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*Original Research*

# Psychosocial Variables Associated with Postpartum Depression in Breastfeeding Women: A Prospective Study

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**Abstract**

**Background**: To analyze (Aim 1) if there is an association between maintaining breastfeeding for 4 months after delivery and postpartum depression (n = 160) and (Aim 2) what sociodemographic, obstetric and psychosocial factors are associated to the presence of postpartum depression among the women who continue to breastfeed for 4 months after delivery (n = 81). **Methods**: A total of 160 women who initiated exclusive breastfeeding within an hour of childbirth participated for Aim 1. For Aim 2, a total of 81 of these same participants, specifically those who continued breastfeeding 4 months after giving birth, constituted the final sample. For Aim 2, a prospective design was used, which included four stages. During the first trimester of pregnancy, pregnancy worries, extroversion and neuroticism, external locus of control and psychiatric symptoms were assessed. In the third trimester of pregnancy, psychiatric symptoms were assessed again. Immediately after childbirth, the initiation of exclusive breastfeeding was recorded, and four months after childbirth, both postpartum depression scores and the continuation of breastfeeding were assessed. Likewise, different sociodemographic and obstetric variables were assessed, including age, type of delivery, pain during and after delivery, among others. **Results**: In relation to Aim 1, no statistically significant associations were found between postpartum depression and the continuation of breastfeeding four months after childbirth. In relation to Aim 2, the presence of postpartum depression among the women who continued to breastfeed was associated to higher scores on neuroticism, pregnancy worries, external locus of control and anxiety and depression during both trimesters, as well as with lower extraversion scores. The results of binary logistic regression showed that, of the above variables, anxiety during the third trimester was the strongest predictor. **Conclusions**: It seems as though it would be necessary to assess psychosocial risks to be able to prevent postpartum depression and therefore improve mothers' wellbeing during breastfeeding.

**Keywords:** postpartum depression; breastfeeding; breastfeeding duration; mental health

## 1. Introduction

In 1991, based on the Innocenti Declaration, the "Baby-Friendly™ Hospital Initiative" (BFI) was launched by The United Nations Children's Fund (UNICEF) and the World Health Organization (WHO). The purpose of this was to help hospitals, health services and, in particular, mothers, to adopt initiatives to protect, promote and support breastfeeding from birth.

On average, in the countries that make up the Organization for Economic Cooperation and Development (OECD), maternal lactation is initiated in approximately 70% of cases, but less than half of these children will continue to be breastfed after three months, and only about 15% of children continue to be breastfed until six months [1]. Through different interventions studies carried out to improve the continuation of breastfeeding, the need to intervene on modificable risk factors that influence both the initiation and the continuation of breastfeeding has been corroborated [2].

In the last decades, different studies have aimed to explore the role of postpartum depression as a possible risk factor in the duration of breastfeeding [3–5]. Postpartum depression is considered a mood disorder that affects between 11%–12% of all women in the 4–6 weeks postpartum, peaking at around six months and can last until the end of the first postpartum year [6]. Mothers suffering from postpartum depression experience feelings of extreme sadness, anxiety and tiredness that get in the way of their daily activities in relation to caring for others and of their own self-care [7]. There is a hypothesis regarding depressed mothers that they considers them to be less confident in their ability to breastfeed in comparison to others who don't have depressive symptoms and that this makes them less willing to continue to do so [8].

Nevertheless, it is true that, currently, there is no consensus in relation to the association between breastfeeding and postpartum depression. In spite of some studies showing that there is a clear association between the duration of breastfeeding and the presence of postpartum depression [9–14], not all authors have found significant associations between these two factors [15–17]. Also, to the best of our knowledge, there are no studies that have analyzed the psychosocial profile of the mothers that, in spite of having postpartum depression, continue to breastfeed. In this sense, it seems that there are common risk factors that predict the onset of postpartum depression and the duration of breast-

feeding. The presence of depressive and/or anxious symptoms during pregnancy [18,19], high levels of neuroticism [20,21] or high levels of worry [22,23], have been associated with a higher prevalence of postpartum depression and a shorter duration of exclusive breastfeeding. However, previous literature also indicates that personality traits such as extraversion [21,24] or having an internal locus of control [25,26] decrease the risk of developing postpartum depression and increase the probability of continuing with exclusive breastfeeding for longer. Because of this, two main aims are established in this study: (Aim 1) determine if there is an association between the maintenance of exclusive breastfeeding for four months and postpartum depression and (Aim 2) to explore the psychosocial risk factors (also taking into account the role of sociodemographic and obstetric variables) for postpartum depression among the women who continue to breastfeed four months after childbirth.

## 2. Materials and Methods

### *2.1 Procedure and Sample*

This study is part of a larger project that aims to analyze the evolution of maternal psychosocial variables during pregnancy, childbirth and the puerperium. In this large study, the sample (n = 285) was recruited in the first trimester of pregnancy during the first appointment at the obstetric clinic, coinciding with the first ultrasound. The inclusion criteria were: women over 18 years of age, mentally and physically healthy, which includes absence of diagnosis of depression or any other psychiatric disorder, a maximum gestational age of 14 weeks and without a diagnosis of maternal or fetal diseases. As an additional inclusion criterion, *in vitro* fertilization-embryo transfer (IVF-ET) pregnancies were ruled out, with all pregnancies resulting from natural causes. Once the women were enrolled in the project, they were given a battery of paper questionnaires (see Data Collection section) at the first trimester consultations, during the trimester, and during admission in the immediate postpartum period. The questionnaires corresponding to the third trimester of pregnancy and to four months after delivery were sent by email. Participants were asked to return the completed questionnaires within one week via email or directly to the researcher.

Within this larger project, the study that we present here, with the two proposed aims, includes women who began exclusively breastfeeding within the first hour postpartum (n = 160, Aim 1). To accomplish this, the midwife who cared for the mothers at the hospital, and who was also part of the research team, observed the mothers to determine if they had started breastfeeding within the first hour after delivery. Four months later, these women were assessed as to whether they continued to exclusively breastfeed and their postpartum depression was also assessed to answer Aim 1. For Aim 2, of the women participating in Aim 1, only those who continued breastfeeding 4 months after giving birth were included in the study (n = 81) (see Fig. 1). Within the aforementioned larger project in which the present study is located, sociodemographic, obstetric and psychosocial data were available for this sample of participants (n = 81) taken in the first and third trimester of pregnancy and in the immediate postpartum, which has allowed the achievement of Aim 2. In each of the assessments carried out, it was verified that the sample continued to meet the previously mentioned inclusion criteria established for the larger project. Those pregnant women who did not meet these criteria were excluded from the research.

The study was approved by the ethics committee of Hospital Universitario de Fuenlabrada. All women included in the study were informed that they could stop participating at any time without consequences for their medical quality or for themselves. All participants signed a consent form to declare their voluntary participation in this project.

### *2.2 Data Collection*

#### 2.2.1 First Trimester

*Neutoticism and extraversion.* We base our assessment on the Big Five personality factors model. The Spanish version [27] of NEO Five Factor Inventory (NEO FFI) [28] was used. This scale is composed of the five main factors of personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness.The NEO FFI includes 60 items. Participants rate each item using a five-point Likert response scale. This scale is widely used internationally, having shown good psychometric properties. For this study, it was decided to use the factors of neuroticism and extraversion due to their relevance in the pregnancy process. In this study, Cronbach's alpha for neuroticism was 0.88 and for extraversion 0.82.

*Pregnancy worries*. We used the Spanish version [29] of the Cambridge Worry Scale (CWS) [30]. The CWS includes 16 items. Participants rate each item using a scale from 0 (not a worry) to 5 (major worry). This instrument has demonstrated good psychometric properties [29,30]. The global measure of pregnancy worries has been used for this study. Cronbach's alpha was 0.81 for this study.

*Locus of control* (LOC). The Spanish version [31] of Rotter's Locus of Control Scale [32] we used. This instrument includes 29 items, 6 of which are included as control items. All items, except for the control ones, have one option about expectations of external control and another about internal control expectations. The higher the score the higher the external locus of control. This test has demonstrated good psychometric properties [31,32]. Cronbach's alpha was 0.82 in this study.

#### 2.2.2 First Trimester and Third Trimester

*Anxious and depressive symptomatology*. The validated Spanish version [33] of the Symptom Checklist-90-R (SCL-90-R) [34] was used to assess anxiety and depression

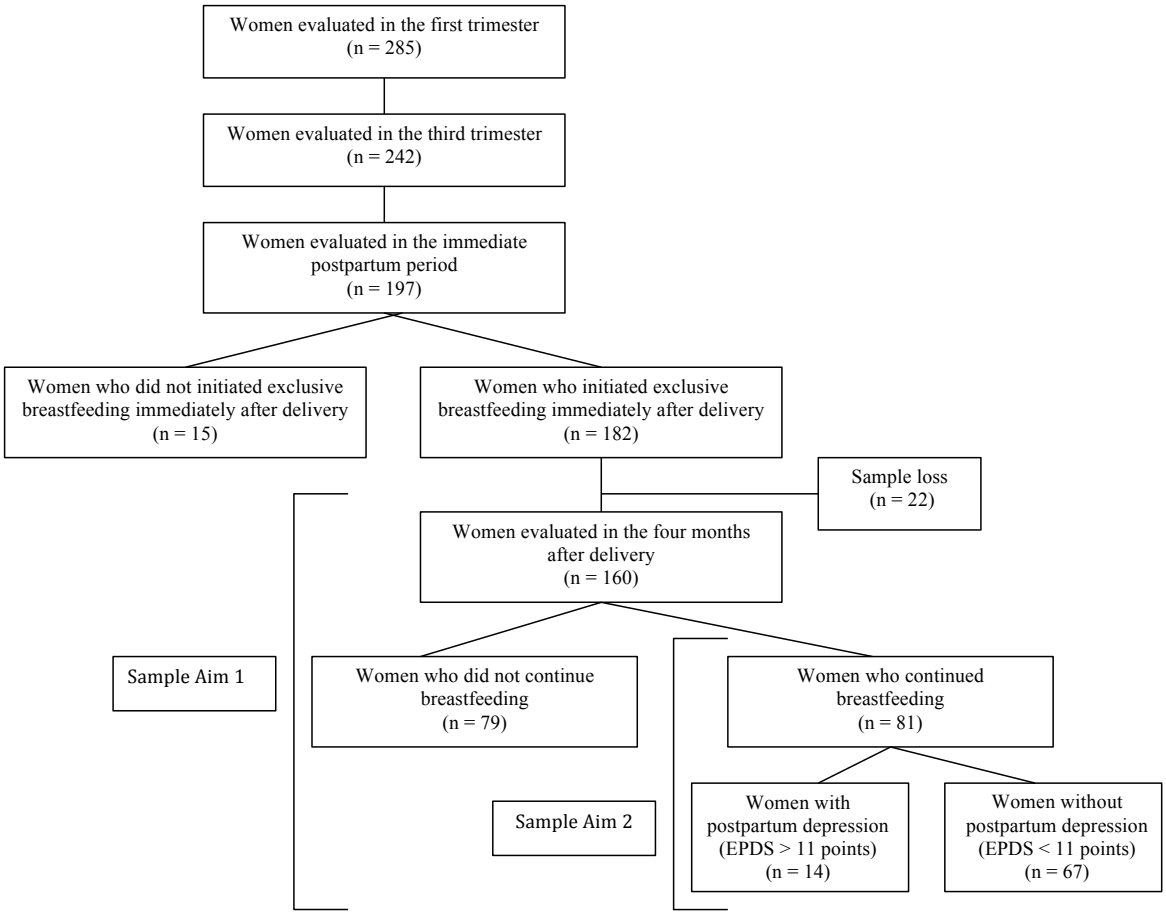


**Fig. 1. Selection of study population.** EPDS, Edinburgh Postnatal Depression Scale.

symptoms (10 and 13 items respectively). The SCL-90-R includes 90 items which allows for the assessment of nine dimensions of psychiatric symptomatology (i.e., somatization, obsessive-compulsiveness, hostility, anxiety, depression…), rated on a 5-point Likert scale. This instrument has been widely used, translated and validated in different languages, showing good psychometric properties [34]. In this study, Cronbach's alpha for depression was 0.87 and for anxiety was 0.81.

2.2.3 After Childbirth (1 Hour).

*Initiation of breastfeeding (yes/no)*. The midwife who worked at the hospital and who, in turn, was part of the research team assessed initiation to breastfeeding using an observational measure.

2.2.4 Four Months after Childbirth

*Post-partum depression*. The Spanish version [35] of the Edinburgh Postnatal Depression Scale (EPDS) [36] was used. Ten multiple-answer items, with four possible alternatives each, compose the scale. The cut-off score for major depression was established at 11, with a sensitivity of 100%, and specificity of 92%, and a positive predictive value (PPV) of 28.8%. For this study both a categorical measure (yes/no) based on the cutoff point at 11 as well as a continuous measure were used [37]. Cronbach's alpha was 0.88 in this study.

*Maintenance of breastfeeding*. Women were asked if they maintained breastfeeding on demand using an ad-hoc item (yes/no).

*Sociodemographic and obstetrical variables*. Through the electronic medical record, the following were evaluated: age, educational level, work activity at the time of the study, previous miscarriages or abortions, previous deliveries, planning of the pregnancy, weeks of gestation at the time of birth, type of delivery, use of epidural, average weight of the newborn at birth, apgar test at one minute, apgar test at five minutes, pain during labor and pain after childbirth. These variables were also considered as possible predictor variables.

*2.3 Statistical Analysis*

The SPSS 21 Statistics Package (IBM Inc., Armonk, NY, USA) was used to perform the analyses. Descriptive analyses and internal consistency analyses (Cronbach's Alpha coefficient) were performed. For Aim 1, chi-square test (categorical variables) were used to analyze the associations between postpartum depression and maintenance of breast-

**Table 1. Association between postpartum depression and continuation of breastfeeding for four months after giving birth.**

| | Women who maintain breastfeeding for four months. | Women who do not breastfeed for four months. | Total |
|---|---|---|---|
| | *n* (%) | *n* (%) | *n* (%) |
| Women with postpartum depression (EPDS score >11) | 14 (17.3) | 18 (22.7) | 32 (20) |
| Women without postpartum depression (EPDS score <11) | 67 (82.7) | 61 (77.2) | 128 (80) |
| Total *n* (%) | 81 (100) | 79 (100) | 160 (100) |

EPDS, Edinburgh Postnatal Depression Scale.

feeding four months after childbirth. For Aim 2, women (all of them maintaining breastfeeding 4 months postpartum) with postpartum depression versus no postpartum depression were compared on socio-demographic, obstetric and psychosocial variables using the Mann–Whitney-U or the chi-square test depending on the nature of the variable. Effect size differences were assessed using Cohen d, with d = 0.2–0.49 being a small effect, d = 0.5–0.79 being a medium effect, and d >0.80 being a large effect size difference. Furthermore, binary logistic regression analyses (enter method) were used to determine independent factors on postpartum depressive status in women who maintained breastfeeding.

## 3. Results

### *3.1 Aim 1: Association between Postpartum Depression and Continuation of Breastfeeding for Four Months after Giving Birth (n = 160)*

*Participants and sociodemographic and obstetric characteristics*. The sample used to address objective 1 is made up of a total of 160 women (see Fig. 1) with a mean age of 31.28 years (Standard deviation (S.D.) = 3.96; range 23–42). Regarding parity, 51.3% were primiparous. The majority of participants (48.3%) had completed secondary education, 23.3% had completed primary education and 28.3% had completed university studies. Twenty-four point two percent of the women had previously suffered at least one spontaneous miscarriage or voluntary interruption of pregnancy. The majority (85%) of the women had planned the pregnancy. More than half of the sample worked outside the home (68.1%). The mean number of weeks in which delivery occurred was 38.33 (S.D. = 2.28). The type of vaginal delivery was predominant in this sample (57.2%) compared to 25.5% of delivery by cesarean sections, and 17.3% instrumental delivery. Most women used an epidural (76.8%). The average of the Apgar test in the first minute was 8.69 (S.D. = 1.10) and at five minutes it was 9.75 (S.D. = 0.68). The mean pain during labor was 6.72 (S.D. = 2.75). The mean pain after childbirth was 3.61 (S.D. = 2.63). The average weight of the neotas was 3.229 grams (S.D. = 454 grams). A total of 50.63% of the women who started to breastfeed immediately post-partum, continued to breastfeed 4 months after childbirth (n = 81).

*Association between postpartum depression and continuation of breastfeeding for four months after giving birth*. To assess the incidence of postpartum depression, a cut-off point of 11 points on the EPDS scale (Edinburgh Postnatal Depression Scale) was used, and it was found that 20% (n = 32) of the women who started to breastfeed immediately post-partum had developed postpartum depression by this time.

No statistically significant differences (see Table 1) were found in post-partum depression (yes/no) between the women who continued to breastfeed four months later and those who did not (chi square: 0.764, $p$ = 0.382). Likewise, when using the postpartum depression variable as a continuous variable, no significant differences were found (t = 0.68, df = 118, $p$ = 0.498) in postpartum depression between women who continued breastfeeding four months later (mean = 5.70, S.D. = 4.29) and those who did not (mean = 6.40, S.D. = 5.44).

### *3.2 Aim 2: Sociodemographic, Obstetric and Psychosocial Risk Factors Associated with Postpartum Depression in Mothers who Continue Breastfeeding 4 Months Postpartum*

*Participants and sociodemographic and obstetric characteristics*. Of the total number of mothers who in the immediately postpartum commenced exclusive breastfeeding, maintaining it until hospital discharge (n = 160), about half (n = 81, 50.63%) continue exclusive breastfeeding four months after delivery. The socio-demographic and obstetric characteristics of these participants were not statistically significantly different from those who participated in the objective 1 study (n = 160). Of the participants who maintained breastfeeding four months after delivery (n = 81), 17.3% (n =14) had postpartum depression (see Table 1). In relation to Aim 2, we will analyze, in mothers who maintain breastfeeding in the fourth month postpartum (n = 81), the differences in sociodemographic, obstetric and psychosocial variables between mothers who exhibit postpartum depression (n = 14, 17.3%) and those who do not (n = 67, 82.7%).

#### 3.2.1 Sociodemographic and Obstetric Risk Factors Associated with Postpartum Depression in Mothers who Continue Breastfeeding 4 Months Postpartum

Table 2 shows the results in relation to sociodemographic and obstetric variables, in women who continue breastfeeding 4 months after childbirth, between those who have postpartum depression and those who do not. The re-

**Table 2. Analysis of sociodemographic and obstetric variables associated with postpartum depression in women that maintaining breastfeeding 4 months after birth.**

| | Postpartum depression | | U de Mann-Whitney or $\chi^2$ | $p$ |
|---|---|---|---|---|
| | No | Yes | | |
| | (n = 67) | (n = 14) | | |
| Age, mean | 28.69 | 27.38 | 183 | 0.833 |
| Educational level, n | | | 3.80 | 0.827 |
| Primary education | 16 | 4 | | |
| Secundary education | 28 | 6 | | |
| University studies | 23 | 4 | | |
| Working at the time of the study | | | 0.007 | 0.624 |
| Yes | 43 | 10 | | |
| No | 24 | 4 | | |
| Previous miscarriages or abortions, n | | | 0.114 | 0.545 |
| Yes | 20 | 4 | | |
| No | 47 | 10 | | |
| Previous deliveries, n | | | 0.890 | 0.279 |
| Yes | 37 | 5 | | |
| No | 30 | 9 | | |
| Planning of the pregnancy, n | | | 2.025 | 0.181 |
| Yes | 51 | 12 | | |
| No | 16 | 2 | | |
| Weeks of gestation at the time of birth, mean | 39.22 | 38.25 | 107 | 0.167 |
| Type of delivery, n | | | 1.826 | 0.873 |
| Vaginal birth | 39 | 6 | | |
| Cesarean birth | 16 | 5 | | |
| Instrumental birth | 12 | 3 | | |
| Use of epidural, n | | | 0.058 | 0.588 |
| Yes | 44 | 9 | | |
| No | 23 | 3 | | |
| Average weight of the newborn at birth, mean | 3.203 | 3.101 | 194.5 | 0.973 |
| Apgar test at one minute, mean | 29.78 | 24.25 | 158 | 0.280 |
| Apgar test at five minutes, mean | 29.08 | 28.50 | 192 | 0.863 |
| Pain during labor, mean | 20.44 | 23.71 | 100 | 0.506 |
| Pain after childbirth, mean | 28.34 | 32.10 | 204 | 0.510 |

sults did not show significant differences between women who suffered from postpartum depression and those who did not in any of the sociodemographic and obstetric variables, including age, educational level, working at the time of the study, previous miscarriages or abortions, previous deliveries, planning of the pregnancy, weeks of gestation at delivery, type of delivery, use of epidural, average birth weight of the newborn, one-minute Apgar test, five-minute Apgar test, pain during childbirth and pain after childbirth (all $p > 0.05$).

### 3.2.2 Psychosocial Risk Factors Associated with Postpartum Depression in Mothers who Continue Breastfeeding 4 Months Postpartum

Table 3 shows the results in relation to psychosocial variables, in women who continue breastfeeding 4 months after childbirth, between those who have postpartum depression and those who do not. The presence or absence of postpartum depression among women who continued to breastfeeding significantly associated with neuroticism, extraversion, pregnancy worries, external locus of control, anxious and depressive symptomatology in both the first and third trimesters of pregnancy (see Table 3). Women with postpartum depression obtained higher scores on all of the above mentioned dimensions except for extraversion.

### 3.2.3 Binary Logistic Regression for Postpartum Depression in Mothers who Continue Breastfeeding 4 Months Postpartum

Table 4 presents the results of the binary logistic regression carried out for the prediction of postpartum depression in women who maintain exclusive breastfeeding 4 months after delivery using as predictors the sociodemographic, obstetric and psychosocial variables statistically significant in the previous bivariate analyses.

**Table 3. Analysis of psychosocial variables associated with postpartum depression in women that maintaining breastfeeding 4 months after birth.**

| | Postpartum depression | | | | |
|---|---|---|---|---|---|
| | No | Yes | U de Mann-Whitney | *p* | Cohen d |
| | Mean (S.D.) | Mean (S.D.) | | | |
| Psychopathological Symptoms (1T) | | | | | |
| Depression | 0.59 (0.46) | 0.87 (0.56) | 105.7 | 0.023 | 0.54 |
| Anxiety | 0.37 (0.35) | 0.99 (0.66) | 97 | 0.002 | 1.17 |
| Personality (1T) | | | | | |
| Neuroticism | 16.62 (6.94) | 25.50 (10.23) | 128.5 | 0.012 | 1.02 |
| Extraversion | 32.77 (5.96) | 26.00 (5.11) | 116 | 0.006 | 1.22 |
| Pregnancy worries (1T) | | | | | |
| Global pregnancy worries | 1.75 (0.74) | 2.36 (0.91) | 158 | 0.049 | 0.76 |
| External locus of control (1T) | 12.48 (2.94) | 14.56 (2.65) | 125 | 0.040 | 0.74 |
| Psychopathological symptoms (3T) | | | | | |
| Depression | 0.64 (0.39) | 1.22 (0.77) | 73.5 | 0.010 | 0.95 |
| Anxiety | 0.40 (0.29) | 1.25 (0.77) | 50 | 0.003 | 1.46 |

S.D., standard deviation.

**Table 4. The first step and final model in the binary logistic regression predicting postpartum depression among women who breastfeed four months postpartum.**

| | B | *p* | Exp (B) | 95% CI Exp (B) |
|---|---|---|---|---|
| First model-all variables | | | | |
| Neuroticism (First trimester) | 0.110 | 0.189 | 2.301 | 0.327–16.202 |
| Extraversion (First trimester) | –0.046 | 0.449 | 0.955 | 0.847–1.076 |
| Anxiety (First trimester) | 1.935 | 0.057 | 8.942 | 2.27–34.521 |
| Depression (First trimester) | –1.100 | 0.394 | 0.333 | 0.027–4.174 |
| External locus of control (First trimester) | 0.063 | 0.605 | 1.065 | 0.838–1.355 |
| Pregnancy worries (First trimester) | 0.592 | 0.255 | 1.808 | 0.652–5.014 |
| Anxiety (Third trimester) | 1.212 | 0.168 | 3.361 | 0.601–18.803 |
| Depression (Third trimester) | –0.964 | 0.381 | 0.381 | 0.044–3.297 |
| Final model-selected variables | | | | |
| Anxiety (First trimester) | 2.270 | 0.001 | 9.679 | 2.57–36.424 |

As given in Table 4, the binary logistic regression suggested a final model with one predictor, namely, anxiety at first trimester (B = 2.270, $p = 0.001$). The explained variance of this final model ranged from 23% (Cox and Snell $R^2$) and 36.1% (Nagelkerke $R^2$). The initial model with all the predictors only explained an additional 1.8% of variance compared to this final one-factor model. The percentage of correct cases explained in the last model (with anxiety in the first trimester as a predictorrs) was 82.4%, while in the initial model with all variables, it was 80.7%. The results, therefore, indicate a good level of prediction using only first trimester anxiety as a predictor.

## 4. Discussion

Consistent with Aim 1, the results of this study show that postpartum depression is not significantly associated with continuated breastfeeding four months after childbirth. Previous literature suggests that the association between postpartum depression and breastfeeding depends on time variables. Specificacally, a significant association is observed when the evaluation is performed before three months postpartum [11,12,38] or after six months postpartum [4,14]. Howevwer, and in accordance with our own results, when the measures are taken between 3–6 months, studies don't show statistically significant associations between these variables [15,17]. Longitudinal studies including different measures of breastfeeding maintenance (after childbirth, 3 months, 6 months, 12 months and 24 months postpartum) shows that long-term exclusive breastfeeding (six months or more) is associated with decreased rates of postpartum depression. This time dependence shows that the relationship between breastfeeding and depression is complex and bidirectional; early breastfeeding predicts fewer cases of depressive symptoms and early depressive symptoms predict less breastfeeding [4].

Unlike previous studies that independently analyze psychosocial risk factors for postpartum depression or cessation of breastfeeding, the present study provides a differ-

ential profile between lactating women with and without postpartum depression four months after delivery (Aim 2). Our results show that presenting anxious symptoms in the first trimester of pregnancy is the best predictor of the presence of postpartum depression in this population. This finding is especially interesting since the effect of prenatal anxiety has been less thoroughly investigated than the impact of prenatal depression [39]. Anxiety, in addition to being considered an unpleasant emotional state, is a response that encompasses cognitive aspects (apprehension and tension), mototes (poorly adaptive behaviors) and physiological aspects (high level of the autonomic nervous system) [40]. This emotional response can be elicited by internal stimuli such as expectations, self-efficacy, attributions or beliefs, among others, which could imply the appearance of postpartum depression and that the difficulties of breastfeeding may have nullified the positive effects of initiating breastfeeding. In this sense, recent studies have already reported on the negative effects of anxiety on mother-child interactions, feeding practices or child temperament [41–43].

The most frequent causes of the appearance of postpartum depression mentioned by previous literature have been: previous symptoms [44,45], life events [44], insufficient social support [44,46], unhappy relationships [47] or unwanted pregnancies [48]. Of these, perinatal depression has been pointed out as the most influential factor in the development of postpartum depression [44,49], as well as early abandonment of exclusive breastfeeding [3,50]. In relation to the latter, Hahn-Holbrook *et al*. [4] suggest that having developed depressive symptoms during pregnancy may complicate initiation of exclusive breastfeeding and decrease the likelihood of longer breastfeeding. However, the differences in which are the main predictors of postpartum depression may be due to the characteristics of the selected sample. None of the previous research distinguishes between pregnant women who breastfeed and who do not breastfeed. For all of the above, it would be advisable to apply preventive interventions in women who present anxious and/or depressive symptoms during pregnancy, paying special attention to anxious symptoms in the first trimester of pregnancy.

Bivariate analyses, in turn, reveal the influence of other risk variables for postpartum depression in lactating women, such as prenatal depressive symptoms, pregnancy concerns, external locus of control, high neuroticism, and low extraversion. Although some of these variables, specifically history of prior depression, worry, and neuroticism, have been shown to influence postpartum depression [46,51], their role in postpartum depression in women who continue to breastfeed has been unknown to our knowledge. These results are especially relevant since they allow early and differential detection in the first trimester of pregnancy of women who could develop postpartum depression despite continuing to breastfeed. In this sense, and in accordance with previous research, the lack of continuation of breastfeeding after four months should not be considered as an indicator of the presence of postpartum depression [14].

The current study has a number of limitations that should be borne in mind. The sample was made up by pregnant women who belong to the Community of Madrid, which makes the generalizability of results more difficult. Although public health is the main health service in the Spanish population, this sample only includes women treated in a public health center, which may also limit generalization. The participation in the study was voluntary, which can mean there is a sampling bias. However, the sociodemographic, obstetric and clinical data of the participants are very similar to those observed in other studies [52,53].

## 5. Conclusions

The results here presented shine a light on the complex associations between postpartum depression and exclusive breastfeeding. It would be of great interest to carry out longitudinal studies that would allow us to determine the direction of this association or the possible two-way interactions that may be occurring. The current study allow us to conclude that continuing with exclusive breastfeeding four months after giving birth does not imply that there is no postpartum depression (Aim 1). For this reason, it is important to attend to both factors. Furtheremore,it is especially relevant to pay attention to anxiety levels in the first trimester of pregnancy to prevent postpartum depression in mothers who continue to breastfeed (Aim 2).

## Availability of Data and Materials

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

## Author Contributions

PC and CP have contributed to the research concept and design; CP, CE, and LG contributed to the design of this study; CP, CE, and LG collected data; PC and CP contributed to data analysis; PC helped interpret data; PC has drafted the manuscript and prepared the final version of the manuscript. All authors read and critically reviewed the manuscript to identify important intellectual content, and then approved the final version of the manuscript for publication.

## Ethics Approval and Consent to Participate

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of Hospital Universitario de Fuenlabrada (date of approval 02/01/2012).

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## Conflict of Interest

The authors declare no conflict of interest.

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