

Prevalence of breast-feeding and exclusive breast-feeding at 48 h after birth and up to the sixth month in Cyprus: the BrEaST start in life project

Mary Economou^{1,*}, Ourania Kolokotroni^{2,3}, Irene Paphiti-Demetriou³, Christiana Kouta¹, Ekaterini Lambrinou¹, Eleni Hadjigeorgiou¹, Vasiliki Hadjiona¹, Froso Tryfonos¹, Elena Philippou⁴ and Nicos Middleton¹

¹Department of Nursing, School of Health Sciences, Cyprus University of Technology, Vragadinou 15, 3041 Limassol, Cyprus; ²University of Nicosia Medical School, Nicosia, Cyprus; ³Cyprus Breastfeeding Association – ‘Gift for Life’, Nicosia, Cyprus; ⁴Department of Life and Health Sciences, University of Nicosia, Nicosia, Cyprus

Submitted 10 May 2017: Final revision received 16 September 2017: Accepted 2 October 2017: First published online 27 November 2017

Abstract

Objective: To assess the prevalence and sociodemographic determinants of breast-feeding (BF) and exclusive breast-feeding (EBF) in Cyprus up to the sixth month.

Design: Cross-sectional and longitudinal descriptive study. BF and EBF were estimated based on mothers' self-reported BF status in line with Step 7 of the WHO/UNICEF Baby-Friendly Hospital Initiative questionnaire and based on 24 h recall.

Setting: Maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics nationwide.

Subjects: Consecutive sample of 586 mothers recruited within 48 h from birth, followed up by telephone interview at the first, fourth and sixth month.

Results: Although 84.3% of mothers initiated BF before discharge, prevalence of BF at the sixth month was 32.4%, with the highest reduction observed between the first and fourth months. Prevalence of EBF at 48 h was 18.8% and fell gradually to 5.0% at the sixth month. Mothers with higher educational attainment or higher family income were more likely to breast-feed until the sixth month. In terms of EBF, an association was observed only with education, which persisted until the sixth month. Other than social gradient, mode of delivery was the strongest determinant of BF initiation, exclusivity and continuation. Mothers who gave birth vaginally were three to four times more likely to initiate BF (OR = 3.1; 95% CI 1.7, 5.4) and EBF (OR = 4.3; 95% CI 2.7, 6.8).

Conclusions: The low prevalence of BF and EBF in Cyprus, together with the fact that caesarean section rates are currently among the highest in Europe, suggest the need for further research to understand this multidimensional phenomenon and for interdisciplinary policy action to protect, promote and support BF.

Keywords
Breast-feeding
Prevalence
Longitudinal
Sociodemographic determinants

The numerous short-term and long-term beneficial effects of breast-feeding (BF) are well recognized, and include nutritional, developmental, immunological, psychological and cognitive benefits for breast-fed infants^(1–4) as well as health and psychological benefits for breast-feeding mothers^(1,4,5). The WHO recommends exclusive breast-feeding (EBF) for the first 6 months and continuation for 2 years or beyond. Even though the 2025 World Health Assembly's Global Target for Nutrition⁽⁶⁾ is to achieve an increase in the rate of exclusively breast-fed infants aged 0–6 months to at least 50%, only 38% of infants worldwide breast-feed exclusively⁽⁷⁾.

While a rise of BF initiation rates has been recorded in recent years, there is still widespread concern that BF is not

exclusive and is discontinued prematurely⁽⁸⁾. In a nationwide telephone survey in Canada of more than 8000 mothers⁽⁹⁾, the prevalence of BF initiation was 90.3%; however, only 14.4% breast-fed exclusively up to the sixth month. A series of articles published recently in the *Lancet* provides overwhelming evidence that the prevalence of BF and EBF remains at unsatisfactory levels and falls short of the recommendations in both high- and low-income countries⁽¹⁰⁾.

Across Europe, there is wide variability in the prevalence of BF initiation as well as BF exclusivity and duration^(8,11). For several countries, information is limited to the first 48 h. According to EuroPerinatal Survey (2010), Cyprus ranks among the lowest in terms of the initiation of

*Corresponding author: Email mc.economou@edu.cut.ac.cy

BF and EBF at 48 h. The reported estimates, which originate from a Perinatal Survey by the Cyprus Statistical Services⁽¹²⁾, suggest that only 16% of infants were exclusively breast-fed in the first 48 h, while as many as 33.8% of mothers did not breast-feed at all. Other than being outdated by nearly a decade, the survey captured only the first 48 h. Reported statistics from maternity wards in public hospitals by the Cyprus Ministry of Health covering period the 2007–2012 suggest a somewhat better picture⁽¹³⁾. Nevertheless, the prevalence of EBF was still estimated at 27.7%⁽¹³⁾. The latest 2014 Perinatal Survey of the Ministry of Health, which also included the private sector, suggests little improvement in over a decade⁽¹⁴⁾. In Cyprus, as many as 74.5% of births take place in the private sector where the rate of caesarean section (C/S), a strong determinant of BF initiation^(15–17), approaches 60% according to official data⁽¹⁴⁾. Official statistics in Cyprus go back only a decade (2008–2015), and suggest that C/S rates have been high in this period and still rising (from 53.4% in 2008 to 56.9% in 2015)⁽¹⁸⁾. Of those, 16.4% were classified as emergency C/S, whereas elective C/S reached up to 40.5%⁽¹⁸⁾. It is worth noting that, based on the same report, C/S rates in the private sector have been constantly high in this period while rates have also risen in the public sector. No home deliveries are currently conducted in Cyprus.

The purpose of the present study was to: (i) provide current estimates of the prevalence of BF and EBF in Cyprus beyond 48 h and up to the sixth month of an infant's life; and (ii) describe the sociodemographic determinants of exclusivity and duration of BF. The study is part of a wider programme entitled 'The BrEaST start in life: addressing social inequalities and supporting breastfeeding through inclusion activities', which aimed to strengthen the evidence base as well as raise awareness among health professionals and the general public alike.

Methods

Study design

The present study is a nationwide cross-sectional and longitudinal descriptive study, conducted in two phases between April 2014 and June 2015. During phase I, a consecutive sample of mother–infant dyads was recruited during their stay at maternity clinics over a period of 6–8 weeks. Keeping the recruitment period constant across sites was important to approximate the correct distribution of births across settings, as there is no official clinic-level data on the number of births in the private sector, which nevertheless accounts for over 70% of all births. Adjustments to the length of the stay were made if necessary, given the observed non-participation rate, in order for the final sample to approximate the expected proportion of birth across sectors (70–30 split) and across the five districts on the Republic of Cyprus. During phase

II, all mothers who provided contact details (telephone and/or email) were followed up prospectively with a telephone interview at the first, fourth and six months postpartum.

All maternity clinics in Cyprus were formally invited in writing to participate, followed by personal meetings with the hospital administration. Maternity wards in all public hospitals (five in total) and twenty-nine of thirty-five private clinics agreed to participate. Of the six that did not participate, four are small maternity clinics in terms of the total number of births. Among the larger clinics (i.e. more than forty births during the recruitment period), two did not participate. In both cases, inconvenience and/or disruption of routine activities were cited as the reasons for opting out.

Eligibility criteria and sample size

Mothers who gave birth in any of the participating clinics during the recruitment period were eligible to participate if they were: at least 18 years of age; could read or speak Greek or English (so as not to exclude the high proportion of non-Greek-speaking service users); had no health problems precluding them from BF, as recorded in the medical file and communicated to the team by the maternity clinic staff (e.g. bilateral mastectomy, postpartum maternal complications); and were not separated for any reason from their infants after birth (e.g. infant was transferred to a neonatal intensive care unit).

Precision analysis with finite population correction (as the annual number of births is about 10 000) suggested that the minimum required sample size to estimate the prevalence of BF with 95% CI not wider than $\pm 5\%$ was 370 participants. This sample size also provided sufficient statistical power of 80% to detect a 10–15% difference in magnitude at the 5% statistical significance level for the comparisons of interest (e.g. private *v.* public sector, vaginal *v.* C/S birth). This was considered satisfactory and within the expected range based on previous local estimates and published literature. To take into consideration the potential loss to follow-up during phase II, the minimum required sample for phase I was set to at least 550.

Recruitment procedure

Mother–infant dyads were recruited during their stay at the maternity departments. In consultation with the department staff, trained researchers approached mothers at 24 h and no later than 48 h after birth to invite them to participate. Visits were held every other day, since commonly the duration of stay at the maternity clinic in Cyprus is rarely less than 2 d. Eligible mothers were informed by the fieldworkers about the aims of the study and if they agreed to participate, they were asked to complete a questionnaire while fieldworkers waited outside their room to ensure privacy. The questionnaire was then returned in a sealed envelope. The mothers were also given the option

to complete the questionnaire in their own time, in which case the fieldworkers arranged a later time to pick it up.

Definition of breast-feeding and exclusive breast-feeding

BF and EBF were based on the WHO definitions⁽¹⁹⁾. Breast-feeding was considered exclusive if an infant did not receive anything other than breast milk, except for medications, vitamin or mineral drops, oral rehydration solution, etc. An infant was considered to be breast-feeding if he/she received breast milk in addition to any other liquid or food, including formula. Specifically, estimates for the prevalence of BF and EBF at each time point of interest were based on the following questions:

1. A question on breast-feeding status during the first 48 h, 'Have you breast-fed your newborn baby in the first 48 h?', was used to estimate BF initiation.
2. Regarding exclusivity, the set of questions referring to Step 7 ('Implementation of Exclusive Breastfeeding'), as phrased in Section 4 of the Baby-Friendly Hospital Initiative questionnaire for mothers' self-assessment of maternity unit practices⁽²⁰⁾, was used. This included a negative response to the question 'Did your baby receive any supplement?', together with a negative response to 'Did your baby receive any of the following?' referring to formula, water or sugar water, other fluids.

Missing information was considered a negative response regarding BF and EBF, respectively.

At the first month of follow-up, the estimation of BF and EBF followed the same rationale and was based on the mother's response to the following questions, as used previously^(21,22):

1. 'Does your baby receive: (i) only breast milk; (ii) mainly breast milk, but also formula; (iii) mainly formula, but also breast milk; or (iv) only formula?'
2. 'Until today, has your baby received: (i) water or sugar water; (ii) chamomile tea or other tea; or (iii) fruit or vegetable juice or any other liquid?'

Thus, in addition to the response of 'only breast milk', EBF status was defined as a negative response to having received any liquid up the point of conducting the interview.

At the fourth and sixth month of follow-up, any mother who responded positively to the question 'Do you still breast-feed?' was considered to still be breast-feeding. A response of 'only breast milk' to the same question as above was considered EBF, together with a negative response to the question 'Until today, has your baby received: (i) water or sugar water; (ii) chamomile tea or other tea; or (iii) fruit or vegetable juice or any other liquid?', as well as a negative response to the question 'Until today, has your baby received: (i) fruit purée; (ii) any ready-made baby cereal or food; or (iii) mashed or solid food?'

In addition, a 24 h recall of feeding practices was reported by mothers at every follow-up based on the Centers for Disease Control and Prevention IFP questionnaire used in the Infant Feeding Practices Study II (IFPS II)⁽²³⁾ modified accordingly based on the literature⁽²¹⁾ as well as recommendations of an expert panel of paediatricians and lactation consultants from the Cyprus Breastfeeding Association in order to take into consideration predominant local practices (e.g. aniseed tea). Similarly, the IFP questionnaire was further modified accordingly for the fourth- and sixth-month follow-up to include other liquids and solids that might be introduced at any time up to the sixth month.

Generally, effort was made so that the follow-up interviews were conducted within a week of the fourth and sixth month of the infant's life. Nevertheless, in some cases there was a longer delay in interviewing participants. To correct for the fact that BF or EBF cessation can occur in these critical time points, the self-reported month of BF cessation and of liquid/solid introduction was also taken into account to determine EBF or BF status at the fourth and sixth month.

Research tools

The baseline questionnaire also included a number of other research tools. For the assessment of mothers' reported experience of the 'Ten Steps for Successful Breastfeeding', the self-administered WHO/UNICEF questionnaire – Section 4 (part of the WHO/UNICEF Baby-Friendly Hospital Initiative questionnaire) was used⁽²⁰⁾, with permission from the Greek National Commission of UNICEF. The assessment of perceived breast-feeding self-efficacy was based on the Breastfeeding Maternal Self-Efficacy scale–short form (BSES-SF)^(24,25), with permission by the developer who provided an existing Greek translation of the scale. Nevertheless, a number of grammatical and syntax changes were deemed necessary, after a forward–backward translation process, to improve its readability. In a pilot study, the internal consistency of the scale (Cronbach's $\alpha=0.95$) and its test–retest reliability were deemed satisfactory (intraclass correlation coefficient=0.73). The BSES-SF contains fourteen 5-point Likert-scale items, with positive statements beginning with 'I can always ...'. The response scale provided for each statement ranges from 1 = 'not at all confident' to 5 = 'very confident'. At the sixth month, mothers were also asked to rate, on 5-point Likert scales with 1 = 'strongly disagree' and 5 = 'strongly agree', the importance they personally attributed to a list of fifteen reasons for discontinuing BF, including insufficient milk, inadequate weight gain, breast problems, household and childcare responsibilities, fatigue, etc. (adapted from a similar study⁽²¹⁾), or provide additional reasons if they wished. Finally, participating mothers provided information on sociodemographic factors, parity, BF history and intention to breast-feed.

Ethical considerations

Before the initiation of the study, all necessary approvals were obtained from the Cyprus National Bioethics Committee, the Research Promotion Committee of the Ministry of Health, which also grants permission of access to public hospitals, as well as from the administration of all participating clinics. Furthermore, notification was sent to the Commissioner of Personal Data Protection. Written consent was obtained from mothers for their participation. Separate consent was obtained for each phase, since participation in the second phase required the provision of personal contact details (telephone number and/or email). Mothers were informed that their participation was on a voluntary basis and that they could withdraw their participation at any time point of the study.

Statistical analysis

Summary statistics (frequencies and mean/sd as appropriate) were used for the description of the sociodemographic characteristics of the participants at baseline. Differences in sociodemographic and other characteristics between mothers who did and did not participate at follow-up were assessed using χ^2 tests for categorical variables and independent *t* tests for continuous variables. The prevalence of BF/EBF was estimated based on the total number of mothers in the sample at each time point according to the operational definitions above. Mothers who reported BF or EBF cessation at the first or fourth month were included in the sample and retained their BF/EBF status irrespective of non-participation at subsequent time points. Estimation of the 95% CI for prevalence estimates was conducted using EpiInfo based on the normal distribution approximation except for the sixth-month EBF estimate, for which, due to the very low numbers, exact binomial distribution was used instead. Differences in the prevalence of BF and EBF according to sociodemographic and other characteristics of the mothers were explored in χ^2 tests. The *P* value for trend was also calculated in the case of ordinal variables. The association between BF/EBF and sociodemographic or other characteristics was also explored in binary logistic regression models. OR of BF and EBF were calculated for mode of delivery, parity, educational attainment and family income at each time point of interest. The associations of BF and EBF with the abovementioned variables were explored before and after mutually adjusting for each other, as well as upon further adjusting for mother's age, employment and marital status. The statistical software package IBM SPSS Statistics for Windows version 21 was used for the analyses.

Results

Participant characteristics

A total of 1006 mothers were approached during the period of study, of whom 797 fulfilled the inclusion criteria. The baseline sample consisted of 586 mother–infant dyads

(response rate 73.5%). Of those, 372 (response rate 63.5%), 383 and 340 mothers were contacted by telephone at the first, fourth and sixth month, respectively. Table 1 presents the sociodemographic characteristics of the participants. The majority were aged 25–29 years, were married or cohabiting (92.7%) and most were Cypriot (71.5%). In terms of education, 40.6% of mothers had at most secondary education, while 31.2 and 21.2% had undergraduate and postgraduate tertiary education. With regard to employment, 60.6% reported a full-time status, whereas 22.9% were not employed. Only 12.1% reported a net family income above 3000 €/month. More than half (54.6%) delivered their infants with C/S (30.9 and 69.1% in the public and private sector, respectively; *P*=0.001). The observed rate of C/S is consistent with officially published data. For 47.4% of mothers, this was their first child. Among the rest, 82.9% reported previous BF experience. Even though the prevalence of EBF was only 18.8% at 48 h, 73.2% of mothers reported their intention to breast-feed exclusively.

Table 1 also presents the sociodemographic composition of the first-month follow-up sample and a comparison between those who did and did not participate in the telephone follow-up. There were no significant differences between responders and non-responders in terms of age, marital status, education, employment, parity, BF initiation or mode of birth. Non-Cypriot mothers and mothers in lower income categories appeared more likely to participate in the follow-up. Even though no differences were observed in terms of either initiation of BF or intention for EBF, there was a statistically significant difference between responders and non-responders in terms of reported intention to breast-feed exclusively for 6 months (71.0 *v.* 64.0%, respectively; *P*=0.026), most likely suggesting that mothers who participated in the follow-up phase might have more positive attitudes towards BF. No other significant differences were observed regarding sociodemographic characteristics or in terms of perceived BF self-efficacy.

Breast-feeding and exclusive breast-feeding rates up to the sixth month

As shown in Table 2, initiation of BF while at the maternity department was estimated at 84.3%. Nevertheless, only 18.8% (95% CI 15.6%, 21.9%) of mothers among the full sample exclusively breast-fed while at the clinic. At the first month postpartum, there was not much change since the prevalence of BF and EBF was 73.9% (95% CI 69.4, 78.3%) and 17.3% (95% CI 13.4, 21.1%), respectively, among mothers who participated in the follow-up. This might be an overestimate of the true prevalence, given that mothers with a more positive attitude towards BF might have been more likely to participate at the follow-up.

By the sixth month, the prevalence of BF was estimated at 32.4% (95% CI 27.7, 37.2%), with the sharpest decline observed between the first and fourth months. With respect to EBF, a more gradual reduction was observed up to the sixth month when only 5.0% (95% CI 3.1, 7.6%) of

Table 1 Sociodemographic characteristics, breast-feeding (BF) initiation, intention for exclusive breast-feeding (EBF) and perceived maternal self-efficacy, at baseline and among responders and non-responders at the first month, among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015

	Baseline		1st month				P value
	(N 586)		Responders (N 372; 63.5%)		Non-responders (N 214; 36.5%)		
	n	%	n	%	n	%	
Age (years)*							
18–24	145	24.7	91	24.5	54	25.2	0.938
25–29	258	44.0	164	44.1	94	43.9	
30–34	117	20.0	72	19.4	45	21.0	
35–39	28	4.8	18	4.8	10	4.7	
≥ 40	9	1.5	6	1.6	3	1.4	
Not stated	29	4.9	21	5.6	8	3.7	
Education*							
Primary school	4	0.7	2	0.5	2	0.9	0.136
Secondary school	234	39.9	156	41.9	78	36.4	
College/undergraduate	183	31.2	116	31.2	67	31.3	
Postgraduate degree	124	21.2	68	18.3	56	26.2	
Not stated	41	7.0	30	8.1	11	5.1	
Marital status*							
Married/cohabiting	543	92.7	340	91.4	203	94.9	0.163
Single	12	2.0	7	1.9	5	2.3	
Divorced/separated	2	0.3	1	0.3	1	0.5	
Not stated	29	4.9	24	6.5	5	2.3	
Employment status*							
Full-time	355	60.6	217	58.3	138	64.5	0.109
Part-time	65	11.1	38	10.2	27	12.6	
Unemployed	134	22.9	92	24.7	42	19.6	
Not stated	32	5.5	25	6.7	7	3.3	
Monthly net family income*							
≤ 1500 €	230	39.2	158	42.5	72	33.6	0.040
1501–3000 €	192	32.8	107	28.8	85	39.7	
3001–4500 €	54	9.2	31	8.3	23	10.7	
≥ 4501 €	17	2.9	12	3.2	5	2.3	
Not stated	93	15.9	64	17.2	29	13.6	
Country of origin*							
Cypriot	419	71.5	253	68.0	166	77.6	0.015
Not Cypriot	129	22.0	88	23.7	41	19.2	
Not stated	38	6.5	31	8.3	7	3.3	
Type of birth*							
Vaginal	249	42.5	162	43.5	87	40.7	0.608
Caesarean section	320	54.6	198	53.2	122	57.0	
Not stated	17	2.9	12	3.2	5	2.3	
Parity*							
Primiparous	278	47.4	170	45.7	108	50.5	0.519
Multiparous	292	49.8	191	51.3	101	47.2	
Not stated	16	2.7	11	3.0	5	2.3	
Previous BF experience*, †							
Yes	244	83.6	158	82.7	86	85.1	0.009
No	44	15.1	33	17.3	11	10.9	
Not stated	4	1.4	0	0.0	4	4.0	
BF during the first 48 h*							
Yes	494	84.3	314	84.4	180	84.1	0.758
No	55	9.4	33	8.9	22	10.3	
Not stated	37	6.3	27	7.3	12	5.6	
Intention for EBF*							
Yes	429	73.2	276	74.2	153	71.5	0.337
No	123	21.0	72	19.4	51	23.8	
Not stated	34	5.8	24	6.5	10	4.7	
Intention for EBF during the first 6 months*							
Yes	401	68.4	264	71.0	137	64.0	0.062
No	146	24.9	81	21.8	65	30.4	
Not stated	39	6.7	27	7.3	12	5.6	
Perceived maternal BF self-efficacy at 48 h ‡							
N and %	504	86.0	321	64.7	183	36.3	0.166
Mean and SD	3.40	0.90	3.44	0.91	3.33	0.88	

*The χ^2 test was used for categorical variables.

†Only multiparous participants were included in the analysis.

‡The independent *t* test was used for continuous variables.

Table 2 Prevalence of breast-feeding (BF) and exclusive breast-feeding (EBF) at 48 h after birth and up to the sixth month, according to estimation method, among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015

	EBF				BF			
	N	n	%	95% CI	N	n	%	95% CI
Self-reported status								
48 h	586	110	18.8	15.6, 21.9	586	494	84.3	81.4, 87.3
1st month*	371	64	17.3	13.4, 21.1	371	274	73.9	69.4, 78.3
4th month*, †	415	51	12.3	9.1, 15.5	393	169	44.0	38.1, 47.9
6th month*, †	417	21	5.0	3.1, 7.6	376	122	32.4	27.7, 37.2
24 h recall ‡								
4th month	369	73	19.8	15.7, 23.9	369	146	39.6	34.6, 44.6
6th month	341	1	0.3	0.007, 1.6	341	112	32.8	27.9, 37.8

*Sample size based on number of participants at that time point.
 †Sample size at the fourth and sixth months is based on the information given on EBF/BF status at that time point, as well as the assumption that mothers who reported discontinuing EBF/BF at the first or fourth month and lost to follow-up would not initiate BF or EBF again. The observed differences in the denominators for EBF and BF at the fourth and sixth months arise due to the fact that information given by mothers on the introduction of liquids and/or solids is used to indicate their EBF status. Once mothers were lost to follow-up, detailed information on their BF status was not available. Thus, while it might not be known whether some continue to breast-feed, it could be safely assumed that they are not exclusively breast-feeding at that point in time based on information about their EBF status at the previous contact.
 ‡For the purposes of comparison between the two methods of estimation, the last two rows present BF and EBF estimates for the fourth and sixth months based on 24 h recall.

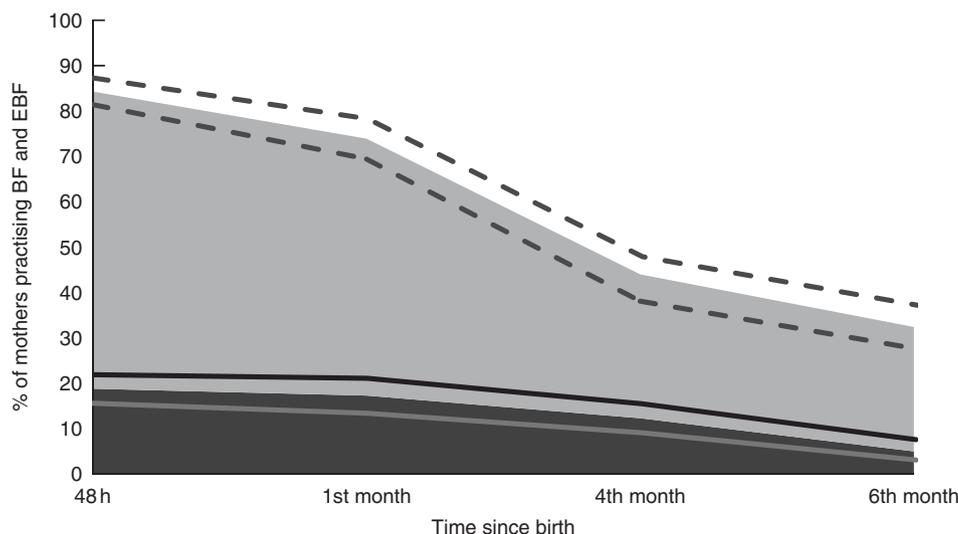


Fig. 1 Prevalence of breast-feeding (BF; □) and exclusive breast-feeding (EBF; ■) at 48 h after birth and up to the sixth month among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015. The dotted and solid lines represent the 95% CI for the BF and EBF prevalence estimates, respectively

mothers were breast-feeding exclusively (Table 2; also see Fig. 1). The prevalence of BF based on the 24 h recall of feeding practices was similar, if not slightly lower, than the respective estimates based on self-reported status. For example, the prevalence of BF at the fourth month was estimated at 44.0% based on reported BF status and at 39.6% based on whether mothers breast-fed their baby in the 24 h period prior to the interview. With respect to EBF, a slightly larger difference was observed depending on the method of assessment. For example, at the fourth month, the proportion of the mothers who exclusively breast-fed was estimated at 12.3% based on self-reported status and

slightly higher at 19.8% based on the prior 24 h. In contrast, at the sixth month, only 0.3% exclusively breast-fed in the 24 h prior to the interview *v.* 5.0% based on reported status. In terms of self-reported reasons for discontinuation, the highest ranking items in terms of importance were: (i) insufficiency of breast milk, by far (since as many as 62.5% reported that they agree/strongly agree with this statement); followed by (ii) concern with regard to the quantity of breast milk the baby consumes (reported by 32.7%); (iii) return to work (reported as important by 23.9%); and (iv) fatigue, depression and stress (reported by 16.6%). Of the mothers, 8.8% rated inadequate weight

gain as an important reason for discontinuing. In contrast, only 3.5% of mothers reported that smoking was an important reason for discontinuation and only 6.3% reported discontinuing due to personal reasons or choice or due to a previous unpleasant experience.

Breast-feeding and exclusive breast-feeding by sociodemographic characteristics

Table 3 presents the prevalence of BF and EBF according to sociodemographic and other characteristics of the participants. There was no significant difference in the

Table 3 Baseline characteristics, according to breast-feeding (BF) and exclusive breast-feeding (EBF) status at 48 h after birth, the first and fourth month, among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015

	BF*									EBF*									
	48 h			1st month			4th month			48 h			1st month			4th month			
	N	N	%	n	N	%	n	N	%	n	N	%	n	N	%	n	N	%	n
Age (years)																			
18–24	145	141	89.4	126	91	65.9	60	95	35.8	34	145	16.6	24	91	7.7	7	100	9.0	9
25–29	258	251	89.6	225	164	73.8	121	175	45.1	79	255	18.4	47	164	17.7	29	182	13.2	24
30–34	117	117	92.3	108	72	81.9	59	76	44.7	34	116	27.6	32	72	26.4	19	81	11.1	9
≥ 35	37	35	88.6	31	24	79.2	19	28	57.1	16	36	13.9	5	24	16.7	4	29	20.7	6
P value	0.832			0.125			0.199			0.084			0.017			0.369			
P for trend†	0.666			0.027			0.056			0.228			0.012			0.199			
Education																			
Primary/secondary school	238	231	87.4	202	158	67.7	107	165	35.8	59	236	18.6	44	158	13.3	21	175	8.6	15
College/undergraduate studies	183	181	90.1	163	116	75.9	88	119	40.3	48	182	19.8	36	116	17.2	20	125	12.0	15
Postgraduate studies	124	123	95.1	117	68	82.4	56	82	61.0	50	122	20.5	25	68	23.5	16	84	20.2	17
P value	0.071			0.056			0.001			0.907			0.163			0.027			
P for trend†	0.024			0.017			<0.001			0.662			0.060			0.009			
Marital status																			
Married/cohabiting	543	531	89.8	477	340	73.5	250	363	43.3	157	538	19.5	105	340	16.8	57	380	12.4	47
Single/divorced/separated	14	14	92.9	13	8	100.0	8	8	50.0	4	14	14.3	2	8	25.0	2	9	11.1	1
P value†	0.711			0.091			0.703			0.625			0.539			0.910			
Employment status																			
Full-time	355	348	91.7	319	217	75.1	163	238	45.8	109	354	20.1	71	217	17.1	37	248	10.5	26
Part-time	65	63	92.1	58	38	89.5	34	37	48.6	18	64	23.4	15	38	18.4	7	40	15.0	6
Unemployed	134	130	83.8	109	92	64.1	59	96	35.4	34	131	16.0	21	92	15.2	14	100	15.0	15
P value	0.035			0.009			0.177			0.426			0.885			0.424			
P for trend†	0.018			0.100			0.107			0.406			0.729			0.214			
Monthly net family income																			
≤ 1500 €	230	225	88.4	199	158	71.5	113	164	39.0	64	229	18.3	42	158	15.2	24	175	10.9	19
1501–3000 €	192	189	93.1	176	107	79.4	85	119	46.2	55	192	19.3	37	107	18.7	20	122	12.3	15
≥ 3001 €	71	70	97.1	68	43	90.7	39	49	71.4	35	69	27.5	19	43	23.3	10	51	19.6	10
P value	0.044			0.023			<0.001			0.234			0.433			0.252			
P for trend†	0.013			0.006			<0.001			0.152			0.198			0.137			
Country of origin																			
Non-Cypriot	129	123	89.4	110	88	70	79.5	84	40	47.6	126	27	21.4	88	16	18.2	92	13	14.1
Cypriot	419	412	90.8	374	253	184	72.7	282	121	42.9	417	80	19.2	253	43	17.0	290	35	12.1
P value†	0.656			0.206			0.445			0.579			0.800			0.603			
Type of birth																			
C/S with general anaesthesia	95	86	77.9	67	70	64.3	45	72	27.8	20	94	7.4	7	70	4.3	3	74	1.4	1
C/S without general anaesthesia	225	220	88.2	194	128	90	70.3	139	36.7	51	223	10.8	24	128	17.2	22	145	11.0	16
Vaginal	249	242	95.9	232	162	130	80.2	169	54.4	92	247	32.0	79	162	21.0	34	181	16.6	30
P value	<0.001			0.023			<0.001			<0.001			0.007			0.003			
P for trend†	<0.001			0.007			<0.001			<0.001			0.003			0.001			
Parity and previous BF experience																			
First child	294	265	92.1	244	180	72.8	131	195	36.4	71	275	11.6	32	180	11.7	21	206	8.3	17
≥ 2 children without previous experience	44	44	61.4	27	33	27.3	9	34	11.8	4	44	15.9	7	33	3.0	1	35	5.7	2
≥ 2 children with previous experience	244	237	93.2	221	158	84.8	134	164	57.3	94	241	29.5	71	158	26.6	42	174	18.4	32
P value	<0.001			<0.001			<0.001			<0.001			<0.001			0.005			
P for trend†	<0.001			0.014			0.724			0.001			0.255			0.161			

C/S, caesarean section.

*Total number of mothers who practise EBF at 48 h, first and fourth months: N 110, 64 and 51, respectively; total number of mothers who practise BF at 48 h, first and fourth months: N 494, 274 and 169, respectively.

†The χ^2 test was used for categorical variables.

prevalence of BF initiation or EBF at 48 h by age, marital status or nationality. In fact, no difference was generally observed according to these variables during the whole period of follow-up. In contrast, there was evidence of a social gradient in favour of mothers of higher socio-economic position. Mothers with higher educational attainment or with higher family income were more likely to BF at 48 h, even though they were not necessarily more likely to breast-feed exclusively. Moreover, they were more likely to still breast-feed at the first and fourth months. For instance, the prevalence of BF at the fourth month displayed a stepwise increase across increasing categories of income (i.e. 39.0, 46.2 and 71.4%; P for trend <0.001). While not statistically significant, a similar stepwise pattern was observed in terms of EBF whereby twice

as many mothers in high-income families were breast-feeding exclusively at the fourth month compared with mothers in the lower income category (19.2 *v.* 10.9%; P for trend = 0.137). A similar pattern was observed in terms of educational attainment and in fact a statistically significant difference by educational attainment was also observed in terms of EBF at the fourth and sixth months. Estimates for the sixth month are not presented in Table 3 because, apart from education, the observed gap in BF and EBF prevalence rates seemed to narrow by the sixth month.

The variables for which the most striking and statistically significant differences were observed are also presented in Fig. 2. In terms of mode of delivery, while no difference was observed in terms of BF initiation, EBF was almost three times higher among mothers who gave birth

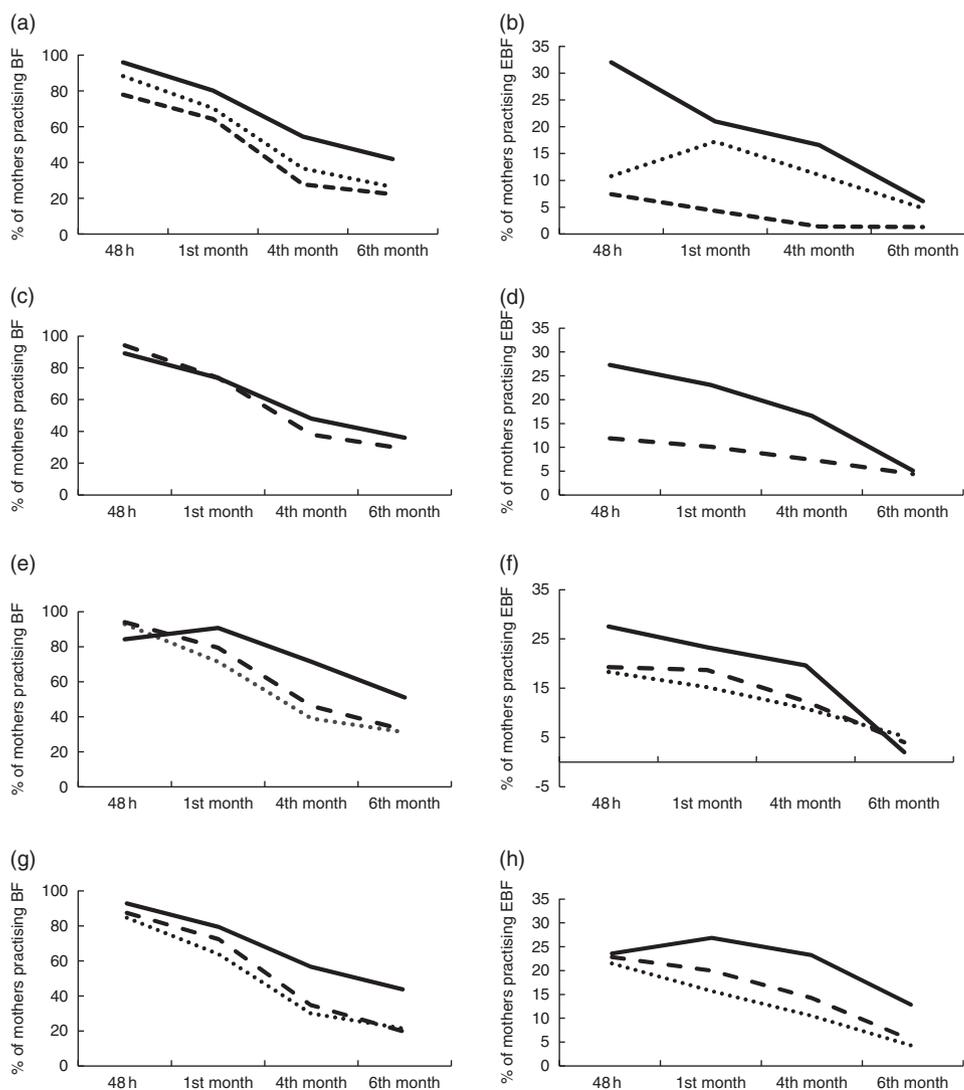


Fig. 2 Graphical representation of the prevalence of breast-feeding (BF; left column) and exclusive breast-feeding (EBF; right column) at 48 h after birth and up to the sixth month, by sociodemographic characteristics, among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015. (a, b) Type of birth (—, vaginal; ····, caesarean section without general anaesthesia; — —, caesarean section with general anaesthesia); (c, d) parity (— —, primiparous; —, multiparous); (e, f) monthly net family income (····, ≤ 1500 €; — —, 1501–3000 €; —, ≥ 3001 €); (g, h) educational attainment (····, primary/secondary school; — —, college/undergraduate studies; —, postgraduate studies)

vaginally (32.0 *v.* 10.8 and 7.4% among mothers who gave birth by C/S without and with general anaesthesia, respectively). The difference in EBF by mode of birth was observed across all time points, and was still apparent at the sixth month even though no longer statistically significant. Similarly, while the likelihood to breast-feed did not appear to differ according to whether this was the mother's first child, EBF was at least twice higher in multiparous compared with primiparous mothers. In fact, the prevalence of EBF at 48 h among primiparas (11.6%) appeared lower even compared with that among mothers who had other children but reported no previous experience of BF (15.9%). The difference between primiparous and multiparous mothers remained apparent, and statistically significant, at the first (23.1 *v.* 10.1%, $P=0.001$) and fourth (16.6 *v.* 7.4%; $P=0.005$) months, but not the sixth month.

Table 4 presents crude and adjusted OR of BF and EBF by mode of delivery, parity, educational attainment and income. Mode of delivery was the strongest determinant of BF and EBF initiation as well as continuation, at least up to the fourth month. Mothers with a vaginal birth were about three to four times more likely to initiate BF (OR = 3.1; 95% CI 1.7, 5.4; $P<0.001$) and to breast-feed exclusively (OR = 4.3; 95% CI 2.7, 6.8; $P=0.001$). After adjustments, this association appeared even stronger for both BF (adjusted OR = 4.5; 95% CI 2.1, 10.0) and EBF (adjusted OR = 5.6; 95% CI 3.3, 9.7), attributed to the fact that mothers of higher socio-economic position (educational attainment and/or income) were more likely to give birth by C/S, yet more likely to breast-feed/exclusively breast-feed. In terms of parity, multiparous women appeared two to three times more likely to breast-feed exclusively throughout the period, and the observed association remained strong even after adjusting for other sociodemographic variables. Even though the estimates attenuated somewhat in the fully adjusted models and were not always statistically significant, evidence of a social gradient in BF and EBF was apparent in terms of both income and educational attainment. Interestingly, the association in terms of education appeared stronger than that of income for both BF and EBF, but seemed largely restricted to mothers with postgraduate education who appeared statistically significantly more likely to breast-feed both at the fourth (adjusted OR = 2.1; 95% CI 1.1, 3.9) month and the sixth month (adjusted OR = 2.4; 95% CI 1.2, 4.6) compared with mothers with secondary education. The association appeared even stronger in terms of EBF. In contrast, it seemed that the association with income appeared stronger in the case of BF (but not EBF), especially after the fourth month.

Discussion

Main findings

The present study estimated the prevalence of BF and EBF for the first time among a representative sample of

mothers giving birth in Cypriot private and public maternity departments. While BF initiation appeared high, premature discontinuation was observed with the highest reduction after the first and before the fourth month. By the sixth month, only one in three mothers was still practising BF. The prevalence of EBF was low even at 48 h (18.8%), while by the sixth month only 5.0% of the mothers were still breast-feeding exclusively. For primiparas and those who gave birth by C/S, lower rates of initiation, exclusivity and duration of BF were observed. In addition, there was evidence of a social gradient, with mothers of higher socio-economic position being more likely to breast-feed, breast-feed exclusively (particularly those with higher educational attainment) and breast-feed longer.

Prevalence of breast-feeding and exclusive breast-feeding

BF initiation was comparable to estimates seen in some countries such as Greece (87.9%)⁽²¹⁾; slightly lower than in some e.g. Canada (90.3%)⁽⁹⁾, Italy (91.6%)⁽²⁶⁾ and Australia (93.3%)⁽²⁷⁾; but higher than in others e.g. the UK (81%)⁽²⁸⁾. The prevalence of BF at the sixth month was lower than respective figures reported elsewhere, such as Italy (57.7%)⁽²⁶⁾, Norway (82%)⁽²⁹⁾, Australia (41.7%)^(27,30), Canada (53.4%)^(9,31) and the USA (51.8%)⁽³²⁾, but comparable to the UK (34%)⁽²⁸⁾. In contrast, the prevalence of EBF was particularly low even at 48 h, and much lower by comparison to other high-income countries such as Italy (57.2%)⁽²⁶⁾ and Australia (75.6%)⁽³⁰⁾, being more similar to that observed in Greece (41.1%)⁽²¹⁾. At 6 months, only one in twenty mothers breast-fed exclusively. This particularly low rate appears comparable to the respective value reported in a recent study from Italy (5.5%)⁽²⁶⁾. Even though the various studies are not directly comparable, both in terms of methodology as well as the time periods, the low rate of EBF observed in Cyprus at the sixth month appears lower than in Norway (10%)⁽²⁹⁾, Canada (13.8%; 14.4%)^(9,31) and Spain (10%)⁽³³⁾, but higher than in Australia (<1%)⁽³⁰⁾, Greece (0.9%)⁽²¹⁾ and the UK (1%)⁽²⁸⁾. By comparison to other studies^(9,26,29,34), it is also of note that BF discontinuation appears to occur sooner in Cyprus since BF rates drop sharply between the first and fourth months. In fact, 50% of the mothers reported BF discontinuation within the first 2 months (data not shown). A similar pattern was observed in a study in Greece, where the greatest reduction was observed even sooner than in the present study⁽²¹⁾.

Sociodemographic determinants of breast-feeding initiation, exclusivity and duration

Delivery by C/S was the strongest negative determinant of BF and EBF during the first 48 h. This finding is consistent with several previous studies^(15–17,31,35–37). The high rate of C/S deliveries in Cyprus might partly explain the very

Table 4 OR (95% CI) of breast-feeding (BF) and exclusive breast-feeding (EBF) at 48 h after birth and at first, fourth and sixth months, according to each sociodemographic variable before and after mutually adjusting for each other in multivariable logistic models, among a consecutive sample of 586 mothers recruited from maternity wards in all public hospitals and twenty-nine (of thirty-five) private maternity clinics in Cyprus, April 2014–June 2015

	48 h				1st month				4th month				6th month			
	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI
BF																
Mode of delivery																
C/S	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
Vaginal	3.09	1.75, 5.44	4.58	2.10, 10.02	1.90	1.16, 3.09	1.93	1.06, 3.52	2.36	1.55, 3.57	2.60	1.60, 4.23	2.18	1.39, 3.40	2.28	1.37, 3.78
Parity																
Primiparous	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
Multiparous	0.83	0.51, 1.35	0.84	0.43, 1.65	1.14	0.71, 1.82	1.02	0.55, 1.87	1.74	1.15, 2.62	2.05	1.22, 3.45	1.57	1.01, 2.44	1.83	1.06, 3.18
Educational attainment																
Primary/secondary	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
College/undergraduate	1.45	0.81, 2.61	1.59	0.76, 3.33	1.50	0.87, 2.57	1.22	0.62, 2.38	1.22	0.75, 1.97	1.26	0.71, 2.23	0.93	0.54, 1.59	1.03	0.55, 1.94
Postgraduate	2.98	1.29, 6.91	2.57	0.89, 7.40	2.22	1.10, 4.51	1.13	0.50, 2.55	2.81	1.63, 4.85	2.09	1.10, 3.97	2.47	1.41, 4.31	2.36	1.21, 4.62
Monthly net family income																
≤1500 €	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
1500–3000 €	1.71	0.91, 3.24	1.66	0.76, 3.63	1.54	0.86, 2.76	1.68	0.85, 3.33	1.34	0.83, 2.17	1.53	0.87, 2.70	1.06	0.63, 1.77	1.19	0.64, 2.20
≥3001 €	3.53	1.05, 11.92	2.89	0.74, 11.29	3.88	1.31, 11.50	3.38	1.02, 11.13	3.91	1.95, 7.83	3.24	1.39, 7.56	2.30	1.18, 4.45	1.71	0.73, 4.02
EBF																
Mode of delivery																
C/S	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
Vaginal	4.33	2.74, 6.84	5.65	3.28, 9.73	1.84	1.05, 3.23	2.02	1.04, 3.94	2.36	1.26, 4.44	3.34	1.58, 7.08	1.75	0.69, 4.45	1.74	0.54, 5.65
Parity																
Primiparous	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
Multiparous	2.80	1.79, 4.40	3.88	2.21, 6.83	2.62	1.43, 4.79	2.76	1.34, 5.68	2.47	1.28, 4.76	2.75	1.24, 6.09	1.05	0.42, 2.64	2.82	0.79, 10.03
Educational attainment																
Primary/secondary	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
College/undergraduate	1.08	0.66, 1.76	1.34	0.73, 2.46	1.36	0.70, 2.64	1.43	0.64, 3.17	1.46	0.68, 3.10	2.12	0.85, 5.29	1.41	0.40, 4.96	2.54	0.44, 14.55
Postgraduate	1.11	0.64, 1.93	1.11	0.56, 2.20	2.01	0.97, 4.14	1.73	0.73, 4.10	2.71	1.28, 5.73	3.29	1.31, 8.28	4.08	1.32, 12.59	16.33	3.32, 80.26
Monthly net family income																
≤1500 €	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.	1.00	Ref.
1500–3000 €	1.07	0.65, 1.75	1.37	0.75, 2.51	1.28	0.67, 2.46	1.21	0.56, 2.63	1.15	0.56, 2.37	1.50	0.64, 3.55	0.77	0.25, 2.36	0.60	0.16, 2.28
≥3001 €	1.64	0.88, 3.05	1.73	0.78, 3.84	1.69	0.74, 3.88	0.96	0.33, 2.79	2.00	0.87, 4.64	1.75	0.57, 5.40	0.37	0.05, 2.97	0.23	0.02, 2.43

AOR, adjusted OR; C/S, caesarean section; Ref., reference category.

The above variables were mutually adjusted but also adjusted for the following variables: age, marital status, employment status.

low rate of EBF. Comparable low EBF rates are reported elsewhere with similar high rates of C/S⁽³⁸⁾. Furthermore, as in the present study, C/S has also been associated with BF duration^(39,40). Evidence supports that delay of initiating BF may lead to difficulty in successfully establishing BF and therefore to premature discontinuation^(14,16). To date, no studies from Cyprus have directly addressed the multitude of reasons behind the currently high C/S rate. One study of qualitative design⁽⁴¹⁾ may shed further light into the issue. Even though that study focused on women's choice of place of birth (rather than mode of birth), some of the themes identified provide a deeper understanding into the birth environment as well as some of the perceptions of Cypriot women around childbirth. Medicalization of childbirth, as well as fear and safety of mother and baby, were identified as some of the main factors that influence the choice of place of birth. Furthermore, a qualitative study among midwives on their role as advocates of normal birth identified five main interconnected themes: 'lack of professional recognition', 'deficiencies in basic or continuing education', 'physician dominance', 'medicalization of childbirth' and 'lack of institutional support'⁽⁴²⁾.

Evidence on the association of BF with parity in the literature is inconsistent. Several studies report that primiparous mothers may be more likely to initiate BF^(36,43). However, they are more likely to discontinue BF⁽³⁴⁾, probably due to lower self-efficacy for BF and lack of support⁽²⁴⁾. It is not uncommon for studies to also show that BF initiation⁽³⁷⁾ and premature BF discontinuation⁽³⁹⁾ are more common among multiparous mothers, or report no differences by parity^(34,44). This is probably largely dependent on the community health services and support (formal and informal) available for first-time mothers, which vary considerably across settings. For instance, in the case of Cyprus, it is not surprising given the lack of BF support in the community. With no community midwifery, care is largely provided by paediatricians in the private sector with varied practices, while a number of non-governmental organizations fill the gap in formal services by providing postnatal education and support, but the capacity and reach are limited. In fact, their services may benefit the more health literate who seek the support, introducing further social stratification.

Similar to the social gradient observed in the present study, several studies have repeatedly shown a positive association of educational attainment^(10,29,31,45–48) and/or family income^(20,46,47) with BF initiation and longer duration. However, beyond indicators of social position, an important aspect that has been receiving more attention in recent years is the health literacy of parents. A recent study from the USA provides evidence to suggest that low parental health literacy is associated with 'obesogenic' infant care behaviours, including formula-feeding and immediate feeding when the baby cries⁽⁴⁹⁾ and premature BF discontinuation⁽⁵⁰⁾. Furthermore, while research evidence suggests that motivation to change towards a healthier

lifestyle is higher during the transition to parenthood^(51,52), there is also evidence suggesting that, while intentions may generally improve, perceived behavioural control or actual change may be differential among fathers *v.* mothers as well as new parents *v.* established parents⁽⁵³⁾. The extent to which this is also differential according to the socio-economic position or indeed the health literacy of the parents is not well understood. Moreover, owing to the fact that initiation of BF is high (about eight out of ten women initiate BF), low rates of EBF and early discontinuation may not necessarily indicate that parents do not acknowledge the benefits of BF or show lack of motivation⁽⁵⁴⁾. Taking a socio-ecological framework approach, several factors beyond the intrapersonal level are at play, such as practical difficulties⁽⁵⁵⁾, misconceptions with regard to infant feeding⁽⁵⁴⁾ (such as perception of insufficient breast milk, also observed in the present study) and lack of BF support or supportive policies from the immediate or wider social environment, health professionals and workplace^(56,57).

One important aspect is BF education in the prenatal period (Step 3 of the 'Ten Steps for Successful Breastfeeding'). It has been previously reported that implementation of Step 3 across Cypriot maternity clinics is suboptimal⁽²⁵⁾. Specifically, only 15.7% of mothers reported receiving information in the antenatal period on all three topics concerning successful EBF (the importance of skin-to-skin contact, rooming-in and the risk of giving water, formula or other supplements in the first 6 months), while as many as 57.9% reported receiving no such advice. Regarding adherence to the International Code of Marketing of Breast-milk Substitutes, a high proportion of mothers (83.8%) reported not receiving any breast-milk substitute up to the point of the interview (24–48 h after birth). Nevertheless, this might be an overestimation resulting from the study design since samples may be given at discharge.

Methodological issues on the estimation of breast-feeding indicators

The present study used both a 24 h recall of infant feeding practices as well as self-reported status to estimate the prevalence of BF and EBF. Even though the WHO recommends the 24 h recall dietary method for comparability and consistency of estimation of the BF indicators, this method has been criticized because it may lead to misclassification of BF status^(58–61). In fact, the 24 h recall method appears to overestimate EBF at the fourth month compared with self-reported status. This observation could be attributed to the fact that during the weaning phase, mothers may have already introduced other liquids in the child's diet but exclusively breast-fed the day prior to the interview. Other studies have also suggested that the 24 h method may overestimate the prevalence of EBF^(59–61). In Aarts *et al.*'s study, current status of EBF was estimated to be about 40% higher at the second and fourth months and

9.2% higher at the at six month in comparison with retrospective measurement of EBF since birth⁽⁶⁰⁾.

In the present study, the 24h recall produced a lower estimate for EBF than self-reported status at the sixth month (0.3%) compared with the fourth month (5.0%). This is more likely to be a design effect, since the self-reported month of BF cessation and of liquid/solid introduction in infant feeding were also taken into account to determine EBF or BF status at the fourth and sixth months. For example, at this critical period, if a mother was interviewed a few days past the sixth month and reported liquid or solid introduction at the sixth month and no sooner, she was then considered to be breast-feeding exclusively up to the sixth month.

Strengths and limitations

The present study is the first to provide current estimates of BF and EBF past the first 48h in Cyprus, with participation of nearly all the maternity clinics in the country from the public and private sectors. A clear strength of the study is the prospective design which facilitated the assessment of infant feeding practices over the period of the first 6 months, avoiding the recall bias of a retrospective design. Furthermore, in addition to self-reported BF and EBF status, the study also assessed the time of introduction of liquids or solids. The extent to which the self-exclusion of two larger private clinics has affected the estimates is not clear, but the national representativeness of the sample is supported by the fact that no differences were observed in terms of the anticipated proportion of C/S based on best available national data.

However, the present study has some limitations. First, the baseline response rate was 73.5%, which none the less is within the range observed in studies elsewhere⁽²⁹⁾. Reasons for not participating were not clear; thus, the extent to which potential selection bias has over- or underestimated the prevalence is not known. Nevertheless, the observed prevalence rates at 48h appear very similar to the only available data^(12–14). This may suggest that there has not been much improvement in nearly a decade. Alternatively, assuming that a less favourable attitude towards BF may have contributed to the decision of mothers to opt out, then this may also suggest that the study may not only have overestimated the true prevalence of BF, but also that there has been a decline in BF and EBF prevalence over this period. Similarly, even though no significant sociodemographic or other differences were observed in terms of participation in the follow-up phase of the study, it is more likely that the study has overestimated the true prevalence, given that mothers with a more positive attitude towards BF as indicated by reported intention to BF were more likely to participate.

Conclusion

Significant improvements have been achieved in many European countries through the development of national

policies and actions to promote and support BF over the last decade⁽⁶²⁾. The National Breastfeeding Committee of the Cyprus Ministry of Health has recently developed a national strategy for breast-feeding (2011) and policy (2015), published on the Cyprus Ministry of Health's website (www.moh.gov.cy; available only in Greek), which includes a call to launch the Baby-Friendly Hospital Initiative. Currently, no hospital in Cyprus is certified as baby-friendly. The particularly high rates of C/S, together with fragmented implementation of the 'Ten Steps for Successful Breastfeeding'⁽²⁵⁾, may contribute to the low prevalence of EBF and its premature discontinuation.

This highlights the need for further research of both quantitative and qualitative design into understanding this multidimensional phenomenon, including the reasons for the high rate of C/S, knowledge about the benefits and practice of BF, as well as general parental health literacy. Furthermore, there is a pressing need for interdisciplinary policy action to protect, promote and support BF with clear BF policies, including structural changes such as the introduction of community care and community intervention programmes, as well as public awareness campaigns to challenge both potential misconceptions (e.g. insufficient milk) and social norms (e.g. breast-feeding in public).

Acknowledgements

Acknowledgements: The authors wish to express their appreciation and gratitude to all mothers who participated in the study and to the fieldworkers for their essential contribution in the recruitment of participants at the maternity clinics and data collection at the baseline phase of the study. Furthermore, they would like to acknowledge the National Breastfeeding Committee for its support. *Financial support:* The study was part of the research programme 'The BrEaST start in life: addressing social inequalities and supporting breastfeeding through inclusion activities', which was funded by Iceland, Liechtenstein and Norway through the EEA Financial Mechanism and the Republic of Cyprus. The funders had no role in the design, analysis or writing of this article. *Conflict of interest:* The authors declare of no conflict of interest. *Authorship:* N.M., I.P.-D., O.K., C.K., E.L. and E.H. conceived and designed the study and secured the funding. I.P.-D. was the project leader and N.M. was the scientific coordinator of the BrEaST start in life programme. M.E. was the study's research coordinator and the study forms part of her doctoral dissertation. N.M. was the main PhD advisor of the first author (M.E.) and C.K. and E.L. were members of the PhD advisory committee, and were all involved in the overall supervision of the study. N.M., V.H., E.P. and M.E. trained the fieldworkers and monitored the data collection at phase I. V.H. and F.T. performed data collection at phase I of the study and contributed to

data management and analysis and to the editing of the manuscript. M.E. conducted the telephone follow-up data collection at phase II, managed the data set, performed the statistical analysis and wrote the first draft of the manuscript. N.M. guided the statistical analysis and N.M. and O.K. assisted in drafting and editing the first draft of the manuscript. All authors assisted in interpreting the data and critically revised the manuscript. All authors have read and approved the final version of the manuscript. *Ethics of human subject participation*: This study was approved by the Cyprus National Bioethics Committee, the Research Promotion Committee of the Ministry of Health, and the administration of all participating clinics. Notification was sent to the Commissioner of Personal Data Protection. Written consent was obtained from mothers for each phase of their participation.

References

- American Academy of Pediatrics (2012) Breastfeeding and the use of human milk. *Pediatrics* **129**, e827–e841.
- Dennis CL (2002) Breastfeeding initiation and duration: a 1990–2000 literature review. *J Obstet Gynecol Neonatal Nurs* **31**, 12–32.
- Horta BL & Victora CG (2013) *Long-Term Effects of Breastfeeding: A Systematic Review*. Geneva: WHO.
- James DC & Lessen R (2009) Position of the American Dietetic Association: promoting and supporting breastfeeding. *J Am Diet Assoc* **109**, 1926–1942.
- US Department of Health and Human Services (2011) *The Surgeon General's Call to Action to Support Breastfeeding*. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General.
- World Health Organization (2012) *Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition*. Geneva: WHO; available at http://apps.who.int/iris/bitstream/10665/113048/1/WHO_NMH_NHD_14.1_eng.pdf?ua=1
- Black RE, Victora CG, Walker SP *et al.* (2013) Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* **382**, 27–51.
- Bosi ATB, Eriksen KG, Sobko T *et al.* (2016) Breastfeeding practices and policies in WHO European region member states. *Public Health Nutr* **19**, 753–764.
- Chalmers B, Levitt C, Heaman M *et al.* (2009) Breastfeeding rates and hospital breastfeeding practices in Canada: a national survey of women. *Birth* **36**, 122–132.
- Victora CG, Bahl R & Barros AJD, for the Lancet Breastfeeding Series Group, *et al.* (2016) Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet* **387**, 475–490.
- European Perinatal Health Report (2010) Health and Care of Pregnant Women and Babies in Europe. <http://www.europeristat.com/reports/european-perinatal-health-report-2010.html> (accessed May 2013).
- Republic of Cyprus, Ministry of Health (2010) Cyprus maternity units: perinatal health indicators for the years of 2007–2009 compared to the European Perinatal Health Report for year 2004. http://www.europeristat.com/images/doc/NPHR/cyprus_perinatal_health_data_for_public_sector_maternity_units_cyprus.pdf (accessed January 2017).
- Republic of Cyprus, Ministry of Health (2015) Cyprus public maternity units: perinatal health indicators for the years of 2007–2012. http://www.europeristat.com/images/Perinatal_Health_Report_2013_Cyprus_Public_Maternity_Units_2007-2012.pdf (accessed January 2017).
- Republic of Cyprus, Ministry of Health (2016) Cyprus public and private maternity units: perinatal health indicators for the year 2014. [http://www.moh.gov.cy/moh/moh.nsf/All/8DC461429CBC4DE7C22579CE002EF07D/\\$file/Perinatal%20Health%20Report%202016_Cyprus%20Maternity%20Units%202014.pdf](http://www.moh.gov.cy/moh/moh.nsf/All/8DC461429CBC4DE7C22579CE002EF07D/$file/Perinatal%20Health%20Report%202016_Cyprus%20Maternity%20Units%202014.pdf) (accessed January 2017).
- Zanardo V, Svegliado G & Cavallin F (2010) Elective cesarean delivery: does it have a negative effect on breastfeeding? *Birth* **37**, 275–279.
- Prior E, Santhakumaran S, Gale C *et al.* (2012) Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature. *Am J Clin Nutr* **95**, 1113–1135.
- Rowe-Murray HJ & Fisher JR (2002) Baby friendly hospital practices: cesarean section is a persistent barrier to early initiation of breastfeeding. *Birth* **29**, 124–131.
- Republic of Cyprus, Ministry of Health (2017) Caesarean sections: Cyprus and other countries last available data. [https://www.moh.gov.cy/Moh/MOH.nsf/0/8DC461429CBC4DE7C22579CE002EF07D/\\$file/Perinatal%20Indicators%202017_Caesareans,%20Cyprus%20and%20other%20countries.pdf](https://www.moh.gov.cy/Moh/MOH.nsf/0/8DC461429CBC4DE7C22579CE002EF07D/$file/Perinatal%20Indicators%202017_Caesareans,%20Cyprus%20and%20other%20countries.pdf) (accessed January 2017).
- World Health Organization (2008) Indicators for assessing infant and young child feeding practices. Part 1: definitions. Conclusions of a consensus meeting held 6–8 November 2007 in Washington, DC, USA. http://apps.who.int/iris/bitstream/10665/43895/1/9789241596664_eng.pdf (accessed January 2017).
- World health Organization, UNICEF & Wellstart International (2009) Baby Friendly Hospital Initiative. Revised updated and expanded for integrated care. Section 4: Hospital self-appraisal and monitoring. https://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf (accessed January 2017).
- Gaki E, Papamichail D, Sarafidou G *et al.* (2009) National survey of prevalence and determinants of breastfeeding. https://www.unicef.gr/uploads/filemanager/PDF/info/Ekthesi_Ethnikhs_Melets_Thilasmou.pdf (accessed December 2016).
- Scott JA (1997) Determinants of the initiation and duration of breast-feeding. PhD Thesis, Curtin University of Technology.
- Centers for Disease Control and Prevention (n.d.) Infant Feeding Practices Study II and Its Year Six Follow Up: Questionnaires. <https://www.cdc.gov/breastfeeding/data/ifps/questionnaires.htm> (accessed February 2014).
- Dennis CL & Faux S (1999) Development and psychometric testing of the Breastfeeding Self-Efficacy Scale. *Res Nurs Health* **22**, 399–409.
- Hadjiona V, Middleton N, Kouta C *et al.* (2016) Cyprus mothers' breast feeding self-efficacy and their perceptions about the implementation of the '10 steps' in the first 48 hours after birth. *Midwifery* **36**, 43–52.
- Lauria L, Spinelli A & Grandolfo M (2016) Prevalence of breastfeeding in Italy: a population based follow-up study. *Ann Ist Super Sanita* **52**, 457–461.
- Magarey A, Kavian F, Scott J *et al.* (2016) Feeding mode of Australian infants in the first 12 months of life: an assessment against national breastfeeding indicators. *J Hum Lact* **32**, NP95–NP104.
- McAndrew F, Thompson J, Fellows L *et al.* (2012) *Infant Feeding Survey 2010*. Leeds: Health and Social Care Information Centre.
- Kristiansen AL, Lande B, Øverby NC *et al.* (2010) Factors associated with exclusive breast-feeding and breast-feeding in Norway. *Public Health Nutr* **13**, 2087–2096.
- Scott J, Binns C, Oddy W *et al.* (2006) Predictors of breastfeeding duration: evidence from a cohort study. *Pediatrics* **117**, e646–e653.
- Al-Sahab B, Lanes A, Feldman M *et al.* (2010) Prevalence and predictors of 6-month exclusive breastfeeding among Canadian women: a national survey. *BMC Pediatr* **10**, 20.
- Centers for Disease Control and Prevention (2016) Breastfeeding report card: progressing towards breastfeeding goals,

- United States, 2016. <https://www.cdc.gov/breastfeeding/pdf/2016breastfeedingreportcard.pdf> (accessed January 2017).
33. Lozano de la Torre MJ, Martin-Calama & Hernandez-Aguilar MT (2001) Breast-feeding in Spain. *Public Health Nutr* **4**, 1347–1351.
 34. Camutdan AD, Ilhan M, Beyazova U *et al.* (2008) How to achieve long-term breast-feeding: factors associated with early discontinuation. *Public Health Nutr* **11**, 1173–1179.
 35. Pérez-Escamilla R, Maulén-Radovan I & Dewey KG (1996) The association between cesarean delivery and breast-feeding outcomes among Mexican women. *Am J Public Health* **86**, 832–836.
 36. Scott J, Landers M, Hughes R *et al.* (2001) Factors associated with breastfeeding at discharge and duration of breast-feeding. *J Paediatr Child Health* **37**, 254–261.
 37. Tavoulari EF, Benetou V, Vlastarakos PV *et al.* (2015) Factors affecting breast-feeding initiation in Greece: what is important? *Midwifery* **31**, 323–331.
 38. Pechlivani F, Vassilakou T, Sarafidou Jasmin *et al.* (2005) Prevalence and determinants of exclusive breastfeeding during hospital stay in the area of Athens, Greece. *Acta Paediatr* **94**, 928–934.
 39. Kohlhuber M, Rebhan B, Schwegler U *et al.* (2008) Breast-feeding rates and duration in Germany: a Bavarian cohort study. *Br J Nutr* **99**, 1127–1132.
 40. Ahluwalia IB, Li R & Morrow B (2012) Breastfeeding practices: does method of delivery matter? *Matern Child Health J* **16**, 231–237.
 41. Hadjigeorgiou E, Kouta C, Papastavrou E *et al.* (2012) Women's perceptions of their right to choose the place of childbirth: a qualitative study. *Int J Childbirth* **2**, 230–238.
 42. Hadjigeorgiou E & Coxon K (2014) In Cyprus, 'midwifery is dying...'. A qualitative exploration of midwives' perceptions of their role as advocates for normal childbirth. *Midwifery* **30**, 983–990.
 43. Manios Y, Grammatikaki E, Kondaki K *et al.* (2009) The effect of maternal obesity on initiation and duration of breast-feeding in Greece: the Genesis study. *Public Health Nutr* **12**, 517–524.
 44. Ekström A, Widström AM & Nissen E (2003) Duration of breastfeeding in Swedish primiparous and multiparous women. *J Hum Lact* **19**, 172–178.
 45. Flacking R, Nyqvist KH & Ewald U (2007) Effects of socioeconomic status on breastfeeding duration in mothers of preterm and term infants. *Eur J Public Health* **17**, 579–584.
 46. Amir L & Donath S (2008) Socioeconomic status and rates of breastfeeding in Australia: evidence from three recent national health surveys. *Med J Aust* **189**, 254–256.
 47. Meedya S, Fahy K & Kable A (2010) Factors that positively influence breastfeeding duration to 6 months: a literature review. *Women Birth* **23**, 135–145.
 48. Yngve A & Sjöström M (2001) Breastfeeding determinants and a suggested framework for action in Europe. *Public Health Nutr* **4**, 729–739.
 49. Yin HS, Sanders LM, Rothman RL *et al.* (2014) Parent health literacy and 'obesogenic' feeding and physical activity-related infant care behaviors. *J Pediatr* **164**, 577–583.
 50. DeWalt DA & Hink A (2009) Health literacy and child health outcomes: a systematic review of the literature. *Pediatrics* **124**, Suppl. 3, S265–S274.
 51. Edvardsson K, Ivarsson A, Eurenus E *et al.* (2011) Giving offspring a healthy start: parents' experiences of health promotion and lifestyle change during pregnancy and early parenthood. *BMC Public Health* **11**, 936.
 52. Lindqvist M, Lindkvist M, Eurenus E *et al.* (2017) Change of lifestyle habits – motivation and ability reported by pregnant women in northern Sweden. *Sex Reprod Healthc* **13**, 83–90.
 53. Bassett-Gunter RL, Levy-Milne R, Naylor PJ *et al.* (2013) Oh baby! Motivation for healthy eating during parenthood transitions: a longitudinal examination with a theory of planned behavior perspective. *Int J Behav Nutr Phys Act* **10**, 88.
 54. Synnott K, Bogue J, Edwards CA *et al.* (2007) Parental perceptions of feeding practices in five European countries: an exploratory study. *Eur J Clin Nutr* **61**, 946–956.
 55. Odom EC, Li R, Scanlon KS *et al.* (2013) Reasons for earlier than desired cessation of breastfeeding. *Pediatrics* **131**, e726–e732.
 56. Atchan M, Foureur M & Davis D (2011) The decision not to initiate breastfeeding – women's reasons, attitudes and influencing factors – a review of the literature. *Breastfeed Rev* **19**, 9–17.
 57. Hannula L, Kaunonen M & Tarkka MT (2008) A systematic review of professional support interventions for breastfeeding. *J Clin Nurs* **17**, 1132–1143.
 58. Hector DJ (2011) Complexities and subtleties in the measurement and reporting of breastfeeding practices. *Int Breastfeed J* **6**, 5.
 59. Agampodi SB, Fernando S, Dharmaratne SD *et al.* (2011) Duration of exclusive breastfeeding; validity of retrospective assessment at nine months age. *BMC Pediatrics* **11**, 80.
 60. Aarts C, Kylberg E, Hörnell A *et al.* (2000) How exclusive is exclusive breastfeeding? A comparison of data since birth with current status data. *Int J Epidemiol* **29**, 1041–1046.
 61. Li R, Scanlon KS & Serdula MK (2005) The validity and reliability of maternal recall of breastfeeding practice. *Nutr Rev* **63**, 103–110.
 62. Cattaneo A, Burmaz T, Arendt M *et al.* (2010) Protection, promotion and support of breast-feeding in Europe: progress from 2002 to 2007. *Public Health Nutr* **13**, 751–759.