

RESEARCH

Open Access



# Factors influencing breastfeeding initiation, duration, and early cessation: a focus on maternal and infant characteristics

Susana Vargas-Pérez<sup>1,2</sup>, Carmen Hernández-Martínez<sup>1,2</sup>, Josefa Canals-Sans<sup>1,2</sup> and Victoria Arija<sup>1,3\*</sup>

## Abstract

**Background** Although breastfeeding provides well-documented benefits for both mothers and infants, breastfeeding rates remain suboptimal in many countries. Despite most women initiating breastfeeding, a significant proportion cease within the first six months, falling short of the recommendations by health authorities. Previous studies have primarily focused on sociodemographic or health-system-related factors; however, the influence of maternal emotional status and infant characteristics has received comparatively less attention. A more integrative approach is needed to understand the complex interplay of factors influencing breastfeeding initiation, early cessation, and duration. This study aims to examine how maternal sociodemographic characteristics, prenatal lifestyle habits, emotional well-being during the perinatal period, and infant characteristics contribute to breastfeeding decisions, early cessation, and duration.

**Methods** A longitudinal cohort study followed 397 mother–infant dyads in Tarragona (Spain) from pregnancy through the child’s fourth year. The study was conducted between years 2014 and 2021. During pregnancy, we assessed maternal sociodemographic characteristics, health habits, lifestyle factors, and emotional status. At 40 days postpartum, infant temperament was assessed using the Early Infant Temperament Questionnaire. Additional variables were collected throughout the perinatal period, including mode of birth, breastfeeding initiation, early cessation, and total duration of breastfeeding.

**Results** Non-smoking during pregnancy (OR:0.239; CI 95%:0.128–0.445) and higher emotional stability in the third trimester (OR:1.066; CI 95%:1.001–1.134) were associated with the decision to initiate breastfeeding. Conversely, lower infant birth weight (OR:0.999; CI 95%:0.998–1.000), lower postpartum emotional stability (OR:0.913; CI 95%:0.840–0.992), and lower infant rhythmicity (OR:0.621; CI 95%:0.386–0.998) were related early cessation of breastfeeding within during the firsts 40 days postpartum. Longer breastfeeding duration was predicted by older maternal age ( $\beta$ :0.370; CI 95%:0.020–0.720), maternal cultural background ( $\beta$ :5.086; CI 95%:0.759–9.413), higher emotional stability ( $\beta$ :0.474; CI 95%:0.074–0.875), infant rhythmicity ( $\beta$ :2.568; CI 95%:0.350–4.784) and infant mood ( $\beta$ :2.915; CI 95%:0.399–5.431).

**Conclusion** These findings emphasize the importance of maternal emotional health during the perinatal period and the influence of early infant temperament on breastfeeding outcomes. Interventions aimed at supporting

\*Correspondence:

Victoria Arija  
victoria.arija@urv.cat

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

breastfeeding should integrate psychological support for mothers and consider infant behavioral characteristics. A more holistic and personalized approach could improve breastfeeding rates and better align maternal intentions with breastfeeding experiences.

## Background

Although the benefits of breastfeeding are well established and widely recognized, current practices still fall short of international recommendations. In Spain, despite institutional efforts and public health policies promoting breastfeeding, rates remain below recommended levels. While 90.7% of women initiate breastfeeding at birth, only 35.2% continue exclusive breastfeeding for the first six months of life, as recommended by the World Health Organization (WHO) and national health authorities [1]. This early drop-off reflects a complex interplay of factors—ranging from social and cultural norms to maternal well-being and infant-related challenges—that influence both the decision to breastfeed and the ability to sustain it over time. This situation carries global consequences beyond individual health outcomes. It is estimated that the global lack of investment in promoting and protecting breastfeeding results in an annual loss of \$341.3 billion in potential benefits for health and human development [2]. Understanding the factors that contribute to choosing breastfeeding over commercial milk formula (CMF) feeding and promoting longer breastfeeding durations in line with WHO recommendations is crucial. This understanding could lead to the design of specific and effective interventions that ensure a successful breastfeeding experience, or at least one perceived as such by most women, for the duration they and their infants mutually choose.

Previous studies examining the decision to breastfeed have primarily focused on maternal sociodemographic characteristics, prenatal habits, and lifestyle [1, 3–5]. These studies have shown that women who choose to breastfeed have a higher educational level, live with a partner, have had a positive previous breastfeeding experience, and do not smoke [3, 6, 7]. However, many mothers who initially choose breastfeeding cease maintaining it. Research highlights several factors associated with this early cessation. According to Santacruz-Salas et al. [8], of the 92.8% of women who decided to breastfeed during pregnancy, only 67.7% continued to do so 15 days after birth. The factors most associated with early cessation were the lower educational level, lack of breastfeeding planning, a negative previous breastfeeding experience, health professionals recommending CMF during the first days of life and early pacifier use in hospital settings [8, 9]. In contrast, according to the review by Santana et al. [10] and the studies by Cohen et al. [11], Thulier and Mercer [12], and Li et al. [13] the factors associated with longer breastfeeding included not smoking, living with a partner, residing in urban areas, advanced maternal age

higher educational level and a previous positive breastfeeding experience [13]. Similarly, smoking during the postpartum period was associated with an 8-weeks reduction in breastfeeding duration [14].

The duration of breastfeeding is significantly affected not only by sociodemographic factors but also by the emotional state of the mother and even infant characteristics. Recent research has highlighted the complex interplay of psychological and social factors in breastfeeding behaviors. Studies have related variables such as maternal self-efficacy, attitudes, perceived behavioral control, social norms, and participation in breastfeeding programs to breastfeeding initiation and duration [15–17]. These findings underscore the importance of considering the broader psychological context in which breastfeeding decisions are made. However, in relation specifically to maternal emotional states, several studies have shown that higher levels of depression and anxiety during pregnancy and the postpartum period are associated with shorter durations of exclusive breastfeeding and a greater likelihood of early cessation [18, 19]. Moreover, some authors have suggested a bidirectional relationship, where not only do emotional difficulties influence breastfeeding, but breastfeeding itself may impact maternal well-being through neurobiological pathways involving oxytocin and bonding [19]. In this context, assessing emotional stability during the perinatal period may offer valuable insights into breastfeeding outcomes, particularly when considering early cessation and overall duration.

Studies focusing on infant characteristics indicate that children with health problems at birth, such as those born prematurely or admitted to the NICU in the early days of life, had more difficulties in initiating breastfeeding [12]. Some studies have even assessed early temperamental characteristics. In a Norwegian cohort, Niegel et al. [20] found that a difficult temperament was associated with a breastfeeding duration of less than 6 months but not with longer breastfeeding durations. Later, Taut et al. [21] found that less rhythmic infants breastfed for longer periods, whereas those who showed greater irritability breastfed for shorter periods.

Breastfeeding is a complex process that encompasses physiological, social, emotional, and cultural aspects of both mothers and infants, with infants playing an active role in their own development [22]. Studying the characteristics of both may shed light on the factors involved in the process of choosing to breastfeed, early cessation, and duration. While previous studies have explored many

of these factors individually, few have considered them simultaneously. This study, by integrating sociodemographic characteristics, lifestyle habits, maternal emotional state, and infant characteristics, aims to provide a more comprehensive understanding of the factors influencing breastfeeding decisions. This broader perspective can help design better-targeted policies and interventions and influence clinical practices among maternal and child health professionals to increase breastfeeding rates.

The aim of this study was to investigate the influence of sociodemographic characteristics, prenatal lifestyle habits, maternal emotional state, and infant characteristics on breastfeeding decision, early cessation of breastfeeding and total breastfeeding duration in a community sample of women from Tarragona (Spain), a European Mediterranean region.

## Methods

### Study design, sample, and procedure

This was a prospective longitudinal study. The final sample consisted of 397 mother and infant pairs from the ECLIPSES-NEN study [23], a follow-up project of ECLIPSES study. The ECLIPSES-NEN study aimed to explore nutritional, environmental, sociodemographic, and emotional factors during pregnancy and early infancy that are related to child development. The participants in ECLIPSES-NEN were originally recruited as pregnant women for the ECLIPSES study [24]. Recruitment was carried out by midwives at primary care centres during the participant's first pregnancy visit. Inclusion criteria were: to be at least 18 years old; being pregnant for 12 weeks or more; not having anaemia ( $Hb > 110$  g/L), and understanding either of the country's official languages (Spanish or Catalan), as well as the study characteristics. The exclusion criteria were to have a multiple pregnancy, to have had an adverse obstetric history, to have taken  $> 10$  mg of iron supplementation every day in the three months prior to the 12th week of gestation, to have reported prior severe illness (state of immunosuppression) or chronic disease that could affect their nutritional status (cancer, diabetes, etc.), or to have reported liver disease.

The ECLIPSES study consisted of three visits during pregnancy (in the 12th, 24th, and 36th weeks), a visit 40 days after delivery (postpartum visit) and the ECLIPSES-NEN consisted of a follow-up visit 4–5 years after delivery. Sociodemographic, clinical and psychosocial information were collected. A total of 793 pregnant women were included in the study at week 12 of pregnancy, 547 women provided data at week 24, 496 at week 36, and 466 at 40 days after delivery. At 4 years old, a total of 397 infants and their mothers came to the follow-up visit. Participant dropout was caused by voluntary

abandonment, emergence of exclusion criteria during pregnancy, miscarriage, and lost to follow-up.

Figure 1 illustrates the longitudinal data collection across pregnancy, partum, 40 days postpartum, and at 4 years of age.

### Variables and assessments

Breastfeeding information was collected at three different times: at birth, from the hospital report when the decision to breastfeed was taken; 40 days postpartum, during the follow-up visit (if the mother reported that she had stopped breastfeeding, it was considered early cessation); and at the 4-year follow-up visit, when the total duration of breastfeeding in months was recorded. In this study, breastfeeding is considered when children have been fed with breastmilk or mixed breastfeeding.

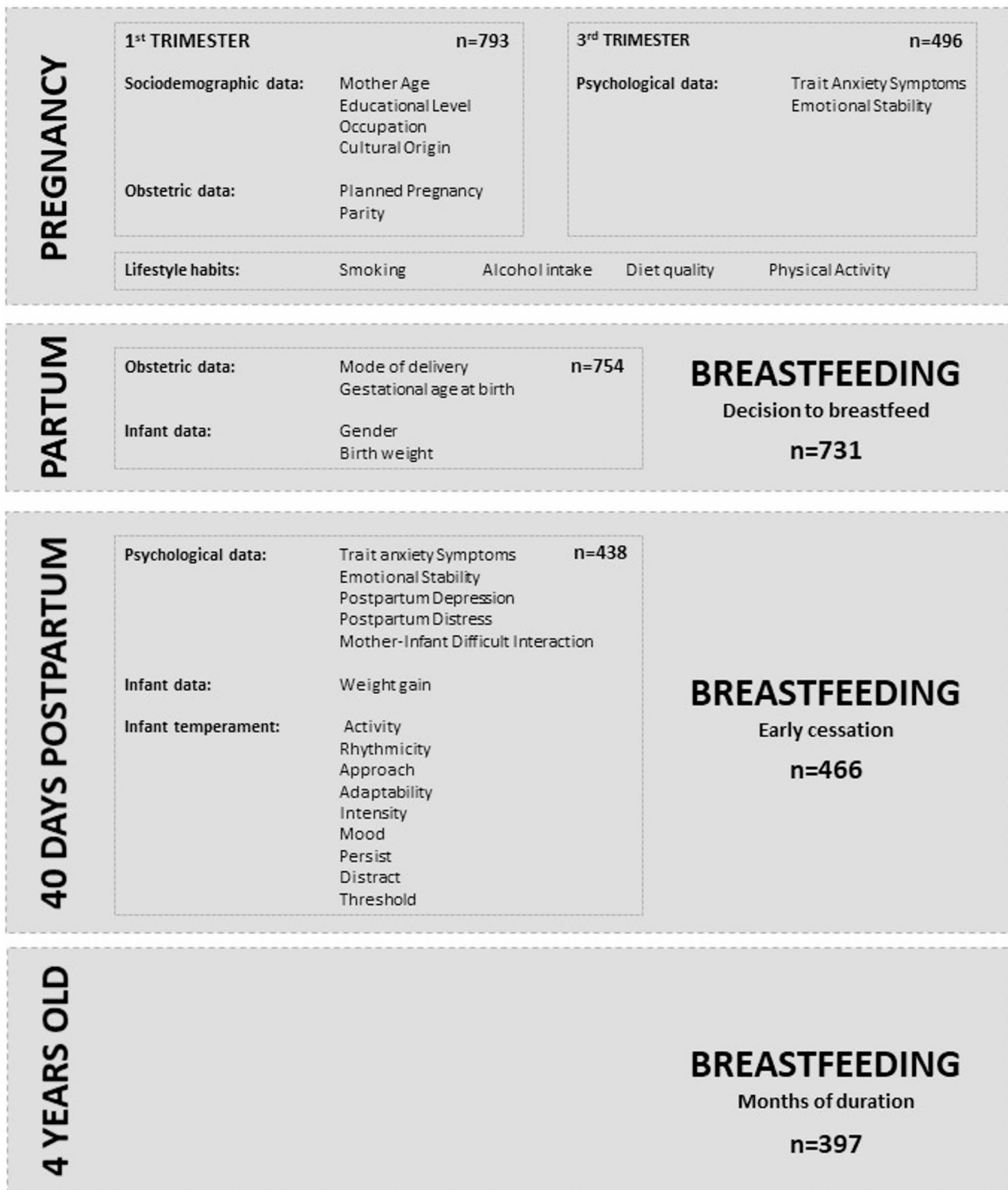
Obstetric and neonatal data were obtained from the medical records. These variables were the mother's age at the beginning of pregnancy; whether the pregnancy was planned; parity; mode of delivery; gestational age at birth; and infant gender and birth weight. In addition, sociodemographic data such as educational level, occupation and cultural background of the mother were collected.

The mother's socioeconomic status (high, medium or low) was calculated using the Hollingshead index [25] by merging data about the educational level and occupation classified according to the Catalan classification of occupations [26].

The mother's trait anxiety symptoms and emotional stability during pregnancy and at 40 days postpartum were assessed by the State-Trait Anxiety Inventory (STAI) [27], a questionnaire designed to assess symptoms of both state and trait anxiety. This self-report questionnaire contains 40 items, and two main scores and four factors can be obtained. The main scores are the state anxiety (the level of transient and situational anxiety) and trait anxiety (the level of dispositional and stable trait anxiety). The four factor scores are factor 1 (state of nervousness, tension, anxiety and restlessness), factor 2 (positive state of activation, animation, welfare, satisfaction and self-confidence), factor 3 (stable trait of melancholy, despair and feelings of inability), and factor 4 (emotional stability and absence of mood changes). This study used factor 3 as trait anxiety and factor 4 as emotional stability.

The mother's smoking during pregnancy was assessed by the Fagerström Questionnaire (Fagerström\_Q) [28]. According to this information, women were classified as smokers or non-smokers.

The mother's diet during pregnancy was assessed using the Food Intake Frequency Questionnaire (FFQ) [29, 30], which included 45 food and beverage items. The frequency of consumption was indicated per week or per month. This information was used to estimate adherence



**Fig. 1** Study design and variables

to the Mediterranean diet as an indicator of quality of diet [30]. Qualified midwives and nutritionists administered the FFQs, and ensured accurate completion, data entry, and subsequent analysis.

Alcohol consumption during pregnancy was determined by analysing the responses to the alcoholic beverages item in the FFQ, with the responses being categorized simply as “no” or “yes”.

Physical activity during pregnancy was evaluated using the International Physical Activity Questionnaire– Short Form (IPAQ-SF) [31]. A self-administered questionnaire that includes 7 items on the frequency and duration of sitting, walking, and moderate and vigorous physical activities during the previous week. Based on the total minutes of moderate-to-vigorous physical activity reported, women were categorized as meeting or not meeting international recommendations for physical activity during pregnancy ( $\geq 150$  min per week) [32].

The mother's postpartum depression symptoms were assessed by the Spanish version of the Edinburgh Postnatal Depression Scale (EPDS) [33, 34], a questionnaire specifically designed to assess depressive symptoms during the postpartum period. EPDS total score was used as a continuous variable to capture the whole range of depressive symptomatology.

The mother's distress and mother-infant interaction difficulties during postpartum were assessed by the Parent Stress Index– Short Form (PSI-SF) [35], a 36-item questionnaire designed to assess stress levels related to the parenting role. In this study, scores for mother's distress, and mother-infant dysfunctional interaction were used.

Infants' temperament was assessed using the Early Infancy Temperament Questionnaire (EITQ) [36], a tool designed to assess the New York Longitudinal Study temperament traits in one- to four-month-old infants. The temperament traits assessed were: activity level (the level and extent of motor activity), rhythmicity (the degree of regularity of functions such as eating, elimination and the sleep-wake cycle), approach (the response to a new object or person in terms of whether the infant accepts the new experience or withdraws from it), adaptability (the adaptability of behaviour to changes in the environment), threshold (the sensitivity to environmental stimuli), intensity (the energy level of responses), mood (the infants' general mood or 'disposition', whether cheerful or prone to crying, pleasant or fussy, friendly or unfriendly), distractibility (the degree of the child's distractibility from what he/she is doing) and persistence (the infant's attention span and his/her persistence in that). Higher scores indicate less desirable infant characteristics.

### Statistical analysis

Descriptive data were expressed as means and standard deviations for continuous variables and as percentages and frequencies for categorical variables. Differences between variables in the breastfeeding groups were assessed using Chi-square tests for categorical variables and Student's t-test for continuous variables.

To identify factors related to decision to breastfeed (no, yes) and early cessation of breastfeeding (no, yes), logistic regressions models using the stepwise method

were performed. The candidate variables to be used in the model to predict the decision to breastfeed included: mother's age (years), mother's socioeconomic status (high, medium, low), employment status (unemployed, employed), cultural background (Spain, other), tobacco use during pregnancy (no, yes), alcohol use during pregnancy (no, yes), diet quality (score), physical activity according to international recommendations (no, yes), trait anxiety symptoms (score) and emotional stability (score) in the third trimester of pregnancy, planned pregnancy (no, yes), parity (primiparous, multiparous), mode of delivery (non-instrumental, instrumental), infant sex (boy, girl), gestational age (weeks), and infant birth weight (grams). For the model predicting the early cessation of breastfeeding, the following variables were added to the variables mentioned above: postpartum trait anxiety symptoms (score), postpartum depression symptoms (score), emotional stability (score), mother's parenting-related distress (score), difficulties in mother-infant interaction (score), infant weight at one month (grams), and temperamental characteristics of the infant: activity (score), rhythmicity (score), approach (score), adaptability (score), intensity (score), mood (score), persistence (score), distractibility (score), and threshold (score). Finally, to explore factors related to the dependent variable total duration of breastfeeding (months) a multiple linear regression model was conducted using the stepwise method. The candidate variables for this model included all the variables from the two previous models. Estimates were presented in the form of an Odds Ratio (OR) for logistic regressions and a  $\beta$  coefficient ( $\beta$ ) for multiple linear regression as well as 95% confidence intervals (CI). The collinearity between variables in the models was assessed. Statistical significance was defined as a p-value of  $< 0.05$ .

The statistical analysis was conducted using SPSS Statistics software, version 29.0 for Windows (SPSS Inc., Chicago, IL).

## Result

### Descriptive characteristics of the sample

The characteristics of the sample are described in Table 1. The mean age of the mothers was 30.3 years ( $SD = 5.1$ ), of whom 43.7% were categorized as low socioeconomic level and 54.3% as Spanish background.

A total of 79.2% of mothers opted to breastfeed their babies for an average duration of 13.84 months ( $SD = 12.7$ ). It should also be pointed out that 10% of the mothers who opted to breastfeed stopped in the first 40 days postpartum.

**Table 1** Descriptive characteristics of the sample

Sociodemographics	Mean (SD) <sup>#</sup> n (%) <sup>*</sup>	Infant Characteristics	Mean (SD) <sup>#</sup> n (%) <sup>*</sup>
Mother's age <sup>#</sup>	30.34 (5.1)	Gender *	
Mother's socioeconomic status <sup>*</sup>		Girl	382 (50.8)
high	102 (20.3)	Boy	370 (49.2)
medium	181 (36.0)	Birth weight (gr) <sup>#</sup>	3285.64 (474.8)
low	220 (43.7)	1 month weight (gr) <sup>#</sup>	4301.42 (688.9)
Mother's employment status <sup>*</sup>		<b>Infant Temperament</b>	<b>Mean (SD)<sup>#</sup>n (%)<sup>*</sup></b>
employed	545 (75.5)	Activity <sup>#</sup>	3.16 (0.7)
unemployed	177 (24.5)	Rhythmicity <sup>#</sup>	3.26 (0.8)
Mother's cultural background <sup>*</sup>		Approach <sup>#</sup>	2.63 (0.7)
Spain	397 (54.3)	Adaptability <sup>#</sup>	2.61 (0.7)
Others	334 (45.7)	Intensity <sup>#</sup>	3.33 (0.9)
<b>Lifestyle habits</b>	<b>Mean (SD)<sup>#</sup>n (%)<sup>*</sup></b>	Mood <sup>#</sup>	3.99 (0.7)
Tobacco use during pregnancy <sup>*</sup>		Persist <sup>#</sup>	2.96 (0.8)
yes	141 (16.2)	Distract <sup>#</sup>	2.55 (0.8)
no	650 (83.8)	Threshold <sup>#</sup>	4.12 (0.7)
Alcohol use during pregnancy <sup>*</sup>		<b>Breastfeeding data</b>	
yes	25 (8.2)	Breastfeeding (yes) <sup>*</sup>	579 (79.2)
no	281 (91.8)	Breastfeeding less than 40 days postpartum <sup>*</sup>	44 (10.0)
Quality of diet (total score) <sup>#</sup>	9.77 (2.1)	Breastfeeding (months) <sup>#</sup>	13.84 (12.7)
Physical activity according to international recommendations <sup>*</sup>			
yes	77 (17.0)		
no	376 (83.0)		
<b>Psychological status</b>	<b>Mean (SD)<sup>#</sup>n (%)<sup>*</sup></b>		
Third trimester Trait anxiety symptoms (score) <sup>#</sup>	11.57 (6.7)		
Emotional stability in the third trimester of pregnancy (total score) <sup>#</sup>	14.63 (4.1)		
Postpartum trait anxiety symptoms (total score) <sup>#</sup>	10.21 (6.6)		
Postpartum emotional stability (total score) <sup>#</sup>	14.96 (4.0)		
Postpartum depression symptoms (total score) <sup>#</sup>	6.77 (4.9)		
Mother's parenting-related distress (total score) <sup>#</sup>	27.05 (9.4)		
Difficulties in mother-infant interaction (total score) <sup>#</sup>	17.35 (8.0)		
<b>Obstetrical outcomes</b>	<b>Mean (SD)<sup>#</sup>n (%)<sup>*</sup></b>		
Planned pregnancy <sup>*</sup>			
yes	633 (80.0)		
no	158 (20.0)		
Parity <sup>*</sup>			
Multiparous	402 (50.9)		
Nulliparous	388 (49.1)		
Mode of delivery <sup>*</sup>			
Instrumental	230 (30.5)		
Non- instrumental	524 (69.5)		
Gestational age (weeks) <sup>#</sup>	39.70 (1.4)		

<sup>\*</sup> Results showed as mean and standard deviation (SD)

<sup>#</sup> Results showed as n and percentage (%)

<sup>\*</sup>The total sample size was  $N = 791$ . Due to missing data, the number of observations (n) varies across variables. Percentages and means are calculated based on available data

### Descriptive characteristics of the sample according to breastfeeding decision and early cessation of breastfeeding

Table 2 displays the characteristics of the sample in terms

of the decision to breastfeed and early cessation of breastfeeding (defined as cessation before 40 days postpartum).

Regarding the decision to breastfeed, 85.8% of women who reported not smoking during pregnancy chose

**Table 2** Descriptive characteristics of the sample according to breastfeeding decision and early cessation of breastfeeding

	No breastfeeding (n = 212) Mean (SD) <sup>#</sup> / n (%) *	B reastfeeding (n = 579) Mean (SD) <sup>#</sup> / n (%) *	T (p) <sup>#</sup> / $\chi^2$ (p)*	Early cessa- tion (n = 44) Mean (SD) <sup>#</sup> / n (%) *	Continuation (n = 397) Mean (SD) <sup>#</sup> / n (%)*	T (p) <sup>#</sup> / $\chi^2$ (p)*
<b>Maternal and Infant Characteristics</b>						
<b>Maternal sociodemographic characteristics</b>						
Mother's age (years) <sup>#</sup>	30.48 (4.5)	30.43 (5.3)	0.059 (0.476)	30.64 (4.5)	30.93 (5.2)	0.125 (0.724)
Mother's socioeconomic status*						
high	11 (11.8)	91 (22.2)	<b>6.702</b> <b>(0.035)</b>	3 (7.0)	88 (23.1)	5.980 (0.050)
medium	42 (45.2)	139 (33.9)		17 (39.5)	128 (33.6)	
low	40 (43.0)	180 (43.9)		23 (53.5)	165 (43.3)	
Mother's employment status (employed)*	115 (76.7)	430 (75.2)	0.143 (0.705)	36 (81.8)	324 (77.3)	0.464 (0.496)
Mother's cultural background (Spain)*	83 (54.6)	314 (54.2)	0.007 (0.934)	34 (77.3)	287 (68.0)	1.595 (0.207)
<b>Maternal Lifestyle habits</b>						
	<b>No breastfeeding</b>	<b>Breastfeeding</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>	<b>Early cessation</b>	<b>Continuation</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>
Tobacco use during pregnancy (Yes)*	45 (30.2)	82 (14.2)	<b>20.490</b> <b>(&lt;0.001)</b>	9 (20.5)	47 (11.2)	3.221 (0.073)
Alcohol use during pregnancy (Yes)*	2 (3.2)	23 (9.5)	2.745 (0.098)	1 (3.2)	22 (9.6)	1.391 (0.238)
Diet quality (score) <sup>#</sup>	9.72 (1.9)	9.79 (2.1)	0.075 (0.784)	9.28 (2.0)	9.84 (2.2)	-1.516 (0.069)
Physical activity according to interna- tional recommendations (Yes)*	74 (85.1)	64 (17.5)	0.322 (0.570)	7 (18.4)	60 (17.7)	0.012 (0.912)
<b>Obstetrical outcomes</b>						
	<b>No breastfeeding</b>	<b>Breastfeeding</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>	<b>Early cessation</b>	<b>Continuation</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>
Planned pregnancy (Yes)*	117 (78.5)	467 (81.1)	0.442 (0.506)	38 (86.4)	340 (81.0)	0.772 (0.379)
Parity (Multiparous)*	71 (47.7)	334 (58.0)	1.408 (0.235)	23 (52.3)	200 (47.6)	0.346 (0.557)
Mode of delivery (Instrumental)*	46 (31.1)	176 (30.5)	0.008 (0.930)	14 (31.8)	136 (32.4)	0.006 (0.939)
Gestational age (Weeks) <sup>#</sup>	39.45 (1.6)	39.58 (1.5)	-0.848 (0.198)	39.19 (2.0)	39.73 (1.4)	<b>-2.321</b> <b>(0.010)</b>
<b>Maternal Psychological status</b>						
	<b>No breastfeeding</b>	<b>Breastfeeding</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>	<b>Early cessation</b>	<b>Continuation</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>
Third trimester Anxiety Trait symptoms(score) <sup>#</sup>	11.95 (7.0)	11.40 (6.6)	0.475 (0.491)	13.91 (7.7)	11.25 (6.5)	<b>2.380</b> <b>(0.009)</b>
Third trimester emotional stability (score) <sup>#</sup>	13.80 (4.3)	14.85 (4.1)	<b>4.546</b> <b>(0.034)</b>	13.44 (4.9)	14.93 (4.0)	<b>-1.715</b> <b>(0.047)</b>
Postpartum trait anxiety symptoms (score) <sup>#</sup>	-	-	-	11.94 (9.6)	10.31 (6.8)	1.665 (0.052)
Postpartum emotional stability (score) <sup>#</sup>	-	-	-	13.64 (4.6)	15.14 (4.0)	<b>-1.887</b> <b>(0.033)</b>
Postpartum depression symptoms (score) <sup>#</sup>	-	-	-	8.69 (5.8)	6.90 (5.0)	<b>1.714</b> <b>(0.044)</b>
Mother's parenting-related distress (score) <sup>#</sup>	-	-	-	28.10 (9.9)	27.28 (9.3)	0.509 (0.307)
Difficulties in mother-infant interaction (score) <sup>#</sup>	-	-	-	17.95 (7.9)	17.32 (8.3)	0.485 (0.315)
<b>Infant Characteristics</b>						
	<b>No breastfeeding</b>	<b>Breastfeeding</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>	<b>Early cessation</b>	<b>Continuation</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>
Infant sex (Girl)*	81 (54.4)	283 (49.2)	1.413 (0.235)	22 (50.0)	207 (49.3)	0.008 (0.928)
Infant birth weight (grams) <sup>#</sup>	3236.4 (442.0)	3289.87 (474.1)	-1.172 (0.121)	3069.65 (468.7)	3325.74 (447.8)	<b>-3.423</b> <b>(&lt;0.001)</b>
Infant month weight (grams) <sup>#</sup>	-	-	-	4097.95 (661.8)	4314.56 (720.3)	-1.926 (0.030)
<b>Infant Temperament</b>						
	<b>No breastfeeding</b>	<b>Breastfeeding</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>	<b>Early cessation</b>	<b>Continuation</b>	<b>T (p)<sup>#</sup> / <math>\chi^2</math>(p)*</b>
Activity (score) <sup>#</sup>	-	-	-	3.11 (0.7)	3.20 (0.7)	-0.778 (0.220)
Rhythmicity (score) <sup>#</sup>	-	-	-	3.05 (0.7)	3.33 (0.8)	<b>-2.495</b> <b>(0.008)</b>

**Table 2** (continued)

	No breastfeeding (n = 212) Mean (SD)# / n (%) *	B reastfeeding (n = 579) Mean (SD)# / n (%) *	T (p) <sup>#</sup> / $\chi^2$ (p)*	Early cessa- tion (n = 44) Mean (SD)# / n (%) *	Continuation (n = 397) Mean (SD)# / n (%)*	T (p) <sup>#</sup> / $\chi^2$ (p)*
Approach (score) <sup>#</sup>	-	-	-	2.64 (0.7)	2.66 (0.7)	-0.158 (0.438)
Adaptability (score) <sup>#</sup>	-	-	-	2.65 (0.7)	2.63 (0.7)	0.192 (0.424)
Intensity (score) <sup>#</sup>	-	-	-	3.19 (0.9)	3.38 (0.9)	-1.265 (0.106)
Mood (score) <sup>#</sup>	-	-	-	2.99 (0.7)	3.02 (0.7)	-0.296 (0.384)
Persistence (score) <sup>#</sup>	-	-	-	3.03 (0.8)	2.98 (0.8)	0.404 (0.344)
Distractibility (score) <sup>#</sup>	-	-	-	2.58 (0.8)	2.57 (0.8)	0.011 (0.456)
Threshold (score) <sup>#</sup>	-	-	-	3.93 (0.8)	4.17 (0.7)	<b>-1.898 (0.032)</b>

\* Results showed as mean and standard deviation (SD); results are shown in t-student;

# Results showed as n and percentage (%); results are shown in chi-square.

A descriptive analysis was performed with chi-square test and t-Student.

**Bold** Indicates statistical significance

breastfeeding ( $\chi^2 = 20.490$ ,  $p < 0.001$ ). Likewise, women who decided to breastfeed presented significantly higher levels of well-being in the third trimester of pregnancy (mean = 14.85, S.D. = 4.1) than women who chose CMF (mean = 13.80, S.D. = 4.3) ( $t = 4.546$ ,  $p = 0.034$ ).

Of the women who chose to breastfeed, we observed that those who abandoned early presented significantly higher levels of anxiety (mean = 13.91, S.D. = 7.7) and lower levels of well-being (mean = 13.44, S.D. = 4.9) at the end of pregnancy than those who continued breastfeeding beyond the first 40 days postpartum (mean = 11.25, S.D. = 6.5; mean = 14.93, S.D. = 4.0 respectively) ( $t = 2.380$ ,  $p = 0.009$ ;  $t = -1.715$ ,  $p = 0.047$  respectively). During the postpartum period, mothers who ceased breastfeeding presented greater symptoms of postpartum depression (mean = 8.69, S.D. = 5.8) and lower well-being (mean = 13.64, S.D. = 4.6) than those who did not abandon prematurely (mean = 6.90, S.D. = 5.0; mean = 15.14, S.D. = 4.0 respectively) ( $t = 1.714$ ,  $p = 0.044$ ;  $t = -1.887$ ,  $p = 0.033$  respectively).

On the other hand, the children of women who ceased breastfeeding during the first 40 days postpartum had significantly lower gestational age at birth (mean = 39.19, S.D. = 2.0) and lower birth weight (mean = 3069, S.D. = 468) than those infants of women who did not (mean = 39.73, S.D. = 1.4; mean = 3325, S.D. = 447 respectively). Also, the children of women who ceased breastfeeding during the first 40 days postpartum also present more regularity (mean = 3.05, S.D. = 0.7) and less sensitivity to physical stimuli (mean = 3.93, S.D. = 0.8) than the children of mothers who continued breastfeeding beyond the first 40 days postpartum (mean = 3.33, S.D. = 0.8; mean = 4.17, S.D. = 0.7 respectively) ( $t = -2.495$ ;  $p = 0.008$ ;  $t = -1.898$ ;  $p = 0.032$  respectively).

### Multiple logistic and linear regressions models predicting breastfeeding decision, early cessation, and duration

Table 3 show predictive models of breastfeeding choice, early cessation, and total duration, respectively. As far as the choice of breastfeeding is concerned, the logistic regression results show that not smoking during pregnancy (OR = 0.239, 95% confidence interval (CI): 0.128, 0.445) and greater emotional stability in the third trimester (OR = 1.066, 95% CI: 1.001, 1.134) increase the probability of choosing breastfeeding as the infants' feeding option ( $\chi^2 = 24.884$ ;  $p < 0.001$ ). Likewise, a lower weight at birth (OR = 0.999, 95% CI: 0.998, 1.000), lower emotional stability in the postpartum (OR = 0.913, 95% CI: 0.840, 0.993) and the perception of more rhythmicity in the baby (OR = 0.621, 95% CI: 0.386, 0.998) increase the risk of early cessation of breastfeeding ( $\chi^2 = 17.244$ ,  $p < 0.001$ ). Finally, as far as the total duration of breastfeeding is concerned, we observed that a higher maternal age ( $\beta = 0.37$ ,  $p = 0.038$ ), the mother's cultural background ( $\beta = 5.086$ ,  $p = 0.021$ ), greater emotional stability ( $\beta = 0.474$ ,  $p = 0.020$ ) and the infant's temperamental characteristics of mood ( $\beta = 2.915$ ,  $p = 0.023$ ) and rhythmicity ( $\beta = 2.568$ ,  $p = 0.023$ ), significantly predicted longer breastfeeding duration ( $F_{5,233} = 5.319$ ,  $p < 0.001$ ).

### Discussion

This study aimed to investigate the influence of maternal sociodemographic characteristics, lifestyle habits, emotional state, and infant characteristics, on the initiation, duration, and cessation of breastfeeding in a community sample from Tarragona, a European Mediterranean region. By examining these factors simultaneously, our study provides a comprehensive understanding of how maternal and infant-related factors influence breastfeeding practices.

Our findings suggest that maternal emotional and psychological factors play a key role in breastfeeding

**Table 3** Multiple logistic models for predicting breastfeeding decision and early cessation (before 40 days postpartum), and linear regression for predicting months duration

Breastfeeding decision	Odds Ratio (95% CI)	Early cessation	Odds Ratio (95% CI)	Breastfeeding duration	$\beta$ (95% CI)
Tobacco use during pregnancy (no, yes)	0.239 (0.128, 0.445) ***	Birth weight (grams)	0.999 (0.998, 1.000) **	Mood (score)	2.915 (0.399, 5.431) *
Third trimester emotional stability (score)	1.066 (1.001, 1.134) *	Postpartum Emotional stability (score)	0.913 (0.840, 0.993) *	Rhythmicity (score)	2.568 (0.350, 4.784) *
		Rhythmicity (score)	0.621 (0.386, 0.998) *	Third trimester emotional stability (score)	0.474 (0.074, 0.875) *
				Cultural background (Spain, others)	5.086 (0.759, 9.413) *
				Mother's age (years)	0.370 (0.020, 0.720) *
Model parameters: $r^2$ Nagelkerke*100 = 9.8; $\chi^2 = 24.884$ ***		Model parameters: $r^2$ Nagelkerke*100 = 10.6; $\chi^2 = 17.244$ ***		Model parameters: $r^2$ *100 = 10.4; $F_{5,233} = 5.319$ ***	

Breastfeeding decision model adjustment variables: mother's age (years), mother's socioeconomic status (high, medium, low), mother's employment status (unemployed, employed), planned pregnancy (no/yes), parity (primiparous, multiparous), cultural background (Spain, other), tobacco use during pregnancy (no, yes), alcohol use during pregnancy (no, yes), diet quality (score), physical activity according to international recommendations (no, yes), trait anxiety symptoms (score) and Third trimester emotional stability (score), mode of delivery (non-instrumental, instrumental), infant sex (boy, girl), gestational age (weeks), infant birth weight (grams)

Early cessation model adjustment variables: mother's age (years), mother's socioeconomic status (high, medium, low), mother's employment status (unemployed/employed), planned pregnancy (no/yes), parity (primiparous, multiparous), cultural background (Spain, other), tobacco use during pregnancy (no, yes), alcohol use during pregnancy (no, yes), diet quality (score), physical activity according to international recommendations (no, yes), trait anxiety symptoms (score) and Third trimester emotional stability (score), mode of delivery (non-instrumental, instrumental), infant sex (boy; girl), gestational age (weeks), infant birth weight (grams), postpartum depression symptoms (score), postpartum trait anxiety symptoms (score) postpartum emotional stability (score), mother's parenting-related distress (score), difficulties in mother-infant interaction (score), infant weight at one month (grams), temperamental characteristics of the infant [activity (score), rhythmicity (score), approach (score), adaptability (score), intensity (score), mood (score), persistence (score), distractibility (score), and threshold (score)]

Breastfeeding duration model adjustment variables: mother's age (years), mother's socioeconomic status (high, medium, low), mother's employment status (unemployed/employed), planned pregnancy (no/yes), parity (primiparous, multiparous), cultural background (Spain, other), tobacco use during pregnancy (no, yes), alcohol use during pregnancy (no, yes), diet quality (score), physical activity according to international recommendations (no, yes), trait anxiety symptoms (score) and Third trimester emotional stability (score), mode of delivery (non-instrumental, instrumental), infant sex (boy; girl), gestational age (weeks), infant birth weight (grams), postpartum depression symptoms (score), postpartum trait anxiety symptoms (score) postpartum emotional stability (score), mother's parenting-related distress (score), difficulties in mother-infant interaction (score), infant weight at one month (grams), temperamental characteristics of the infant [activity (score), rhythmicity (score), approach (score), adaptability (score), intensity (score), mood (score), persistence (score), distractibility (score), and threshold (score)]

\*<0.05; \*\*<0.01; \*\*\*<0.001

initiation. Specifically, non-smoking mothers with greater emotional stability in the third trimester of pregnancy were more likely to choose to breastfeed. These results are partially consistent with previous literature which suggests an association between higher educational levels and non-smoking status with an increased probability of breastfeeding [6, 7, 11, 37]. However, in our sample, emotional stability emerged as a stronger predictor of breastfeeding initiation than sociodemographic factors like educational level.

Maternal psychosocial state also was related to early breastfeeding cessation. In line with O'Brien et al. [38], our results show that higher levels of anxiety and depressive symptoms during pregnancy and postpartum were associated with earlier breastfeeding cessation. These findings are supported by prior studies [39, 40], which have identified emotional distress as a barrier to maintaining breastfeeding [11, 41, 42].

Regarding infant characteristics, our results indicate that lower gestational age and birth weight, as well as sensitivity, reactivity to environmental stimuli, and

rhythmicity in the physiological functions, were associated with early cessation of breastfeeding. The transition here from maternal to infant variables is important, as it suggests that infant temperament may modulate how mothers experience and respond to the breastfeeding process. While previous studies have reported mixed results regarding the impact of infant temperament on breastfeeding, our findings align with research indicating that temperament can shape maternal feeding practices [43, 44]. In this sense, some studies suggest that breastfed babies tend to have more demanding or difficult temperament [45, 46], while others found no significant differences [47, 48].

When analysing breastfeeding duration, both maternal and infant variables were again relevant. Older maternal age and being culturally from the territory (Spain) predicted longer breastfeeding duration, partially aligning with Santana's et al. review [10]. In contrast, we did not observe a significant association with educational level as Santana did. Our findings suggest that mothers from other cultural backgrounds, possibly migrants, may

face additional psychosocial challenges that could affect breastfeeding duration, pointing to the importance of culturally sensitive support interventions [49]. In terms of maternal emotional state, higher emotional well-being was related to longer breastfeeding duration, while lower emotional stability was associated with earlier cessation. This is consistent previous studies which related emotional perinatal anxiety and depression with shorter breastfeeding duration [39, 41], and with Keller et al. [49], who found that maternal neuroticism was inversely correlated with breastfeeding duration. Finally, infant temperamental characteristics, such as less rhythmicity in physiological functions and more negative mood, also played a role predicting longer breastfeeding duration. These findings align with previous studies that have noted the impact of infant temperamental traits [12, 20, 21] although not always focusing on the same characteristics observed in our study.

Overall, our findings suggest that the fit between maternal emotional characteristics and infant temperament may be an important factor for a successful breastfeeding. Maybe, mothers with greater emotional stability are better able to respond more appropriately to their babies' cues, facilitating both emotional bonding and physical regulation through breastfeeding. Moreover, babies with some temperamental traits may adapt better to the breastfeeding process and promoting longer breastfeeding durations. These characteristics seem important for the choice, consolidation, and duration of breastfeeding and should be considered in breastfeeding promotion programs, to ensure that individual and contextual needs are addressed effectively.

### Limitations and strengths

These results should be contextualized by considering the limitations of our study. Firstly, the ECLIPSES study was not exclusively focused on breastfeeding, and therefore did not include certain variables commonly assessed in breastfeeding-specific studies, such as maternal intention to breastfeed during pregnancy, anticipated duration, specific breastfeeding difficulties, reasons for cessation, family support, and social network influences. Secondly, although the total number of breastfeeding months was collected retrospectively when the children were four years old and maternal recall tends to be fairly accurate we acknowledge possible inaccuracies due to recall bias. Additionally, the questionnaire on temperamental characteristics was completed by the families, mostly by the mothers, which may introduce bias due to the socio-emotional characteristics of the mother when evaluating their child [50]. To address this potential bias, we introduced adjustment variables that we consider important in the process of matrescence, such as maternal anxiety and the perception of parental stress in the role of mother/father.

### Conclusion

In conclusion, this study highlights the complex interplay between maternal emotional characteristics and infant temperament in shaping breastfeeding initiation, duration, and cessation. Maternal emotional stability and infant temperamental traits emerged as key elements that influence breastfeeding outcomes, emphasizing the need to consider both maternal and child factors in the design of breastfeeding support programs.

### Abbreviations

CMF	Commercial milk formula
EBF	Exclusive Breastfeeding
EITQ	Early infancy Temperament Questionnaire
EPDS	Edinburgh Postnatal Depression Scale
Fagerström_Q	Fagerström Questionnaire
FFQ	Food Frequency Questionnaire
g/L	Grams per Liter
Hb	Hemoglobine
IPAQ-SF	International Physical Activity Questionnaire
mg	Milligrams
NICU	Neonatal Intensive Care Unit
OR	Odds Ratio
PSI-SF	Parental Stress Index Short Form
S.D.	Standard Deviation
STAI	State-Trait Anxiety Inventory
SPSS	Statistical Package for Social Sciences

### Acknowledgements

The ECLIPSES study has been carried out thanks to the work of people who are part of the following institutions: (1) Research Group in Nutrition and Mental Health (NUTRISAM), Universitat Rovira i Virgili, Reus, Spain. (2) Sexual and reproductive health care services (ASSIR) of Tarragona. (3) Research support Unit- of Institut d'Atenció Primària IDIAP Jordi Gol, Institut Català de la Salut. Authors thank the infants and their parents for participating in this study.

### Author contributions

VA conceptualized the study, acquired funding, administered the project, and obtained resources. SV-P and CH-M carried out the investigation, the data curation, the formal analysis, and the visualization of the manuscript idea. SV-P written the original draft. CH-M, JC-S, and VA provided critical revisions. All authors reviewed, edited the draft and approved the final version.

### Funding

The ECLIPSES study received financial support (PI12/02777; PI17/02252) from the Spanish Health Research Fund of the Ministry of Health and Consumer Affairs (Madrid, Spain) [Instituto de Salud Carlos III], and was co-financed by the European Union (ERDF/ESF, "A way to make Europe"/"Investing in your future"). The funding agencies had no role in the design of the study, in the collection and interpretation of the data, or in the decision to publish. This work was supported by predoctoral programme AGAUR-FI grant (2022FI-B 00946) Joan Oró de la Secretaria d'Universitats i Recerca del Departament de Recerca i Universitats de la Generalitat de Catalunya i del Fons Europeu Social Plus.

### Data availability

No datasets were generated or analysed during the current study.

### Declarations

#### Ethics approval and consent to participate

The ECLIPSES study was approved by the Clinical Research Ethics Committee of the Jordi Gol Research Institute in Primary Care (IDIAP) and the Pere Virgili Health Research Institute (IISPV) (155/2017). The study was designed in compliance with the Declarations of Helsinki and all participating families gave their signed informed consent.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare no competing interests.

**Author details**

<sup>1</sup>Research Group in Nutrition and Mental Health (NUTRISAM), Universitat Rovira i Virgili, Tarragona, Spain

<sup>2</sup>Research Center for Behavioral Assessment (CRAMC), Universitat Rovira i Virgili, Tarragona, Spain

<sup>3</sup>Pere Virgili Institute for Health Research (IISPV), Universitat Rovira i Virgili, Reus, Spain

Received: 30 September 2024 / Accepted: 28 May 2025

Published online: 13 June 2025

**References**

- Martín-Ramos S, Domínguez-Aurrecochea B, García Vera C, Lorente García Mauriño AM, Sánchez Almeida E, Solís-Sánchez G. Lactancia materna en españa y factores relacionados con su instauración y mantenimiento: estudio laydi (PAPenRed) [Breastfeeding in Spain and the factors related to its establishment and maintenance: laydi Study (PAPenRed)]. *Aten Primaria*. 2024;56(1):102772. <https://doi.org/10.1016/j.aprim.2023.102772>.
- Pérez-Escamilla R, Tomori C, Hernández-Cordero S, Baker P, Barros A, Bégin F, Chapman D, et al. Breastfeeding: crucially important, but increasingly challenged in a market-driven world. *Lancet*. 2023;401(10375):472–85. [https://doi.org/10.1016/S0140-6736\(22\)01932-8](https://doi.org/10.1016/S0140-6736(22)01932-8).
- Ballesta-Castillejos A, Gómez-Salgado J, Rodríguez-Almagro J, Ortiz-Esquinas I, Hernández-Martínez A. Factors that influence mothers' prenatal decision to breastfeed in Spain. *Int Breastfeed J*. 2020;15:97. <https://doi.org/10.1186/s13006-020-00341-5>.
- Celi A, Rich-Edwards J, Richardson K, Kleinman K, Gillman M. (2005). Immigration, race/ethnicity, and social and economic factors as predictors of breastfeeding initiation. *Arch Pediatr Adolesc Med*. 2005;159(3): 255–260. <https://doi.org/10.1001/archpedi.159.3.255>
- Victoria C, Bahl R, Barros A, França G, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet*. 2016;387(10017):475–90. [https://doi.org/10.1016/S0140-6736\(15\)01024-7](https://doi.org/10.1016/S0140-6736(15)01024-7).
- Buckman C, Diaz A, Tumin D, Bear K. Parity and the association between maternal sociodemographic characteristics and breastfeeding. *Breastfeed Med*. 2020;15(7):443–52. <https://doi.org/10.1089/bfm.2019.0284>.
- Canicali Primo C, de Oliveira Nunes B, de Fátima Almeida Lima E, Marabotti Costa Leite F, Barros de Pontes M, Gomes Brandão M. Which factors influence women in the decision to breastfeed? Cuáles son los factores que influyen en las mujeres la decisión de amamantar? *Invest Educ Enferm*. 2016;34(1):198–217. <https://doi.org/10.17533/udea.iee.v34n1a22>.
- Santacruz-Salas E, Segura-Fragoso A, Cobo-Cuenca A, Carmona-Torres J, Pozuelo-Carrascosa D, Laredo-Aguilera J. Factors associated with the abandonment of exclusive breastfeeding before three months. *Child (Basel)*. 2020;7(12):298. <https://doi.org/10.3390/children7120298>.
- Oliver Roig A, Richart Martínez M, Cabrero García J, Pérez Hoyos S, Laguna Navidad G, Flores Álvarez JC, Calatayud Pujalte MM et al. Factores asociados al abandono de la lactancia materna durante los primeros 6 meses de vida [Factors associated with the abandonment of breastfeeding during the first 6 months of life]. *REv Latino-Am*. 2010; 18(3).
- Santana G, Giugliani E, Vieira T, Vieira G. (2018). Factors associated with breastfeeding maintenance for 12 months or more: a systematic review. *J Ped (Rio J)*. 2018; 94(2):104–122. <https://doi.org/10.1016/j.jped.2017.06.013>
- Cohen S, Alexander D, Krebs N, Young B, Cabana M, Erdmann P, et al. Factors associated with breastfeeding initiation and continuation: a meta-analysis. *J Pediatr*. 2018;203:190–e19621. <https://doi.org/10.1016/j.jpeds.2018.08.008>.
- Thulier D, Mercer J. Variables associated with breastfeeding duration. *J Obstet Gynecol Neonatal Nurs*. 2009;38(3):259–68. <https://doi.org/10.1111/j.1552-6909.2009.01021.x>.
- Li J, Huang Y, Liu H, Xu J, Li L, Redding S, Ouyang Y. The relationship of previous breastfeeding experiences and factors affecting breastfeeding rates: a follow-up study. *Breastfeed Med*. 2020;15(12):789–97. <https://doi.org/10.1089/bfm.2020.0165>.
- Simard I, O'Brien H, Beaudoin A, Turcotte D, Damant D, Ferland S, et al. Factors influencing the initiation and duration of breastfeeding among low-income women followed by the Canada prenatal nutrition program in 4 regions of Quebec. *J Hum Lact*. 2005;21(3):327–37. <https://doi.org/10.1177/0890334405275831>.
- Li F, Huang C, Lin Q, Xi Y, Xiang C, Yong C, Deng JM. Characteristics. Intention, Self-Efficacy, perceived social support, and exclusive breastfeeding practice: structural equation modeling approaches. *Healthc (Basel)*. 2022;11(1):87. <http://doi.org/10.3390/healthcare11010087>.
- Grano C, Fernandes M, Conner M. Predicting intention and maintenance of breastfeeding up to 2-years after birth in primiparous and multiparous women. *Psychol Health*. 2023;38(11):1536–52. <https://doi.org/10.1080/08870446.2021.2025374>.
- Huang R, Han H, Ding L, Zhou Y, Hou Y, Yao X, et al. Using the theory of planned behavior model to predict factors influencing breastfeeding behavior among preterm mothers at week 6 postpartum: the mediating effect of breastfeeding intention. *Front Psychol*. 2023;14:1228769. <https://doi.org/10.3389/fpsyg.2023.1228769>.
- Dagla M, Mrvoljak-Theodoropoulou I, Karagianni D, Dagla C, Sotiropoulou D, Kontiza E, Kavakou A, Antoniou E. Women's mental health as a factor associated with exclusive breastfeeding and breastfeeding duration: data from a longitudinal study in Greece. *Child (Basel)*. 2021;8(2):150. <https://doi.org/10.3390/children8020150>.
- Nagel E, Howland M, Pando C, Stang J, Mason S, Fields D, et al. Maternal psychological distress and lactation and breastfeeding outcomes: a narrative review. *Clin Ther*. 2022;44(2):215–27. <https://doi.org/10.1016/j.clinthera.2021.11.007>.
- Niegel S, Ystrom E, Hagtvet K, Vollrath M. Difficult temperament, breastfeeding, and their mutual prospective effects: the Norwegian mother and child cohort study. *J Dev Behav Pediatr*. 2008;29(6):458–62. <https://doi.org/10.1097/dbp.0b013e3181877a88>.
- Taut C, Kelly A, Zgaga L. The association between infant temperament and breastfeeding duration: a cross-sectional study. *Breastfeed Med*. 2016;11:111–8. <https://doi.org/10.1089/bfm.2015.0184>.
- Brazelton TB, Nugent JK. Neonatal behavioral assessment scale. 3rd ed. Mac Keith; 1995.
- Iglesias-Vázquez L, Voltas N, Hernández-Martínez C, Canals J, Coronel P, Gimeno M, et al. Importance of maternal iron status on the improvement of cognitive function in children after prenatal iron supplementation. *Am J Prev Med*. 2023;65(3):395–405. <https://doi.org/10.1016/j.amepre.2023.02.006>.
- Arija V, Fargas F, March G, Abajo S, Basora J, Canals J, et al. Adapting iron dose supplementation in pregnancy for greater effectiveness on mother and child health: protocol of the ECLIPSES randomized clinical trial. *BMC Pregnancy Childbirth*. 2014;14:33. <https://doi.org/10.1186/1471-2393-14-33>.
- Hollingshead A. Four factor index of social status. *Yale J Sociol*. 2011; 21–52.
- Institut d'Estadística de Catalunya. Classificació catalana d'ocupacions (CCO). Generalitat de Catalunya. 2011.
- Spielberger CD, Gorsuch RL, Lushene RE. STAI Cuestionario de ansiedad estado rasgo. (Adaptación española: Nicolás Seisdedos Cubero). 1997.
- Heatherton T, Kozlowski L, Frecker R, Fagerström KO. The fagerström test for nicotine dependence: a revision of the fagerström tolerance questionnaire. *Br J Addict*. 1991;86(9):1119–27. <https://doi.org/10.1111/j.1360-0443.1991.tb01879.x>.
- Rodríguez I, Ballart J, Pastor G, Jordà E, Arija V. Validación de un cuestionario de frecuencia de consumo alimentario corto: reproducibilidad y validez [Validation of a short questionnaire on frequency of dietary intake: reproducibility and validity]. *Nutr Hosp*. 2008;23(3):242–52.
- Trichopoulos A, Costacou T, Bamia C, Trichopoulos DN. Adherence to a Mediterranean diet and survival in a Greek population. *Engl J Med*. 2003;348:2599–608. <https://doi.org/10.1191/1358863x04vms52xx>.
- Craig C, Marshall A, Sjöström M, Bauman A, Booth M, Ainsworth B, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003;35(8):1381–95. <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>.
- Bull F, Al-Ansari S, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World health organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*. 2020;54(24):1451–62. <https://doi.org/10.1136/bjports-2020-102955>.
- Cox J, Holden J, Sagovsky R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *The Br J Psychiatry*. 1987;150:782–786. <https://doi.org/10.1192/bjp.150.6.782>

34. García-Esteve L, Ascaso C, Ojuel J, Navarro P. Validation of the edinburgh postnatal depression scale (EPDS) in spanish mothers. *J Affect Disord.* 2003;75(1):71–6. [https://doi.org/10.1016/s0165-0327\(02\)00020-4](https://doi.org/10.1016/s0165-0327(02)00020-4).
35. Abidin R. Parenting Stress Index. Second. Odessa, FL: Psychological Assessment Resources. 1995.
36. Medoff-Cooper B, Carey WB, McDevitt SC. The early infancy temperament questionnaire. *J Dev Behav Pediatr.* 1993;14(4):230–5.
37. Börk L, Bott MJ, Ekholm EM, Ford DJ, Heiman A, Williams PD et al. Maternal/infant characteristics and birth location impact on breastfeeding initiation and duration. *J BSN Honors Res.* 2015;8(1).
38. O'Brien M, Buikstra E, Fallon T, Hegney D. Exploring the influence of psychological factors on breastfeeding duration, phase 1: perceptions of mothers and clinicians. *J Hum Lact.* 2009;25(1):55–63. <https://doi.org/10.1177/0890334408326071>.
39. Lovibond P, Lovibond S. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther.* 1995;33(3):335–43. [https://doi.org/10.1016/0005-7967\(94\)00075-u](https://doi.org/10.1016/0005-7967(94)00075-u).
40. Llorente-Pulido S, Custodio E, López-Giménez M, Sanz-Barbero B, Otero-García L. Barriers and facilitators for exclusive breastfeeding in women's biopsychosocial spheres according to primary care midwives in tenerife (Canary islands, Spain). *Int J Environ Res Public Health.* 2021;18(7):3819. <https://doi.org/10.3390/ijerph18073819>.
41. Stuebe A, Meltzer-Brody S, Propper C, Pearson B, Beiler P, Elam M, et al. The mood, mother, and infant study: associations between maternal mood in pregnancy and breastfeeding outcome. *Breastfeed Med.* 2019;14(8):551–9. <https://doi.org/10.1089/bfm.2019.0079>.
42. Field T, Hernandez-Reif M, Feijo L. Breastfeeding in depressed Mother-Infant dyads. *Early Child Dev Care.* 2002;172:539–45. <https://doi.org/10.1080/03004430215105>.
43. Schneider-Worthington C, Fouts A, Chandler-Laney P, Bahorski J. (2022). Infant temperament is associated with maternal feeding behaviors in early infancy. *Appetite* 2022;168:105686. <https://doi.org/10.1016/j.appet.2021.105686>
44. McMeekin S, Jansen E, Mallan K, Nicholson J, Magarey A, Daniels L. Associations between infant temperament and early feeding practices. A cross-sectional study of australian mother-infant dyads from the NOURISH randomised controlled trial. *Appetite.* 2013;60(1):239–45. <https://doi.org/10.1016/j.appet.2012.10.005>.
45. Barr R, Kramer M, Pless I, Boisjoly C, Leduc D. (1989). Feeding and temperament as determinants of early infant crying/fussing behavior. *Pediatrics.* 1989;84(3):514–521.
46. Lauzon-Guillain B, Wijndaele K, Clark M, Acerini C, Hughes I, Dunger D, et al. Breastfeeding and infant temperament at age three months. *PLoS ONE.* 2012;7(1):e29326. <https://doi.org/10.1371/journal.pone.0029326>.
47. Crockenberg S, Smith P. Antecedents of mother–infant interaction and infant irritability in the first 3 months of life. *Infant Behav Dev.* 2002;25:2–15. [https://doi.org/10.1016/S0163-6383\(02\)00088-7](https://doi.org/10.1016/S0163-6383(02)00088-7).
48. Wells J. Parent-offspring conflict theory, signaling of need, and weight gain in early life. *Q Rev Biol.* 2003;78(2):169–202. <https://doi.org/10.1086/374952>.
49. Keller N, Medved V, Armano G. The influence of maternal personality and risk factors for impaired Mother-Infant bonding on breastfeeding duration. *Breastfeed Med.* 2016;11:532–7. <https://doi.org/10.1089/bfm.2016.0093>.
50. Sechi C, Vismara L, Rollè L, Prino L, Lucarelli L. First-Time mothers' and fathers' developmental changes in the perception of their daughters' and sons' temperament: its association with parents' mental health. *Front Psychol.* 2020;11:2066. <https://doi.org/10.3389/fpsyg.2020.02066>.

#### Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.