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Perinatal depressive symptoms and breastfeeding behaviors: A systematic literature review and biosocial research agenda

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Abstract

Background: Breastfeeding is recommended to improve maternal and infant health globally. Depression has been posited to negatively impact breastfeeding, although potential causal and bidirectional pathways between these two phenomena have not been sufficiently characterized. We therefore conducted a systematic review to critically evaluate available evidence on the relationship between perinatal depressive symptoms and breastfeeding behaviors; to identify knowledge gaps and propose a biosocial research agenda to advance our understanding of this topic.

Methods: A systematic search strategy was applied across seven databases. Data were extracted and aggregated using the matrix method to provide a narrative synthesis of findings.

Results: Thirty-eight studies from 20 countries spanning 1988 through 2018 fit the inclusion criteria. In general, methods across studies were heterogeneous. Fourteen different tools were used to measure perinatal depressive symptoms. Nearly half the studies did not provide breastfeeding definitions. No studies from low-income countries met inclusion criteria. More than half (63%) of studies demonstrated a negative association between depressive symptoms across the perinatal period and less exclusive breastfeeding and/or shorter breastfeeding durations.

Limitations: Heterogeneity in study design, definitions, assessment tools, and measurement time points limited the comparability of study findings. Causality cannot be assessed.

Conclusions: Available evidence suggests perinatal depressive symptoms negatively associated with breastfeeding exclusivity and duration, which can lead to suboptimal infant nutrition and detrimental impacts on maternal mental and physical health. To better understand this relationship,

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Authors' Contributions:

ELT conceptualized the analysis, supported review and analysis, and critically revised multiple drafts of the manuscript. MSB assisted with conceptualization, conducted literature review, narrative analysis, and wrote the first draft of the manuscript. SLY supported the conceptualization, supported review and analysis, and critically revised multiple drafts of the manuscript.

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we propose including consistent operationalization and assessment of depression and breastfeeding globally and concurrent repeated measures of key biological and social factors.

Keywords

perinatal depression; breastfeeding; biosocial framework

INTRODUCTION*

Breastfeeding confers many health benefits for mothers and their infants (AAP, 2012). For mothers, exclusive breastfeeding decreases the risk of type 2 diabetes (Chowdhury et al., 2015), cardiovascular disease (Bartick et al., 2017), and breast and ovarian cancers (Chowdhury et al., 2015; Victora et al., 2016). For infants, exclusive breastfeeding delivers total nutritional requirements and reduces morbidity and mortality by lowering the risk of infectious diseases such as diarrhea, otitis media, necrotizing enterocolitis, and pneumonia (AAP, 2012; Rollins et al., 2016; The World Health Organization, 2011; Victora et al., 2016). As such, the World Health Organization (WHO) and the American Academy of Pediatrics (AAP) recommend that mothers exclusively breastfeed for the first six months of their infant's life, followed by continued breastfeeding for a minimum of two years (AAP, 2012; WHO, 2011).

Despite this recommendation, only one third of women globally exclusively breastfeed their infants for the first six months (Rollins et al., 2016; Victora et al., 2016). Diverse proximal and distal factors which span socioeconomic (e.g., workplace support and policies protecting breastfeeding), sociocultural (e.g., hospital practices, social support, infant feeding norms), and individual (e.g., intention to breastfeed, lifestyle choices, and maternal health) levels, all contribute to suboptimal rates by presenting barriers to breastfeeding (Rollins et al., 2016). At the individual level, depression is one such key factor (Borra et al., 2015; Pope & Mazmanian, 2016).

Perinatal depression (i.e., an episode of major depressive disorder lasting at least two weeks during pregnancy and/or within one year postpartum) (ACOG, 2015) is common globally. During pregnancy, the prevalence of depressive symptoms range from 7–20% in high-income countries (Gavin et al., 2005) and exceeds 20% in many low- and middle-income countries (Biaggi et al., 2016; Gajaria & Ravindran, 2018; Rahman et al., 2003, 2007; WHO, 2008). Postpartum depression is estimated to affect 7–30% of women globally (Biaggi et al., 2016; Gavin et al., 2005; Schiller et al., 2015) with the prevalence of postpartum depression in some low-resource settings reported as high as 45% (Kaaya et al., 2016; Parsons et al., 2012).

*Abbreviations: AAP, American Academy of Pediatrics; ACOG, American College of Obstetricians and Gynecologists; CES-D, Center for Epidemiologic Studies Depression Scale; DASS-21, Depression, Anxiety and Stress Scale 21 items; EPDS, Edinburgh Postnatal Depression Scale; GHQ-20 General Health Questionnaire (20-item); HIV, human immunodeficiency virus; MINI, Mini International Neuropsychiatric Interview; PHQ-9, Patient Health Questionnaire-9; SCID, Structured Clinical Interview for DSM-IV or V; SRQ-20, Self-Reporting Questionnaire 20-item; U.S., United States of America; W.E.I.R.D, Western, educated, industrialized, rich, democratic; WHO, World Health Organization.

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Previous research has demonstrated that perinatal depression and suboptimal breastfeeding behaviors are associated, however gaps remain in our understanding of the broader biological and social factors that influence this relationship during pregnancy, postpartum, and across the perinatal period. Therefore, to advance our knowledge on perinatal depression and breastfeeding behaviors, we sought to conduct a systematic review that expands upon the two previous literature reviews (i.e., Dennis & McQueen, 2009; Dias & Figueiredo, 2015). In this systematic review we aim to 1) critically evaluate the existing literature, identifying what is known about the relationship between perinatal depressive symptoms during pregnancy and/or postpartum and breastfeeding duration and 2) outline a research agenda that can aid in further advancing the field's understanding of perinatal depression and breastfeeding outcomes.

METHODS

A protocol for this systematic review is registered in PROSPERO (registration number: CRD42018105743). Seven online databases were searched between June and July 2018 with no restriction on publication date: CINAHL, Embase, Global Health, psycINFO, PubMed, Scopus, and Web of Science.

The following two search strategies were conducted to meet specific database requirements. For PubMed, search terms included: ("breast feeding" [mesh] OR "infant feeding" [all fields] OR "infant-feeding" [all fields]) AND "humans"[mesh] AND (("depressive disorder" [mesh] OR "depression"[mesh]) AND (mother [all fields] OR mothers [all fields] OR maternal [all fields] OR antenatal [all fields] OR prenatal [all fields] OR perinatal [all fields] OR postpartum [all fields] OR post-partum [all fields])). For CINAHL, Embase, Global Health, psycINFO, Scopus, and Web of Science, the following search terms were used: ((depress*) AND (mothers OR maternal OR antenatal OR prenatal OR perinatal OR postpartum OR post-partum)) AND ("breast feeding" OR "breastfeeding" OR "breast-feeding" OR "infant feeding" OR "infant-feeding").

Inclusion criteria included peer-reviewed studies about depression during pregnancy and/or postpartum and breastfeeding. There were no restrictions on study design or setting. Studies were excluded if primary outcomes did not include breastfeeding behaviors (e.g., use of antidepressants, smoking behaviors, or complementary feeding and child feeding behaviors) or were not available in English (n=1). MSB first screened articles by title and abstract and then by full-text review, with fidelity checks by ELT (Figure 1).

We used the matrix method (Garrard, 2011) to conduct a narrative synthesis describing the relationship between perinatal depressive symptoms and breastfeeding behaviors. In this method, a table is created in which rows represent studies and columns represent relevant characteristics and findings of each study (Table 1). Within the matrix table, studies were grouped by study design and ordered chronologically. Data were then extracted and tallied (Table 1; Appendices 2, 3). We also attempted to conduct a meta-analysis with these data, however, this was not possible due to substantial heterogeneity in depression assessment tools, diverse operationalization of breastfeeding outcomes, and different measurement time points.

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We also evaluated the quality of included studies using a quality appraisal framework (Venkataramanan et al., 2018) that assesses studies across three categories: quality of reporting, minimizing risk of bias, and appropriateness of conclusions (Figure 2, Appendix 3).

Depressive symptoms defined

Onset of perinatal depression can occur at any point during pregnancy and/or within the first year postpartum (Muzik & Borovska, 2010; ACOG, 2019). Symptoms of *perinatal depression* include, but are not limited to, feelings of extreme sadness, anxiety, exhaustion, mood fluctuations, and indifference toward or overconcern with the infant lasting two weeks or more (O'Hara, 2009; Yim et al., 2015). Depressive symptoms that begin in pregnancy and continue into the postpartum period are referred to as *persistent depressive symptoms* (Underwood et al., 2016).

Breastfeeding outcomes defined

The main outcomes examined were duration of exclusive breastfeeding and duration of any breastfeeding (Appendix 2). *Exclusive breastfeeding duration* is defined as the length of time since delivery that infants receive only breast milk and no other foods or fluids, except for medications or vitamins (Labbok & Krasovec, 1990). *Any breastfeeding duration* is defined as the length of time since delivery that infants are breastfed; this includes either predominant breastfeeding (providing mostly breastmilk, as well as water and fruit based liquids, ritual fluids, and vitamins, minerals and medicines), mixed feeding (providing breastmilk and other foods or fluids), or token breastfeeding (irregular breastfeeding with the primary purpose of comforting, not nourishing an infant or child) (Labbok & Krasovec, 1990) (Appendix 2).

RESULTS

Study characteristics

Thirty-eight studies with a total of 68,794 participants across 20 countries from 1988 to 2018 were included (Table 1). The majority of included studies (63%) were conducted in high-income countries and the remaining (37%) in middle-income countries. No studies from low-income countries met inclusion criteria (Table 2).

Over half of studies (61%) both used a prospective design (Table 3) and were conducted during the postpartum period (58%) (i.e., birth to 12 months) (Appendix 1). Study teams represented a range of disciplines, including anthropology, midwifery, neonatology, nursing, nutrition, pediatrics, psychiatry, psychology, and public health.

Participants were recruited from a variety of settings, including the hospitals in which they gave birth (n=12), maternal and child health and/or prenatal/postnatal clinics (n=10), or primary care and/or public health clinics (n=6) (Table 1). The majority of studies conducted purposive sampling of participants, either during pregnancy, around delivery, or in the postpartum period. Eight studies recruited participants from larger cohort studies; of these 3 were secondary analyses and 5 conducted subsample studies from the larger cohorts (Table

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1). Finally, 1 study recruited participants online and 2 studies recruited participants through community-based efforts (Table 1).

Sample sizes ranged widely, from 40 mothers in a U.S. study (Field et al., 2002) to 42,225 in a population-based Norwegian study (Ystrom, 2012) (Table 1). The median sample size was 250.5 (Table 4).

Tools used to assess depressive symptoms

Twelve different tools were used to assess depressive symptoms (Appendix 1). The Edinburgh Postnatal Depression Scale (EPDS) was the only tool explicitly developed to measure postpartum depressive symptoms (Cox et al., 1987). The other 11 tools were developed for use among adults (not specifically perinatal women) to assess depressive symptoms, psychological distress, trauma, or anxiety. Two tools (SCID and MINI) were clinical diagnostic assessments, which must be administered by a clinician (Appendix 1).

Less than half of the included studies assessed psychometric properties for the tools they used. Specifically, reliability, which refers to the consistency of a measure, either over time, across items, or between applications by different researchers (Raykov & Marcoulides, 2011) was reported by less than half of included studies. Among the 18 that reported it, most (n=13) used Cronbach's alpha (a measure of internal consistency) (see Appendix 1). Validity is the extent to which an instrument measures the latent construct it was developed to evaluate (Raykov & Marcoulides, 2011); in the case of the included studies this construct is perinatal depression. Of the 38 studies included, 18 report both instrument validity and reliability, while 5 studies report validity only and 6 studies report reliability only (see Appendix 1). Of the studies reporting validity (n=18), most (n=17) reported that their instrument was valid for use in their population based on previous studies with similar populations (i.e., same country or language), while one study assessed instrument validity within their current population (Appendix 1).

Most tools assessing depressive symptoms were based on self-report, which requires participants to recall their feelings, emotions, and/or experiences over a time period that typically ranges from the prior week to prior month. Responses are based on a Likert scale, which are then summed, with higher scores indicating more severe depressive symptoms.

More than half of the included studies (n=23) used the Edinburgh Postnatal Depression Scale (EPDS). The EPDS is a 10-item tool that asks participants about emotional experiences in the prior seven days using a 0–3 Likert scale from "no, not at all" to "yes, all the time" (Cox et al., 1987). Example items include "I have been able to laugh and see the funny side of things" and "The thought of harming myself has occurred to me". A cut-off of 12 or 13 is suggested as symptoms indicative of probable depression (Cox et al., 1987). The cut-offs applied by the included studies ranged from 9–16, with nearly half (n=14) using a cut-off between 12 and 13.

Depressive symptoms were assessed over a wide range of time points throughout the perinatal period. Only 2 of the 38 studies assessed depressive symptoms during pregnancy: Fairlie et al (2009) between 26–28 weeks gestation (end of 2nd trimester) and Sharifi et al

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(2016) during the 3rd trimester. Twenty-three of the studies assessed symptoms during the postpartum period only (birth to 12 months), with one study measuring depressive symptoms 13 months after birth (Appendix 1). The remaining 13 studies assessed depressive symptoms during both pregnancy and postpartum, with 5 studies explicitly assessing "persistent" depressive symptoms across the perinatal period.

Assessment of breastfeeding behaviors

Twenty-two studies (58%) explicitly defined their breastfeeding outcome whether it was exclusive or any breastfeeding (Table 5). Given the heterogeneity in operationalization of breastfeeding outcomes, we ultimately grouped studies by those that measured exclusive breastfeeding duration (n=14) and those that measured duration of any breastfeeding (n=24) and categorized these designations by when depressive symptoms were measured in order to identify trends across studies (Figure 3).

Associations between depressive symptoms and breastfeeding behavior

Depressive symptoms during pregnancy—Two studies examined depressive symptoms during pregnancy. One study found no association with exclusive breastfeeding (Sharifi et al., 2016), while the other study found that despite higher prenatal depressive symptoms being associated with increased intention to formula feed, 86% of individuals with higher rates of prenatal depressive symptoms initiated breastfeeding (Fairlie et al., 2009).

Perinatal depressive symptoms—Nine studies examined depressive symptoms perinatally, meaning studies looked separately at depressive symptoms during pregnancy and during postpartum. Two studies found depressive symptoms during pregnancy were associated with exclusive breastfeeding. Specifically, depressive symptomatology in the third trimester of pregnancy was the most salient predictor of exclusive breastfeeding duration among women living in Portugal; however depressive symptomatology at 3 month postpartum was not significant (Figueiredo et al., 2014). Similarly, depressive symptoms in pregnancy, but not depressive symptoms postpartum, were predictive of lower exclusive breastfeeding rates at 6 weeks postpartum among women living with HIV in South Africa (Tuthill et al., 2017). A third study found increased incidence of mixed-feeding and bottle feeding among Norwegian mothers (Ystrom, 2012), and a fourth study found less likelihood of breastfeeding among mothers in the United Arab Emirates (Hamdan & Tamim, 2012). Five studies found no significant associations between perinatal depressive symptoms and any breastfeeding duration (Amiel Castro et al., 2017; Bogen et al., 2010; Cooke et al., 2007; Hellin & Waller, 1992; Tamminen, 1988).

Persistent depressive symptoms—Five studies explicitly examined persistent depressive symptoms. Two studies found a significant association between higher levels of depressive symptoms experienced over time and shorter durations of exclusive breastfeeding compared to mothers who experienced depressive symptoms either during pregnancy or postpartum, or not at all (Ahlqvist-Björkroth et al., 2016; Atif Rahman et al., 2016). Another 2 studies found that symptoms across pregnancy and postpartum resulted in shorter breastfeeding durations among U.S. mothers (Pippins et al., 2006), as well as cessation of

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overnight breastfeeding and increased mixed feeding among Egyptian mothers (Abou Nazel & Nosseir, 1994). Conversely, a fifth study found no significant associations between persistent depressive symptoms with any breastfeeding duration among Norwegian mothers (Haga et al., 2017).

Depressive symptoms postpartum—Twenty-two studies examined depressive symptoms postpartum. Seven studies found a negative relationship between depressive symptoms postpartum and exclusive breastfeeding duration. These associations were consistent at multiple time points postpartum, though there was variation in effect size across studies (Appendix 1). Time points included 4 weeks postpartum (Hasselmann et al., 2008; Machado et al., 2014), 6 weeks postpartum (Madeghe et al., 2016), 2 months postpartum (Dennis & McQueen, 2007; Hasselmann et al., 2008; Machado et al., 2014), 3 months postpartum (Yusuff et al., 2016), 4 months postpartum (Machado et al., 2014; Madeghe et al., 2016), and within the first 6 months postpartum (Islam et al., 2017; Vitolo et al., 2007).

Another 9 studies found that higher levels of depressive symptoms postpartum were associated with shorter breastfeeding durations (Assarian et al., 2014; Bick et al., 1998; Brown et al., 2016; Cooper et al., 1993; Field et al., 2002; Galler et al., 1999; Henderson et al., 2003; Misri et al., 1997; Taj & Sikander, 2003). Four of these studies found the onset of depressive symptoms postpartum occurred before breastfeeding ceased in most cases (Cooper et al., 1993; Henderson et al., 2003; Misri et al., 1997; Taj & Sikander, 2003). Two studies found that there were fewer cases of breastfeeding and breastfeeding durations that ceased before 3 months among mothers that experienced depressive symptoms during the first three months postpartum (Bick et al., 1998; Galler et al., 1999). A study in the U.S. with a representative sample found that depressed participants at 8 months (measured by CES-D) had the lowest incidence of breastfeeding and shortest breastfeeding durations (Field et al., 2002). Finally, a study in Iran found that mothers with higher scores on the tool assessing depressive symptoms (GHQ-28) were more likely to be members of what the authors called the “unsuccessful breastfeeding” group (Assarian et al., 2014, p.2).

In contrast, 6 studies found no association between depressive symptoms postpartum and breastfeeding outcomes (Al-Muhaish et al., 2018; Annagür et al., 2013; de Jager et al., 2014; Falceto et al., 2004; Lau & Chan, 2007; McCarter-Spaulding & Horowitz, 2007).

DISCUSSION

Perinatal depressive symptoms are negatively associated with breastfeeding outcomes

Twenty-four studies found negative associations between depressive symptoms and breastfeeding outcomes (i.e., n=4 perinatal; n=4 persistent; n=16 postpartum). Eight studies that examined depressive symptoms either perinatally or persistently found negative associations with breastfeeding outcomes. Strengths among these studies with significant associations include capturing depressive symptoms early, clear operationalization of breastfeeding outcomes, focusing on specific breastfeeding behaviors (i.e., exclusive breastfeeding), and measuring depression at multiple timepoints across the perinatal period,

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allowing for assessment of change over time (Ahlqvist-Björkroth et al., 2016; Figueiredo et al., 2014; Atif Rahman et al., 2016; Tuthill et al., 2017).

In contrast, 14 studies found no associations between depressive symptoms and breastfeeding outcomes (i.e., n=2 pregnancy; n=5 perinatal; n=1 persistent; n=6 postpartum). Both studies examining depressive symptoms during pregnancy found no association with breastfeeding outcomes. This may be due to an absence of a relationship or because of several confounding factors. Additionally, undefined breastfeeding outcomes may have obscured how participants fed their infants posing a challenge to analyses investigating its relationship with depressive symptoms. It is possible that other psychosocial factors (i.e. prenatal-related anxiety) are more predictive of breastfeeding outcomes than measures of depression (Fairlie et al., 2009).

Six studies that examined depressive symptoms either perinatally or persistently found no association. For 5 of these studies, this may be due to undefined breastfeeding outcomes (Amiel Castro et al., 2017; Bogen et al., 2010; Cooke et al., 2007; Hellin & Waller, 1992; Tamminen, 1988). Additionally, some study's participants reported both high breastfeeding initiation rates and ample social support (Bogen et al., 2010; Haga et al., 2017) both of which could be protective against depressive symptomatology and/or negative breastfeeding outcomes (Hahn-Holbrook et al., 2013; Kendall-Tackett, 2007).

Finally, of the 6 studies that examined the relationship with postpartum depressive symptoms, 3 studies did not provide a definition for breastfeeding and/or dichotomized their breastfeeding measure (Al-Muhaish et al., 2018; Annagür et al., 2013; Falceto et al., 2004). One study consisted of an online survey reliant on recall of experiences up to two years postpartum, thus recall bias could have impacted reporting of depressive symptoms (de Jager et al., 2014). This study used a less established tool to measure postpartum depressive symptoms (i.e. DASS-21) potentially underestimating depressive symptoms. Finally, other social factors, (i.e. breastfeeding self-efficacy or intimate partner violence) may be more predictive of breastfeeding outcomes than measures of depression (de Jager et al., 2014; Lau & Chan, 2007).

To the first objective, we critically evaluated available data on the relationship between perinatal depressive symptoms and breastfeeding behaviors. Despite the heterogeneity in study setting, methods, covariates, operationalization of breastfeeding, and assessment of perinatal depressive symptoms in the 38 eligible studies, there was an association between higher rates of perinatal depressive symptoms and lower rates of exclusive or any breastfeeding duration in 24 of the studies. Twenty-five studies did report bivariate and multivariate analyses regarding the relationship of interest, but only 10 studies reported repeated measures of both outcomes and exposure. However, the heterogeneity made determining both the magnitude of effect of covariates, and causal relationships between perinatal depressive symptoms and breastfeeding outcomes impossible.

This review of the relationship between perinatal depression and breastfeeding differs from the two prior reviews (Dennis & McQueen, 2009; Dias & Figueiredo, 2015) in two ways. First, 18 of the studies included in this review were not in either of the prior reviews.

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Second, 10 studies that had been included in the prior reviews were excluded because of differences in the inclusion criteria. For example, we focus on the effects of perinatal depression *on* breastfeeding outcomes versus Dias and Figueiredo's examination of the bidirectional relationship between perinatal depression and breastfeeding outcomes or Dennis and McQueen's broader inclusion of all infant feeding outcomes, i.e. those beyond breastfeeding outcomes such as bottle feeding.

Biosocial Research Agenda

Given the prevalence of perinatal depressive symptoms and suboptimal exclusive breastfeeding rates globally and the plausibility of a causal relationship, continued research efforts to understand this relationship are needed. Based on the gaps in the available literature (i.e., absence of an understanding the mechanisms driving the relationship between perinatal depression and breastfeeding), we propose the application of a biosocial framework. A biosocial perspective is one in which biological phenomena, psychosocial factors, and social context are examined simultaneously, in recognition of these factors' dynamic and inherent interactions (Harris & McDade, 2018).

Current research has predominately investigated the relationship between perinatal depression and breastfeeding from *either* a bio-medical or social science perspective (Yim et al., 2015). Biomedical research has focused on mechanistic drivers and treatment of depressive symptoms, while social science research examines social drivers, largely ignoring the role biological factors play. However, both breastfeeding and perinatal depression are inherently biosocial phenomena; they occur within the body but are influenced and altered by social contexts.

In the biosocial framework, biological phenomena are characterized as processes and structures which occur within the body, while social phenomena are characterized as relationships and interactions among individuals within social contexts who share norms, institutions, and hierarchies, as well as aspects of the physical environment (Harris & McDade, 2018). The biosocial framework has been used to examine human health, development, and behavior across the life course by researchers from a variety of disciplines (Harris & McDade, 2018). Relevant to this review, this framework has been applied by anthropologists and other social scientists to other aspects of breastfeeding research for decades, such as weaning, breastsleeping (the integrated combination of breastfeeding and shared sleep), and milk sharing (McDade & Worthman, 1998; McKenna & Gettler, 2016; Tomori et al., 2017; Van Esterik & O'Connor, 2017).

There is, however, a dearth of studies that systematically examine biological and psychosocial determinants related to perinatal depression and breastfeeding. Therefore, a gap still remains in understanding causal pathways, biological mechanisms, and psychosocial influences due to assumed but underexamined bidirectionality between perinatal depressive symptoms and breastfeeding outcomes (Meltzer-Brody, 2011; Yim et al., 2015).

Despite the lacking information, there is a high plausibility that the relationship between perinatal depressive symptoms and breastfeeding outcomes is bidirectional, that depressive

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symptoms can negatively impact breastfeeding outcomes and that breastfeeding outcomes can affect depressive symptomatology. This is due to the physiological and psychological conditions of the perinatal period, which contribute to myriad processes post-delivery including lactation. Key physiological systems of interest include the hypothalamic-pituitary-adrenal (HPA) axis, the immune system, and genetic vulnerabilities because they contribute to lactation physiology and shape mental health outcomes including perinatal depression (Yim et al., 2015). In addition, social conditions have been demonstrated to affect both perinatal depression and breastfeeding. For instance, pregnancy intention, social support, and intimate partner violence have been shown to positively and negatively shape these experiences. These confounding factors, along with a lack of clarity regarding the etiology of perinatal depression make positing causality impossible. Thus, we propose the application of the biosocial perspective, allowing for the examination of mechanisms and contexts, as well as mediators and moderators which shape this relationship, in order to establish causality in one or both directions.

Drawing on the available data and the biosocial perspective, we propose six considerations (Box 1) to guide future studies investigating the relationship between perinatal depression and breastfeeding.

1. Use consistent cut-offs to define depressive symptoms indicative of depression

The cut-off used to determine probable depression is a key factor in establishing prevalence and associations. In this review, we found different cut-offs were applied among studies despite using the same tool. For example, Ahlqvist-Björkroth and colleagues found no association between depressive symptoms and exclusive breastfeeding duration; however, this study used a cut-off of 15 when they administered the EPDS (3 points higher than recommended). Thus, using a higher cut-off may not capture all experiences of probable depression. Across most of the included studies, the cut-off used was often slightly higher or lower than the suggested cut-off for most tools. If lower, that may help determine the presence of minor probable depression and/or maximize the chances of detecting depression (McCarter-Spaulding & Horowitz, 2007). If slightly higher, that would have imposed more conservative estimates of depression. These differences make it challenging to compare depression across studies on breastfeeding outcomes especially when a rationale for choosing a specific cut-off is not provided.

Most tools assessing for probable depressive have suggested cutoffs (e.g., <12 for EPDS; Cox et al., 1987) to guide researchers in their analyses. To ensure results are reflective of depression levels among a target population, as well as for comparison across studies; we recommend that the cut-off used in analyses and the rationale for choosing that cut-off be reported. Should the chosen cut-off differ from the tool originators' recommendation, an explanation should be provided.

Similarly, applying both continuous and dichotomous analyses of probable depression provides a measure of sensitivity. Using depression as a dichotomous variable also masks variability and if the selected cut-offs fail to identify true depression levels, probable depression may be obscured. Continuous variables can indicate increases in symptoms

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across time. Since these variables can be used as risk factors, associations can still be examined even if probable depression is not indicated.

In sum, to ensure results are reflective of depression levels among the target population, as well as for comparison across studies, we recommend that cut-offs be justified and reported especially when chosen cutoffs differ from those the creators recommend. In addition, including analyses with the recommended cut-off(s) as supplementary information for reference and generalizability, and reporting analyses using dichotomous and continuous measures of depression should be considered as best practices.

2. Measure and report reliability and validity of perinatal depression assessment tools

Using tools with demonstrated reliability and validity, as well as ensuring they are cross-culturally adapted to a study's target population, is key to generating meaningful, comparable data (see Tuthill et al., 2014 for methodological guidance). It is important to choose a tool that consistently measures depression among a given population. If such a tool has not been validated for the target population (but instead for a "similar" population which is sometimes loosely defined as the same language or country), assessing reliability and validity is necessary (see Boateng et al., 2018 for methodological guidance). Financial and time constraints may prohibit psychometric testing to determine the reliability and validity of a tool. Another option is to use factor structures from psychometric instruments, though care should be taken to select an appropriate factor and consideration given to theoretically-driven models (Kozinszky et al., 2017). Therefore, it may be pragmatic to select a tool based on previous psychometric results, published adaptations, or prior experience with a specific tool and report previous psychometric testing in addition to providing the rationale for choosing this tool, aiding future researchers in selecting the tool with best fit.

3. Use consistent timepoints for measuring perinatal depressive symptoms

The reported timepoints for assessing perinatal depression differed substantially across the 35 studies in which they were reported (Appendix 1). In the studies that assessed depressive symptoms during both pregnancy and the postpartum (n=13), 21 different time points were used. Among studies that only measured depressive symptoms postpartum (n=23), 18 different time points were used (Appendix 1). There were several time points where depressive symptoms and breastfeeding were more frequently assessed, including the third trimester, 6 weeks postpartum, and 6 months postpartum (Appendix 1). Indeed, these time points all mark important milestones during the perinatal period given that the third trimester is often when intentions are solidified, 6 weeks postpartum marks a significant postpartum check-up, and 6 months postpartum is when infant feeding milestones are met (i.e., six-month recommendation of exclusive breastfeeding and introduction of foods). Screenings in early pregnancy (i.e. beginning in the first trimester and continuing throughout pregnancy), as well as more frequent screenings during the early postpartum (i.e., the first 12 weeks) may be beneficial additions for enhancing the detection of perinatal depression. Additionally, early and consistent screening throughout the perinatal period may assist in capturing changes in mood, as well as when and in what ways these changes occur. A current limitation in the timing of measurements is the lack of a common *persistent depression* definition, therefore a consistent definition should be established.

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Finally, if possible, a longitudinal study design would be useful for elucidating whether changes across time significantly influence the relationship of interest. Difficulties of this approach include recruiting participants in pregnancy prior to the onset of depression, as well as accurately capturing physiological measures of depression since many symptoms are similar to symptoms of pregnancy (Biaggi et al., 2016). However, these limitations are also fundamental to the perinatal period and important for understanding how depression changes across time, particularly regarding what symptoms of depression are most consequential, as well as are germane for establishing causality.

In addition to frequent and consistent measurements of depressive symptoms at established timepoints throughout the perinatal period, it would be beneficial for recall periods of depressive symptom assessment tools to be harmonized, as these were also variable across studies. All of these factors would improve comparability of depressive symptoms data across studies and should be considered as best practices.

4. Explicitly define breastfeeding outcomes

Many studies lacked explicit operationalization of breastfeeding outcomes, 16 of 38 did not define breastfeeding outcomes. Among the studies that did operationalize their breastfeeding outcome, the definitions varied, making comparisons across studies challenging. Efforts to standardize breastfeeding definitions and outcomes among lactation researchers is ongoing (Chapman & Pérez-Escamilla, 2009; Labbok & Starling, 2012), but caution is also warranted due to cultural practices which may complicate measurements of practices such as exclusivity [e.g., traditional practices like supplementing with pre-lacteals (Ahmed et al., 2020) or the belief that breastmilk is insufficient for infant growth (Bentley et al., 2003)]. Human biological research on lactation among populations globally has demonstrated that there may in fact be no “single human pattern of breastfeeding” (Vitzthum & Aguayo, 1998: 148). Given this, detailed definitions of breastfeeding outcomes will demand in-depth, meticulous qualitative investigations of breastfeeding patterns and styles which are likely to be highly variable and take time to produce, even among women in similar societal groups. Despite these challenges, successful promotion of breastfeeding depends on culturally sensitive and relevant information tailored to populations of interest. This information can be acquired from qualitative examinations of infant feeding practices whether by qualitative (i.e. interviews) or quantitative (i.e. survey) measures.

As such, data collection that includes multiple breastfeeding outcomes may be most meaningful (i.e., initiation, exclusive breastfeeding duration, any breastfeeding duration). In addition, explicit operationalization of these outcomes is particularly important when frequencies, durations, and amounts of breastfeeding are potentially influencing depressive symptoms. Justification for how breastfeeding was operationalized should be provided alongside analyses. Similar to depressive symptoms, we recommend avoiding an analysis with dichotomized breastfeeding variables (i.e., yes/no breastfeeding or “no exclusive breastfeeding/bottlefeeding”) only because these measures obscure rates of specific types of breastfeeding and culturally-based infant feeding decisions, making it harder to delineate breastfeeding outcomes. At minimum, reporting definitions of breastfeeding cognizant of cultural practices that do not dichotomize breastfeeding is an important first step.

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5. Measure human biological characteristics

The rigorous investigation of biological indicators germane to the relationship between perinatal depression and breastfeeding is necessary to address the posited bidirectionality between these two outcomes, as well as aid in establishing causality. Research regarding both perinatal depression and human lactation, as well as the relationship between the two, has indicated that endocrine (e.g., cortisol, oxytocin, or prolactin), immunological (e.g., c-reactive protein, interleukin-6, or tumor necrosis factor-alpha), and/or genetic (e.g., functional polymorphism 5-HTTLPR) factors may be key to understanding the physiological processes driving this relationship (Kendall-Tackett, 2007; Serati et al., 2016; Yim et al., 2015). Collecting biological data can provide insight into which aspects of social and physical environments most affect health and well-being, as well as inform interventions prior to the emergence of disorder or disease (Harris & McDade, 2018).

Biomarkers should be measured consistently across the perinatal period at similar time points to those proposed for perinatal depressive symptoms and breastfeeding outcomes. Despite bidirectionality not being specifically examined in this review, four included studies found that breastfeeding influenced perinatal depressive symptoms (Al-Muhaish et al., 2018; Assarian et al., 2014; Brown et al., 2016; Ystrom, 2012). Biological markers may aid this understanding by highlighting pathways through which experiences outside the body get “under the skin” and effect processes inside of the body (Harris & McDade, 2018; Kimmel et al., 2019). Currently, the etiology of perinatal depression is still not well understood; a biosocial approach could provide a first step to assessing its link to other outcomes, such as breastfeeding.

The biosocial approach may also be beneficial for understanding the use of antidepressants and how their interactions (biological and social) may affect lactation physiology and/or individual’s perceptions; which may influence breastfeeding behavior or delay treatment for depression from fear of potential medication side-effects (Davanzo et al., 2016). A biosocial approach may also prove useful in examining the relationship between perinatal depression and breastfeeding outcomes among people living with HIV. It has been shown that HIV and depression have a bidirectional relationship (Nanni et al., 2015; Remien et al., 2019). Additionally, breastfeeding recommendations for people living with HIV have shifted over the decades and still differ depending on high-income versus low-income context (Greene et al., 2015; Taha et al., 2006; Tuthill et al., 2019). Finally, it should be mentioned that in addition to other factors, the stigma of living with HIV, as well as recommendations promoting exclusive breastfeeding within HIV clinics, may affect breastfeeding behaviors (Young et al., 2011).

6. Measure the social environment

In a biosocial approach, the social context is as important as the biological context; we must understand forces outside of the body that are influencing experiences within the body. This can be achieved by expanding investigations beyond the individual to include factors related to individuals’ social and physical environments.

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Nineteen of the studies investigated individual biosocial factors such as breastfeeding self-efficacy, perceived breastmilk insufficiency and pregnancy complications (Table 6). While these individual-level factors are critical to understand, so too is the inclusion of the social context of individual's lives in investigations. The social context may include measures of interpersonal relationships, social support, socioeconomic factors, or resource insecurity. Included studies also investigated a range of social factors (Table 6). These contextual factors capture interpersonal relationships that show a more nuanced understanding of social support and the social environments within which perinatal depression and breastfeeding co-exist.

In addition, accounting for these factors within the context of low-middle and high-income settings adds to the overall understanding of how this relationship differs by setting (Biaggi et al., 2016). The majority of studies in this review were conducted in high-income settings (n=24) and the rest (n=14) from middle-income settings, leaving a gap in understanding this relationship from the context of low-income settings. Thus, the majority of research regarding this relationship represents W.E.I.R.D. (Western, educated, industrialized, rich, democratic) populations (Henrich et al., 2010). Given perinatal depression is experienced globally and in fact the highest reported prevalence originates from low-resource settings; it is critical we understand the social context that influence experiences of perinatal depressive symptoms more broadly, including the qualitative meaning of perinatal depressive symptoms in and of itself across high, middle, and low-resource settings.

While social factors may add complexity to investigations of relationships between perinatal depression and breastfeeding outcomes, it is important to recognize that we cannot ignore the complexities which influence both social and biological experiences, as they are mutually constituting (Harris & McDade, 2018).

LIMITATIONS

We were unable to conduct a meta-analysis because of inconsistencies in study design, definitions, assessment tools, and measurement time points used across the included studies, though this is a common problem for researchers of this relationship. The considerations (Box 1) outline data collection strategies addressing the challenges we faced, improving the possibility of future meta-analyses. Despite an inclusive search strategy, we did not include the sole non-English paper we identified which may bias our findings. There are three articles which are not included in the review because they were published after our initial search, however we feel it is important to highlight their contributions to the literature on this relationship (Farías-Antúnez et al., 2020; Sha et al., 2019; Stuebe et al., 2019). Finally, there is always a risk of bias. While we conducted a quality assessment of all included articles there is the possibility that studies' samples may be affected by sampling and participation biases.

CONCLUSION

Thirty years of research has confirmed that perinatal depressive symptoms are often associated with suboptimal breastfeeding behavior. This review confirms this, demonstrating

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perinatal depressive symptoms to be negatively associated with lower rates of any or exclusive breastfeeding duration in 24 of the 38 included studies. However, the inconsistencies in study design, including variations in definitions of constructs, time points for assessments and classifying symptoms indicative of depression, creates challenges for understanding the pathways in which depressive symptoms and breastfeeding behaviors interact. We provide considerations for future research (Box 1) that applies a biosocial framework to aid in furthering understanding of this important, multifaceted relationship.

In addition, future research is still needed to address several key gaps that include, 1) the lack of a specific tool to validate depressive symptoms during pregnancy or specific to the entire perinatal continuum, 2) the role of breastfeeding intention and its impact on depressive symptoms and subsequent breastfeeding outcomes and, 3) diversifying both setting (i.e., more research in low-income settings) and social factors that are examined to strengthen understanding of perinatal depressive symptoms across various socioeconomic and cultural contexts.

Taken together, such an approach will address current gaps in knowledge while enhancing understanding of the complex relationship between perinatal depressive symptoms and breastfeeding behavior outcomes; improving maternal and infant health, as well as moving us toward causal explanations of this relationship.

ACKNOWLEDGEMENTS

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Appendix 1.: Perinatal depression outcomes and measures of validation and reliability of assessment tools across included studies (n=38)

Author (Year)	Setting	Depression screening tool	When depression was measured	How depression was measured	Validated	For what period?	By who?	Version	Reliabi (Cronba α – unl otherw indicat
Depressive symptoms measured during pregnancy (n=2)									
Fairlie TG, Gillman MW, Rich-Edwards J. (2009)	US	EPDS	26–28 weeks GA	cut-off: >/=13	yes	pregnancy	previously (Murray et al., 1990)		
Sharifi F, Nouraei S, Shahverdi E. (2016)	Iran	EPDS; BDI	3rd trimester	total score across 10 items	yes	pregnancy	psychiatrists assoc. with this study		0.79
Depressive symptoms measured perinatally (n=9)									
Amiel Castro RT, Glover V, Ehlert U,	UK	EPDS	18 weeks GA; 8 weeks PP	cut off: 13	yes	pregnancy and postpartum	previously (Murray et al., 1990)		

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Author (Year)	Setting	Depression screening tool	When depression was measured	How depression was measured	Validated	For what period?	By who?	Version	Reliabi (Cronbo α – unl otherw indicat
O'Connor T G. (2017)									
Bogen DL, Hanusa BH, Moses-Kolko E, Wisner KL. (2010)	US	SCID; Hamilton Depression Rating Scale	at enrollment; 2, 12 weeks PP	Hamilton: >/=9	no				
Cooke M, Schmied V, Sheehan A. (2007)	Australia	EPDS	28–36 weeks GA; 3 months PP	cut-off: 12	no				
Figueiredo B, Canario C, Field T. (2014)	Portugal	EPDS	8–14, 20–24, 30–34 weeks GA; 1–3 days post-delivery	scores at 1st, 2nd, and 3rd trimesters assessed	no			Portuguese	0.85
Hamdan A, Tamim H. (2012)	UAE	BDI-II; EPDS; MINI	2nd, 3rd trimesters; 2, 4 months PP	cut off: >/=10	no			Arabic	
Hellin K, Waller G. (1992)	UK	BDI	Pregnancy; 1 week post-delivery; 5 months PP	cut-off: 14–20=mild, 21–26=moderate, > 27=severe depression	no				
Tamminen T. (1989)	Finland	BDI	4 separate groups: late pregnancy; delivery; 2–4 months PP; 6–12 months PP	depressed/not depressed	yes	pregnancy and postpartum	previously (Raitasalo, 1977)		yes, previous
Tuthill E, Pellowski J, Young S, Butler L. (2017)	South Africa	PHQ-9	3rd trimester; 6 months PP	cut off: 10 (probable major depression diagnosis on DSM-IV)	yes	pregnancy and postpartum	previously (Xiong et al., 2015)		0.9
Ystrom E, (2012)	Norway	SCL-8	30 weeks GA; 6 months PP	mean score across the 8 items	no				prenatal 0.84; PP 0.86
Depressive symptoms measured persistently (n=5)									
Abou Nazel MW, Nosseir SA. (1994)	Egypt	EPDS	6th-16th weeks PP	cut-off: 16–20	no			Arabic	
Ahlqvist-Bjorkroth S, Vaarno J, Junttila N, Pajulo M, Raiha H, Niinikoski H, Lagström H. (2016)	Finland	EPDS	20 weeks GA; 4 months PP	cut-offs: prenatal: >=15 and postnatal: >= 13 (mothers); >= 10 (fathers, prenatal and postnatal)	no				mother 0.848 fathers 0.807

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Author (Year)	Setting	Depression screening tool	When depression was measured	How depression was measured	Validated	For what period?	By who?	Version	Reliabi (Cronb α – unl otherw indicat
Haga, SM, Lisoy C, Drozd F, Valla L, Slinning K. (2018)	Norway	EPDS	4,6,12 months PP	higher scores reflect higher levels of depressive symptoms	no				
Pippins JR, Brawarsky P, Jackson RA, Fuentes-Afflick E, Haas JS. (2006)	US	CES-D	pregnancy, postpartum	cut off: >10	no			Short form	test-ret score correlat = 0.7
Rahman A, Assad H, Rakshanda B, Siham S, Abid M, Fareed M, Tomenson B, Creed F. (2016)	Pakistan	SCID	3rd trimester; 6 months PP	3 groups: not depressed, depressed antenatally, depressed antenatally and postnatally	yes	pregnancy and postpartum	previously by author	Urdu	kappa interra reliabili 0.91
Depressive symptoms measured during postpartum (n=22)									
Al-Muhaish WS, Al-Azman BA, Al-Ghamdi BA, Al-Qahtani AH, Al-Qahtani NH. (2018)	Saudi Arabia	EPDS	postpartum for most recent birth	cut-off: 14	yes	postpartum	previously (Gubash et al., 1997)	Arabic	
Annagur A, Annagur BB, Sahin A, Ors R, Kara F. (2013)	Turkey	EPDS	48 hours post-delivery; 6 weeks PP	cut-off: 12	yes	postpartum	previously (Aydin et al., 2004)	Turkish	0.87
Assarian F, Moravveji A, Ghaffarian H, Eslamian R, Atoof F. (2014)	Iran	GHQ-28	0–12 months PP	cut-off: 23	yes	postpartum	previously (Ahmadvand et al., 2012)		0.9
Bick DE, MacArthur C, Lancashire RJ. (1998)	UK	EPDS	6–7 months PP	cut-off: 12	no				
Brown A, Rance J, Bennett P. (2016)	UK	EPDS	0–6 months PP	cut-off: 12	no				
Cooper PJ, Murray L, Stein A. (1993)	UK	GHQ; EPDS	6 weeks PP	EPDS: >/= 13	no				
de Jager E, Broadbent J, Fuller-	Australia±	DASS-21	0–6 months PP	higher scores reflect higher levels of	yes		previously (Henry and Crawford, 2005)		0.82, 0.9

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Author (Year)	Setting	Depression screening tool	When depression was measured	How depression was measured	Validated	For what period?	By who?	Version	Reliabi (Cronbo α – unl otherw indicat
Tyszkiewicz M, Skouteris H. (2014)				depressive symptoms					
Dennis CL, McQueen K. (2007)	Canada	EPDS	6 weeks PP	cut-off: 12/13	no				0.87
Falceto OG, Giugliani ERJ, Fernandes CLC. (2004)	Brazil	SRQ-20	4 months PP	cut-off: 7 (women); 5 (men)	yes	postpartum	previously (Mari et al., 1986)		
Field T, Hernandez-Reif M, Feijo L. (2002)	US	CES-D; SCID	8 months PP	cut-off: 16	yes	postpartum	previously (Wells et al., 1987)		test-rete reliabilit 0.79 (ov a one-month period)
Galler JR, Harrison RH, Biggs MA, Ramsey F, Forde V. (1999)	Barbados	Zung Depression and Anxiety Scale	7 weeks, 6 months PP	25–100	yes	postpartum	previously (Marsella, 1977)		7 weeks = 0.8; 6 months = 0.84
Hasselmann MH, Werneck GL, Da Silva CVC. (2008)	Brazil	EPDS	1, 2 months PP	cut-off: >/= 12	no			Portuguese	
Henderson JJ, Evans SF, Straton JAY, Priest SR, Hagan R. (2003)	Australia	EPDS; SCID	2, 6, 12 months PP	cut off: >/=12	no				
Islam Md J, Baird K, Mazerolle P, Broidy L. (2017)	Bangladesh	EPDS	0–6 months PP for most recent birth	cut-off: 10	yes	postpartum	previously (Gausia et al., 2007)	Bangla	0.9
Lau Y, Chan KS. (2007)	Hong Kong	EPDS	2–5 days PP	cut-off: >9	yes	postpartum	previously, bilingual psychiatrists and nonprofessionals (Lee et al., 1998)	Chinese	0.81
Machado MC, Assis KF, Oliveira Fd.e, C, Ribeiro AQ, Araújo RM, Cury AF, Priore SE, Franceschini Sd.o C. (2014)	Brazil	EPDS	1, 2 months PP	cut-off: >/=12	yes		previously (Santos et al., 1999)		83% accuracy

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Author (Year)	Setting	Depression screening tool	When depression was measured	How depression was measured	Validated	For what period?	By who?	Version	Reliabi (Cronb α – unl otherw indicat
Madeghe BA, Kimani VN, Stoep A, vander Nicodimos S, Manasi K. (2016)	Kenya	EPDS	6–16 weeks PP	cut-off: 13	yes	postpartum	previously (Kumar et al., 2015)	Kiswahili	
McCarter-Spaulding D, Horowitz JA. (2007)	US	EPDS; BDI-II	2–4, 4–8, 10–14, 14–18 weeks PP	EPDS cut-off: >/= 10	no				EPDS = 0.81; BI II = 0.87 0.89
Misri S, Sinclair DA, Kuan AJ. (1997)	Canada	CGI	postpartum	markedly ill and mildly ill	no				
Taj R, Sikander KS. (2003)	Pakistan	HADS	2 months-2 years PP for most recent birth	cut-off: 7/8, below this is non-depressive. 10/11, above this is depressive	no			Urdu	
Vitolo MR, Benetti SPDC, Bortolini GA, Graeff A, Drachler MDL. (2007)	Brazil	BDI	12–13 months PP	cut-off: 12	no				
Yusuff ASM, Tang L, Binns CW, Lee AH. (2016)	Malaysia	EPDS	1–3 months PP	higher scores reflect higher levels of depressive symptoms	yes		previously (Azidah et al., 2004)	Malay	

±This was an internet survey conducted by an Australian research team - participants were from Australia, the EU, and USA.

PP = postpartum

Five studies used EPDS in conjunction with another depressive symptom measurement tool. The combinations include, EPDS and the General Health Questionnaire (GHQ) (Cooper et al., 1993), EPDS and the Mini International Neuro-psychiatric Interview (MINI) (Hamdan & Tamim, 2012), EPDS and diagnostic clinical interviews (Henderson et al., 2003), EDPS and the Beck Depression Inventory (BDI) (Sharifi et al., 2016), as well as the EPDS and BDI II (McCarter-Spaulding & Horowitz, 2007). Cooper and colleagues used samples from two different sites, so the participants experienced different screening techniques. The two studies that used both EPDS and BDI scales, used EPDS as a screening tool for participation in the study or measure of presence of depressive symptoms and BDI scales as measures of depression severity (McCarter-Spaulding & Horowitz, 2007; Sharifi et al., 2016). Finally, MINI and clinical diagnostic interviews were offered to participants with high EPDS scores and psychological disorders (Hamdan & Tamim, 2012; Henderson et al., 2003). Overall, only five studies used clinical diagnostic tools, either SCID (Bogen et al., 2010; Field et al., 2002; Henderson et al., 2003; Rahman et al., 2016) or MINI (Hamdan & Tamim, 2012) to diagnose depression in participants (Table 1c and Appendix 2). Just one study used SCID to diagnose depression, without use of a self-report measure for depressive symptoms (Rahman et al., 2016).

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Appendix 2.: Breastfeeding outcomes and time points measured across studies

Author (Year)	Intention to Breastfeed	Initiation of Breastfeeding	Exclusive Breastfeeding *(includes Full BF)*	Exclusive Breastfeeding Duration	Any Breastfeeding	Predominant Breastfeeding *(includes Almost EBF)*	Partial Breastfeeding *(includes High BF and Token BF)*	Mixed Feeding
			Exclusive Breastfeeding Duration		**Any Breastfeeding Duration**			
Pregnancy (n=2)								
Fairlie TG, Gillman MW, Rich-Edwards J. (2009)	2nd trimester	post-delivery						
Sharifi F, Nouraei S, Shahverdi E. (2016)			3rd trimester					3rd trimester
Perinatal (n=9)								
Amiel Castro RT, Glover V, Ehlert U, O'Connor T G. (2017)			1 day, 1, 2, 3, 4, weeks PP		1 day, 1, 2, 3, 4, weeks PP			1 day, 1, 2, 3, 4, weeks PP
Bogen DL, Hanusa BH, Moses-Kolko E, Wisner KL. (2010)	20, 30, 36 weeks pregnancy	2, 12 weeks PP	2 weeks PP				2 weeks PP	
Cooke M, Schmied V, Sheehan A. (2007)								
Figueiredo B, Canario C, Field T. (2014)			3, 6, 12, months PP					
Hamdan A, Tamim H. (2012)					2, 4 months PP			
Hellin K, Waller G. (1992)								
Tamminen T. (1989)								
Tuthill E, Pellowski J, Young S, Butler L. (2017)	pregnancy		pregnancy					
Ystrom E, (2012)			6 months PP				6 months PP	

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Author (Year)	Intention to Breastfeed	Initiation of Breastfeeding	Exclusive Breastfeeding *(includes Full BF)*	Exclusive Breastfeeding Duration	Any Breastfeeding	Predominant Breastfeeding *(includes Almost EBF)*	Partial Breastfeeding *(includes High BF and Token BF)*	Mixed Feeding
			Exclusive Breastfeeding Duration		**Any Breastfeeding Duration**			
							Persistent (n=5)	
Abou Nazel MW, Nosseir SA. (1994)								
Ahlqvist-Bjorkroth S, Vaarno J, Junttila N, Pajulo M, Raiha H, Niinikoski H, Lagström H. (2016)			0–24 months PP	0–24 months PP			0–24 months PP	
Haga, SM, Lisoy C, Drozd F, Valla L, Slinning K. (2018)			4, 6, 12 months PP				4, 6, 12 months PP	
Pippins JR, Brawarsky P, Jackson RA, Fuentes-Afflick E, Haas JS. (2006)		1 month PP						
Rahman A, Assad H, Rakshanda B, Siham S, Abid M, Fareed M, Tomenson B, Creed F. (2016)			0–6 months	0–6 months PP			0–6 months	
							Postpartum (n=22)	
Al-Muhaish WS, Al-Azman BA, Al-Ghamdi BA, Al-Qahtani AH, Al-Qahtani NH. (2018)	postpartum			postpartum				
Annagur A, Annagur BB, Sahin A, Ors R, Kara F. (2013)	48 hours post-delivery		6 weeks PP				6 weeks PP	
Assarian F, Moravveji A, Ghaffarian H, Eslamian			0–12 months PP					0–12 months PP

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Author (Year)	Intention to Breastfeed	Initiation of Breastfeeding	Exclusive Breastfeeding *(includes Full BF)*	Exclusive Breastfeeding Duration	Any Breastfeeding	Predominant Breastfeeding *(includes Almost EBF)*	Partial Breastfeeding *(includes High BF and Token BF)*	Mixed Feeding
			Exclusive Breastfeeding Duration		Any Breastfeeding Duration			
R, Atoof F. (2014)								
Bick DE, MacArthur C, Lancashire RJ. (1998)		6–7 months PP						
Brown A, Rance J, Bennett P. (2016)		0–6 months PP						
Cooper PJ, Murray L, Stein A. (1993)		2–3 months PP						
de Jager E, Broadbent J, Fuller-Tyszkiewicz M, Skouteris H. (2014)	0–6 months			0–6 months				
Dennis CL, McQueen K. (2007)			1, 4, 8 weeks PP			1, 4, 8 weeks PP	1, 4, 8 weeks PP	
Falceto OG, Giugliani ERJ, Fernandes CLC. (2004)			0–4 months PP				0–4 months PP	
Field T, Hernandez-Reif M, Feijo L. (2002)								
Galler JR, Harrison RH, Biggs MA, Ramsey F, Forde V. (1999)								
Hasselmann MH, Werneck GL, Da Silva CVC. (2008)			1, 2 months PP	1, 2 months PP				
Henderson JJ, Evans SF, Straton JAY, Priest SR, Hagan R. (2003)			2, 6, 12 months PP		2, 6, 12 months PP	2, 6, 12 months PP	2, 6, 12 months PP	2, 6, 12 months PP
Islam Md J, Baird K, Mazerolle P,			0–6 months PP					

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Author (Year)	Intention to Breastfeed	Initiation of Breastfeeding	Exclusive Breastfeeding *(includes Full BF)*	Exclusive Breastfeeding Duration	Any Breastfeeding	Predominant Breastfeeding *(includes Almost EBF)*	Partial Breastfeeding *(includes High BF and Token BF)*	Mixed Feeding
			Exclusive Breastfeeding Duration		**Any Breastfeeding Duration**			
Broidy L. (2017)								
Lau Y, Chan KS. (2007)		2–5 days PP	2–5 days PP					2–5 days PP
Machado MC, Assis KF, Oliveira Fd.e, C, Ribeiro AQ, Araújo RM, Cury AF, Priore SE, Franceschini Sd.o C. (2014)			2–4 months PP	2–4 months PP				
Madeghe BA, Kimani VN, Stoep A, vander Nicodimos S, Manasi K. (2016)			6–16 weeks PP					
McCarter-Spaulding D, Horowitz JA. (2007)								4–8, 10–14, 14–18 weeks PP
Misri S, Sinclair DA, Kuan AJ. (1997)			postpartum					postpartum
Taj R, Sikander KS. (2003)								
Vitolo MR, Benetti SPDC, Bortolini GA, Graeff A, Drachler MDL. (2007)			12–16 months PP					
Yusuff ASM, Tang L, Binns CW, Lee AH. (2016)			1, 3 months PP	1, 3 months PP				

PP = postpartum

First, we grouped these outcomes into two sub-categories: “any breastfeeding” and “unspecified breastfeeding” for the purposes of our synthesis. Further, there were 2 cases (Figueiredo et al., 2014; Yusuff et al., 2016) where different terms were used to describe the same breastfeeding outcomes (e.g., full breastfeeding and exclusive breastfeeding) (Labbok & Krasovec, 1990); as well as one study which used ‘almost exclusive breastfeeding’ and ‘token breastfeeding’ to operationalize its breastfeeding outcomes (Dennis & McQueen, 2007). This led to placing ‘almost exclusive breastfeeding’ in the sub-category predominant breastfeeding and ‘token breastfeeding’ in the sub-category partial breastfeeding. Ultimately, in order to synthesize across studies, outcomes were grouped into “exclusive breastfeeding duration” and “any breastfeeding duration” because all studies addressed one of these two outcomes.

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Appendix 3.: Quality assessment for included studies

	Quality of Reporting									
Author	**Objectives**	**Context**	**Study Design**	**Process**	**Data Collection**	**Analysis**	**Score**	**Percentage**	**Average Percentage**	**Appropriateness of sampling**
Case-control (n=2)										
Falceto, O. G. Giugliani, E. R. J. Fernandes, C. L. C. (2004)	1	1	1	1	1	1	6	100%		1
Assarian, F. Moravveji, A. Ghaffarian, H. Eslamian, R. Atoof, F. (2014)	1	1	1	0.5	1	1	5.5	92%	**96%**	1
Prospective (n=23)										
Abou Nazel, M. W. Nosseir, S. A. (1994)	1	1	1	1	1	1	6	100%		1
Ahlqvist-Bjorkroth, S. Vaarno, J. Junttila, N. Pajulo, M. Raiha, H. Niinikoski, H. Lagström, H. (2016)	1	1	1	1	1	1	6	100%		1
Amiel Castro, R. T. Glover, V. Ehlert, U. O'Connor, T. G. (2017)	1	1	1	1	1	1	6	100%		1
Annagur, A. Annagur, B. B. Sahin, A. Ors, R. Kara, F. (2013)	1	1	0.5	1	1	1	5.5	92%		1
Bogen, D. L. Hanusa, B. H. Moses-Kolko, E. Wisner, K. L. (2010)	1	1	1	1	1	1	6	100%		1
Cooke M, Schmied V, and Sheehan A (2007)	1	1	1	1	1	1	6	100%		1
Cooper, Peter J. Murray, Lynne Stein, Alan (1993)	1	1	1	0.5	1	1	5.5	92%		1

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	Quality of Reporting									
Author	**Objectives**	**Context**	**Study Design**	**Process**	**Data Collection**	**Analysis**	**Score**	**Percentage**	**Average Percentage**	**Appropriateness of sampling**
Dennis, Cindy-Lee McQueen, Karen (2007)	1	1	1	1	1	1	6	100%		1
Fairlie, T. G. Gillman, M. W. Rich-Edwards, J. (2009)	1	1	1	1	1	1	6	100%		1
Figueiredo, B. Canario, C., Field T. (2014)	1	1	1	1	1	1	6	100%		1
Galler, J. R. Harrison, R. H. Biggs, M. A. Ramsey, F. Forde, V. (1999)	1	1	1	1	1	1	6	100%		1
Haga, S. M. Lisoy, C. Drozd, F. Valla, L. Slinning, K. (2018)	1	1	1	1	1	1	6	100%		1
Hamdan, Aisha Tamim, Hani (2012)	1	1	1	1	1	1	6	100%		1
Hasselmann, M. H. Werneck, G. L. Da Silva, C. V. C. (2008)	0.5	1	1	1	1	1	5.5	92%		1
Hellin, Katherine Waller, Glenn (1992)	1	1	1	1	1	1	6	100%		1
Henderson, J. J. Evans, S. F. Straton, J. A. Y. Priest, S. R. Hagan, R. (2003)	1	1	1	1	1	1	6	100%		1
Machado, M. C. Assis, K. F. Oliveira Fd.e, C. Ribeiro, A. Q. Araújo, R. M. Cury, A. F. Priore, S. E. Franceschini Sd.o, C. (2014)	1	1	1	1	1	1	6	100%		1

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	Quality of Reporting									
Author	**Objectives**	**Context**	**Study Design**	**Process**	**Data Collection**	**Analysis**	**Score**	**Percentage**	**Average Percentage**	**Appropriateness of sampling**
McCarter-Spaulding, D. Horowitz, J. A. (2007)	1	1	1	1	1	1	6	100%		1
Misri, Shaila Sinclair, Dana A. Kuan, Annie J. (1997)	1	1	1	1	1	0	5	83%		1
Pippins, J. R. Brawarsky, P. Jackson, R. A. Fuentes-Afflick, E. Haas, J. S. (2006)	1	1	1	1	1	1	6	100%		1
Rahman, A. Assad, Hafeez Rakshanda, Bilal Siham, Sikander Abid, Malik Fareed, Minhas Tomenson, B. Creed, F. (2016).	1	1	1	1	1	1	6	100%		1
Ystrom, E. (2012)	1	1	1	1	1	1	6	100%		1
Yusuff, Aza Sherin Mohamad; Tang Li; Binns, Colin W; Lee, Andy H (2016)	1	1	1	1	1	1	6	100%	**98%**	1
Cross-sectional (n=12)										
Al-Muhaish, W. S. Al-Azman, B. A. Al-Ghamdi, B. A. Al-Qahtani, A. H. Al-Qahtani, N. H. (2018)	1	1	0.5	0	1	1	4.5	75%		1
Bick DE, MacArthur C, and Lancashire RJ (1998)	1	1	1	1	1	1	6	100%		1
Brown Amy, Rance Jaynie, and	1	1	1	1	1	1	6	100%		1

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	Quality of Reporting									
Author	**Objectives**	**Context**	**Study Design**	**Process**	**Data Collection**	**Analysis**	**Score**	**Percentage**	**Average Percentage**	**Appropriateness of sampling**
Bennett Paul (2016)										
de Jager, Emily Broadbent, Jaclyn Fuller-Tyszkiewicz, Matthew Skouteris, Helen (2014)	1	1	1	1	1	1	6	100%		1
Field, Tiffany Hernandez-Reif, Maria Feijo, Larissa (2002)	1	1	1	1	1	0.5	5.5	92%		1
Islam, Md Jahirul Baird, Kathleen Mazerolle, Paul Broidy, Lisa (2017)	1	1	1	1	1	1	6	100%		1
Lau, Y. Chan, K. S. (2007)	1	1	1	1	1	1	6	100%		1
Madeghe, B. A. Kimani, V. N. Stoep, A. vander Nicodimos, S. Manasi, Kumar (2016)	0.5	1	1	1	1	1	5.5	92%		1
Sharifi, F. Nouraei, S. Shahverdi, E. (2016)	0.5	1	1	1	1	1	5.5	92%		1
Taj, R. Sikander, K. S. (2003)	1	1	1	1	1	1	6	100%		1
Tamminen, T. (1989)	1	1	1	1	1	0	5	83%		1
Vitolo, M. R. Benetti, S. P. D. C. Bortolini, G. A. Graeff, A. Drachler, M. D. L. (2007)	1	1	1	0.5	1	1	5.5	92%	**94%**	1
Longitudinal randomized control trial (n=1)										
Tuthill, Emily Pellowski, Jennifer Young, Sera	1	1	0.5	1	1	1	5.5	92%	**92%**	1

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	Quality of Reporting									
Author	**Objectives**	**Context**	**Study Design**	**Process**	**Data Collection**	**Analysis**	**Score**	**Percentage**	**Average Percentage**	**Appropriateness of sampling**
Butler, Lisa (2017)										

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Highlights:

- Perinatal depression is associated with lower rates of breastfeeding
- Current data do not indicate magnitude or causality
- Perinatal depression and breastfeeding need to be measured consistently
- Biological and social drivers should be assessed longitudinally

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Box 1.

Considerations for Future Research

1. Use recommended cut-offs to indicate probable depression; consider reporting prevalence at several commonly used cut-off. Use both continuous and dichotomous measures of depression. Assess depression in a manner that is comparable across studies.
2. Measure depressive symptoms at consistent timepoints: 3rd trimester, 6 weeks, 3 months, 6 months.
3. Assess and report reliability and validity of depression assessment tools. Harmonize recall periods for depression assessment tools. Aim to utilize a longitudinal study design to examine the relationship between persistent depression and breastfeeding.
4. Operationalize breastfeeding outcomes using standard definitions. Provide context for breastfeeding measurements with culturally relevant information related to infant feeding.
5. Measure human biological characteristics posited to drive the relationship between probable depression and breastfeeding outcomes using objective biomarkers.
6. Measure the social environment and relevant covariates using qualitative and/or quantitative methods. Expand settings within which the relationship between perinatal depression and breastfeeding are examined.

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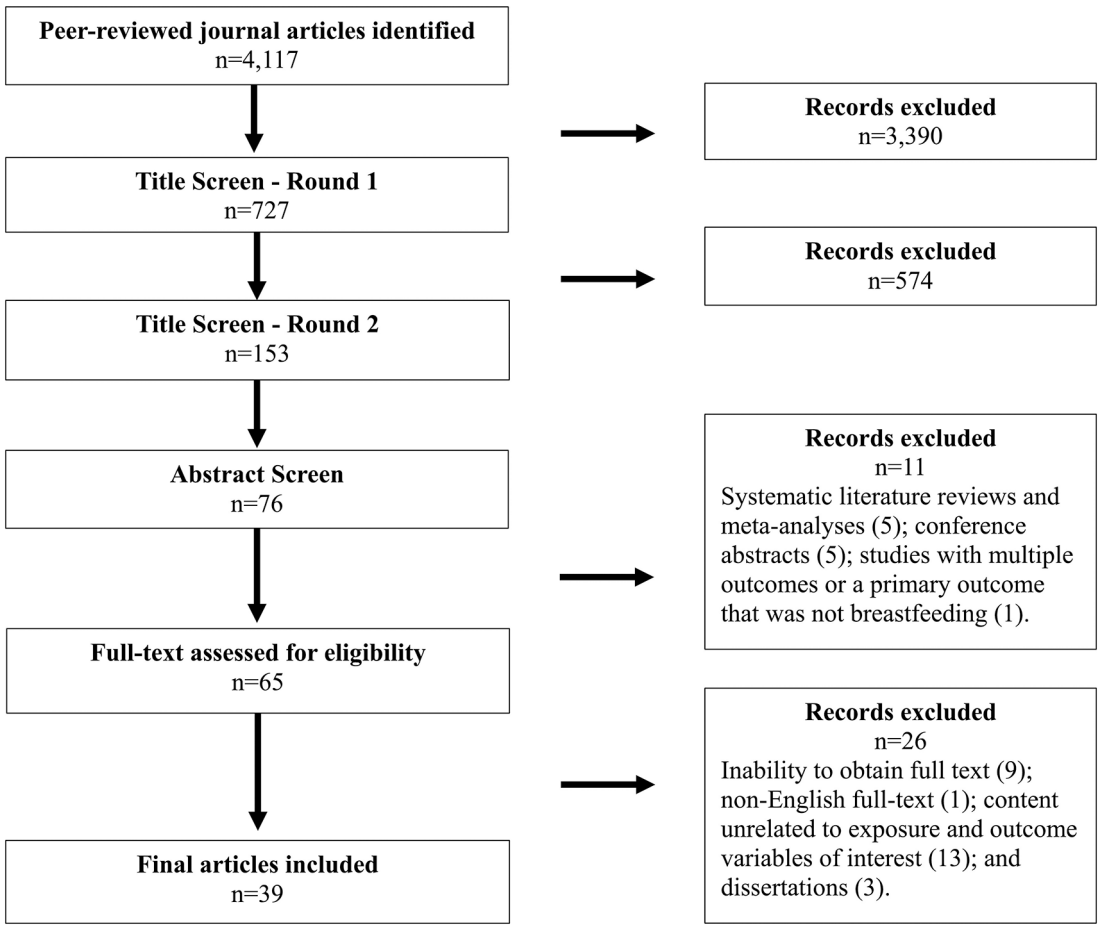

Fig. 1.
Search strategy flowchart, registered with PROSPERO (CRD42018105743).

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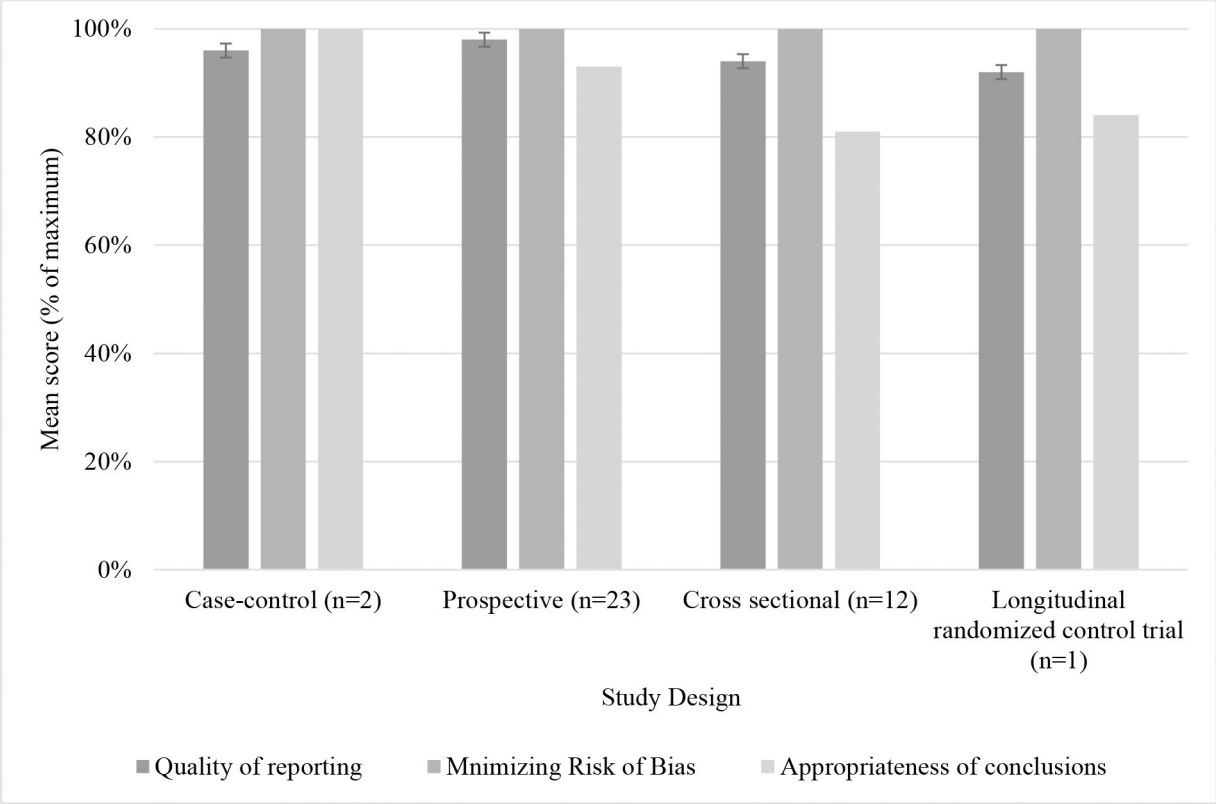

Figure 2.

Quality assessment score (mean percentage) by study design for Quality of Reporting, Minimizing Risk of Bias, and Appropriateness of Conclusions. Raw scores in each category were converted into percentages (Appendix 3), and studies that received the maximum possible score in a category were assigned a value of 100%. Error bars represent standard error of the mean.

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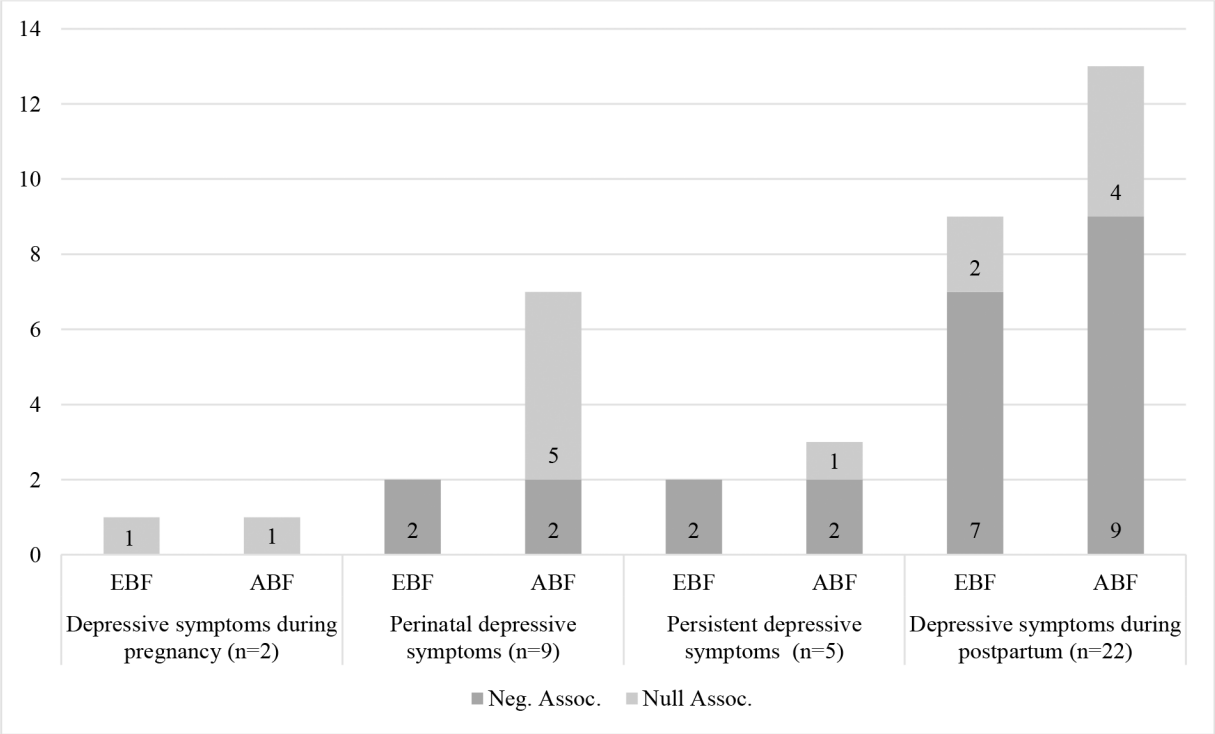

Figure 3.

Frequency of reported significant (<0.05) and null associations between depressive symptoms and breastfeeding outcomes by perinatal period.

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Table 1.

Characteristics, objectives, and results of the included studies.

Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
Abou Nazel, M. W. Nosseir, S. A. (1994)	Public Health	prospective	158 primiparous women (Egypt)	The effect of mother's depression on her breastfeeding attitude and practice	EPDS	N/A	Maternal age, education, employment, history of psychiatric illness; husband's education and employment; socioeconomic status, family type, crowdedness of home	Antepartum depression was significantly linked to postpartum depression and negative attitudes to breast feeding. Persistent maternal depression (ante- and postpartum) was a risk factor for early resorting to mixed infant feeding. Negative mothers' attitudes to breast feeding and postpartum depressive scores taken together predicted mixed infant feeding
Ahlqvist-Bjorkroth, S. Vaarno, J. Junttila, N. Pajulo, M. Raiha, H. Niinikoski, H. Lagström, H. (2016)	Child and Youth Research and Psychology	prospective	873 families (Finland)	Explored the effects of mothers' and fathers' prenatal and postnatal depressive symptoms and marital distress on breastfeeding initiation and exclusive breastfeeding duration	EPDS	EBF, similar to WHO	Marital status, length of relationship, family income, parity, maternal age, education, paternal age, education, birthweight, infant sex	Neither parents' prenatal depressive symptoms predicted breastfeeding initiation or EBF duration. Mothers' prenatal depressive symptoms predicted their postnatal depressive symptoms, which were associated with shorter duration of EBF. EBF duration shortest amongst the mothers who had depressive symptoms both pre- and postnatally compared to mothers who had depressive symptoms only in either time point alone (M = 1.54, 2.06 and 2.04 months, respectively).
Al-Muhaish, W. S., Al-Azman, B. A., Al-Ghamdi, B. A., Al-	Medicine	cross-sectional	300 postpartum women (Saudi Arabia)	Explore relationship between breastfeeding and maternal postpartum depression.	EPDS	N/A	Maternal age, education, employment, monthly salary, parity, delivery mode, history of	Postpartum mothers who intended to breastfeed their babies had a lower EPDS scores compared

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
Qahtani, A. H., Al-Qahtani, N. H. (2018)				Estimate prevalence rate of postpartum depression among Saudi women			miscarriage, presence of chronic disease, BF intention, EBF duration	with those who did not intend to breast-feed. No correlation was found between the duration of breastfeeding and EPDS scores. Prevalence rate of postpartum depression in our sample was 14%.
Amiel Castro, R. T., Glover, V., Ehlert, U., O'Connor, T. G. (2017)	Reproductive and Developmental Biology, and Psychology	prospective	9479 pregnant women (UK)	Investigate the impact of antenatal depressive symptoms, attitudes towards breastfeeding and sociodemographic factors in predicting breastfeeding for 6months in a large community sample	EPDS	N/A	Smoking, parental education; maternal age at delivery, return to work, ethnicity, length of BF for previous baby; gestational age, infant sex, infant head circumference	Antenatal depressive symptoms at both 18-and 32-weeks gestation were associated with decreased breastfeeding initiation and duration. However, the prediction of breastfeeding by these symptoms was confounded by sociodemographic and psychosocial covariates.
Annagur, A. Annagur, B. B. Sahin, A. Ors, R. Kara, F. (2013)	Neonatology	prospective	197 postpartum women (Turkey)	Examine relationship between success of exclusive breastfeeding and postpartum depressive symptomatology	EPDS	1) EBF (breast milk only) 2) Partial breastfeeding and bottle feeding	Marital status, maternal age, education, monthly household income, delivery mode, parity, number of deliveries, number of children; gestational age, Apgar score at 1 minute and 5 minutes, infant weight	All the participants were divided into two groups: exclusive breastfeeding and mixed-feeding (partial breastfeeding and/or bottle feeding). Both groups were compared in terms of features, such as mode of delivery, parity, prevalence of depressive symptomatol ogy (at 48 hours and 6 weeks), and delayed onset of lactation within the first 48 hours. Statistical significance was found for only three variables: delayed onset of lactation within the first 48 hours, gestational age, and the problems related to breastfeeding methods

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
Assarian, F. Moravveji, A. Ghaffarian, H. Eslamian, R. Atoof, F. (2014)	Psychiatry	case-control	458 mothers with infants under 1 year (Iran)	Assess association between maternal mental health and breastfeeding status of mothers	GHQ-28	Control: successful breastfeeding Case: unsuccessful breastfeeding = initiated bottle feeding	Maternal education, employment	Breastfeeding status was directly associated with susceptibility to depression (P=0.001, OR=5.48).
Bick, D.E., MacArthur, C., and Lancashire, R.J. (1998)	Midwifery	cross-sectional	906 women (UK)	Examine obstetric, maternal and social factors associated with uptake and early cessation of breastfeeding and women's reasons for altering from breast to bottle feeding	EPDS	N/A	Maternal age, marital status, parity, obstetric factors, postpartum symptoms, childcare support	63% breastfed, but 40% stopped within 3 months of delivery. Main predictors: physical problems with lactation, return to work within 3 months, childcare support from female relatives, high EPDS score
Bogen, D. L. Hanusa, B. H. Moses-Kolko, E. Wisner, K. L. (2010)	Pediatrics	prospective	238 women (USA)	Determine relationships between (1) MDD and depressive symptom severity during pregnancy and breastfeeding intention; (2) MDD and depressive symptom severity during pregnancy and breastfeeding initiation and status at 2 and 12 weeks; and (3) serotonin reuptake inhibitor (SRI) use and breastfeeding intention, initiation, and status at 2 and 12 weeks	SCID; Hamilton Depression Rating Scale	N/A	Maternal age, marital status, education, parity, race, smoking during pregnancy, pre-pregnancy BMI, return to work/school plans, prior BF experience, infant feeding decision certainty, determination to BF, confidence to BF	Neither MDD nor depressive symptom severity in pregnancy was related to breastfeeding intention, initiation or duration at 2 and 12 weeks. Intention to exclusively breastfeed was the most significant predictor of breastfeeding initiation and duration.
Brown, A., Rance, J., and Bennett, P. (2016)	Public Health, Clinical Health, and Psychology	cross-sectional	217 mothers with infants 0–6 months old (UK)	Examine relationship between specific reasons for breastfeeding cessation and depressive symptoms in the postnatal period	EPDS	N/A	Maternal age, education, employment, marital status	Short breastfeeding duration & multiple reasons for stopping breastfeeding were associated w/higher depression score. Regression analysis: only stopping breastfeeding for physical difficulty and pain remained predictive of depression score.
Cooke, M., Schmied, V., and	Midwifery and Family Health	prospective	365 women (Australia)	Explored the relationship between maternal	EPDS	N/A	Maternal age, psychiatric state,	Antenatal EPDS and anxiety scores not related

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
Sheehan, A. (2007)				distress, breastfeeding cessation, breastfeeding problems, and breastfeeding maternal role attainment			employment, social class, income level, support network, marital status, parity	to BF cessation or BF problems. Relationship between BF cessation and postnatal distress varied according to Maternal Role Attainment (MRA) level. Women who were categorized as high MRA and no longer breast feeding had higher EPDS scores and were more likely to be categorized as distressed (36%) than women who had low MRA (<12%) or women who had high MRA and continued to breast feed (7%).
Cooper, P.J. Murray, L. Stein, A. (1993)	Psychiatry	prospective	356 (243 pregnant women, 113 postpartum women) (UK)	Examine relationship between a variety of psychiatric and social factors and the early termination of breast-feeding	GHQ; EPDS	N/A	Maternal age, parity, marital status, race, education,	There was a significant association with depressive disorder and early breastfeeding, which in the majority preceded the early cessation of breastfeeding.
de Jager, E., Broadbent, J., Fuller-Tyszkiewicz, M., Skouteris, H. (2014)	Psychology	cross-sectional	174 women who gave births 6 months-2 years prior (Australia)	Investigate the psychosocial variables associated with the ability to exclusively breastfeed to 6 months postpartum & evaluate a conceptual model of psychosocial correlates of EBF duration	DASS-21	WHO	Maternal age, parity, marital status, education, ethnicity, employment status pre- and post-pregnancy, household income, pre-pregnancy weight and height, variables specific to pregnancy and postpartum experiences	Women who exclusively breast fed to six months postpartum exhibited higher intention to exclusively breastfeed, breastfeeding self-efficacy, comfort breastfeeding in public, perceived physical strength and reported less perceived breastfeeding difficulties. Maternal attitude towards pregnancy (both during pregnancy and postpartum), psychological adjustment and early breastfeeding difficulties were also found to be significant predictors of

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								exclusive breastfeeding intention and duration
Dennis, CL. McQueen, K. (2007)	Nursing	prospective	594 women (Canada)	Examine the relationship between diverse infant feeding outcomes and postpartum depressive symptomatology	EPDS	Labbok & Krasovec, 1990	Maternal age, marital status, parity, ethnicity, education, delivery mode, post-delivery hospital discharge, household income	No relationship was found between diverse infant feeding outcomes at 1-week postpartum and the development of depressive symptomatol ogy at 4 or 8 weeks. Conversely, mothers with an Edinburgh Postnatal Depression Score >12 at 1 week postpartum were significantly more likely at 4 and/or 8 weeks to discontinue breastfeeding, be unsatisfied with their infant feeding method, experience significant breastfeeding problems and report lower levels of breastfeeding self-efficacy.
Falceto, O. G. Giugliani, E. R. J. Fernandes, C. L. C. (2004)	Psychiatry and Pediatrics	case-control	153 families of 4-month-old infants (Brazil)	Association between maternal mental health and breastfeeding duration is contradictory	SRQ-20	N/A	Maternal age, education, employment, smoker, delivery mode, gestation length, separation in hospital; birth order, infant sex, household condition	Depression was the most prevalent disorder affecting both mothers and fathers. Maternal mental health problems during the first month postpartum, twice as likely to interrupt breastfeeding. 76% still had mental health problems at 4 months postpartum.
Fairlie, T. G. Gillman, M. W. Rich-Edwards, J. (2009)	Pediatrics	prospective	1436 pregnant women (USA)	Determine impact of prenatal depressive symptoms and high pregnancy-related anxiety on (1) prenatal intention to breastfeed and (2) breastfeeding initiation	EPDS	1) Planned to breastfeed (indicated plans to only or mostly breastfeed) 2) Planned to formula feed	Maternal age, parity, race/ ethnicity, country of origin, education, partner status, household income, pre-pregnancy history of depression,	In multivariate analyses, women with prenatal depressive symptoms (OR 1.92, 95% CI 1.11, 3.33), neither prenatal depressive symptoms (OR 1.06, 95% CI 0.61, 1.84) nor

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
							gestation age delivered, delivery mode, BMI	high pregnancy-related anxiety (OR 1.28, 95% CI 0.74, 2.20) was associated with failure to initiate breastfeeding
Field, T., Hernandez-Reif, M., Feijo, L. (2002)	Medicine	cross-sectional	40 women (USA)	(1) The incidence of breastfeeding in an already depressed mother sample, (2) The duration of their breastfeeding, (3) Selfreported confidence in breastfeeding, and (4) The mother's perception of the infant's temperament including irritability and alertness	CES-D; SCID	N/A	Maternal age, socioeconomic status, ethnicity, marital status, parity, birthweight, infant sex, infant's current age and weight	Depressed mothers less often breastfed, stopped breastfeeding infants significantly earlier in infancy, and scored lower on a breastfeeding confidence scale. Independent of maternal depression, mothers who breastfed rather than bottle fed their infants had higher confidence levels and rated their infants as less alert and less irritable during feedings.
Figueiredo, B. Canario, C., Field T. (2014)	Psychology and Medicine	prospective	145 pregnant women (Portugal)	Explored effects of prenatal and postpartum depression on breastfeeding and the effect of breastfeeding on postpartum depression	EPDS	Labbok & Krasovec, 1990	Maternal age, education, marital status, socioeconomic status, employment, parity, intended pregnancy, infant sex, gestational age delivered, birthweight	Depression scores at the 3rd trimester, but not at 3 months postpartum, were the best predictors of exclusive breastfeeding duration ($\beta = -0.30$, $t = -2.08$, $p < 0.05$). A significant decrease in depression scores was seen from childbirth to 3 months postpartum in women who maintained exclusive breastfeeding for 53 months ($F1,65 = 3.73$, $p < 0.10$, $\eta 2p = 0.05$).
Galler, J. R. Harrison, R. H. Biggs, M. A. Ramsey, F. Forde, V. (1999)	Psychology and Medicine	prospective	93 postpartum women (Barbados)	Identify psychosocial variables affecting early infant feeding practices	Zung Depression and Anxiety Scale	N/A	Home environment factors: household composition, house conveniences, family income, father's income, maternal	Significant predictive relationships between mood and feeding practices remained even when the effects of the home environment were controlled. Specifically,

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
							reproductive age, child-rearing experience, closeness to parents, maternal health, and information-seeking	depressive symptoms at 7 weeks postpartum predicted a reduced preference for breast feeding at current and later infant ages. Conversely, feeding practices did not predict maternal moods at later ages.
Haga, S. M.Lisoy, C. Drozd, F. Valla, L. Slinning, K. (2018)	Infant Mental Health and Nursing and Health Promotion	prospective	1396 (577 pregnant and 819 postpartu m) (Norway)	Contribute to the understanding of the relationship between perinatal depression and breastfeeding in a population-based sample	EPDS	Labbok & Krasovec, 1990	Maternal age, marital status, parity, education, employment, intended pregnancy, ethnicity, current or previous psychiatric disorder, prematurity, smoking during pregnancy, partner's employment	Depressive symptoms measured prenatally during the last trimester, at 4 and 6 months postpartum did not predict breastfeeding behavior at 4, 6, or 12 months postpartum, respectively. Furthermore, breastfeeding at 4 and 6 months postpartum did not predict depressive symptomatology at 6 or 12 months postpartum. There were no significant concurrent associations between breastfeeding and depressive symptoms at 4, 6, or 12 months postpartum. Depressive symptoms predicted subsequent depressive symptoms and breastfeeding predicted subsequent breastfeeding. There was no evidence of a relationship between depressive symptoms and breastfeeding.
Hamdan, A. Tamim, H. (2012)	Health Sciences and Medicine	prospective	137 pregnant Arab women (UAE)	Investigate possible correlation or predictive relationship between	BDI-II; EPDS; MINI	N/A	Maternal age, nationality, birth country, number of wives in family, parity,	Women who were breastfeeding at 2 and 4 months had lower scores on EPDS ($p <$ 0.0037 and $p <$

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
				breastfeeding and Postpartum Depression (PPD)			education, monthly income, religion, husband's employment	0.0001, respectively) and were less likely to be diagnosed with PPD at 4 months ($p < 0.0025$). Higher scores on EPDS and diagnosis of PPD at 2 months were predictive of lower rates of breastfeeding at 4 months ($p < 0.0001$ and $p < 0.005$, respectively). Breastfeeding women at 2 months had lower scores on EPDS ($p < 0.003$) and were less likely to be diagnosed with PPD ($p < 0.05$) at 4 months
Hasselmann, M. H. Werneck, G. L. Da Silva, C. V. C. (2008)	Nutrition	prospective	429 infants under 1 month old (Brazil)	Evaluates association between postpartum depression and interruption of exclusive breastfeeding in the first two months of life	EPDS	WHO	Child's age and sex, birthweight, prematurity, delivery mode, maternal education, indicator of housing condition, maternal age, number of prenatal visits, childbirth conditions, social support, marital status, maternal employment	Children of mothers with postpartum depressive symptoms were at higher risk of early interruption of exclusive breastfeeding in the first and second months of follow-up (RR = 1.46; 95%CI: 0.98–2.17 and RR = 1.21; 95%CI: 1.02–1.45, respectively). Considering mothers that were exclusively breastfeeding at the first month, postpartum depression was not associated with interruption of exclusive breastfeeding in the second month (RR = 1.44; 95%CI: 0.68–3.06).
Hellin, K. Waller, G. (1992)	Psychiatry	prospective	111 pregnant women (UK)	Examine relationship between women's mood, their perception of feeding difficulties, and their chosen feeding practices for their babies	BDI	N/A	Maternal age, marital status, education, employment, previous pregnancies	Maternal mood at all 3 times points were significantly associated with feeding problems and practices. Depression in pregnancy led to more physical difficulties with breastfeeding.

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								Ceased breastfeeding and introduced solids at a younger age.
Henderson, J. J. Evans, S. F. Straton, J. A. Y. Priest, S. R. Hagan, R. (2003)	Midwifery and Biostatistics	prospective	1745 postpartu m women (Australia)	Investigate relationship between maternal postnatal depression and breastfeeding duration	EPDS; SCID	Labbok & Krasovec, 1990	Maternal age, parity, education, socioeconomic status, relationship status, delivery mode, birthweight, hospital separation, day of hospital discharge, maternal smoking, return to work, infant admission to hospital	Of the 18% of participants diagnosed with postnatal depression, the onset occurred before 2 months in 63% of cases. Median duration of breastfeeding was 26 weeks for women with early-onset depression, 28 weeks for women with late-onset depression, and 39 weeks for women without depression. Early cessation of breastfeeding was found to be significantly associated with postnatal depression (adjusted hazard ratio 1.25, 95% CI 1.03–1.52). Onset of postnatal depression occurred before cessation of breastfeeding in most cases
Islam, M. J., Baird, K., Mazerolle, P., Broidy, L. (2017)	Criminology and Criminal Justice, Nursing, and Midwifery	cross-sectional	426 married women with at least one child under 6 months old (Bangladesh)	Explore the influence of psychosocial factors including IPV on EBF.	EPDS	WHO	Maternal education, family monthly income, place of residence (rural/urban), family structure, maternal age during last pregnancy, intended pregnancy, parity, number of children under 5 years of age, sex of most recent baby, antenatal care visits, maternal health status, delivery mode, place of birth, childbirth complications	Women who experienced physical IPV (AOR 0.17,95% Cl [0.07, 0.40]) and psychological IPV (AOR 0.51, 95% Cl [0.26,1.00]) after childbirth and women who reported childhood sexual abuse (AOR 0.32,95% Cl [0.13,0.80]) and PPD (AOR 0.20, 95% Cl [0.09,0.44]) were significantly less likely to exclusively breastfeed their infants than those who had not reported these experiences.

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
Lau, Y., Chan, K. S. (2007)	Health Sciences	cross-sectional	1200 Chinese mother-infant pairs (Hong Kong)	Explores two understudied correlates that may influence breastfeeding initiation: intimate partner violence during pregnancy and early postnatal depressive symptoms	EPDS	EBF, similar to WHO	Maternal age, place of birth, marital status, living conditions, BF support, parity, intended pregnancy, delivery mode	Women who had no experience of intimate partner violence during pregnancywere significantly more likely to initiate breastfeeding (adjusted odds ratio = 1.84; 95% confidence interval, 1.162.91) after adjustment fordemographic, socioeconomic, and obstetric variables. Early postnatal depressive symptoms were not significantly associated with feeding modes in a multinomial logistic regression model
Machado, M. C. Assis, K. F. Oliveira Fd.e, C. Ribeiro, A. Q. Araujo, R. M. Cury, A. F. Priore, S. E. Franceschini S. C. (2014)	Nutrition	prospective	168 new mothers (Brazil)	Assessed determinants of exclusive breastfeeding abandonment	EPDS	WHO	Maternal age, education, number of people in household, home ownership, income, mother in school/work post-delivery, income of all household residents, parity, presence of BF guidelines prenatally and postnatally, delivery mode, birth trauma, and birthweight	Depressive symptoms and traumatic delivery were associated with exclusive breastfeeding abandonment in the second month after childbirth.
Madeghe, B. A., Kimani, V. N., Stoep, A. vander, Nicodimos, S., Manasi, K. (2016)	Psychiatry	cross-sectional	200 mother-infant pairs (Kenya)	Examine effects of postpartum depression on infant feeding practices and malnutrition among women	EPDS	WHO	Maternal age, marital status, education, occupation, monthly income, living situation	Taking into account differences in socioeconomic status of depressed and nondepressed mothers, nondepressed mothers had a 6.14 (95% CI 2.45–13.36) times higher odds of practicing exclusive breastfeeding than mothers who were depressed. Mothers with

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								PPD had a 4.40 (95% CI 1.91–11.93) time higher odds of having an underweight infant than mothers without depression
McCarter-Spaulding, D. Horowitz, J. A. (2007)	Nursing	prospective	122 postpartu m women (USA)	Examine patterns of exclusive breastfeeding, combination feeding, and exclusive bottle-feeding among a sample of women identified at 24 weeks postpartum with positive PPD symptoms	EPDS; BDI-II	Labbok & Krasovec, 1990	Maternal race/ ethnicity, age, nationality, education, marital status, living with a partner, social support, employment, return to work, socioeconomic status, birth weight, gestation at birth, parity	Severity of depression was not significantly related to breastfeeding.
Misri, S. Sinclair, D.A. Kuan, A.J. (1997)	Psychiatry and Obstetrics, Gynecology	prospective	51 postpartu m women (Canada)	Studied the relationship between breast-feeding cessation and the onset of postpartum depression	CGI	Exclusive breast-feeders and supplement al breast-feeders	Maternal age, education, parity, marital status, birthweight, delivery mode, delivery complication, delivery interventions, partner present at delivery,	The majority (39 out of 51; 83%) of the women reported that their depression began before the cessation of breastfeeding, while only 8 patients (17%) stated that their depression was subsequent to breastfeeding cessation. It is concluded that in this outpatient sample of depressed postpartum women, the onset of depression preceded the cessation of breastfeeding. The severity of the illness did not appear to influence breastfeeding persistence significantly.
Pippins, J. R. Brawarsky, P. Jackson, R. A. Fuentes-Afflick, E. Haas, J. S. (2006)	Medicine	prospective	1448 postpartu m women (USA)	Identify risk factors for lack of breastfeeding initiation and duration and examine depressive symptoms during pregnancy as a potential risk factor for not initiating or	CES-D	N/A	Maternal age, race/ethnicity, education, marital status, socioeconomic status, parity, delivery mode, BF instruction/ preparat ion, smoking, presence of	5.6% of women did not initiate breastfeeding, and 11.1% of women who initiated breastfeeding had a duration of breastfeeding of <1 month; no racial or ethnic differences in initiation of

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
				continuing breastfeeding			chronic disease, selfreported health status, perceived stress	breastfeeding after adjusting for demographic and clinical characteristic s. At 1-month postpartum, African American women were more likely than white women to have a duration of breastfeeding lasting <1 month. Depressive symptoms during or prior to pregnancy had no effect on initiation of breastfeeding even when symptoms were persistent. Women with persistent depressive symptoms (symptoms at two time points, including one prior to delivery) were more likely to have breastfeeding duration of <1 month (odds ratio [OR] 1.77, 95% confidence interval [95% CI] 1.10–2.86), whereas depressive symptoms at a single time point were not associated with breastfeeding duration of <1 month.
Rahman, A. Assad, H. Rakshanda, B. Siham, S. Abid, M. Fareed, M. Tomenson, B. Creed, F. (2016).	Psychology	prospective	279 women in their 3rd trimester (Pakistan)	Hypothesized that perinatal depression was associated with early cessation of exclusive breastfeeding and reduced quantity of breast milk	SCID	EBF, similar to WHO	Maternal age, literacy, education, financial empowerment, number of children under 7 years, family type, husband education, infant sex, socioeconomic status, delivery mode, birthweight, infant weight at 6 months	Depression was associated with fewer days of exclusive breastfeeding (91.8 (SD=47.1) vs. 108.7 days (SD=54.3) (95% CI: 3.4 to 30.3 P=0.014)). Women with persistent depression ceased exclusive breastfeed earliest. There was no difference in the quantity of breast milk produced by

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								depressed and nondepressed mothers: 89.3 (SD=38.1) vs. 83.9 (29.0) ml/kg infant wt/24 hours, P=0.57. Depressed mothers were significantly more likely to report insufficient milk: PIM scores were 34.4 (SD=14.3) for depressed and 39.7 (SD=10.4) for nondepressed women (P=0.004). In Cox regression PIM score mediated the association between depression and early cessation of breastfeeding
Sharifi, F., Nouraei, S., Shahverdi, E. (2016)	Midwifery	cross-sectional	92 pregnant women (Iran)	Ascertain relationship between maternal mental health and breastfeeding status of mothers	EPDS; BDI	N/A	Maternal age, housing, residence (urban/rural), education, employment, husband's employment, income; previous pregnancies status history (Table 2)	Average Beck Depression Inventory score was 1.35±0.84 totally (1.33±0.81 in the exclusive breastfeeding group vs. 1.33±1.00, P=0.584). An average of EPDS score was 1.65±1.11, 1.64±1.11, and 1.44±0.88 in total, in the exclusive breastfeeding and nonexclusive breastfeeding groups, respectively (p=0.604).
Taj, R., Sikander, K. S. (2003)	Psychiatry	cross-sectional	100 mothers with breastfeeding children (Pakistan)	Examine effects of maternal depression on breastfeeding behavior	EPDS	N/A	Maternal age, residence, education, number of children, employment	38% of the women had stopped breast feeding and their mean score on HADS was 19.66 (cut-off=10/11). Whereas 62% of the women were breast feeding their children with a mean score 3.27 on HADS. Out of the nonbreastfeeding mothers, 36.8% reported that their depressive symptoms preceded

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								cessation of breastfeeding
Tamminen, T. (1988)	Public Health	cross-sectional	90 firsttime mothers (Finland)	Determine impact of mother's depression on her breastfeeding attitudes and experiences	BDI	N/A	Maternal age, marital status, social class	Depressed mothers expressed more difficulties with breastfeeding than other mothers. The attitudes of depressed mothers seem to be more positive during pregnancy, but more negative during breastfeeding than those of nondepressed mothers
Tuthill, E., Pellowski, J., Young, S., Butler, L. (2017)	Nursing and Anthropology	longitudinal randomized control trial	58 women (South Africa)	Investigate impact of perinatal depression on exclusive breastfeeding among HIV-infected women.	PHQ-9	Are you currently EBF your infant? Have you started giving infant food or fluids in addition to giving breast milk? If your choice was to EBF and you or your family introduced other fluids or foods in addition to your initial choice, when did this occur?	Maternal age, education, employment, in school, living with mother, current partner, HIV status, EBF intention	Most (80.9 %) of the sample reported at least some symptoms of depression prenatally. Rates of depression were lower postpartum (47.1 %). In multivariate models, higher prenatal depression scores significantly predicted lower likelihood of EBF at 6-weeks postpartum after adjusting for demographics, condition, and intentions (AOR = 0.68, $p < 0.05$). Postpartum depression was not a significant predictor of EBF rates (AOR = 0.99, $p = 0.96$).
Vitolo, M. R., Benetti, S. P. D. C., Bortolini, G. A., Graeff, A., Drachler, M. D. L. (2007)	Medical Sciences	cross-sectional	263 postpartu m mothers (Brazil)	Verifying incidence of depressive symptoms in a group of mothers of children between 12 and 16 months and their associations with breast feeding and overall child development	BDI	EBF, similar to WHO	Maternal age, education, employment, marital status, family structure, family income	Mothers without partners (prevalence ratio - PR = 1.70; IC95% = 1.20–2.38) and mothers from nonnuclear families presented more depressive symptoms (PR = 1.38; IC95% = 0.99–1.92). Exclusive breast feeding at 6 (PR = 1.86; IC95% = 0.94–3.68) and 12 months (PR = 1.80; IC95% =

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								1.26–2.58) was more frequent in the group of mothers without depressive symptoms
Ystrom, E. (2012)	Public Health	prospective	42225 women (Norway)	1) Investigate whether breastfeeding cessation is related to an increase in symptoms of anxiety and depression from pregnancy to six months postpartum. 2) Investigate whether the proposed symptom increase after breastfeeding cessation was disproportionately high for those women already suffering from high levels of anxiety and depression during pregnancy.	SCL-8	WHO	Maternal age, plural birth, preterm birth, delivery mode, gestation age, smoking	Prepartum levels of anxiety and depression were related to breastfeeding cessation (β 0.24; 95%CI 0.21–0.28), and breastfeeding cessation was predictive of an increase in postpartum anxiety and depression (β 0.11; 95%CI 0.09–0.14). Second, prepartum anxiety and depression interacted with the relation between breastfeeding cessation and postpartum anxiety and depression (β 0.04; 95%CI 0.01–0.06). The associations could not be accounted for by the adjusting variables.
Yusuff, M. A. S., Tang, L., Binns, C. W., Lee, A. H. (2016)	Medicine and Public Health	prospective	2072 women in their 3rd trimester (Malaysia)	Investigate the relationship between full breastfeeding at 3 months postpartum and postnatal depressive symptoms	EPDS	WHO	Maternal age, ethnicity, education, marital status, employment, household income, infant sex, maternal satisfaction with infant sex, antenatal EPDS score at baseline	Mothers fully breastfeeding at 3 months postpartum had significantly ($P < .001$) lower mean EPDS scores at both 1 and 3 months postpartum (mean ± SD, 4.14 ± 4.12 and 4.27 ± 4.12, respectively) than others who did not initiate or maintain full breastfeeding for 3 months (4.94 ± 4.34 and 5.25 ± 4.05, respectively). After controlling for the effects of covariates, the differences in EPDS scores remained statistically

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Author (Year)	Primary discipline of author team	Research design	Population	Objective	Tool assessing depressive symptoms	Breastfeeding definition	Covariates	Results
								significant (P = .001) between the 2 breastfeeding groups.

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Table 2.

Study settings by country, as designated by World Bank country income status *.

High-income	Number of studies (n=24)	Middle-income	Number of studies (n=14)
United States	5	Brazil	4
United Kingdom	5	Iran	2
Australia	3	Pakistan	2
Norway	2	Turkey	1
Finland	2	Bangladesh	1
Canada	2	Malaysia	1
Barbados	1	Egypt	1
Portugal	1	Kenya	1
Hong Kong	1	South Africa	1
Saudi Arabia	1		
United Arab Emirates	1		

* The World Bank, 2018

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Table 3.

Perinatal period under investigation, by study design (n=38).

Study Design	Pregnancy	Perinatal	Persistent	Postpartum
Prospective (n=23)	1	7	5	10
Cross-sectional (n=12)	1	1		10
Case-control (n=2)				2
Longitudinal randomized control trial (n=1)		1		

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Table 4.

A wide range of sample sizes were represented across included studies

Sample Size Range	40–60	60–100	100–300	300–600	800–1800	2000+	Total
Number of Studies	3	4	15	6	7	3	38
Mean	49.67	93.75	190	438	1286.3	17925.3	1810.37
Median	51	92.5	174	427.5	1396	9479	250.5

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Table 5.

Breastfeeding definitions provided by included studies

World Health Organization's definition of exclusive breastfeeding (n=7)	EBF: the consumption of breast milk only (including expressed milk and medicines) and excludes infant artificial milk, non-human milk, water or water-based drinks, tea or fruit juice.	de Jager et al., 2014; Hasselmann et al., 2008; Islam et al., 2017; Machado et al., 2014; Madeghe et al., 2016; Ystrom 2012; Yusuff et al., 2016
Exclusive breastfeeding definition, similar to WHO but no reference provided (n=4)	EBF: the infant receiving no other food than mother's breast milk since birth, except small amounts of water (Ahlqvist-Björkroth et al., 2016).	Ahlqvist-Björkroth et al., 2016; Lau & Chan, 2007; Rahman et al., 2016; Vitolo et al., 2007
	Breastfeeding: feeding an infant with only breastmilk (including expressed milk) (Lau & Chan, 2007).	
	EBF: only breastfeeding being practiced with no other semi-solid or liquid foods (other than medication and/or oral rehydration solutions) (Rahman et al., 2016).	
	EBF: breast milk without water, tea or any	
	other food; Breast feeding: presence of breast milk independent of other foods (Vitolo et al., 2007).	
Labbok & Krasovec, 1990 **(n=6)**	EBF: no other liquid or solid is given to the infant, aside from breast milk [other definitions i.e. Almost Exclusive, Partial, Token also included].	Dennis & McQueen, 2007; Field et al., 2002; Figueiredo et al., 2014; Haga et al., 2017; Henderson et al., 2003; McCarter-Spaulding & Horowitz, 2007
Other definition provided (n=5)	See Table 1	Annagür et al., 2013; Assarian et al., 2014; Fairlie et al., 2009; Misri et al., 1997; Tuthill et al., 2017
No definition provided (n=16)	N/A	Abou Nazel & Nosseir, 1994; Al-Muhaish et al., 2018; Amiel Castro et al., 2017; Bick et al., 1998; Bogen et al., 2010; Brown et al., 2016; Cooke et al., 2007; Cooper et al., 1993; Falceto et al., 2007; Galler et al., 1999; Hamdan & Tamim, 2012; Hellin & Waller, 1992; Pippins et al., 2006; Sharifi et al., 2016; Taj & Sikander, 2003; Tamminen, 1988

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Table 6.

Individual and social factors assessed by included studies

Individual Factors Assessed	**Studies**
Breastfeeding self-efficacy (n=3)	de Jager et al., 2014; Dennis & McQueen, 2007; Bogen et al., 2010
Attitudes toward breastfeeding (n=5)	Abou Nazel & Nosseir, 1994; Amiel Castro et al., 2017; Field, 2010; Galler et al., 1999; Tamminen, 1988
Difficulties with breastfeeding (n=2)	Bick et al., 1998; Brown et al., 2016
Perceived breastmilk insufficiency (n=3)	Abou Nazel & Nosseir, 1994; Henderson et al., 2003; Rahman et al., 2016
Pregnancy complications (n=3)	Annagür et al., 2013; de Jager et al., 2014; Machado et al., 2014
Social Factors Assessed	
Social support (n=5)	Ahlqvist-Björkroth et al., 2016; Bick et al., 1998; Islam et al., 2017; McCarter-Spaulding & Horowitz, 2007; Vitolo et al., 2007
Paternal depression (n=2)	Ahlqvist-Björkroth et al., 2016; Falceto et al., 2004
Intimate partner violence (n=2)	Islam et al., 2017; Lau & Chan, 2007