



Review

Breastfeeding and depression: A systematic review of the literature



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ABSTRACT

Background: Research has separately indicated associations between pregnancy depression and breastfeeding, breastfeeding and postpartum depression, and pregnancy and postpartum depression. This paper aimed to provide a systematic literature review on breastfeeding and depression, considering both pregnancy and postpartum depression.

Methods: An electronic search in three databases was performed using the keywords: “breast feeding”, “bottle feeding”, “depression”, “pregnancy”, and “postpartum”. Two investigators independently evaluated the titles and abstracts in a first stage and the full-text in a second stage review. Papers not addressing the association among breastfeeding and pregnancy or postpartum depression, non-original research and research focused on the effect of anti-depressants were excluded. 48 studies were selected and included. Data were independently extracted.

Results: Pregnancy depression predicts a shorter breastfeeding duration, but not breastfeeding intention or initiation. Breastfeeding duration is associated with postpartum depression in almost all studies. Postpartum depression predicts and is predicted by breastfeeding cessation in several studies. Pregnancy and postpartum depression are associated with shorter breastfeeding duration. Breastfeeding may mediate the association between pregnancy and postpartum depression. Pregnancy depression predicts shorter breastfeeding duration and that may increase depressive symptoms during postpartum.

Limitations: The selected keywords may have led to the exclusion of relevant references.

Conclusions: Although strong empirical evidence regarding the associations among breastfeeding and pregnancy or postpartum depression was separately provided, further research, such as prospective studies, is needed to clarify the association among these three variables. Help for depressed pregnant women should be delivered to enhance both breastfeeding and postpartum psychological adjustment.

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Contents

1. Introduction	143
2. Methods	143
2.1. Data sources and search methodology (identification)	143
2.2. Study selection (screening)	143
2.3. Data extraction (eligibility and inclusion)	143

Abbreviations: AAS, Adult Attachment Scale; AKUADS, Aga Khan University Anxiety and Depression Scale; BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; BDI-II, Beck Depression Inventory-Second Edition; BSES, Breastfeeding Self-Efficacy Scale; BSES-SF, Breastfeeding Self-Efficacy Scale-Short Form; BSSS, Berlin Social Support Scales; CERQ, Cognitive Emotion Regulation Questionnaire; CES-D, Center for Epidemiologic Studies Depression Scale; CGI, Clinical Global Impressions Scale; DIS, Diagnostic Interview Schedule; EMQ/EFQ, Experience of Motherhood/Fatherhood Questionnaire; EPDS, Edinburgh Postpartum Depression Scale; GAMS, General Adjustment and Morale Scale; GASD, Goldberg Scales of Anxiety and Depression; HADS, Hospital Anxiety and Depression Scale; HDRS, Hamilton Depression Rating Scale; HRS, Health Responses Scale; IDS, Inventory of Depressive Symptomatology; IFQ, Infant Feeding Questionnaire; LIFE, Longitudinal Interval Follow-Up Evaluation; MABS, Mother and Baby Scale; MINI, Mini International Neuropsychiatric Interview; MOS, Medical Outcomes Study; MSPSS, Multidimensional Scale of Perceived Social Support; QLDS, Quality of Life in Depression Scale; PDSS, Postpartum Depression Screening Scale; PSE, Present State Examination; PSI/SF, Parenting Stress Index, Short Form; PSS, Perceived Stress Scale; RSES, Rosenberg Self Esteem Scale; SAS, Zung Self-Rating Anxiety Scale; SCID, Structured Clinical Interview for DSM-IV; SCL – 8, Hopkins Symptom Checklist; SDS, Zung Self-Rating Depression Scale; SES, Socio-Economic Status Scale; SLC – 8, Hopkins Symptom Checklist; SLEI, Stressful Life Events Inventory; SQA, Symptom Questionnaire Anxiety; SQD, Symptom Questionnaire Depression; SPI, Standardized Psychiatric Interview; SSI, Social Support Index; SSS, Social Support Survey; STAI, State-Trait Anxiety Inventory

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2.3.1.	Eligibility	143
2.3.2.	Inclusion	144
2.3.3.	Data analysis	144
3.	Results	144
3.1.	Study characteristics	144
3.2.	Does pregnancy depression predict the rates of breastfeeding?	145
3.3.	Is breastfeeding associated with postpartum depression?	145
3.4.	Does breastfeeding predict postpartum depression? or Does postpartum depression predict breastfeeding?	147
3.5.	Does pregnancy or postpartum depression predict breastfeeding and does breastfeeding predict postpartum depression?	149
4.	Discussion	151
	Role of funding source	153
	Conflict of interest	153
	Acknowledgments	153
	References	153

1. Introduction

Breastfeeding offers a wide range of benefits for both the child and the mother. The benefits for the infant include a diminished risk of infectious diseases and obesity and decreased blood pressure (Brion et al., 2011; Duijts et al., 2010; Horta et al., 2007). For the mother, breastfeeding confers a lower risk of ovarian and breast cancers and decreased blood pressure (Ebina and Kashiwakura, 2012; González-Jiménez et al., 2013; Jonas et al., 2008). Recognized as the optimal infant feeding method, the guidelines specified by the World Health Organization (WHO), the European Commission for Public Health (ECPH) and the American Academy of Pediatrics (AAP) recommend exclusive breastfeeding in the first 6 months postpartum (American Academy of Pediatrics, 2012; EU Project on Promotion of Breastfeeding in Europe, 2008; World Health Organization, 2007).

Although large variability across, most countries do not reach desirable rates of exclusive breastfeeding initiation and exclusive breastfeeding for 6 months (Cattaneo et al., 2005). Several studies have aimed to predict women at risk of no breastfeeding initiation or having an early cessation, given that this recommendation is not followed by most mothers (e.g., Bartick and Reinhold, 2010; Chalmers et al., 2009; Lee et al., 2013).

Pregnancy depression and postpartum depression appear to be possible significant contributors to this issue (Figueiredo et al., 2014; Hahn-Holbrook et al., 2013; Seimyr et al., 2004). It is widely known that pregnancy and postpartum depression have high incidence and that depressed women at pregnancy are usually depressed at the postpartum period (e.g., Figueiredo et al., 2007; Milgrom et al., 2008). Additionally, pregnancy and postpartum depression adverse effects have been consistently pointed out not only in breastfeeding, but also in mothers' behavior, health and psychological adjustment (e.g., Groer and Morgan, 2007), in infants' behavior and development (e.g., Figueiredo et al., 2010), and in the mother–infant interaction (e.g., Murray and Cooper, 1997).

To our knowledge, there are no published systematic reviews addressing the association among breastfeeding and pregnancy and postpartum depression. Given that pregnancy depression is the best predictor of postpartum depression (Figueiredo et al., 2007; Milgrom et al., 2008; Yonkers et al., 2001), it is important to simultaneously consider both pregnancy and postpartum depression in relation to breastfeeding in a review addressing the associations between these variables. This paper aimed to provide a systematic review of the literature on the association among breastfeeding and pregnancy and postpartum depression. Due to the associative nature of the majority of the published studies, it was not possible to perform a meta-analysis.

2. Methods

A total of 1673 relevant references were identified in an electronic search of three databases: MEDLINE, Web of Knowledge and PsycINFO. Duplicated references were removed and 771 articles remained. The titles and abstracts of the identified references were screened, and 707 non-relevant references were excluded. The full-text of the 65 remaining studies was then screened, and 17 studies met one or more exclusion criteria. At the final stage, 48 studies were included in the review. A flow diagram of the search selection for the included studies is presented in Fig. 1, and the procedures are described below.

2.1. Data sources and search methodology (identification)

An electronic search for empirical articles in MEDLINE, Web of Knowledge and PsycINFO from 1980 to December 2013 was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Moher et al., 2009). The search used the following keywords related to the review subject combined with standard MeSH terms: “breast feeding”, “bottle feeding”, “depression”, “pregnancy”, and “postpartum”. The electronic search was independently performed by the first author (C.C.D.) and then replicated by the coauthor (B.F.).

2.2. Study selection (screening)

For the purpose of this review, only empirical studies that assessed the association among breastfeeding and pregnancy and/or postpartum depression were included. Different aspects of breastfeeding were considered—the intention, initiation, duration, confidence, self-efficacy, exclusivity or attitudes, as well as the different measures for pregnancy depression and postpartum depression. Studies were included regardless of the study design, the sample size or the measurement type. Only primary research was considered. Studies that met the following criteria were excluded: a) non-original research (review articles and meta-analysis) and b) studies focused on the effects of antidepressants on breastfeeding.

The included studies were assessed for quality based on the following criteria: 1) participants should be clearly defined as pre- or postpartum women; and 2) studies should identify the outcome measurements.

2.3. Data extraction (eligibility and inclusion)

2.3.1. Eligibility

In the first stage, the two authors (C.C.D. and B.F.) independently evaluated the titles and abstracts of all identified articles ($n=771$) in order to assess potentially relevant references.

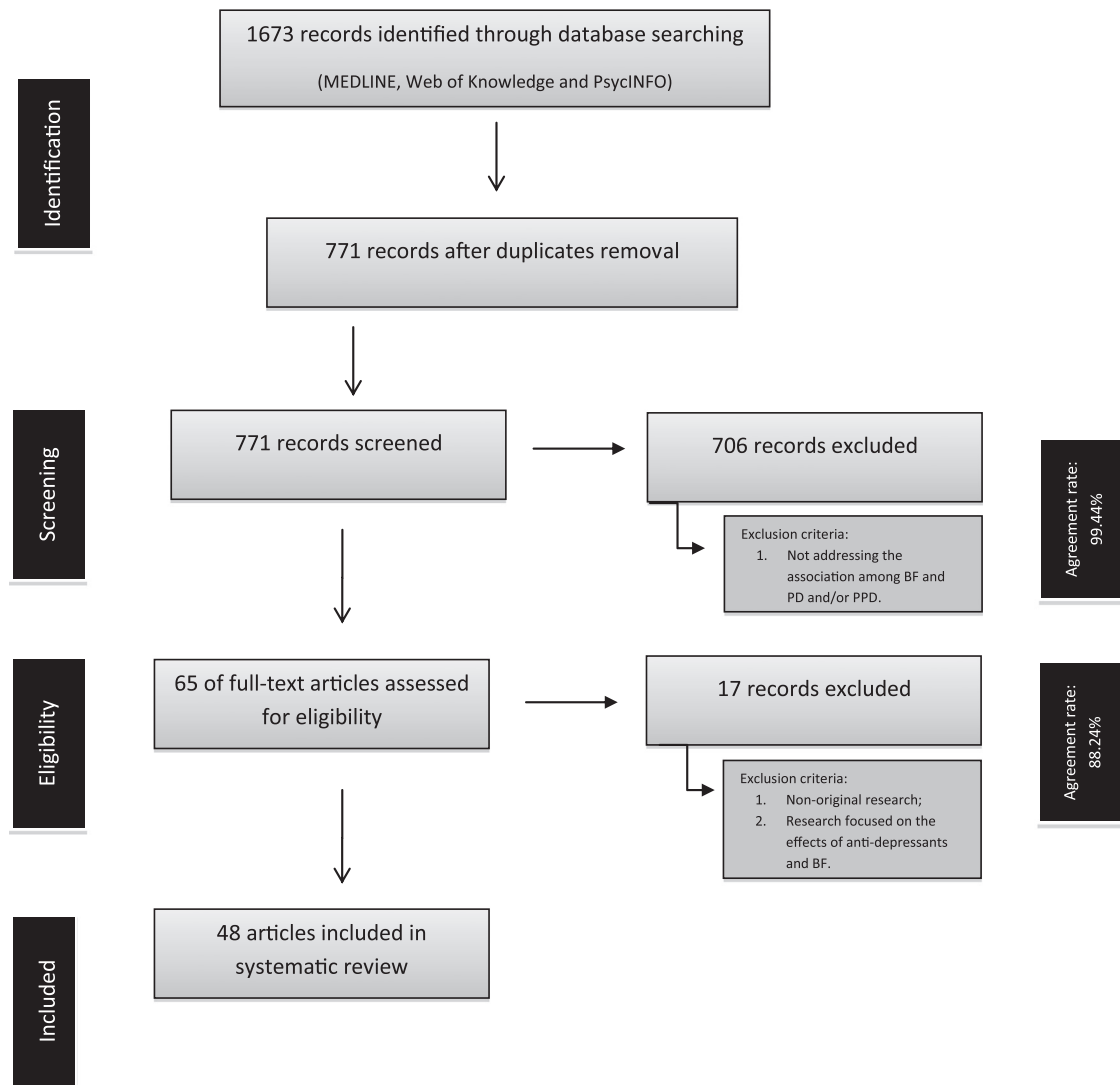


Fig. 1. Search strategy flow diagram.

Abstracts that did not address the association among breastfeeding and pregnancy depression and/or postpartum depression were automatically excluded at this stage ($n=706$). The agreement rate between the two investigators at the first stage was 99.44%.

In the second stage, the articles with abstracts that appeared relevant were selected for full-text evaluations ($n=65$). Study selection was independently determined by the two authors based on the inclusion and exclusion criteria: non-original studies and studies focusing on the effects of antidepressants on breastfeeding were excluded ($n=17$). The agreement rate between the two investigators was 88.24%.

2.3.2. Inclusion

The two authors independently extracted data from the selected studies ($n=48$) and fulfilled a standardized data extraction sheet. For each article, the extracted data included information about the authors, the publication year, the study's aim, the sample size and country, the measures and procedures, and the results.

The selected papers were organized according to the study aims and design. In these aspects, four main differences were found: prospective studies that analyzed if pregnancy depression predicts breastfeeding; associative studies analyzing the association between breastfeeding and postpartum depression; prospective studies on the prediction of breastfeeding and postpartum depression; and prospective studies taking into account both pregnancy and

postpartum depression on the prediction of breastfeeding. Studies were then organized according to these four items: 1. *Does pregnancy depression predict the rates of breastfeeding?* 2. *Is breastfeeding associated with postpartum depression?* 3. *Does breastfeeding predict postpartum depression?* 4. *Does pregnancy or postpartum depression predict breastfeeding and does breastfeeding predict postpartum depression?* Studies were organized alphabetically by the first author.

At this stage, the agreement rate between the two investigators was 80.85%. In all stages, in the case of a disagreement, a consensus was reached after discussion.

2.3.3. Data analysis

Quantitative results of each study regarding the association among breastfeeding and pregnancy and postpartum depression were retrieved. Both investigators performed registration of data.

3. Results

3.1. Study characteristics

The included studies were published between 1983 and 2013 in 19 different countries and evaluated a total of 71,245 participants.

Table 1
Does pregnancy depression predict rates of breastfeeding (intention/initiation/duration)?

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Fairlie et al. (2009)	Impact of pregnancy depression (PD) and high pregnancy-related anxiety on: 1) Prenatal intention to breastfeed 2) Breastfeeding (BF) initiation	1436 pregnant women (USA)	Measures: brief interview; questionnaire on pregnancy-related anxiety; questionnaire on history of depression; questions about subject's intention to breastfeed; EPDS (≥ 13); information on BF initiation (postdelivery); BF assessed by self-report measures and defined as a dichotomous variable Time-points: 1st clinical prenatal appointment (usually in the 1st trimester gestation); 26–28 weeks gestation; post-delivery	PD (EPDS ≥ 13 at 2nd trimester gestation) associated with \downarrow BF intention PD (EPDS ≥ 13 at 2nd trimester gestation) did not predict BF initiation	Population with a BF initiation rate higher than the national
Insaf et al. (2011)	Association between prenatal psychosocial risk factors and BF intention	424 pregnant Hispanic women (USA)	Measures: PSS; STAI; EPDS (≥ 13); socio-demographic, behavioral and acculturation information; BF intention assessed by medical records and defined as a dichotomous variable Time-points: 13.6 weeks and 25.7 weeks gestation	PD (EPDS ≥ 13 at 25.7 weeks) associated with \downarrow BF intention	
Pippins et al. (2006)	PD as a potential risk factor for not initiating or continuing BF	1448 pregnant women (USA)	Measures: CES-D (>10); PSS; survey and medical record data; BF assessed by self-report measures and defined as a dichotomous variable Time-points: 15.6, 26.1, and 34 weeks gestation and 66.6 days postpartum	PD (CES-D >10) did not predict BF initiation PD (CES-D >10) at 2 time points (but not at 1 time-point only) associated with \downarrow BF duration (<1 month)	Early assessment of BF duration

The majority of the studies were conducted in the United States ($n=15$) and in the United Kingdom ($n=6$). The remaining studies were published in Australia ($n=3$), Brazil ($n=3$), Canada ($n=3$), Barbados ($n=2$), Norway ($n=2$), Pakistan ($n=2$), Turkey ($n=2$), China ($n=1$), Congo ($n=1$), Finland ($n=1$), Iceland ($n=1$), Italy ($n=1$), Japan ($n=1$), Mexico ($n=1$), Portugal ($n=1$), Sweden ($n=1$), and the United Arab Emirates ($n=1$).

Breastfeeding was assessed by self-report measures in 47 studies and by a medical records consultation in one study. Breastfeeding status was defined according to different criteria: Labbok and Krasovec criteria ($n=5$); WHO recommendations ($n=1$); as a dichotomous variable ($n=10$); as a 3 or 4 group variable ($n=5$); with the inclusion of solids ($n=2$); exclusive breastfeeding status ($n=7$); and not specified ($n=13$). Breastfeeding duration was assessed at different postpartum time-points: before the 6-month public recommendations ($n=26$), and at 6 months ($n=12$).

Thirty-nine studies assessed depression only through questionnaires, and nine studies used a clinical interview diagnosis for depression. Three studies assessed depression only during pregnancy, 35 studies measured it only at the postpartum period and nine studies assessed depression both during pregnancy and at the postpartum period. Pregnancy depressive symptoms were assessed during the three pregnancy trimesters ($n=2$), during the 2nd and 3rd pregnancy trimesters ($n=2$), during the 2nd trimester ($n=4$) or during the 3rd trimester ($n=3$). Postpartum depressive symptoms were screened before the second month after childbirth ($n=15$) and after the second month ($n=27$).

3.2. Does pregnancy depression predict the rates of breastfeeding?

Three studies (see Table 1) were published on the prediction of breastfeeding by pregnancy depression without taking into account postpartum depression (Fairlie et al., 2009; Insaf et al., 2011; Pippins et al., 2006). Two studies highlighted breastfeeding intention and concluded that depression during pregnancy predicts shorter breastfeeding intention (Fairlie et al., 2009; Insaf et al., 2011). No association was found between pregnancy depression and breastfeeding initiation (Fairlie et al., 2009; Pippins et al., 2006). One study indicated that pregnancy depression predicts a

shorter breastfeeding duration (Pippins et al., 2006) when depression occurred in more than one time point over pregnancy.

These studies showed that the association between pregnancy depression and breastfeeding intention and initiation is unclear, although pointed an association between pregnancy depression and a shorter breastfeeding duration.

3.3. Is breastfeeding associated with postpartum depression?

Eighteen studies (see Table 2) were found on the association among breastfeeding and postpartum depression that measured these variables at the same time-point (Astbury et al., 1994; Bick et al., 1998; Cooper et al., 1993; Dunn et al., 2006; Imbula et al., 2012; Feldens et al., 2011; Flores-Quijano et al., 2008; Hannah et al., 1992; Hatton et al., 2005; McCoy et al., 2006; McLearn et al., 2006; Misri et al., 1997; Papinczak and Turner, 2000; Taj and Sikander, 2003; Tamminen, 1988; Thome et al., 2006; Yonkers et al., 2001; Zubarán and Foresti, 2013).

A shorter breastfeeding duration was associated with higher rates of depressive symptoms and postpartum depression (Astbury et al., 1994; Bick et al., 1998; Cooper et al., 1993; Dunn et al., 2006; Imbula et al., 2012; Feldens et al., 2011; Flores-Quijano et al., 2008; Hannah et al., 1992; Hatton et al., 2005; McCoy et al., 2006; McLearn et al., 2006; Papinczak and Turner, 2000; Taj and Sikander, 2003; Thome et al., 2006; Yonkers et al., 2001; Zubarán and Foresti, 2013). Four studies referred specifically to the exclusive breastfeeding duration (Imbula et al., 2012; Flores-Quijano et al., 2008; Thome et al., 2006; Zubarán and Foresti, 2013) and concluded that postpartum depression and depressive symptomatology during the postpartum period were associated with early exclusive breastfeeding cessation. Three articles also concluded that the depressive symptoms were reported before the interruption of breastfeeding in the majority of the studied sample (Cooper et al., 1993; Misri et al., 1997; Taj and Sikander, 2003). Negative breastfeeding attitudes (Tamminen, 1988), breastfeeding difficulties (Tamminen, 1988), and a lower breastfeeding confidence (Flores-Quijano et al., 2008) have also been associated with more depressive symptoms and a higher incidence of postpartum depression.

These studies showed an unequivocal association between breastfeeding and postpartum depression.

Table 2
Is breastfeeding associated with postpartum depression?

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Astbury et al. (1994)	Contribution of birth events, satisfaction with care and social differences to depression after birth	790 postpartum women (Australia)	Measures: EPDS (≥ 13); BF status not specified Time-points: 8–9 months postpartum	↓BF duration (8–9 months) associated with postpartum depression (PPD) (EPDS ≥ 13 at 8–9 months postpartum)	BF status not specified
Bick et al. (1998)	Obstetric, maternal and social factors associated with the uptake and early cessation of BF and women's reasons for altering from BF to BoF	906 postpartum women (UK)	Measures: EPDS (≥ 12); BF status assessed by home-based interview and defined as a dichotomous variable Time-points: a mean of 11 months postpartum	↓BF duration (< 3 months) associated with PPD (EPDS ≥ 12 in the first three months)	Early assessment of BF duration
Cooper et al. (1993)	Association between psychosocial factors and early termination of BF	483 postpartum women from 2 cohorts: Cambridge and Oxford (UK)	Measures: EPDS; PSE; SPI; BF status not specified Time-points: 8 weeks postpartum	↓BF duration (8 weeks postpartum) associated with PPD (8 weeks postpartum) PPD preceded the cessation of BF in a great majority of women	Early assessment of BF duration BF status not specified
Dunn et al. (2006)	Vulnerability factors associated with BF outcome at 6 weeks postpartum after controlling for age and education	526 breastfeeding women (Canada)	Measures: telephone survey; EPDS (>11); BF status defined as 3 groups: exclusive BF, BF, and BoF Time-point: 6 weeks postpartum	↓BF duration (6 weeks postpartum) associated with PPD (EPDS ≥ 11 at 6 weeks postpartum)	Early assessment of BF duration Early assessment of PPD
Imbula et al. (2012)	Frequency, risk factors and clinical forms of PPD	120 postpartum women (Congo)	Measures: EPDS; SCID; GASD; exclusive BF assessed by self-report measures Time-points: 1–10 months postpartum	↓Exclusive BF duration (less than 6 months) associated with PPD (DSM IV criteria) (1–10 months postpartum)	
Feldens et al. (2011)	Risk factors for discontinuing BF	360 postpartum women (Brazil)	Measures: socio-demographic and BF interviews; BDI; BF status not specified Time-points: at birth, 6 and 12 months postpartum	↓BF duration (12 months postpartum) associated with moderate (BDI ≥ 20) to severe (BDI ≥ 36) depressive symptoms (12 months postpartum)	BF status not specified
Flores- Quijano et al. (2008)	Association between PPD, a woman's confidence in her ability to sustain lactation, BF exclusiveness, and the sodium-to-potassium (Na:K) ratio in milk	163 postpartum BF women (Mexico)	Measures: EPDS (≥ 13); questionnaire on demographics and infant feeding and hand-expressed breast milk to assess BF exclusivity Time-points: one assessment between 2 and 12 weeks postpartum	↓Exclusive BF duration (2–12 weeks) associated with PPD (EPDS ≥ 13 at 2–12 weeks) ↓BF confidence (2–12 weeks) associated with PPD (EPDS ≥ 13 at 2–12 weeks)	Early assessment of BF duration Early assessment of PPD
Hannah et al. (1992)	Association between early postpartum mood and PPD	217 postpartum women (UK)	Measures: Questionnaire; EPDS (≥ 13); BF status not specified Time-points: 5 days and 6 weeks postpartum	↓BF duration (1 week postpartum) associated with ↑depressive symptoms (1 week postpartum) ↓BF duration (< 6 weeks postpartum) associated with PPD (6 weeks postpartum)	Early assessment of BF duration Early assessment of PPD BF status not specified
Hatton et al. (2005)	Association between depressive symptoms and BF	377 postpartum women (USA)	Measures: EPDS (≥ 14); BF status not specified Time-points: 6 and 12 weeks postpartum	↓BF duration (6 weeks) associated with PPD (EPDS ≥ 14 at 6 weeks) BF duration (< 12 weeks) not associated with PPD (EPDS ≥ 14 at 12 weeks)	BF status not specified
McCoy et al. (2006)	Association between incidence of PPD and age, BF status, tobacco use, marital status, history of depression, and method of delivery	209 postpartum women (USA)	Measures: EPDS (≥ 13), BF status and socio-demographic information; BF status not specified Time-points: 4 weeks postpartum	↓BF duration (4 weeks postpartum) associated with PPD (EPDS ≥ 13 at 4 weeks postpartum)	Early assessment of BF duration Early assessment of PPD BF status not specified
McLearn et al. (2006)	Whether maternal depressive symptoms are associated with mothers' early parenting practices	5565 families (UK)	Measures: Short questionnaire; Interview about the presence of depressive symptoms, early parenting practices and additional demographic characteristics; CES-D (≥ 11); BF status defined in 4 categories from 2 to 4 months:	↓BF duration (2–4 months postpartum) associated with PPD (CES-D ≥ 11 at 2–4 months postpartum)	Early assessment of BF duration

Table 2 (continued)

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Misri et al. (1997)	Association between BF cessation and the onset of PPD	51 postpartum women meeting DSMIV criteria for major depression and who had stopped BF (UK)	"gave cereals"; "gave water", "gave juice"; and "continued to BF" Time-points: 2–4 months postpartum Measures: IFQ; CGI; BF exclusivity assessed by self-report measures Time-points: 7.6 months postpartum and 3 months later	PPD retrospectively reported before the cessation of BF in 83% of the cases <i>Exclusive BF</i> (8 weeks) associated with less distress surrounding BF process <i>Exclusive BF duration</i> not associated with PPD severity ↑ <i>BF duration</i> associated with ↑ <i>BF self-confidence</i> ↓ <i>BF duration</i> associated with PPD	Early assessment of BF duration
Papinczak and Turner (2000)	Association between certain personal and social maternal factors and the length of the breastfeeding experience	159 postpartum women (Australia)	Measures: qualitative and quantitative data; BF status defined as "exclusive" or "partial" Time-points: at hospital discharge, 3 and 6 months postpartum	↓ <i>BF duration</i> (2–12 months postpartum) associated with ↑depressive symptoms (2–12 months postpartum) 36.8% of non BF women reported that their depressive symptoms preceded BF cessation	Not specification of PPD measurement
Taj and Sikander (2003)	Effects of maternal depression on BF behavior	100 postpartum women (Pakistan)	Measures: HADS; Socio-demographic information; BF status not specified Time-points: one assessment between 2 months and 2 years postpartum	BF <i>difficulties</i> (at the four groups) associated with ↑depressive symptoms Negative BF <i>attitudes</i> (at the four groups) associated with ↑depressive symptoms	BF status not specified
Tamminen (1988)	Impact of mother's depression on her BF and nursing attitudes	90 women – 4 groups: 17 in late-pregnancy, 10 at 1–10 days postpartum; 30 at 2–4 months postpartum, and 33 at 6–12 months postpartum (Finland)	Measures: BDI; BF and childbearing attitude scales. BF status not specified Time-points: at clinical assessment and 1–5 weeks later	↓ <i>Exclusive BF duration</i> (2–3 months postpartum) associated with ↑depressive symptoms (2–3 months postpartum)	BF status not specified
Thome et al. (2006)	Association between depressive symptoms and parenting stress and exclusive BF	734 postpartum women (Iceland)	Measures: EPDS; PSI/SF; self-report questionnaires on infant feeding methods; demographic information; BF status defined in 4 categories: "Exclusive BF"; "Supplemented BF"; "Bottle-feeding"; "Feeding of semi-solids" Time-points: 2–3 months postpartum	↓ <i>BF duration</i> (3 weeks) associated with PPD (EPDS *11 at 3 weeks postpartum)	Early assessment of BF duration
Yonkers et al. (2001)	Risk factors for and rate of PPD in a predominantly African American and Hispanic clinic population compared to Caucasian women	802 postpartum women from 4 inner-city community maternal health clinics (USA)	Measures: Demographic information form; EPDS (*11); IDS; SCID; QLDS; BF status not specified Time-points: 3 weeks, 4 weeks and 4–5 weeks postpartum	↓ <i>Exclusive BF duration</i> (2–12 weeks) associated with ↑depressive symptoms (2–12 weeks)	Early assessment of BF duration Early assessment of PPD BF status not specified
Zubaran and Foresti (2013)	Association between BF self-efficacy and PPD	89 postpartum BF women (Brazil)	Measures: BSES-SF; EPDS (≥ 13); PDSS (> 81); SES; exclusive BF assessed by self-report measures Time-points: between 2 and 12 weeks postpartum	↑ <i>Exclusive BF duration</i> (2–12 weeks) associated with associated ↑ <i>BF self-efficacy</i> (2–12 weeks)	Early assessment of BF duration Early assessment of PPD

3.4. Does breastfeeding predict postpartum depression? or Does postpartum depression predict breastfeeding?

Studies on the association between breastfeeding and postpartum depression (see Table 3), which measured depressive symptoms and breastfeeding at different time-points (Akman et al., 2008; Alder and Cox, 1983; Ali et al., 2009; Annagür et al., 2013; Chaudron et al., 2001; Dennis and McQueen, 2007; Gagliardi et al., 2012; Galler et al., 1999, 2006; Haga et al., 2012; Hasselmann et al., 2008; Henderson et al., 2003; Lau and Chan, 2007; McCarter-Spaulding and Horowitz, 2007; Mezzacappa and Endicott, 2007; Nishioka et al., 2011; Taveras et al., 2003; Watkins et al., 2011), tried

to determine the predictive value of breastfeeding and postpartum depression.

Regarding the predictive value of postpartum depression (assessed before breastfeeding duration assessment), nine studies showed that depressive symptoms or postpartum depression predicted a shorter breastfeeding duration (Akman et al., 2008; Dennis and McQueen, 2007; Gagliardi et al., 2012; Galler et al., 1999; Hasselmann et al., 2008; Henderson et al., 2003; McCarter-Spaulding and Horowitz, 2007; Nishioka et al., 2011; Taveras et al., 2003). Three studies reported specifically on depressive symptoms during the early postpartum period (Dennis and McQueen, 2007; Gagliardi et al., 2012; Hasselmann et al., 2008). One study found that depressive

Table 3
Does breastfeeding predict further rates of postpartum depression? Does postpartum depression predict further patterns of breastfeeding?

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Akman et al. (2008)	1. Psychological adjustment during early postpartum months 2. Effect of maternal depressive symptoms, anxiety levels, availability of social support and maternal attachment on BF discontinuation	60 postpartum women and their infants (Turkey)	Measures: an initial assessment interview; EPDS (at 1 month); STAI; MSPSS; AAS; Exclusive BF assessed by interview Time-points: 1 week, 1 and 4 months postpartum	↓Exclusive BF duration (4 months) associated with ↑depressive symptoms (1 month postpartum)	Early assessment of BF duration Early assessment of PPD
Alder and Cox (1983)	Association between BF and PPD	89 postpartum women who took part on a prospective study of PPD (UK)	Measures: EPDS; Exclusive BF defined as total BF until 12 weeks Time-points: 18 months	Exclusive BF duration (12 weeks) associated with higher incidence of PPD (18 months)	Early assessment of BF duration
Ali et al. (2009)	Impact of postpartum anxiety and depression on child growth and development	420 postpartum women (Pakistan)	Measures: Socio-demographic questionnaire; home environment/family relationship questionnaire; post-natal questionnaire; AKUADS (≥ 19) Time-points: 10 days, 1, 2, 6 and 12 months postpartum	BF difficulties (birth) associated with PPD (AKUADS ≥ 19 at least at one time-point)	
Annagür et al. (2013)	Association between exclusive BF and postpartum depressive symptomatology	197 postpartum women (Turkey)	Measures: EPDS; BF status defined as a dichotomous variable Time-points: 48 h and 6 weeks postpartum	BF duration (6 weeks) not associated with postpartum depressive symptomatology (48 h and 6 weeks)	Early assessment of BF duration Early assessment of PPD
Chaudron et al. (2001)	1. Incidence of PPD 2. Whether somatic complaints, subsyndromal depressive symptoms, or birth-related concerns among non-depressed women at 1 month were predictive of PPD	465 postpartum women (USA)	Measures: DIS; CES-D (≥ 16); HRS; measures specifically designed for this study. BF status not specified Time-points: 1 and 4 months postpartum	Bottle-feeding (BoF)/BF (1 month) not associated with PPD (CES-D ≥ 16 at 1 and 4 months postpartum) BF worries (1 month) associated with PPD (CES-D ≥ 16 at 1 and 4 months postpartum)	Early assessment of BF duration BF status not specified
Dennis and McQueen (2007)	Association between diverse infant feeding outcomes and PPD	594 postpartum women (Canada)	Measures: EPDS (> 12); Infant feeding method, maternal satisfaction, infant feeding plans, BF progress and BF self-efficacy; BF status defined according to Labbok and Krasovec criteria Time-points: 1, 4 and 8 weeks postpartum	BoF/ BF (1 week) not associated with PPD (EPDS > 12 at 1, 4 or 8 weeks) ↓BF duration (< 4 or 8 weeks) associated with PPD (EPDS > 12 at 1 week)	Early assessment of BF duration Early assessment of PPD
Gagliardi et al. (2012)	Ability of the EPDS to predict later BF problems	592 postpartum women (Italy)	Measures: EPDS; BF status defined by WHO Time-points: 2–3 days and 12–14 weeks postpartum	↓Exclusive BF duration (3 months) associated with ↑depressive symptoms (2–3 days postpartum) The odds of BoF increased with EPDS scores, even at low scores	Early assessment of BF duration Early assessment of PPD
Galler et al. (1999)	Psychosocial variables affecting early infant feeding practices in Barbados	93 postpartum women and infants (Barbados)	Measures: SDS; SAS; GAMS; questionnaire to evaluate feeding practices; BF status not specified Time-points: 7 weeks, 3, and 6 months postpartum	BoF/BF (7 weeks, 3, and 6 months postpartum) predicted by PPD (7 weeks) BoF/BF (7 weeks) did not predict PPD (3 and 6 months postpartum) PPD preceded BF cessation	BF status not specified
Galler et al. (2006)	Feeding attitudes at 7 weeks postpartum and concurrent and later feeding practices	226 postpartum women (Barbados)	Measures: Questionnaire addressing feeding practices; SDS; SAS; GAMS; background variables; BF self-report questionnaire; BF status unspecified Time-points: birth, 7 weeks, 3 and 6 months postpartum	Positive BF attitudes (7 weeks) associated with ↓depressive symptoms (7 weeks and 6 months)	BF status not specified
Haga et al. (2012)	Multilevel model variations in symptoms of PPD and use of emotion regulation strategies, social support, and BF self-efficacy	344 postpartum women (Norway)	Measures: EPDS; CERQ; BSES; BSSS Time-points: 5–6 weeks, 3 months and 6 months postpartum	BF self-efficacy (5–6 weeks, 3 and 6 months postpartum) predicted ↓levels of depressive symptoms (5–6 weeks, 3 and 6 months postpartum)	
Hasselmann et al. (2008)	PPD and risk of early interruption of exclusive BF	429 children (Brazil)	Measures: Exclusive BF assessed by interview. EPDS (≥ 12); socio-demographic information	↓Exclusive BF duration (< 1 month and cumulative 2 months) associated with PPD (EPDS ≥ 12 at early postpartum)	Early assessment of BF duration

Table 3 (continued)

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Henderson et al. (2003)	Association between PPD and BF duration	1745 postpartum women (Australia)	Time-points: baseline visit (until 20 days postpartum), 1st month and 2nd month Measures: Self-report questionnaires; EPDS (≥ 12); SCID; BF status defined according to Labbok and Krasovec criteria Time-points: 2, 6, and 12 months after birth	In mothers who exclusively BF, depressive symptoms at 1st month not associated with interruption of exclusive BF in the 2nd month \downarrow BF duration (26–28 weeks for women with depression and 39 weeks for women without depression) associated with PPD (EPDS ≥ 12 at 2 and 6 months) 82% of depressed women stopped BF after onset of PPD; 11% when they became depressed; 7% before	Early assessment of PPD
Lau and Chan (2007)	2 correlates that may influence BF initiation: intimate partner violence during pregnancy and PPD	1220 postpartum women (China)	Measures: EPDS (≥ 9); demographic, socioeconomic and obstetrics data collection; BF status defined by 3 groups: “BF”; “Mixed feeding”; and “Artificial feeding” Time-point: 2–5 days postpartum	BF initiation did not predict PPD (EPDS ≥ 9 at 2–5 days postpartum)	Early assessment of PPD
McCarter-Spaulling and Horowitz (2007)	Patterns of exclusive BF, combination feeding, and exclusive BoF in women identified with PPD	122 postpartum women with elevated PPD symptoms at 2–4 weeks compared to a random sample of women (USA)	Measures: EPDS; BDI-II; demographic and feeding data; exclusive BF Time-points: 4–8, 10–14 and 14–18 weeks postpartum	\downarrow Exclusive BF duration associated with PPD (2–4 weeks)	
Mezzacappa and Endicott (2007)	The association between BF and depressive symptoms among mothers who differ in BF status and parity	465 primiparous and 690 multiparous postpartum woman (USA)	Measures: CES-D (≥ 16); demographic information; BF status defined as a dichotomous variable Time-point: until 1 year postpartum	No BF initiation by multiparas (but not among primiparas) associated with PPD (CES -D ≥ 16 at one assessment until 1 year postpartum)	
Nishioka et al. (2011)	Effect of postpartum depressive symptoms and bonding on the feeding pattern from 1- to 5-month postpartum	405 postpartum women (Japan)	Measures: EPDS (≥ 9); demographic questionnaire; Bonding questionnaire; BF status defined by 2 groups: “BF only and BF combined with less than 426 ml/day formula milk”; and “BoF only and BF combined with more than 426 ml/day formula milk” Time-points: 1 and 5 months postpartum	BoF/ BF (1 month) not associated with PPD (1 and 5 months) \downarrow BF duration (< 5 months) associated with PPD (5 months)	Early assessment of BF duration
Taveras et al. (2003)	1. Reasons for BF discontinuation during the first 12 postpartum weeks 2. Associations between BF discontinuation and modifiable factors	1163 postpartum women and newborns (USA)	Measures: Interview about BF, other outcomes, and satisfaction; CES-D (≥ 16); BF status defined as a dichotomous variable Time-points: during postpartum hospitalization; 2 and 12 weeks postpartum	\downarrow BF duration (≤ 2 weeks) associated with lack of confidence in ability to breastfeed at 1–2 day, early BF problems \downarrow BF duration (≤ 12 weeks) associated with \uparrow depressive symptoms (2 weeks)	Early assessment of BF duration Early assessment of PPD
Watkins et al. (2011)	Association between early BF experiences and PPD	2586 postpartum women who initiated BF (USA)	Measures: questionnaire about early BF experiences; EPDS (≥ 13); demographic questionnaire Time-points: 3 weeks, and 2 months postpartum	Negative BF attitudes (1st week) associated with PPD (EPDS ≥ 13 at 2 months) Severe BF pain (1st day, 1st week, and 2nd week) associated with PPD (EPDS ≥ 13 at 2 months)	

symptomatology at 48 h and 6 weeks did not predict further breastfeeding duration (Annagür et al., 2013).

Regarding the predictive value of breastfeeding (assessed before postpartum depression assessment), research remains equivocal. One study found that breastfeeding initiation was not associated with postpartum depressive symptoms (Lau and Chan, 2007), whereas another study concluded that breastfeeding initiation (only in multiparas) predicted lower postpartum depression (Mezzacappa and Endicott, 2007). Four studies found that breastfeeding or bottle-feeding status in the early postpartum period did not predict the development of further depressive symptoms (Chaudron et al., 2001; Dennis and McQueen, 2007; Galler et al., 1999; Nishioka et al., 2011). One study showed that exclusive breastfeeding duration predicted higher levels of postpartum depression (Alder and Cox, 1983). Breastfeeding worries (Chaudron et al.,

2001), negative breastfeeding attitudes (Galler et al., 2006; Watkins et al., 2011), breastfeeding difficulties (Ali et al., 2009), breastfeeding pain (Watkins et al., 2011), and a lower breastfeeding self-efficacy (Haga et al., 2012) were shown to predict higher levels of depressive symptoms or postpartum depression.

Prospective studies showed that depressive symptoms predict the early cessation of breastfeeding and that breastfeeding difficulties predict the development of depressive symptomatology.

3.5. Does pregnancy or postpartum depression predict breastfeeding and does breastfeeding predict postpartum depression?

Nine studies (see Table 4) highlighted the association between pregnancy depression and breastfeeding, also taking into account postpartum depression (Bogen et al., 2010; Chung et al., 2004; Field

Table 4
Does pregnancy depression predict rates of breastfeeding?/Is breastfeeding associated with postpartum depression?

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Bogen et al. (2010)	Association between: 1. Major depressive disorder and depressive symptom severity during pregnancy and BF intention; 2. Major depressive disorder and depressive symptom severity during pregnancy and BF initiation and status; 3. Serotonin reuptake inhibitor use and BF intention, initiation and status	238 pregnant women (USA)	Measures: Feeding intention survey; Feeding practices survey; SCID; HDRS; LIFE; BF status defined by 4 groups: "Breast"; "Breast and formula"; "Formula"; and "Uncertain" Time-points: 20, 30, and 30 weeks gestation, 2 and 12 weeks postpartum	PD and depressive symptom severity not associated with BF <i>intention</i> PD and PPD (at 2 or 12 weeks postpartum) not associated with BF <i>initiation</i> or BF <i>duration</i> at 2 or 12 weeks	Early BF duration assessment
Chung et al. (2004)	Association between maternal depressive symptoms and the use of infant health services, parenting practices, and injury- prevention measures	774 pregnant women (USA)	Measures: structured surveys; CES-D (≥ 16); BF status not specified Time-points: pregnancy, 3–4 months and 9–12 months postpartum	PD (CES-D ≥ 16 at pregnancy) and PPD (CES-D ≥ 16 at 3–4 and 9–12 months) not associated with BF <i>duration</i> (≥ 1 month)	Early BF duration assessment BF status not specified
Field et al. (2002)	1. Incidence of BF in a sample of pregnant depressed woman 2. Duration of BF, mother's self-reported confidence in BF, and perception of the infant's temperament.	40 pregnant women (USA)	Measures: CES-D (≥ 16) SCID; phone interview about depression, BF practices, self-perceptions about BF confidence and infant behavior during BF; MABS; BF status defined according to Labbok and Krasovec criteria Time-points: 21 weeks gestation and 8 months postpartum	PD (CES-D ≥ 16 at 21 weeks) associated with \uparrow scores of depressive symptoms at 8 months postpartum PD (CES-D ≥ 16 at 21 weeks) associated with \downarrow BF <i>duration</i> at 8 months postpartum	
Figueiredo et al. (2014)	1. Effects of PD and PPD on exclusive BF initiation, early cessation and length 2. Effects of exclusive BF initiation and early cessation on PPD.	145 pregnant women (Portugal)	Measures: Socio-demographic questionnaire; EPDS; BF status defined according to Labbok and Krasovec criteria Time-points: 1st, 2nd and 3rd pregnancy trimester, at childbirth and 3, 6, and 12 months postpartum	\uparrow Depression scores (1st trimester) predicted \uparrow exclusive BF <i>duration</i> (3 months postpartum) \uparrow Depression scores (3rd trimester) associated with \downarrow BF <i>duration</i> BF <i>initiation</i> associated with a decrease on depression scores (from 1st pregnancy trimester to 3-months postpartum), while no significant differences in depression scores for women who did not initiate BF \uparrow Depression symptoms scores (1st trimester and childbirth) associated with no BF <i>initiation</i> or \downarrow exclusive BF <i>duration</i> \uparrow Depression scores (3rd trimester) were the best predictors of lower BF duration	Early BF duration assessment
Hahn- Hol- brook et al. (2013)	1. Effects of early BF behaviors on later depressive symptomatology in mothers 2. Effects of PD on later BF behaviors 3. Which variables could account for the association between BF and depression	205 pregnant women (USA)	Measures: CES-D (≥ 4); EPDS (≥ 10); socio-demographic questionnaire; MOS; SSS; BF status defined according to Labbok and Krasovec criteria Time-points: 15, 20, 25, 31 and 37 weeks of gestation and at 3, 6, 12, and 24 months postpartum	PD (CES-D ≥ 4 at any pregnancy time-point) associated with \downarrow BF <i>duration</i> (3 months), but not between 3 and 12 months \uparrow BF <i>duration</i> (3 or more months) associated with \downarrow depression symptoms scores (24 months postpartum) Depressive symptoms (3 months) not associated with later BF duration BF <i>initiation</i> and \uparrow BF <i>duration</i> (< 2 months) associated with \downarrow depressive symptoms scores at 2 months postpartum	
Hamdan and Tamin (2011)	Risk and protective factors of PPD	137 pregnant women (United Arab Emirates)	Measures: Socio-demographic questionnaire; BDI-II; BAI; SLEI; Self-reported religiosity; EPDS; MINI; postnatal questionnaire; BF status defined as dichotomous variable Time-points: 2nd and 3rd trimester gestation; 2 and 4 months postpartum	PD (CES-D ≥ 4 at any pregnancy time-point) associated with \downarrow BF <i>duration</i> (< 6 months)	Early BF duration assessment
Kehler et al. (2009)	1. Rates of BF initiation and continuation for 6 months 2. Risk factors for early cessation of BF ^b	780 postpartum women (Canada)	Measures: SQD (> 8.30); SQA (> 11.58); SSI (< 33 rd percentile of scores); RSES (< 33 rd percentile of scores); EPDS (≥ 13); socio-demographic information; BF status defined as a dichotomous variable Time-points: study intake, 32–36 weeks gestation, 8 weeks, and 3 years postpartum	PPD (EPDS ≥ 13) not associated with \downarrow BF <i>duration</i> (< 6 months)	
Seimyr et al. (2004)	1. Period and point prevalence of maternal depressive mood before and after childbirth 2. Association to the parent's psychosocial conditions and experiences of parenthood	434 pregnant women (Sweden)	Measures: EPDS (≥ 10); EMQ/EFQ; questionnaire about background and psychosocial conditions in the life situation; BF status not specified Time-points: pregnancy (> 30 weeks gestation), 2 and 12 months postpartum	PD (EPDS ≥ 10 at 30 weeks) associated with \downarrow BF <i>initiation</i> and \uparrow BF <i>difficulties</i> ; PPD (EPDS ≥ 10 at 2 months postpartum) associated with \downarrow BF <i>initiation</i> , \uparrow BF <i>difficulties</i> , and \downarrow BF <i>duration</i> (< 5 months)	Early BF duration assessment BF status not specified

Table 4 (continued)

Authors/ Title	Aims	Participants	Measures and Procedures	Results	Quality criteria
Ystrom (2012)	<ol style="list-style-type: none"> Association between BF cessation and an increase in symptoms of anxiety and depression from pregnancy to 6 months postpartum The disproportionately high proposed symptom increase after BF cessation for women already suffering from high levels of prepartum anxiety and depression 	42,225 pregnant women (Norway)	<p>Measures: ultrasound examination; self-report questionnaires; SLC – 8; BF status defined by 3 groups: “Predominant BF”; “Mixed BF”; “Bottle-feeding”</p> <p>Time-points: 30 weeks gestation and 6 months postpartum</p>	<p>Depressive symptoms (30 weeks gestation) associated with ↓BF duration (< 6 months)</p> <p>↓BF duration (< 6 months) predicted ↑depressive symptoms (6 months postpartum)</p> <p>Anxiety and depressive symptoms during pregnancy interacted with the relation between BF cessation and postpartum anxiety and depression, in terms that pregnancy anxiety and depression baseline levels are increased at 6 months postpartum by BF cessation</p>	

et al., 2002; Figueiredo et al., 2014; Hamdan and Tamin, 2011; Hahn-Holbrook et al., 2013; Kehler et al., 2009; Seimyr et al., 2004; Ystrom, 2012). Only one study examined the association between pregnancy depression and breastfeeding intention and found no association (Bogen et al., 2010). Research on the association between pregnancy depression and breastfeeding initiation remains equivocal, with one study showing no association between the variables (Bogen et al., 2010) and two studies suggesting that depressive symptomatology during pregnancy and pregnancy depression predicted shorter breastfeeding initiation (Figueiredo et al., 2014; Seimyr et al., 2004). The association between pregnancy depression and breastfeeding duration was analyzed in seven studies. Two studies found no association between these variables (Bogen et al., 2010; Chung et al., 2004), and five studies concluded that depressive symptomatology during pregnancy or pregnancy depression predicted shorter breastfeeding duration (Field et al., 2002; Figueiredo et al., 2014; Hahn-Holbrook et al., 2013; Kehler et al., 2009; Ystrom, 2012). One of the articles specifically measured exclusive breastfeeding duration (Figueiredo et al., 2014). Pregnancy depression also predicted more breastfeeding difficulties (Seimyr et al., 2004).

Seven studies aimed to investigate the association between breastfeeding and postpartum depression, also taking into account pregnancy depression (Bogen et al., 2010; Chung et al., 2004; Figueiredo et al., 2014; Hamdan and Tamin, 2011; Hahn-Holbrook et al., 2013; Seimyr et al., 2004; Ystrom, 2012). Two studies showed that no breastfeeding initiation predicted postpartum depression (Hamdan and Tamin, 2011; Seimyr et al., 2004), while another study found no association between these variables (Bogen et al., 2010). A shorter breastfeeding duration was associated with postpartum depression in some studies (Figueiredo et al., 2014; Hamdan and Tamin, 2011; Seimyr et al., 2004; Ystrom, 2012), but not in others (Bogen et al., 2010; Hahn-Holbrook et al., 2013; Kehler et al., 2009). One study showed that postpartum depression predicted a shorter breastfeeding duration (Seimyr et al., 2004). Another study found that shorter breastfeeding duration did not predict postpartum depression (Chung et al., 2004). Breastfeeding difficulties were also associated with postpartum depression (Seimyr et al., 2004). Two studies showed that the association between pregnancy depression and postpartum depression is mediated by breastfeeding (Figueiredo et al., 2014; Ystrom, 2012). One study (Figueiredo et al., 2014) reported that breastfeeding initiation decreases depression scores from pregnancy to postpartum, and the other study (Ystrom, 2012) showed that breastfeeding cessation increases depressive symptoms from pregnancy to postpartum.

These studies found that pregnancy depression predicted shorter breastfeeding duration and that breastfeeding initiation and longer duration predicted a decrease on depressive symptomatology during the postpartum.

4. Discussion

This systematic review provides an overview of the current knowledge on the associations among breastfeeding and pregnancy or postpartum depression. It includes studies from several countries published over a 30-year period. However, the four selected keywords may have led to the exclusion of relevant references. The use of broader keywords such as “maternal mental health”, “psychological wellbeing”, or “maternal depression” could have led to the identification of more records. Despite methodological differences between the included studies (e.g., differences in the studies' designs, and in breastfeeding and pregnancy and postpartum depression assessment measures), an association between breastfeeding and depression during both the prenatal and postpartum periods is suggested.

Does pregnancy depression predict the rates of breastfeeding? Research on the prediction of breastfeeding intention, initiation, and duration by pregnancy depression remains scarce or presents methodological differences, providing some unclear results. The only clear prediction this review found was with regards to breastfeeding duration (Pippins et al., 2006), particularly in studies that consider both pregnancy and postpartum depression as reported later.

Is breastfeeding associated with postpartum depression? The association between breastfeeding and postpartum depression seems to be clear. Early exclusive and non-exclusive breastfeeding cessation is associated with the presence of postpartum depression in all studies published in the last 30 years (Astbury et al., 1994; Bick et al., 1998; Cooper et al., 1993; Dunn et al., 2006; Imbula et al., 2012; Feldens et al., 2011; Flores-Quijano et al., 2008; Hamdan and Tamin, 2011; Hannah et al., 1992; Hatton et al., 2005; McCoy et al., 2006; McLearn et al., 2006; Papinczak and Turner, 2000; Seimyr et al., 2004; Taj and Sikander, 2003; Thome et al., 2006; Yonkers et al., 2001; Ystrom, 2012; Zubaran and Foresti, 2013).

Does breastfeeding predict postpartum depression? or Does postpartum depression predict breastfeeding? In several studies, postpartum depressive symptoms were shown to predict early breastfeeding cessation (Akman et al., 2008; Dennis and McQueen, 2007; Gagliardi et al., 2012; Galler et al., 1999; Hasselmann et al., 2008; Henderson et al., 2003; McCarter-Spaulding and Horowitz, 2007; Nishioka et al., 2011; Taveras et al., 2003), with the exception of one study (Annagür et al., 2013). These studies offer trends suggesting that depressive symptoms precede and lead to the early cessation of breastfeeding.

Negative breastfeeding experiences were also reported to precede the onset of depressive symptomatology. In particular, breastfeeding worries (Chaudron et al., 2001), difficulties (Ali et al., 2009), negative attitudes (Galler et al., 2006; Watkins et al., 2011),

pain (Watkins et al., 2011), and a low self-efficacy (Haga et al., 2012) preceded the emergence of depressive symptoms.

Two studies focused on the prediction of depressive symptoms by breastfeeding initiation and provided contradictory results (Lau and Chan, 2007; Mezzacappa and Endicott, 2007). One study found no prediction (Lau and Chan, 2007), while the other study showed that breastfeeding initiation by multiparas predicted lower levels of depressive symptoms during the postpartum period (Mezzacappa and Endicott, 2007). Moreover, later breastfeeding or bottle-feeding status was not shown to predict postpartum depression in other studies as well (Chaudron et al., 2001; Dennis and McQueen, 2007; Galler et al., 1999; Nishioka et al., 2011). An imprecise breastfeeding definition and timing of measurement (without indication regarding breastfeeding initiation) are important limitations of these studies. More research is warranted on the association between breastfeeding initiation and the further onset of depressive symptoms.

Does pregnancy or postpartum depression predict breastfeeding and does breastfeeding predict postpartum depression? Pregnancy and postpartum depression are both associated with a shorter breastfeeding duration in most of the selected studies (Field et al., 2002; Figueiredo et al., 2014; Hamdan and Tamin, 2011; Hahn-Holbrook et al., 2013; Kehler et al., 2009; Seimyr et al., 2004; Ystrom, 2012). The only two studies (Bogen et al., 2010; Chung et al., 2004) that found no association among breastfeeding and pre- and postnatal depression measured breastfeeding duration at 1 and 2 months postpartum and did not indicate if the 6 month usual recommendation was fulfilled by depressed women. Moreover, despite no significant association among breastfeeding and pre- and postnatal depression, Chung et al. (2004) showed an overall trend towards a decrease in breastfeeding with the increase in postpartum depressive symptoms.

Some recent studies showed that pregnancy depression is a stronger predictor than postpartum depression for a shorter breastfeeding duration (e.g., Figueiredo et al., 2014; Kehler et al., 2009; Hahn-Holbrook et al., 2013), with pregnant depressed women at higher risk for a shorter breastfeeding duration. These studies claim the need to identify depression early during pregnancy to detect women at higher risk for a shorter breastfeeding duration and to identify the mechanisms underlying breastfeeding behavior in these women. Moreover, recent evidence also indicates that when both antenatal and postnatal depression are taken into account, breastfeeding may act as a moderator factor, decreasing or increasing depressive symptoms from pre- to postpartum (Figueiredo et al., 2014; Hahn-Holbrook et al., 2013; Ystrom, 2012).

In conclusion, trends were found regarding symptoms of depression both during pregnancy and the postpartum period having a negative impact on breastfeeding. Women with depressive symptomatology both before and after childbirth are at higher risk of breastfeeding discontinuation. Study design revealed some important patterns between studies. Prospective studies analyzing the prediction of breastfeeding by pregnancy depression showed that prenatal depression predicts shorter breastfeeding duration. However, they did not explain postpartum depressive symptoms' role on this prediction, as they did not assess for postpartum depressive symptoms and/or postpartum depression. Associative studies found a correlation between breastfeeding duration and postpartum depression, although not explaining the direction of this association. Prospective studies analyzing the impact of postpartum depression on breastfeeding and the impact of breastfeeding on postpartum depression showed that postpartum depression and postpartum depressive symptoms predict lower breastfeeding duration. Moreover, these studies revealed that experiencing breastfeeding problems (e.g., breastfeeding difficulties, pain, worries, low self-efficacy, and negative attitudes) could also expose women to a higher risk of developing postpartum depression. However, as they did not assess

for pregnancy depressive symptoms and/or pregnancy depression, these studies did not explain the effect of prenatal depression on breastfeeding duration and/or breastfeeding problems. Prospective research taking into account both pregnancy and postpartum depression pointed the role of depressive symptoms during pregnancy on breastfeeding duration and the role of breastfeeding duration on depressive symptomatology maintenance through the postpartum period. These studies give important clues on the direction of the association among breastfeeding and pregnancy and postpartum depression, as they brought initial evidence that in women who were depressed during pregnancy, breastfeeding could act as an important factor for decreasing depressive symptoms after birth. However, these findings still require further research, and additional empirical evidence is warranted, specifically prospective studies taking into account both the pregnancy and postpartum periods. Pregnancy depression has also been referred as the strongest risk factor for postpartum depression in the literature. There is evidence that pregnancy depression plays an important role in the association between breastfeeding and postpartum depression, and some studies have shown that pregnancy depression is a strong predictor for shorter breastfeeding duration, even when postpartum depression was considered.

In general, research showed an association among breastfeeding and pregnancy and postpartum depression. However, there are still some equivocal findings that remain to be explained. Methodological differences across the studies may help to clarify circumstances associated with non-replicate results.

Regarding participants, some studies used homogeneous samples or samples with a breastfeeding initiation rate higher than the national average, thereby compromising the generalization of the results.

With regards to the variables' measurement, both breastfeeding and pregnancy and postpartum depression were assessed using a wide range of measures and at different time points during pregnancy and the postpartum period. Breastfeeding, for example, was assessed with very different criteria: some studies assessed breastfeeding according to Labbok and Krasovec or WHO standards, whereas other studies assessed breastfeeding as a dichotomous variable (e.g., "yes/no"), which lead to an imprecise definition. Studies varied in terms of the time point assessment as well: some studies assessed breastfeeding at the 6-month usual recommendation and other studies assessed breastfeeding earlier. Studies also used a wide range of self-report measures and only 19% a clinical interview diagnosis for depression. In addition, depressive symptoms were assessed at different time points after childbirth, and not all studies addressed postpartum depression. The postpartum period is a critical period for the onset of depressive symptoms, and postpartum depression has been reported to begin between the second and the third months postpartum (Kumar and Robson, 1984; O'Hara, 1997; Pitt, 1968). When measuring depressive symptoms earlier than the first month postpartum, studies are addressing Postpartum Blues (Kennerley and Gath, 1989; Yalom et al., 1968), which is not a depressive disorder.

Some studies screened for the mother's anxiety (e.g., Ali et al., 2009; Fairlie et al., 2009; Insaf et al., 2011; Kehler et al., 2009; Papinczak and Turner, 2000; Ystrom, 2012). These studies found an association between the mother's anxiety and increased breastfeeding difficulties, as well as shorter breastfeeding intention and duration. Research has shown that depression and anxiety symptoms are often comorbid (Austin et al., 2010; Figueiredo and Conde, 2011). Moreover, recent literature suggested an association between maternal anxiety and a shorter breastfeeding duration (Adedinsewo et al., 2014; Paul et al., 2013).

Methodological differences between the selected studies may help to clarify some important differences between them. For example, the only study that found a positive association between

breastfeeding duration and postpartum depression used a small sample. On its turn, when we look to studies that show no association between PD or postpartum depression and breastfeeding duration or breastfeeding/bottle-feeding status (Annagür et al., 2013; Bogen et al., 2010; Chaudron et al., 2001; Chung et al., 2004; Dennis and McQueen, 2007; Galler et al., 1999; Hatton et al., 2005; Kehler et al., 2009; Nishioka et al., 2011) we can see that the majority assessed breastfeeding duration early in the postpartum (1 week to 6 weeks) not addressing breastfeeding maintenance but breastfeeding initiation. Perhaps the mechanisms underlying breastfeeding initiation could be different than those underlying breastfeeding duration. Moreover, almost all of these studies have an imprecise definition of breastfeeding or defined it as a dichotomous variable, and none of them assessed breastfeeding exclusivity, giving no indications if pregnancy and/or postpartum depression predicts early cessation of exclusive breastfeeding.

On the other hand, differences on depression assessment may reveal different results. With the exception of one (Bogen et al., 2010), all studies that used a clinical diagnosis interview for depression found an association among pregnancy or postpartum depression and breastfeeding duration.

According to these methodological issues, to use standard criteria and measurements for both breastfeeding and postpartum depression is main concern for future research. To specifically address exclusive breastfeeding for at least 6 months according to the standards and to use a clinical interview diagnosis tool (and not only self-report measures) between the second and third months postpartum to effectively diagnose postpartum depression are specific recommendations. Researchers should also use representative samples in order to draw unbiased conclusions that can be generalized. Special attention for the effect of parity and anxiety in the association among breastfeeding and pregnancy and postpartum depression should also be given.

Breastfeeding carries a wide range of benefits for both the mother and the child, and exclusive breastfeeding is recommended for the first 6 months of an infant's life. The identification of risk factors for early breastfeeding cessation is a health priority. Screening for depression during pregnancy could be a useful tool to identify women at risk for both a shorter breastfeeding duration and postpartum depression. Experiencing breastfeeding problems can also put women at risk for depressive symptoms in the postpartum period. This review supports the need to identify and help women with depressive symptoms during pregnancy or facing problems with breastfeeding at early postpartum in order to enhance breastfeeding and promote postpartum psychological adjustment.

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Conflict of interest

This work has no conflict of interest.

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