1 *Introduction of solid foods*

2 No significant difference was found between infants exclusively or predominantly breastfed in
3 the maternity ward for the age at introduction of solids foods (Table 4). Mean (SD) age at the
4 first introduction of solid foods was, respectively, 4.7 (1.0) and 4.6 (1.0). All infants received
5 solid foods by the age of 9 months.

6

7 **Discussion**

8 This study investigated determinants of predominant breastfeeding in the maternity ward and the
9 relationship of predominant breastfeeding with infants' feeding practices through the first year of
10 life. The reference population was clearly identified and included a representative sample of
11 healthy full-term infants. Breastfeeding was strictly classified in accordance with the WHO's
12 criteria (2, 7, 10). Owing to the study design and the relatively low participation rate (76%),
13 caution should be exercised in drawing definitive conclusions. It should be however noted that
14 this was the first large population-based study conducted in an industrialized country to examine
15 association of exclusive vs. predominant breastfeeding during postpartum hospital stay with later
16 feeding practices.

17 The results of the present study show that in Italy the national rate of initiation of full
18 breastfeeding (68%), although lower than in Scandinavia (16, 25), is higher than in other
19 Western countries. For instance, in the USA a breastfeeding initiation rate of 59% has been
20 reported (3). Indeed the rate of initiation of exclusive breastfeeding (39%) was inadequate as
21 compared to international recommendations (1, 3, 5, 6), whereas the rate of predominant
22 breastfeeding (29%) was surprisingly high. The ratio of exclusive to predominant breastfeeding
23 was about 4:3, even lower than the value of about 2:1 estimated recently in Brasilia (26). The

1 duration of breastfeeding is also unsatisfactory. Currently, in Italy only 55% of mothers who
2 exclusively or predominantly breastfeed during postpartum hospital stay still breastfeed 6
3 months after delivery, and fewer than 40% practice full breastfeeding 4 months after delivery.
4 Compliance with international recommendations for the introduction of complementary foods (4,
5 8, 9) is also inadequate. 26% of analyzed infants had been given formula before the age of 1
6 month, and more than 4% received any solid before 3 months.

7 Reasons for frequent use of supplemental liquid feedings during postpartum stay in Italy
8 are currently unknown and future research would be desirable to clarify this issue. Based on
9 results of the present study we can reasonably argue that main reasons for giving supplemental
10 liquids (in particular glucose water) were low hospital adherence to the WHO's ten steps and
11 unsatisfactory education of pediatricians and nurses towards benefits of exclusive breastfeeding.
12 Moreover nurses may feel useful to give the mothers a rest, especially the mothers who
13 underwent caesarian section delivery, and may be neither predisposed nor well-read for helping
14 the mothers to initiate breastfeeding early after delivery. Current adherence to WHO step 4 is
15 really low in Italy (about 20% (24)).

16 An analysis of the pooled data revealed that predominant breastfeeding in the maternity
17 ward was more common among mothers who delayed initiation of breastfeeding, or did not
18 practice rooming in, or were promoted by nurses to provide the infants with supplementation of
19 liquids, or did not breastfeed on demand. This reflects an inadequate compliance of hospitals
20 with the WHO's ten steps. Type of delivery and maternal BMI were also independently
21 associated with predominant breastfeeding in the maternity ward. Association with type of
22 delivery is not unexpected. It might reflect mainly the difficulties of mothers underwent to
23 caesarian section in breastfeeding during the first hours of delivery (27). Implication for

1 caesarian section should be further assessed. The observation that mothers overweight or obese
2 were more predisposed to predominantly breastfeed confirms that BMI outside of normal range
3 can play a negative role on breastfeeding practices (28, 29), and further suggests that incorrect
4 feeding practices of these mothers may begin in the maternity ward.

5 Few studies have evaluated influence of predominant breastfeeding during the first days
6 of delivery on later feeding practices (20, 23) but no epidemiological data currently exist in
7 general populations. In experimental trials, it has been observed that glucose water
8 supplementation may result in a lower duration of breastfeeding (22, 23) and early introduction
9 of formula milk (23). In the present survey, duration of full breastfeeding, as well the age at the
10 first introduction of formula significantly differed between infants exclusively or predominantly
11 breastfed in the maternity ward at univariate analysis only, and no difference was found for the
12 age at introduction of solid foods. Indeed, the negative practice to give the infant supplemental
13 water feedings may reveal its main detrimental effects on breastfeeding during the first weeks of
14 life. In the present study, in accordance with a previous study (23), incidence of introduction of
15 formula within the first month was remarkably higher among infants who were predominantly,
16 rather than exclusively, breastfed in the maternity ward (30% vs. 23 %). This result may suggest
17 that physiological attitude of the infant in recognizing nipple or in demanding breast milk is
18 weakened, at least during the first weeks of life, as breast milk is early supplemented with
19 liquids.

20 Owing to the study design, causality for associations of predominant breastfeeding during
21 the postpartum hospital stay and later infant's feeding practices cannot be properly discussed
22 here. On the whole, within the limitations of this study, it can be concluded that in the general
23 population, besides being associated with mother's BMI in the range outside the normal and

1 caesarean section, the negative practice to predominantly breastfeed during postpartum hospital
2 stay is strongly sensitive to lack of hospital's adherence to the WHO's ten steps to successful
3 breastfeeding. Supplementing breast milk with water and/or water-based drinks disclosed a weak
4 negative effect on duration of breastfeeding and age at introduction of formula, but increased
5 incidence of stopping breastfeeding and of introduction of formula within the first weeks after
6 delivery. The hospitals need to be compliant with the WHO's ten steps. Training for the Baby
7 Friendly Hospital Initiative and education of health staff should be promoted and recommended
8 to make effective improvement of breastfeeding practices in the maternity ward (30, 31).

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1 Table 1. Maternal and infants' characteristics, according to type of breastfeeding in the maternity
 2 ward.

3

Characteristic	Exclusive breastfeeding	Predominant breastfeeding	<i>P</i> -value [†]
	Mean (SD) or %	Mean (SD) or %	
Mother's age (y)	30.8 (4.0)	31.5 (4.4)	0.005*
Mother's pre-pregnancy weight (kg)	60.3 (7.8)	61.2 (9.2)	0.076
Mother's height (cm)	163.5 (5.9)	163.4 (5.9)	0.776
Mother's pre-pregnancy BMI (kg/m ²)	22.6 (2.6)	22.9 (3.0)	0.039*
Mother overweight (BMI≥25)	7.9	13.0	<0.001*
Mother obese (BMI≥30)	1.4	3.2	0.015
Mother education			
Mean level (y)	12.2 (3.1)	12.5 (3.1)	0.194
Low (≤8 y)	28.8	24.8	
Medium (9-13 y)	57.7	60.9	0.238
High (>13 y)	13.5	14.3	
Social class			
Low	4.2	4.1	
Medium	85.5	86.4	0.965
High	10.3	9.5	
Mother's smoking during pregnancy	21.8	20.9	0.692
Breast preparation during pregnancy	49.1	50.9	0.500
Primiparous	68.4	64.7	0.130
Caesarian section	16.9	26.7	<0.0001*
Infant gender (female)	51.6	49.6	0.540
Infant's birth body weight (g)	3374 (411)	3397 (404)	0.181
Infant's birth length (cm)	50.3 (1.9)	50.4 (1.9)	0.291
Duration of postpartum hospital stay (days)	2.8 (1.4)	3.0 (1.6)	0.106

4
 5 [†]Student's t-test or chi-square test.

6 *Statistically significant.

1 Table 2. Hospital's adherence (percentage of) to the WHO's ten steps to successful
 2 breastfeeding, as reported by mothers, according to type of breastfeeding in the
 3 maternity ward.

WHO step (short spelling)	Exclusive breastfeeding	Predominant breastfeeding	<i>P</i> -value [†]
1 (Breastfeeding policy of healthcare staff)	Not assessed	Not assessed	---
2 (Train of healthcare staff)	Not assessed	Not assessed	---
3 (Receiving information about breastfeeding benefits)	73.3	72.3	0.693
4 (Starting breastfeeding in the first half hour of delivery)	30.0	21.3	<0.01*
5 (Having been showed how breastfeed)	62.2	62.3	0.976
6 (No promotion of non breast milk foods or drinks)	58.2	48.5	<0.001*
7 (Rooming in)	36.0	23.9	<0.0001*
8 (Breastfeed on demand)	68.3	52.2	<0.0001*
9 (No pacifier use)	68.3	64.4	0.112
10 (Participation in support groups)	12.9	15.2	0.188

5

6 [†]Chi-square test.

7 *Statistically significant.

1 Table 3. Significant determinants of predominant breastfeeding vs. exclusive breastfeeding in the
 2 maternity ward. Multiple logistic regression analysis.^a

3

Variable	Odds ratio	95% CI	<i>P</i> -value
Caesarian section ^b	1.75	1.27-2.40	<0.0001
Mother's overweight ^b	1.74	1.12-2.69	<0.01
Adherence to the WHO's steps ^c			
Step 6	1.58	1.21-2.05	<0.001
Step 7	1.43	1.05-1.95	0.023
Step 8	1.76	1.32-2.35	<0.0001

4

5 ^aAdjusted for geographical area, mother's age, education level, social class, smoking habits,
 6 infant's gender, and infant's body weight and length at birth.

7 ^bYes vs. no

8 ^cNo vs. yes

1 Table 4. Feeding practices through the first 12 months of life in infants exclusively or predominantly breastfed in the maternity ward,
 2 in Italy (percentage of infants).^a

Age (completed months)	Exclusive breastfeeding in the maternity ward				Predominant breastfeeding in the maternity ward			
	Breastfeeding	Full breastfeeding	Formula milk ^b	Solid foods	Breastfeeding	Full breastfeeding	Formula milk ^b	Solid foods
1	93.0	76.9***	23.1***	0.0	91.1	69.9	30.1	0.0
2	84.7*	70.1**	29.8***	0.7	81.8	62.6	37.4	1.1
3	77.5**	62.1	37.6	4.0	74.2	58.0	41.4	5.2
4	66.9	41.2	46.9**	26.0	64.7	37.5	53.6	26.3
6	56.3**	5.8***	61.1	89.9	51.3	1.9	58.4	91.1
9	32.1	0.0	79.3	100.0	28.8	0.0	78.6	100.0
12	13.3	0.0	80.3	100.0	14.3	0.0	81.8	100.0

4 ^aOverall comparison between groups: duration of breastfeeding, $P= 0.058$; duration of full breastfeeding, $P= 0.027$; time at
 5 introduction of formula milk, $P=0.013$; time at introduction of solid foods, $P= 0.593$. (Log-rank test)

6 ^bThis category includes infants receiving formula milk, i.e., combines non-breastfed and breastfed infants receiving formula milk.

7 Exclusive vs. predominant: * $P<0.05$; ** $P<0.01$; *** $P<0.001$. (Chi-square test)