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Social Factors Associated with Non-initiation and Cessation of Predominant Breastfeeding in a Mother–Child Cohort in Spain

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Abstract
Objective The aim of the study was to identify factors associated with non-initiation and cessation of predominant breastfeeding (PBF) in a mother–child cohort from Spain. *Materials and Methods* The analysis included 2195 mother-infant from birth to 14 months post- delivery recruited between 2004 and 2008. Maternal characteristics were collected during the pregnancy. Lactation data were obtained at 6 and 14 months after delivery. PBF was defined as intake of breast milk plus liquids like juices or water. The PBF cessation was calculated using the date that women started PBF and the date that she reported to start giving infant formula and/or food. The relationship between maternal variables and PBF initiation and cessation was modeled using logistic and Cox proportional hazards regression analysis. *Results* The prevalence of PBF at hospital discharge was 85.3, 53.4% at 3 months, 46.1% at 4 months and 7.2% at 6 month. Only two women continued PBF at 12 months and none at 14 months. The initiating of PBF was associated with higher levels of maternal education, being a first-time mother and worked in a non-manual occupation. Higher level of physical activity, not smoking and having a healthy BMI, were also positively associated with PBF initiation. PBF cessation was higher in young, obese women, who had had complications during the pregnancy, and who had lower levels of education and smoked. The employment status of women, in week 32 of pregnancy and also in month 14 post-delivery, determined likelihood of PBF cessation. *Conclusions* Healthier habits and education positively influenced PBF initiation and duration. Decrease in PBF duration rates in Spain can be interpreted in part as a consequence of women returning to work.

Keywords Breastfeeding · Predominant breastfeeding · Socioeconomic factors · Life style

Significance

In this study, a positive influence of healthier habits and higher education on predominant breastfeeding (PBF) initiation and duration has been demonstrated. The decrease in PBF duration rates in Spain can be interpreted partly as a consequence of the return to work of women. This study will facilitate the revision and amendment of the guidelines and recommendations for the protection and promotion of PBF by health services. The findings breastfeeding imply

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the need to review existing measures to reconcile work and family life.

Introduction

Breastfeeding is one of the most important contributions, not only to a child's health and development (Der et al. 2006) but also to maternal health (Salone et al. 2013; Stuebe and Schwarz 2010). International guidelines recommend exclusive breastfeeding (EB) from birth up to 6 months of life, and then continuing breastfeeding with complementary foods until at least, 2 years of age (World Health Organization and UNICEF 2007). Despite the well-documented benefits of EB, few women are meeting the recommendations at 6 months postpartum, particularly in industrialized countries.

In Spain, 66.2% of infants were exclusively breastfed during 6 weeks, 53.6% for the first 3 months and 28.5% during 6 months (INE 2011). In industrialized countries, the highest percentages of initiation of exclusive breastfeeding were in Norway, Denmark, and Japan with 99, 98.7 and 98.3% respectively. The lowest percentages were in the United Kingdom, the United States, and France with, 70.0, 69.5 and 62.6% respectively (Ibanez et al. 2012). Successful breastfeeding depends on multiple factors such as socio-demographic characteristics (Grjibovski et al. 2005), healthcare-related or psychosocial influences (Sunyer et al. 2010) and those associated factors with a supportive environment (Giovannini et al. 2005; Swanson and Power 2005). In a review of the literature on developed countries, the key positive factors include older maternal age, higher level of education, higher socioeconomic status and healthy maternal habits (Lande et al. 2003; Thulier and Mercer 2009). Other studies also confirm a strong and consistent association of breastfeeding initiation and duration with maternal intention to breastfeed prior to the birth (Kronborg and Vaeth 2004). Further, returning to work is a social factor that may influence women's decisions to discontinue breastfeeding. In fact, maternal employment is often linked to premature weaning (Johnston and Esposito 2007). In Spain the maternity leave (the responsibility of the Ministry of Labor and Immigration) lasts 16 weeks. Regarding protection, promotion, and support of breastfeeding in Spain, currently national plans that include general objectives and recommended strategies from the European Plan of Protection, promotion, and support of breastfeeding have been developed. The Spanish Association of Pediatrics in collaboration with the Health Ministry has implemented actions and recommendations to promote the breastfeeding such as the baby friendly hospital initiative (BFHI) or the plan to support breastfeeding in the workplace, conducted in collaboration with the business sector.

Variations in the definition of breastfeeding are likely to underlie mixed results when comparing breastfed and artificially-fed infants (Ibanez et al. 2012; Kramer and Kakuma 2012). As the rates of EB, only breast milk, no other liquids or infant formula, are extremely low in our setting, we decided to study PBF defined by the WHO as receiving breast milk only, but allowing supplementations of non-milk liquids (e.g., water or water-based drinks such as sweetened and flavored water, teas, infusions), fruit juice, oral rehydration salts solution, and drop or syrup forms of vitamins, minerals, and medicines (World Health Organization et al. 2008) taking into account that this definition has a widespread use in the literature (Ibanez et al. 2012; Santini et al. 2008; Scott et al. 2006) (Appendix 1).

The identification of variables related to breastfeeding duration offers many implications for clinical and public health practice. Here, we present information on breastfeeding among women from the INfancia y Medio Ambiente, the Spanish for Childhood and the Environment (INMA) project, a multicenter cohort study which aims to investigate the effect of environmental exposures and diet during pregnancy on foetal and child development (Guxens et al. 2012). The objectives of this research were to (i) assess PBF prevalence in women participating in the INMA project, (ii) analyze the association of non-initiation of PBF and cessation with social and lifestyle factors among these women, and (iii) identify profiles of increased susceptibility to PBF cessation or a shorter duration of breastfeeding.

Methods

Study Population

The study population comprised pregnant women from four cohorts of the INMA project. Specifically, women were recruited in the first trimester of pregnancy in four regions in Spain: two northern regions, Asturias (N = 494) and Gipuzkoa (N = 638; Basque Country), and two Mediterranean, Sabadell (N = 657) and Valencia (N = 855) (Guxens et al. 2012). Recruitment took place between 2003 and 2008. Inclusion criteria were: maternal age of 16 years or older, singleton pregnancy, enrollment at 10–13 weeks of gestation, unassisted conception, delivery scheduled at the reference hospital, and no limitations in communication. Women participating in the study signed an informed consent form and the Ethics Committees of the centres involved in the study approved the research protocol. Of the 2506 women who continued in the study at birth, 2315

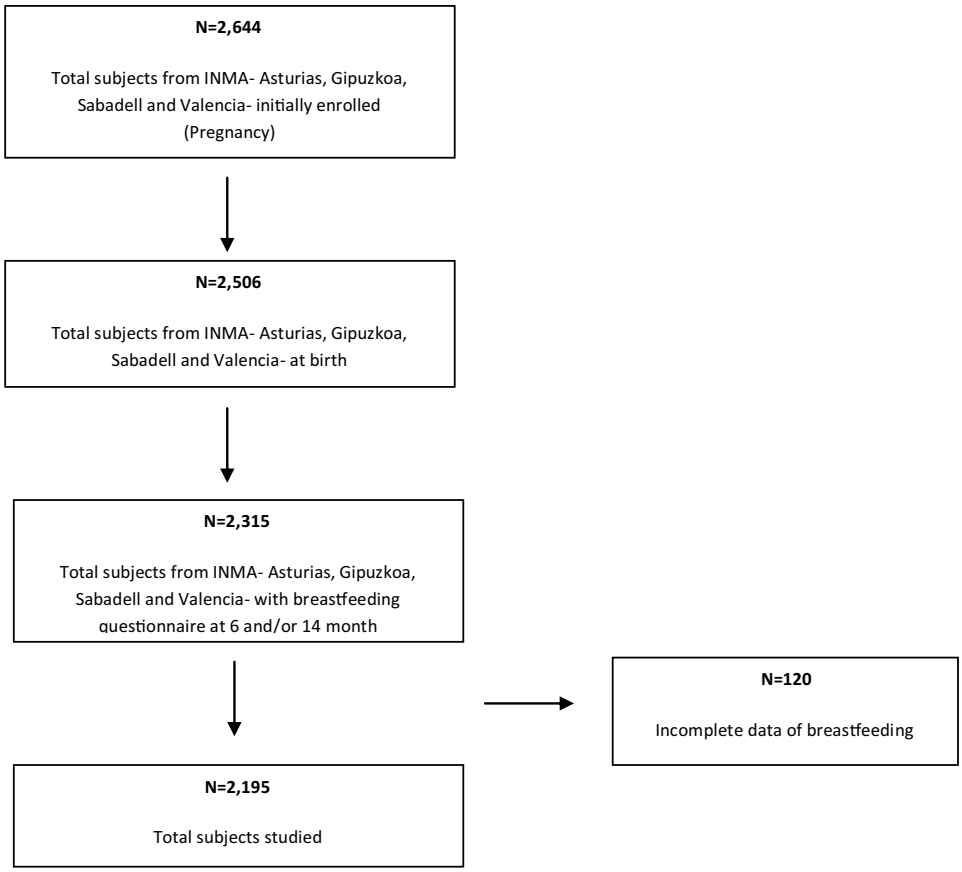

Fig. 1 Selection of study population (n = 2195), INMA birth cohort (2003–2008)

women complemented questionnaire regarding breastfeeding. Women who did not complete both breastfeeding questionnaires at 6 and 14 months after delivery (N = 120) were excluded. Overall, data of 2195 women was analyzed (Fig. 1).

Questionnaires

Women filled in questionnaires during the first and third trimester of pregnancy and 6 and 14 months post-delivery. The questionnaires were administered by trained interviewers and focused on breastfeeding, socio-demographic and environmental factors and lifestyle information related to pregnancy. The maternal covariates used in this study were country of birth, maternal age, complications in the current pregnancy, miscarriages, parity, type of delivery, educational level, working situation during week 32 of pregnancy and at 14 months post-delivery, social class, physical activity, pre-pregnancy body mass index (BMI) and smoking during pregnancy. Educational level was based on the total years of education completed by the women, grouped into three categories: primary education (< 11 years of education), secondary education (12–15 years), and university or other higher education (> 16 years). Five categories of occupational class were considered according to the Spanish adaptation of the British Register General's Social Class classification (Domingo-Salvany et al. 2000). In order to increase the statistical power, the five levels were grouped into two: manual or lower class (IV and V) and non-manual/skilled or higher class (I–III), respectively.

Breastfeeding

Data on breastfeeding were based on questionnaires administered to the women at 6 and 14 months after delivery, and only women who fully completed these questionnaires were included in the analysis. Women were considered to have initiated breastfeeding if they continued to breastfeed at day 3 or 4 after the birth, corresponding with the time of discharge from hospital in most cases.

PBF is defined by the WHO as receiving breast milk only, but allowing supplementations of non-milk liquids (e.g., water or water-based drinks such as sweetened and flavored water, teas, infusions), fruit juice, oral rehydration salts solution, and drop or syrup forms of vitamins, minerals, and medicines (World Health Organization et al. 2008). The date of PBF cessation was defined as the minimum

value of the date of introduction of infant formula or non-human milk and the date of introduction of food. These dates, and the specific food items introduced, were collected in the questionnaires administered to the women at 6 and 14 months.

Statistical Analysis

Descriptive statistics were generated for the whole cohort and data were expressed as mean and standard deviation (SD) for continuous variables. The association between categorical variables was performed using (χ^2). P value less than 0.05 was considered statistically significant, and all p values were based on two-tailed tests. Data analysis was performed at fixed time points: at discharge, 3 months (week 13), 6 months (week 26), and 14 months post-delivery.

Binary and multivariate logistic analysis was used to examine the relationship of non-initiation and cessation of PBF with maternal characteristics in whole sample (N = 2195). All significant variables ($p < 0.05$) in binary analysis were included in multivariate models. The final multivariate logistic model was performed by stepwise backward regression. Binary and multivariate Cox proportional hazards regression were used to estimate the association between stopping PBF and maternal characteristics in those that started PBF (N = 1874). All significant variables ($p < 0.05$) in binary analysis were included in multivariate models, the final multivariate Cox proportional hazards model was performed by stepwise backward regression. All models were adjusted for study cohort. The Kaplan–Meier method was employed to assess rates of PBF on the sample of women that initiated PBF. Infants who were continuing to breastfeed at the time of data collection were entered as censored data. All statistical analyses were conducted using SPSS (version 21) and R-project (version 3.2.0). Statistical significance was established in $p < 0.05$.

Results

Overall, 2195 women completed the questionnaires, identifying 1874 mothers who initiated PBF and 321 (14.6%) who never breastfed (Table 1). The duration of PBF was 17.50 (median) weeks. The prevalence of PBF at hospital discharge was 85.3%, at 13 weeks 53.4%, at 16 weeks 46.1% and at 26 weeks 7.2% (Table 2). Only two women take PBF at 12 months and none at 14 months.

Most participants were Spanish (92%) and, at the time of enrollment, they had an average age of 30.73 ± 4.14 years, over half were nulliparous (56.8%), almost a third (31.8%) reported having complications in the current pregnancy, and 22.9% had had previous miscarriages. Just over half (51%) were categorized as low social class (unqualified and/or manual workers), a percentage slightly lower than the figure for the general population (Instituto Nacional de Estadística 2014). Employment status recorded from delivery to 14 months post-partum showed that 71% of the women worked at least until week 32 of pregnancy and 67.3% returned to work by 26 weeks post-delivery.

Table 2 presents the rates of PBF over the study period as a function of maternal characteristics. Initiation of PBF was most strongly associated with higher levels of maternal education, have a country of birth different from Spain, being a first-time mother, and those who worked in a non-manual occupation. Healthier habits, such as a higher level of physical activity, not smoking, and having a healthy BMI, were also positively associated to PBF initiation. Additionally, these lifestyle-related variables were factors strongly related to PBF continuation until week 26 after delivery. Women with higher levels of education were significantly more likely to breastfeed for a longer period ($p < 0.001$). On the other hand, smoking and working status were found to be significantly related to a shorter PBF duration ($p = 0.001$). Further in each of the working periods studied, in week 16 and onwards, the rate of PBF was significantly higher among women who did not work than those who worked ($p < 0.05$). Nevertheless, at discharge, the working mothers were more likely to breastfeed that the non-working ones ($p < 0.05$). Employment appears to have a less deleterious effect on initiation of PBF.

Figure 2 shows the Kaplan–Meier survival rates of PBF (%) during the infants first 26 weeks of life. Overall the 1874 women that initiated PBF, during the first week 10.1% stopped. At 13 and at 16 weeks of age, 62.7 and 53.9% of the infants were receiving breast milk respectively. And at week 26, the prevalence of PBF fell down to 8.4%.

Factors associated with the risk of no initiation and cessation PBF are compiled in Table 3, which represents the unadjusted and adjusted models as a function of maternal characteristics. Among the whole sample, women (N = 2195), with university education and non-manual occupational class, with normal weight, nulliparous, physically active > 3 h week and those who did not smoke during pregnancy were more likely to initiation of PBF at delivery, even after adjusting for potential confounders. In the adjusted model the same variables except occupational class explained the initiation of PBF. Moreover, smokers had a higher risk of no initiation throughout the whole sample as unadjusted and adjusted OR (95% CI) were; 1.80 (1.34–2.41), and 1.74 (1.27–2.34) respectively.

In women that started PBF (N = 1874), the cessation of breastfeeding was higher in young women, who had had complications during the pregnancy, nulliparous, obese, who

Table 1 Description of the study sample

		N	%	Missing data
Country of birth	Spain	2020	92.0	4
	Other	171	7.8	
Age (years)	< 25	213	9.7	1
	25–29	857	39.0	
	30–34	713	32.5	
	≥ 35	411	18.7	
Age mean (± SD)		30.73 (4.14)		
Complications during pregnancy	No	1476	67.2	20
	Yes	699	31.8	
Previous miscarriages	No	1691	77.0	2
	Yes	502	22.9	
Type of delivery	Vaginal	1333	60.7	51
	Instrumental	430	19.6	
	Cesarean	381	17.4	
Parity	0	1247	56.8	3
	1	806	36.7	
	> 2	139	6.3	
Education	Primary	504	23.0	4
	Secondary	916	41.7	
	University	771	35.1	
Social class	Manual	1118	50.9	1
	Non-manual	1076	49.0	
Physical activity	<1 h week	918	41.8	69
	1–3 h week	795	36.2	
	>3 h week	413	18.8	
Pre-pregnancy BMI	Underweight	90	4.1	1
	Normal weight	1525	69.5	
	Overweight	412	18.8	
	Obese	167	7.6	
Smoking in pregnancy	No	1800	82.0	39
	Yes	356	16.2	
Employment status at week 32 of pregnancy	Working	1558	71.0	36
	Non-working	601	27.4	
Employment status at 14 months post delivery	Working	1478	67.3	33
	Non-working	684	31.2	

had lower levels of education and manual occupational class, with physically active > 1 h week, and those who did smoke during pregnancy. In the adjusted model, age, complications during the pregnancy, educational level of the women and obesity were the variable that explained the risk of PBF cessation. The employment status of the women, in week 32 HR (95% CI) were; 1.16 (1.04–1.30), and 1.19 (1.04–1.36) of pregnancy and also in month 14 post-delivery OR (95% CI) were; 1.15 (1.04–1.28), and 1.16 (1.03–1.32); both determined the likelihood of PBF cessation in women who started PBF, even after adjusting for potential confounders. Overall, the results imply that the later the return to work, the longer the mean duration of PBF.

Discussion

The results of our study suggest that women over 25 years, with university education, non-manual occupational class, and with healthy lifestyles have a positive influence on both the initiation and duration of PBF. Evidence in the literature suggests that greater duration and intensity of PBF, as well as exclusivity, have important beneficial effects on maternal and infant health, including long-term outcomes (Duijts et al. 2010; Stuebe et al. 2011).

In Spain 68.4% of newborns are given PBF at 3 months and 24.72% at 6 months. This percentage varies depending on the region. With regards to our study areas, at 3 months

Table 2 Rates of PBF over the study period as a function of maternal characteristics

Characteristic	Discharge Yes/total	%	*p*	Week 13 Yes/total	%	*p*	Week 16 Yes/total	%	*p*	Week 26 Yes/total	%	*p*
PBF at discharge	1874/2195	85.3		1172/2195	53.4		1011/2195	46.1		158/2195	7.2	
Country of birth												
Spain	1714/2020	84.9	0.012	1068/2016	53.0		923/2016	45.8		139/2016	6.9	0.035
Other	156/171	91.2		101/171	59.1		85/171	49.7		19/171	11.1	
Age (years)												
< 25	182/231	78.8	0.014	89/231	41.8	0.000	72/231	31.2	0.000	7/231	3.3	0.008
25–29	742/857	86.6		461/856	53.8		394/856	46.0		51/856	6.0	
30–34	619/713	86.8		418/712	59.7		362/712	50.8		64/712	9.0	
≥ 35	330/411	80.3		203/409	49.6		182/409	44.5		36/409	8.8	
Complications in pregnancy												
No	1258/1476	85.2		815/1472	55.4	0.012	703/1472	47.8	0.02	113/1472	7.7	
Yes	599/699	85.7		350/699	50.1		302/699	43.2		43/699	6.2	
Previous miscarriages												
No	1446/1691	85.5		910/1688	53.9		219/501	43.7		43/501	8.6	
Yes	426/502	84.9		260/501	51.9		791/1688	46.9		115/1688	6.8	
Type of delivery												
Vaginal	1143/1333	85.7		748/1332	55.0	0.001	662/1332	49.7	0.000	104/1332	7.8	
Instrumental	369/430	85.8		221/429	51.5		172/429	40.1		22/429	5.1	
Cesarean	312/381	91.9		174/380	45.7		147/380	38.7		27/380	7.1	
Parity												
0	1097/1247	88.0	0.000	650/1245	52.2		551/1245	49.7		84/1245	6.7	
1	655/806	81.3		442/804	55.0		390/804	41.5		59/804	7.3	
> 2	119/139	85.6		77/139	55.4		69/139	38.7		15/139	10.8	
Education												
Primary	402/504	79.8	0.000	224/504	44.4	0.000	190/504	37.7	0.000	35/504	6.9	0.007
Secondary	781/916	85.3		478/913	52.4		407/913	44.6		50/913	5.5	
University	687/771	89.1		469/770	60.9		413/770	53.6		73/770	9.5	
Social class												
Manual	926/1118	82.8	0.000	538/1115	48.3	0.000	453/1115	40.6	0.000	74/115	6.6	
Non-manual	947/1076	88.0		633/1075	58.9		557/1075	51.8		84/1075	7.8	
Physical activity												
< 1 h week	763/918	83.1	0.017	442/916	48.3	0.000	385/916	42.1	0.002	55/916	6.0	
1–3 h week	697/795	87.7		463/793	58.4		395/793	49.8		60/793	7.6	
> 3 h week	360/413	87.2		237/413	57.4		206/413	49.9		37/413	9.0	
Pre-pregnancy BMI												
Underweight	78/90	86.7	0.000	53/90	58.9	0.000	44/90	49.9		may-90	5.6	
Normal weight	1329/1525	87.1		847/1522	55.7		726/1522	47.7		106/1522	4.0	
Overweight	340/412	82.5		211/411	51.3		188/411	45.7		39/411	9.5	
Obese	127/167	76.0		61/127	48.0		53/167	31.7		8/167	4.8	
Smoking in pregnancy												
No	1567/1800	87.1	0.000	996/1796	55.5	0.000	866/1796	48.2	0.000	143/1796	8.0	0.020
Yes	277/356	77.8		161/356	45.2		132/356	37.1		13/356	3.7	
Employment status at week 32 of pregnancy												
Non-working	494/601	82.2	0.004	306/599	51.1		268/599	44.7		55/599	9.2	0.018
Working	1353/1558	86.8		853/1556	54.8		731/1556	47.0		100/1556	6.4	
Employment status at month 14 post delivery												
Non-working	582/684	85.1		371/683	54.3		329/683	48.2		60/683	8.8	0.042
Working	1264/1478	85.5		780/1475	52.9		661/1475	44.8		97/1475	6.6	

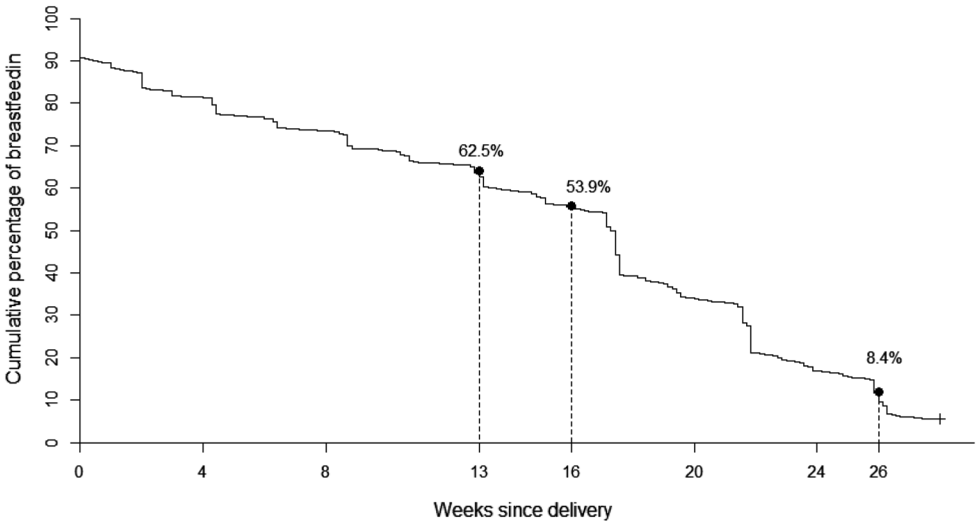

Fig. 2 Kaplan–Meier survival rates of PBF (%) during the infants' first 26 weeks of life (N = 1874)

of life the percentages of PBF are 28.47, 64.12, 47.74 and 55.88 in Asturias, Basque Country, Valencia and Catalonia respectively. The prevalence decreases at 6 months, with 14.68, 39.19, 25.61, 28.89% respectively. According to social class, the percentage is 54.1% for non-manual (I–III) and 53.1% for manual (IV–V) workers at 3 months and 37.3 and 27.9% to 14 months (INE 2011). Taking into account that the 18 autonomous communities of Spain are included in the Spanish Health Survey, PBF ranges are between 13.75 and 74.37% at 3 months and between 1.59 and 39.19% at 6 months.

The INMA Project is a population-based study. However, it might not be fully representative of all children in the study areas due to refusals and losses to follow up. The internal validity regarding the association of PBF with the studied variables is not necessarily affected. Nevertheless, although attrition rates were low, non-participants were more likely to have a lower socio-economic status (Guxens et al. 2012). This fact could lead to a mild overestimation of the PBF prevalence in the Spanish population. Moreover, of the 2315 women participating in the study at birth, 120 women did not complete the questionnaires at 6 or 14 months. Among those who do not respond, A higher proportion of women of low social class and educational level was observed. The losses represent only 5% of the total, so the habit of breastfeeding in these women would have to be very different from the rest to interfere with the study results.

Data on rates across European countries are limited by inconsistent monitoring methods and definitions of breastfeeding (Ibanez et al. 2012; Kramer and Kakuma 2012); the definitions have varied between studies and have often been based on convenience, determined by the data the researchers had available.

Our results match those of previous studies that have consistently found that women who breastfeed tend to be older and well educated, with healthy lifestyle habits (Callen and Pinelli 2004; Thulier and Mercer 2009). Indeed, educational level and social class were the two variables that most strongly determined the decision to delay formula feeding. On the other hand, Dubois and Girard (2003) have reported that high income level was negatively associated with initiation. Our data supports the idea that immigrant women are more likely to breastfeed than non-immigrants as reported in other European countries, where a higher prevalence of PBF has been also identified in immigrant populations (Merten et al. 2007; Ibanez et al. 2012). Likewise, it provides data concerning a southern European population, less well studied than those of Nordic countries and with its own distinct sociocultural characteristics (Santini et al. 2008). Compared to data reported for Scandinavian countries such as Norway, Denmark and Sweden (Flacking et al. 2007), with PBF initiation rates of 99, 98.7, and 98% respectively, breastfeeding rates in Spain are lower, but they are somewhat higher than figures from Italy, the United Kingdom, the United States, with rates of 70, 69.5, and 62.6% respectively for PBF initiation. Specifically, the data collected in this study positions Spain in the middle, with a PBF initiation prevalence of 85.3%. Our observation that social class, educational level, and healthier lifestyle habits were strongly related to PBF continuation underlines the importance of social environment in the decision to breastfeed (Julvez et al. 2014; Lange et al. 2007).

Similar factors have been detected as potential breastfeeding promoters in Europe and America where educational level and social class are determinant, in contrast with the data from a Middle-Eastern country indicating that

Table 3 Unadjusted and adjusted Odds and hazard ratios for the likelihood of non-initiation and cessation of PBF as a function of various socio-demographic and lifestyle factors in the whole sample (N = 2195) and those that started PBF (N = 1874)

Variables		N = 2195		N = 1874	
		Unadjusted	Adjusted[b]	Unadjusted	Adjusted[c]
		OR (95% CI)	OR (95% CI)	HR (95% CI)	HR (95% CI)
Country of birth	Spain	1		1	
	Other	0.59 (0.34–1.03)		0.86 (0.72–1.02)	
Age (years)	< 25	1		1	1
	25–29	0.90 (0.58–1.39)		0.76 (0.64–0.89)	0.74 (0.62–0.88)
	30–34	0.86 (0.54–1.34)		0.66 (0.56–0.79)	0.74 (0.58–0.85)
	≥ 35	1.28 (0.80–2.05)		0.65 (0.54–0.78)	0.65 (0.54–0.80)
Complications in the current pregnancy	No	1		1	1
	Yes	0.96 (0.74–1.25)		1.10 (1.00-1.22)	1.11 (1.00-1.23)
Previous miscarriages	No	1		1	
	Yes	1.06 (0.80–1.41)		0.97 (0.87–1.09)	
Type of delivery	Vaginal[a]	1		1	
	Cesarean	1.24 (0.92–1.67)		1.09 (0.96–1.24)	
Parity	0	1	1	1	
	≥ 1	1.69 (1.33–2.16)	1.54 (1.20–1.99)	0.85 (0.76–0.92)	
Education	Primary	1.44 (1.06–1.94)	1.38 (1.01–1.87)	1.26 (1.11–1.44)	1.34 (1.16–1.54)
	Secondary	2.30 (1.65–3.20)	1.83 (1.30–2.58)	1.20 (1.08–1.34)	1.24 (1.10–1.29)
	University	1	1	1	1
Social class	Manual	1.43 (1.11–1.83)		1.17 (1.06–1.28)	
	Non-manual	1		1	
Physical activity	< 1 h week	1.35 (0.95–1.88)	1.43 (1.01–2.03)	1.13 (1.00-1.29)	
	1–3 h week	0.99 (0.69–1.43)	1.03 (0.72–1.50)	1.04 (0.91–1.19)	
	> 3 h week	1	1	1	
Pre-pregnancy body mass index (BMI)	Underweight	1.12 (0.59–2.13)	1.01 (0.53–1.91)	0.99 (0.77–1.24)	0.98 (0.77–1.24)
	Normal weight	1	1	1	1
	Overweight	1.37 (1.01–1.86)	1.23 (0.90–1.69)	0.90 (0.78–1.26)	0.90 (0.79–1.03)
	Obese	2.11 (1.42–3.14)	1.90 (1.27–2.84)	1.26 (1.04–1.51)	1.21 (1.00-1.47)
Smoking in pregnancy	No	1	1	1	
	Yes	1.80 (1.34–2.41)	1.74 (1.27–2.34)	1.24 (1.08–1.41)	
Employment status at week 32 of pregnancy	No	1		1	1
	Yes	0.82 (0.63–1.07)		1.16 (1.04–1.30)	1.19 (1.04–1.36)
Employment status at 14 months post delivery	No	1		1	1
	Yes	0.95 (0.73–1.23)		1.15 (1.04–1.28)	1.16 (1.03–1.32)

[a]Instrumental delivery included in this category

[b]Adjusted for cohort/region, parity, education, social class, physical activity, BMI, Smoking in pregnancy and employment status

[c]Adjusted for cohort/region, age, complications in the current pregnancy, social class, education, physical activity, BMI, smoking in pregnancy and employment status

women with only primary education breastfed for longer periods than those with greater levels of education (Radwan 2013).

The most pronounced decline in exclusive breastfeeding occurs between 16 and 26 weeks post-delivery, coinciding with most of the working women going back to work. This finding demonstrates the interest of being able to measure prevalence at these two different moments. These results are in agreement with other studies showing that the PBF declines sharply in women who return to work and that employment of mothers outside the home has a negative influence on PBF duration (Fein et al. 2008) and contrasts with the suggestion of Bakoula et al. (2007) that working mothers are more likely to breastfeed than housewives. Our findings support the hypothesis that the decrease in PBF duration rates in Spain can be interpreted

in part as a consequence of women returning to work. In Spain the maternity leave is 16 weeks: 6 weeks are obligatory and must be taken following the birth, while the remaining 10 weeks can be taken before or after birth. Also, there are differences between women that work in the private and the public sector have been observed, especially with regards to the duration of full and/or partial salary during maternity leave and the provision of paid breast-feeding breaks. Additionally, the data presented could help to identify strategies to improve PBF rates in our setting. Firstly, regarding the importance of educational level in the PBF decision, the influence could be partially compensated for by antenatal education (Artieta-Pinedo et al. 2013). Secondly, returning to work is an obstacle to continuing PBF and indicate a need to develop policies and practical measures to support women at this stage (Fein et al. 2008). Finally, it is recommended to establish healthy habits, such as not smoking, physical activity, and have a healthy weight before pregnancy, due to its association with longer breastfeeding and improving maternal and child health.

Like the authors of other European studies, we conclude that PBF is strongly influenced by socio-demographic determinants and further research is required to enable public health professionals to target appropriate subgroups of women at key stages. On the other hand, an accurate comparison of the social factors associated with PBF between countries because of several methodological differences. The comparison between different studies is hindered by the different definitions and characteristics of breastfeeding employed in the literature. In this study, data regarding breastfeeding and socio-demographic and life style factors were collected by questionnaire previously validated and administered face to face by trained interviewers.

Taking into account the evidence that confirms a strong association of PBF initiation and duration with maternal intention to breastfeed prior to the birth (Kronborg and Vaeth 2004), medical counseling during first stages of pregnancy could improve PBF rates and women's behavior, although returning to work seems to have a substantial impact in PBF continuation. The design and development of effective policies and other strategies to promote PBF should be adapted to the target population. Initiatives such as the Baby-Friendly Hospital Initiative (Merten et al. 2005) contribute to promoting and supporting breastfeeding. In view of our data, we believe that until employers in Spain develop maternity policies which do not discourage breastfeeding, the recommended 6 months of PBF is unlikely to be achieved by most working women.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest.

Appendix 1

Criteria that define selected infant feeding practices, according to the World Health Organization's definitions (Source: WHO/UNICEF/IFPRI/UCDavis/FANTA/AED/USAID. Indicators for assessing infant and young child feeding practices. Part 1: Definitions. Geneva, Switzerland: World Health Organization; 2008. http://whqlibdoc.who.int/publications/2008/9789241596664$4eng.pdf. Accessed November 19, 2012)

Exclusive breastfeeding: breast milk (including milk expressed or from a wet nurse). Allows the infant receive ORS, drops or syrups (vitamins, minerals, medicines). Anything else

Predominant breastfeeding: breast milk (including milk expressed or from a wet nurse) as the predominant source of nourishment). Allows the infant receive certain liquids (water and water-based drinks, fruit juice) ritual fluids and ORS, drops or syrups (vitamins, minerals, medicines). Anything else (in particular, non-human milk, food-based fluids)

Breastfeeding: breast milk (including milk expressed or from a wet nurse). Allows the infant receive anything else: any food or liquid including non-human milk and formula

References

Artieta-Pinedo, I., Paz-Pascual, C., Grandes, G., Bacigalupe, A., Payo, J., & Montoya, I. (2013). Antenatal education and breastfeeding in a cohort of primiparas. *Journal of Advanced Nursing, 69*, 1607–1617.

Bakoula, C., Veltsista, A., Prezerakou, A., Moustaki, M., Fretzayas, A., & Nicolaidou, P. (2007). Working mothers breastfeed babies more than housewives. *Acta Paediatrica, 96*, 510–515.

Callen, J., & Pinelli, J. (2004). Incidence and duration of breastfeeding for term infants in Canada, United States, Europe, and Australia: A literature review. *Birth, 31*, 285–292.

Der, G., Batty, G. D., & Deary, I. J. (2006). Effect of breast feeding on intelligence in children: Prospective study, sibling pairs analysis, and meta-analysis. *British Medical Journal, 333*, 945–950.

Domingo-Salvany, A., Regidor, E., Alonso, J., & Alvarez-Dardet, C. (2000). Proposal for a social class measure. Working Group of the Spanish Society of Epidemiology and the Spanish Society of Family and Community Medicine. *Atencion Primaria, 25*, 350–363.

Dubois, L., & Girard, M. (2003). Social inequalities in infant feeding during the first year of life. The Longitudinal Study of Child Development in Quebec (LSCDQ 1998–2002). *Public Health Nutrition, 6*, 773–783.

Duijts, L., Jaddoe, V. W., Hofman, A., & Moll, H. A. (2010). Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy. *Pediatrics, 126*, e18–e25.

Fein, S. B., Mandal, B., & Roe, B. E. (2008). Success of strategies for combining employment and breastfeeding. *Pediatrics, 122*(Suppl 2), S56-S62.

Flacking, R., Nyqvist, K. H., & Ewald, U. (2007). Effects of socioeconomic status on breastfeeding duration in mothers of preterm and term infants. *European Journal of Public Health, 17*, 579–584.

Giovannini, M., Riva, E., Banderali, G., Salvioni, M., Radaelli, G., & Agostoni, C. (2005). Exclusive versus predominant breastfeeding in Italian maternity wards and feeding practices through the first year of life. *Journal of Human Lactation, 21*, 259–265.

Grjibovski, A. M., Yngve, A., Bygren, L. O., & Sjostrom, M. (2005). Socio-demographic determinants of initiation and duration of breastfeeding in northwest Russia. *Acta Paediatrica, 94*, 588–594.

Guxens, M., Ballester, F., Espada, M., Fernandez, M. F., Grimalt, J. O., Ibarluzea, J., et al. (2012). Cohort profile: The INMA–INfancia y medio ambiente—(environment and childhood) project. *International Journal of Epidemiology, 41*, 930–940.

Ibanez, G., Martin, N., Denantes, M., Saurel-Cubizolles, M. J., Ringa, V., & Magnier, A. M. (2012). Prevalence of breastfeeding in industrialized countries. *Revue d'Épidémiologie et de Santé Publique, 60*, 305–320.

Instituto Nacional de Estadística (2014). Anuario Estadístico de España. 2014. Nivel, calidad y condiciones de vida.

Instituto Nacional de Estadística (INE) (2011). Encuesta Nacional de Salud de 2011/2012 (ENSE 2011/2012). http://www.msssi.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2011.htm. Accessed on November 19, 2012

Johnston, M. L., & Esposito, N. (2007). Barriers and facilitators for breastfeeding among working women in the United States. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 36*, 9–20.

Julvez, J., Guxens, M., Carsin, A. E., Forns, J., Mendez, M., Turner, M. C., et al. (2014). A cohort study on full breastfeeding and child neuropsychological development: The role of maternal social, psychological, and nutritional factors. *Developmental Medicine & Child Neurology, 56*, 148–156.

Kramer, M. S., & Kakuma, R. (2012). Optimal duration of exclusive breastfeeding. *Cochrane Database of Systematic Reviews, 8*, CD003517.

Kronborg, H., & Vaeth, M. (2004). The influence of psychosocial factors on the duration of breastfeeding. *Scandinavian Journal of Public Health, 32*, 210–216.

Lande, B., Andersen, L. F., Baerug, A., Trygg, K. U., Lund-Larsen, K., Veierod, M. B., et al. (2003). Infant feeding practices and associated factors in the first 6 months of life: The Norwegian infant nutrition survey. *Acta Paediatrica, 92*, 152–161.

Lange, C., Schenk, L., & Bergmann, R. (2007). Distribution, duration and temporal trend of breastfeeding in Germany. Results of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS). *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz, 50*, 624–633.

Merten, S., Dratva, J., & Ackermann-Liebrich, U. (2005). Do baby-friendly hospitals influence breastfeeding duration on a national level? *Pediatrics, 116*, e702–e708.

Merten, S., Wyss, C., & Ackermann-Liebrich, U. (2007). Caesarean sections and breastfeeding initiation among migrants in Switzerland. *International Journal of Public Health, 52*, 210–222.

Radwan, H. (2013). Patterns and determinants of breastfeeding and complementary feeding practices of Emirati Mothers in the United Arab Emirates. *BMC Public Health, 13*, 171.

Salone, L. R., Vann, W. F. Jr., & Dee, D. L. (2013). Breastfeeding: an overview of oral and general health benefits. *Journal of the American Dental Association, 144*, 143–151.

Santini, P., Calevo, M. G., Caviglia, M. R., Asprea, T., Bonacci, W., Serra, G., et al. (2008). Breastfeeding in Northern Italy. *Acta Paediatrica, 97*, 613–619.

Scott, J. A., Binns, C. W., Graham, K. I., & Oddy, W. H. (2006). Temporal changes in the determinants of breastfeeding initiation. *Birth, 33*, 37–45.

Stuebe, A. M., & Schwarz, E. B. (2010). The risks and benefits of infant feeding practices for women and their children. *Journal of Perinatology, 30*, 155–162.

Stuebe, A. M., Schwarz, E. B., Grewen, K., Rich-Edwards, J. W., Michels, K. B., Foster, E. M., et al. (2011). Duration of lactation and incidence of maternal hypertension: A longitudinal cohort study. *American Journal of Epidemiology, 174*, 1147–1158.

Sunyer, J., Basagana, X., Gonzalez, J. R., Julvez, J., Guerra, S., Bustamante, M., et al. (2010). Early life environment, neurodevelopment and the interrelation with atopy. *Environment Research, 110*, 733–738.

Swanson, V., & Power, K. G. (2005). Initiation and continuation of breastfeeding: Theory of planned behaviour. *Journal of Advanced Nursing, 50*, 272–282.

Thulier, D., & Mercer, J. (2009). Variables associated with breastfeeding duration. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 38*, 259–268.

World Health Organization, UNICEF, IFPRI, UCDavis, FANTA, AED et al. (2008). Indicators for assessing infant and young child feeding practices: Conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C.

World Health Organization & UNICEF (2007). Planning Guide for national implementation of the Global Strategy for Infant and Young Child Feeding. Report of a WHO study group.