Optimizing cognitive and behavioural approaches for perinatal depression: a systematic review and meta-regression analysis

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Abstract

Cognitive behavioural therapies (CBT) have been demonstrated efficacious in treating perinatal depression (PND). This has been demonstrated in several meta-analyses of randomized controlled trials and quasi-experimental studies. However, there is a need for up-to-date meta-analytical evidence providing reliable estimates for CBT's effectiveness in treating and preventing PND. Furthermore, with the world moving towards precision medicine, approaches require a critical synthesis of psychotherapies, especially to unpack their mechanisms of action and to understand what approaches work best for whom. Therefore, the present systematic review and meta-regression analyses aim to answer these research questions.

We searched six academic databases through February 2022 and identified 56 studies for an in-depth review. Using pretested data extraction sheets, we extracted patient-level and intervention-level characteristics and effect size data from each study. Random effects meta-analyses and mixed effect subgroup analyses were run to delineate the effectiveness and moderators of CBT interventions for PND, respectively. CBT based interventions yielded a strong effect size (SMD= -0.74, 95% CI: -0.91 to -0.56, n= 9,722) in alleviating depressive symptoms. These interventions were effective across different delivery formats (individual, group, and electronic) and could be delivered effectively by specialists and non-specialists. Longer duration CBT interventions may not necessarily be more effective than shorter ones. Moreover, CBT-based interventions should consider including various behavioural ingredients to maximize intervention benefits.

Keywords: Cognitive behavioural therapy, CBT, perinatal depression

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Impact statement

Perinatal depression is very prevalent worldwide. It is associated with poor maternal and infant health outcomes and thus, a significant public health concern. Cognitive behavioural (CB) therapy is an evidence-based and one of the most effective treatments for perinatal depression. This systematic review and meta-analysis provide an overview of interventional research testing different cognitive behavioural approaches for perinatal depression. It synthesizes findings about the development of CB-based approaches delivered either individually, in groups or electronically. Thereafter, using established frameworks, this review also dissects the interventions into their components. Quantitative evidence is provided regarding the factors which could improve or worsen the efficacy of these interventions. These include but are not limited to characteristics of women undergoing CB treatment, the format of delivery and approaches utilized in these intervention programmes. It is hoped that this synthesis of literature would guide researchers, clinicians and implementors in better delivery of CB approaches for perinatal depression in different settings.

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1.1. Background

Perinatal depression (PND) is a public health priority due to its high prevalence and ill effects on child health (Anderson et al., 2017; Bowers et al., 2021; Gelaye et al., 2016; Husain et al., 2006). It is one of the most common mental disorders among perinatal women and is studied widely in low and middle-income countries (LMIC) (Gelaye et al., 2016). In LMIC, around 25.3% of antenatal women and 19% of postpartum women report depressive symptoms (Gelaye et al., 2016). Women with PND are at a higher risk of developing perinatal complications, including intrauterine growth retardation, preterm deliveries, low birth weight, and infectious illnesses among their infants (Gelaye et al., 2016). In addition, untreated PND affects child health postnatally, leading to poorer growth, neurodevelopmental, socioemotional, and academic outcomes (Ashman et al., 2008; Bao et al., 2016; Betts et al., 2015; Bowers et al., 2021; Chae et al., 2020; Dubowitz et al., 2002; Fanti and Kimonis, 2017; Netsi et al., 2018). Therefore, strategies to address maternal mental health is increasingly becoming the focus of maternal and child public health initiatives, especially in LMIC (Rahman et al., 2018; Rahman et al., 2008; Sikander et al., 2019a; Sikander et al., 2019b).

Fortunately, efficacious preventive and treatment interventions exist for PND in the form of psychological and psychosocial therapies (Li et al., 2022; Rahman et al., 2018; Sockol, 2015; Waqas et al., 2022b). Experimental evidence, however, is still lacking for pharmacotherapies for PND (Brown et al., 2021; Howard and Khalifeh, 2020). Several meta-analyses of randomized controlled trials (RCTs) have repeatedly shown that cognitive behavioural therapies (CBT) are among the most efficacious treatments for PND (Li et al., 2022; Rahman et al., 2018; Sockol, 2015; Waqas et al., 2022b). For instance, strong effect sizes were reported for CBT based treatment interventions for PND (SMD= 0.65, 95% CI: 0.54–0.76) (Sockol, 2015). While CBT interventions have yielded weak to moderate strength effect sizes in the prevention of PND (SMD=0.39, 95%CI: 0.17–0.60) (Sockol, 2015). These therapies are also acceptable among the stakeholders and end-consumers in LMIC and, thus, suitable for large-scale implementation (Rahman et al., 2018).

Research evidence demonstrates CBT interventions' adequate effectiveness, utility, and implementation (Li et al., 2022; Rahman et al., 2018; Sockol, 2015; Waqas et al., 2022b). However, there is a paucity of evidence delineating what works and for whom. Answering these questions is important to optimize psychotherapies for different populations, for example, by choosing the right treatments for the right candidates (Delgadillo et al., 2022). An increasing body of research has shown that these treatments work in different settings (Sockol, 2015). However, there is little research evidence on how and for whom these interventions work (Cuijpers et al., 2019; Furukawa et al., 2021). Thus, delineating the mechanistic pathways of different psychotherapeutic treatments has gained priority in the research agenda for depression (Huibers et al., 2020). Mediation research is an important tool to understand how psychotherapies work, while prediction and moderation research

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help identify for whom these interventions work (Huibers et al., 2020). Using these tools, we can attempt to unpack the black box of psychological therapies, a challenge for the field identified as early as 1967 by Paul (Huibers et al., 2020; Paul G, 1967).

More recently, two complementary research streams in psychotherapy have emerged: one that focuses on harmonizing terminology across different schools of psychotherapies (Chorpita et al., 2005; Chowdhary et al., 2014; Singla et al., 2017), and the other focuses on empirical causal processes of change brought about by psychological interventions (Singla et al., 2021). Important research in the former domain includes the works of Chorpita et al. (Chorpita et al., 2005) and Abraham & Michie (Abraham and Michie, 2008), who sought to harmonize the taxonomy of treatment strategies utilized across different psychotherapies. Based on this work, researchers have posited that there are commonalities between different forms of psychotherapies. While having different theoretical underpinnings, these psychotherapies may work through similar mechanisms.

Two classes of therapeutic ingredients of psychotherapies have been posited: specific and non-specific or common ingredients (Singla et al., 2017). Specific active ingredients emerge from the theoretical models of different psychotherapies. For instance, cognitive behavior therapy is based on cognitive theory and hypothesized to work through challenging and changing maladaptive thought patterns or cognitive schemas, while behavioural therapies work by correcting maladaptive behaviors. Similarly, interpersonal psychotherapy is hypothesized to act through interpersonal change mechanisms (Chorpita et al., 2005; Cuijpers et al., 2019; Huibers et al., 2020; Kahl et al., 2012). Whereas common ingredients or elements include techniques used by therapists during the delivery of therapy sessions, e.g., building rapport and empathy or helping the client to identify sources of social support. These common active ingredients are shared across all forms of psychotherapy. Rosenzweigh cites these common ingredients as the primary reason for comparable effect sizes across different psychotherapies (Eyesenck, 1955; Rosenzweigh, 1936).

Even after decades of research, none of the theories has yielded conclusive empirical evidence, and the black box of psychotherapies remains unpacked. Moreover, there is also a paucity of evidence on optimizing and personalizing treatment with psychotherapies. Therefore, the present systematic review and meta-regression analysis aims to:

i. Assess the effectiveness of CBT-based interventions for prevention and treatment of PND
ii. Explore the settings in which these interventions work the best.
iii. Explore the individual level and intervention level factors driving PND's prognosis among women undergoing CBT.
iv. Explore the active ingredients of CBT interventions for PND.

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1.2. Methods

1.2.1. Search strategy

This systematic review and meta-analysis have been conducted per the PRISMA guidelines (Page et al., 2021). Before the conduct of this review, its protocol was registered on the PROSPERO database (Waqas and Rahman, 2022). The current systematic review does not report findings concerning secondary outcomes mentioned in the PROSPERO protocol. Using a pretested search strategy (Supplementary Table 1), we searched six academic databases, including PubMed, Medline, Web of Science, Psychinfo, Cochrane central registry of trials, and CINAHL, through February 2022.

1.2.2. Inclusion & Exclusion criteria

We included all randomized and cluster randomized controlled trials that reported the effectiveness of cognitive, behavioural, and third-wave psychotherapeutic interventions as standalone or as part of complex multicomponent interventions (Supplementary Table 2). We included cognitive and behavioural therapy-based interventions for perinatal depression, delivered during the antenatal period and up to 1-year postnatal. Those trials were considered that reported either the rate of perinatal depression or symptom severity of perinatal depressive symptoms as a primary outcome. Preventive interventions were considered for both indicated (populations with prodromal symptoms) and targeted (at-risk) populations. While for treatment interventions, we included those which recruited perinatal women who were either screened positive for perinatal depression using psychometric scales or diagnosed clinically using ICD or DSM clinical diagnostic criteria. Interventions conducted among peripartum women with medical comorbidities were also considered. When available, we also reviewed intervention manuals and secondary publications associated with the eligible randomized controlled trials. This was done to aid in synthesizing evidence on the active ingredients of CBT interventions.

We excluded studies that did not report perinatal depression (rates of diagnoses or severity of symptoms) as an outcome. We also excluded studies not available in the English language and short formats of publications such as brief reports, letters to editors, conference papers and abstracts.

1.2.3. Outcomes

As primary outcomes, we considered on either rate of PND assessed using clinical criteria of diagnoses or scores on valid and reliable psychometric scales; assessed post-intervention. This review does not report findings pertaining to secondary outcomes outlined in the PROSPERO protocol.

1.2.4. Study selection procedures and data extraction

Teams comprising two independent reviewers screened database records against inclusion and exclusion criteria using a two-phased approach (titles and abstracts followed by full texts). After identification of studies fulfilling the eligibility criteria, data on characteristics of intervention and

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study samples were extracted. Study level characteristics included the year of publication, study design, type of control group, and inclusion and exclusion criteria. While patient-level characteristics included mean age, the proportion of participants belonging to minority ethnic groups and lower income class, parity, family structure, and intervention timing (antenatal or gestational age if available, or postpartum period). We also catalogued intervention-level characteristics such as the scope of the intervention (targeted prevention, indicated prevention, and treatment), the theoretical underpinning of interventions, the format of delivery (individual, group, electronic), setting of intervention, delivery agent (specialist and non-specialist) and the number of sessions of intervention. These variables were selected apriori as described in the systematic review protocol (Waqas and Rahman, 2022).

1.2.5. Taxonomy of interventions: Distillation & Matching framework

This exercise was done to delineate different elements and active ingredients of cognitive behavioural interventions included in this review. It is based on the premise that interventions to improve mental health are varied and may comprise: i) a combination of specific or non-specific active ingredients underpinned by a single theory-based approach, often called a therapy (e.g., CBT) or ii) a combination of elements drawn from different theories, forming a multicomponent intervention or eclectic therapy. An additional complication is that multi-component interventions usually comprise ingredients that may be derived from another discipline, e.g., CBT may be delivered in tandem exercise or yoga. All this creates a problem for the field as it is important for policymakers to know which interventions provide the best evidence for effectiveness and feasibility (Abraham and Michie, 2008; Chorpita et al., 2005; Cuijpers et al., 2019; Furukawa et al., 2021; Huibers et al., 2020; Michie et al., 2013). Furthermore, it also complicates the understanding of mediational or causal mechanisms that drive an intervention's efficacy.

To decompose the CBT-based interventions into their components or active ingredients, we utilized the distillation and matching framework for psychotherapies devised by Chorpita et al. (2005). This approach was further informed by Michie and colleagues' hierarchically clustered taxonomy of behaviour change techniques (Abraham and Michie, 2008; Michie et al., 2013). These frameworks were used to harmonize the definitions of active ingredients across the studies included in this review. To devise a hierarchal taxonomy suitable for this review, we used the definitions proposed by the Institute of Medicine's framework for psychotherapies (England et al., 2015). The hierarchy comprised three levels: elements, strategies, and active ingredients. We defined the elements as either specific or non-specific. Nonspecific elements are fundamental engagement strategies (e.g., showing empathy) and are essential for building an effective client-therapist alliance. Specific elements are unique to a particular theoretical orientation underpinned by behavioural, cognitive, interpersonal, and emotional domains. This categorization is recommended by Singla et al. and widely adopted by the stakeholders (Rahman et al., 2018; Waqas et al., 2022b). All these elements and active ingredients

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have been defined in the World Health Organization's guidelines for preventing and treating perinatal depression and anxiety (Rahman et al., 2018) and presented here for review. The finalized hierarchy of active ingredients comprised 58 most utilized behaviour change techniques and treatment elements (Supplementary Table 3 and 4). Using the above frameworks, we could also harmonize and standardize strategies utilized across different disciplines and theories. For example, "thought records" in cognitive-behavioural therapy were considered similar to "mood ratings" in interpersonal psychotherapy (England et al., 2015).

This phase was conducted by three experts trained in clinical psychology and psychiatry at postgraduate levels. The reviewers evaluated the content of the interventions as detailed in the trial papers and associated manuals (if available) to identify commonly utilized approaches.

1.2.6. Risk of bias

The risk of bias among RCTs was assessed using the Cochrane tool for risk of bias assessments (Higgins et al., 2019). It was assessed across five domains, including the method for random sequence generation, allocation concealment, blinding of outcome assessment, attrition bias, and selective reporting. We did not rate risk across blinding of participants and personnel domain as it is challenging to maintain during trials of psychotherapies.

1.2.7. Data analysis

We conducted a meta-analysis for depressive symptoms according to psychometric scales and the rate of perinatal depressive disorders (ICD/DSM criteria) assessed after intervention. Findings on secondary outcomes were only synthesized narratively. For continuous outcomes about depressive symptoms severity on psychometric scales, we extracted the mean (SD) and sample size of intervention and control groups. For binary outcomes, we extracted both groups' number of events and sample sizes. In case scores on psychometric scales were presented as binary outcomes in studies, we converted them to standardized mean differences using the following formula: $SMD = \sqrt{3}/\pi \ln OR$ (Higgins et al., 2019).

We expected a high clinical heterogeneity in the eligible studies due to varied approaches for assessment of clinical outcomes, theoretical underpinnings of included therapies, and population studies. Therefore, we utilized random effects (Der Simonian & Laird method) to pool data across the studies. Study level and pooled effect sizes were visualized as a forest plot. Sensitivity analyses were conducted to adjust meta-analytical estimates for outliers. Publication bias in the study was assessed statistically using Egger's regression and visualized as Begg's funnel plot (Thornton and Lee, 2000). To identify moderators of effect sizes, we conducted subgroup analyses for study, intervention, and patient-level variables if reported in more than four studies (Borenstein et al., 2021). Meta-regression was done to assess the association of quantitative variables with effect size. To ensure optimum

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power, meta-regression was only performed when continuous variables were reported in at least ten studies. (Borenstein et al., 2021)

1.3. Results

1.3.1. Screening process

The electronic database searches yielded 515 titles and abstracts, out of which 116 duplicate records were removed using Endnote. Out of 399 titles and abstracts, 323 records were excluded after assessing their titles and abstracts against the eligibility criteria for this review. Finally, full texts of 76 studies were appraised, out of which 34 were excluded. A total of 42 studies were eligible to be included in the review. The main reasons for exclusion were non-RCT/cRCT study design (n=30), intervention not for PND (n=2), and short forms of publication (n=2). Fourteen studies were included after the manual screening of bibliographies of included studies and consultations with experts (Figure 1).

Among these 56 studies, there were 59 interventions. Among the included studies, a high proportion of the interventions were delivered individually (n=24), followed by group (n=25) and electronic (n=10) delivery format. These interventions were tested among participants with a mean age of 28.48 years (2.99), married ($\bar{x}$ =66.8%, SD= 31.95), and ($\bar{x}$ =48.26%, SD= 18.03). Among the participants in included studies, around 41% reported low-income levels (SD= 22.32) and poor education ($\bar{x}$= 35.25, SD= 23.69).

1.3.2. Quality of trials

These interventions were tested in generally high-quality trials, where random sequence generated was rated at low risk of bias among 41 studies, allocation concealment (n=29), blinding of outcomes assessment (n=26), attrition bias (n=35), and selective reporting (n=56). The risk of bias was unclear for allocation concealment in 27 studies, blinding of outcome assessment (n=27), attrition bias (n=13), and random sequence generation (n=10) (Figure 2).

1.3.3. Interventions delivered to individuals

Among these interventions (Supplementary Table 5), nine were delivered during the antenatal period (Ammerman et al., 2013; Burns et al., 2013; Cho et al., 2008; Dimidjian et al., 2014, 2016; Hayden et al., 2012; Nejad et al., 2021; Silverstein et al., 2011; Yazdanimehr et al., 2016), followed by postnatal (n=8) (Chabrol et al., 2002; Cooper et al., 2003; Hou et al., 2014; Kordi et al., 2018; Morrell et al.,

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2009; Ngai et al., 2015; Van Horne et al., 2021) and both periods (n=7) (McKee et al., 2006; O'Mahen et al., 2013a; Prendergast J, 2001; Rahman et al., 2018; Rahman et al., 2008; Sikander et al., 2019b; Tandon et al., 2018; Trevillion, 2014). Eleven interventions were delivered in communities, especially through home visits (Ammerman et al., 2013; Burns et al., 2013; Chabrol et al., 2002; Cooper et al., 2003; Morrell et al., 2009; Prendergast J, 2001; Rahman et al., 2008; Sikander et al., 2019a; Tandon et al., 2018; Van Horne et al., 2021), three in multiple settings (Dimidjian et al., 2017; McKee et al., 2006; Silverstein et al., 2011), while the rest were delivered in healthcare settings (clinic or hospital) (Cho et al., 2008; Dimidjian et al., 2016; Hayden et al., 2012; Hou et al., 2014; Kordi et al., 2018; Nejad et al., 2021; Ngai et al., 2015; O'Mahen et al., 2013a; Trevillion, 2014; Yazdanimehr et al., 2016). A higher proportion of studies utilized EPDS for outcome assessment (n=12), followed by BDI (n=6), HDRS (n=2), PHQ-9 (n=2), QIDS and DASS-21 (n=2).

A total of 18 interventions were tested for PND treatment and underpinned by CBT (n=16). Three trials tested PST (Kordi et al., 2018; Silverstein et al., 2011; Van Horne et al., 2021), mindfulness-based stress reduction or cognitive therapy (n=3) (Dimidjian et al., 2016; Nejad et al., 2021; Yazdanimehr et al., 2016), and BA therapy (n=1) (Dimidjian et al., 2017). These interventions were delivered by either specialists (n= 14), non-specialists (n=8), or multidisciplinary teams (n=2). Delivery agents reported diverse disciplinary backgrounds and experience in the delivery of care. Non-specialists ranged from peers (Sikander et al., 2019a), health visitors (Morrell et al., 2009; Tandon et al., 2018), and allied health professionals such as lady health workers (Rahman et al., 2008), midwives (Ngai et al., 2015), early childhood nurses (Prendergast J, 2001), and social workers (Ammerman et al., 2013; Hayden et al., 2012; McKee et al., 2006; Van Horne et al., 2021) and graduate students in social work, public health, and medical sciences (Silverstein et al., 2011). While delivery agents specializing in mental health included practising clinical psychologists, graduate students, recent graduates (Burns et al., 2013; Chabrol et al., 2002; Cho et al., 2008), counsellors, and well-being practitioners (Hou et al., 2014; Trevillion, 2014). Half of these interventions (n=12) were integrated into healthcare settings (Ammerman et al., 2013; Dimidjian et al., 2016; Dimidjian et al., 2017; Hou et al., 2014; Morrell et al., 2009; Ngai et al., 2015; Prendergast J, 2001; Rahman et al., 2008; Sikander et al., 2019a; Tandon et al., 2018; Trevillion, 2014; Van Horne et al., 2021).

The number of sessions ranged from one for prevention intervention by Chabrol et al. (Chabrol et al., 2002) to sixteen for treatment (Thinking Healthy Programme) of PND (Rahman et al., 2008). Among non-specific interventions, most frequently utilized non-specific active ingredients were active listening (n=10), empathy (n=9), collaboration (n=9) and inciting social support (n=9) and normalization (n=7). Assigning homework (n=8) and goal setting (n=8) were most frequently utilized in-session techniques.

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Among specific ingredients, interpersonal strategies were frequently utilized, including identifying and eliciting social support (n=14), communication skills (n=11), and identifying affect (n=10). Among behavioural strategies, problem-solving (n=16), relaxation (n=7), emotional regulation and stress management, and decision making (n=5 each) were frequently utilized. Essential cognitive strategies were identifying thoughts and behaviours and their links (n=19), cognitive restructuring (n=16), self-awareness (n=8), and mood monitoring (n=7). Caregiver coping (n=8), parent-child interaction (n=6), and psychoeducation regarding birth procedures or specific health areas of children (n=6) were also important (Supplementary Figures 1 to 3)

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1.3.4. Intervention delivered in groups

Among these 25 interventions (Supplementary Table 6), 14 were delivered antenatally (Austin et al., 2008; Bittner et al., 2014; Brugha et al., 2000; Futterman et al., 2010; Jesse et al., 2015; Kaaya et al., 2013; Khamseh et al., 2019; Kozinszky et al., 2012; Lara et al., 2010; Le et al., 2011; Leung et al., 2013; Van Ravesteyn et al., 2018; Zemestani and Fazeli Nikoo, 2019), postnatally (n=7) (Christine Puckering, 2010; Graciela Rojas, 2007; Hagan et al., 2004; Leung SS, 2016; Mao et al., 2012; Milgrom et al., 2005; Van Lieshout et al., 2022), and four during both periods (Muñoz et al., 2007; Ngai et al., 2019; Tandon et al., 2014). Only three of these interventions were conducted in communities (Muñoz et al., 2007; Tandon et al., 2014; Van Lieshout et al., 2022), while the rest were conducted in healthcare settings. EPDS was the most frequently utilized scale for outcome assessment, followed by BDI I/II (n=5). Seven interventions were delivered by specialists, 14 by non-specialists, and four by multidisciplinary teams. Delivery agents were heterogeneous in terms of disciplines and experience and included counselling or clinical psychologists, academics and doctoral students in psychology, nurses, midwives, doctors, obstetricians, social workers, occupational therapists, art therapists, infant mental health specialists, and peers. Thirteen of these interventions were integrated into healthcare systems, while the rest were delivered as standalone.

A total of 13 interventions were tested for treatment and 12 for prevention of PND. Twenty trials testes classical CBT interventions, PST (n=2), psychoeducation (n=2) and MCBT (n=1). The sessions ranged from one (Ngai et al., 2019) to 14 (Christine Puckering, 2010). Among group therapies, the most frequently utilized non-specific ingredients were inciting social support (n=12), normalization (n=9), and involvement of significant other (n=6). Most frequently employed in-session techniques were assigning homework (n=11), goal setting (n=13), and interpersonal focus (n=9). Among interpersonal strategies, the most frequently utilized ingredients were identifying affect (n=15), identifying, and eliciting social support (n=13), and communication skills (n=11). Problem solving (n=18), relaxation (n=16), stress management (n=13) were most frequently utilized behavioural ingredients. Identifying thoughts, behaviours, and their links (n=18), cognitive restructuring (n=13), and mood monitoring (n=6) were important cognitive ingredients. Caregiver coping skills (n=8) and parent-child interaction coaching (n=6) were imparted in a small proportion of trials (Supplementary Figures 4 to 6).

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1.3.5. Interventions delivered online

Seven of these interventions (Supplementary Table 7) were tested during postpartum (Fonseca et al., 2020; Jannati et al., 2020; Loughnan et al., 2019a; Milgrom et al., 2016; O'Mahen et al., 2013b; Van Lieshout et al., 2021; Wozney et al., 2017) and three during the antenatal period (Duffecy et al., 2019; Forsell et al., 2017; Loughnan et al., 2019b). Two of these interventions were for the prevention of perinatal depression (Duffecy et al., 2019; Fonseca et al., 2020), while the rest were treatment interventions. All interventions were designed to be used by individuals, except Duffecy et al. and Van Lieshout et al. who delivered to groups of participants (Duffecy et al., 2019; Van Lieshout et al., 2021). Only two of these interventions were guided either by specialist mental health professionals (Van Lieshout et al., 2021) or non-specialists (Wozney et al., 2017). The number of sessions of interventions ranged from one (Van Lieshout et al., 2021) to 16 (Duffecy et al., 2019). Only one intervention was integrated into healthcare settings (Forsell et al., 2017).

All interventions were based on CBT except Fonseca et al. and O'Mahen et al., who tested CBT-ACT and BA-based interventions (Fonseca et al., 2020; O'Mahen et al., 2013b). Among these interventions, inciting social support (n=6) was the most frequently utilized non-specific ingredient. Identifying affect (n=9), identifying and eliciting social support (n=8), and communication skills training (n=7) were important interpersonal strategies. Problem-solving (n=7), relaxation (n=7), and self-monitoring were important behavioural approaches. Among cognitive approaches, identifying thoughts (n=10), cognitive restructuring (n=8), and mood monitoring (n=7) were important elements. Assigning homework (n=6) was frequently employed in-session technique. Caregiver coping and parent-child interaction coaching were utilized in four interventions.

None of the interventions employed reinforcement-oriented active ingredients. Four interventions included information on caregiver coping skills (Duffecy et al., 2019; Fonseca et al., 2020; Milgrom et al., 2016; O'Mahen et al., 2013b) and four included parent-child interaction coaching (Duffecy et al., 2019; Milgrom et al., 2016; O'Mahen et al., 2013b; Wozney et al., 2017). Psychoeducation, either on birth procedures, nutrition, breastfeeding, or sexual behaviours was provided in only two interventions (Duffecy et al., 2019; Milgrom et al., 2016). Nutrition and substance use-related counselling were each provided in one study (Duffecy et al., 2019; Wozney et al., 2017). Table 4-6 present the characteristics of studies included in this section. Supplementary figures 7 to 9 present active ingredients utilized in online interventions

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1.3.6. Meta-Analysis: Effectiveness

CBT based interventions yielded a strong effect size (SMD= -0.74, 95% CI: -0.91 to -0.56, n= 9,722) in alleviating depressive symptoms. There was evidence of substantial heterogeneity in effect sizes across studies (I^2= 92.65%, p < 0.001, Q= 775.03). Sensitivity analysis did not reveal any substantial changes in effect size after removing outliers. There was substantial publication bias, as evidenced by the funnel plot (Supplementary Figure 10) and Egger's regression statistic (p=0.009). Duval & Tweedie's trim and fill method adjusted pooled effect size for publication bias. After trimming 13 studies to the left of the mean, the adjusted SMD was -0.95 (95% CI: -1.14 to -0.76).

Forest plots were developed separately according to the mode of delivery of interventions. Interventions delivered electronically (n=9) yielded strong effect sizes (SMD= -1.12, 95% CI: -1.80 to -0.63, n=1218) (Figure 3). There was substantial evidence of heterogeneity across studies (I^2= 93.99%, p < 0.001, Q= 133.12). There was no evidence of publication bias (Egger's regression p=0.65). Intervention delivered to individuals (Figure 4) also yielded strong effect sizes in favor of intervention group (SMD= -0.63, 95% CI: -0.81 to -0.44, n= 3589). There was evidence of significant heterogeneity across the studies (I^2= 80.99%, p<0.001, Q=121.02). There was evidence for significant publication bias (Egger's regression P=0.06), which after adjustment led to a higher effect size (SMD= -0.75, 95% CI: -0.94 to -0.55). Interventions delivered among groups (Figure 5) also yielded strong effect sizes in favour of the intervention group (SMD=-0.67, 95% CI: -0.96 to -0.38, n=4915). Statistical heterogeneity was substantial (I^2= 94.59%, p<0.001, Q=443.90). There was some evidence of publication bias (Egger's regression p=0.10), with the trim & fill method yielding a higher adjusted effect size (SMD= -1.00, 95% CI: -1.33 to -0.67). Sensitivity analysis did not reveal any substantial changes in effect size after removing outliers in any of the above analyses.

1.3.7. Moderator analyses: Intervention level characteristics

Moderator analyses for intervention level characteristics yielded several important insights (Supplementary Table 8). Interventions for treatment (SMD= -0.94, 95% CI: -1.15 to -0.73) of perinatal depressive symptoms yielded significantly higher effect sizes than preventive ones (SMD=. -0.36, 95% CI: -0.65 to -0.07). Interventions offered as tested as stand-alone programmes (SMD= -1.01, 95% CI: -1.24 to -0.79) performed better than those integrated in healthcare settings (SMD= -0.38, 95% CI: -0.63 to -0.14).

Effect sizes did not differ according to the delivery format, where no differences were observed between interventions delivered either through electronic means, face-to-face in groups, or individually (Q=4.76, p=0.09). Delivery agents with varying disciplinary backgrounds: multidisciplinary teams, non-specialists, online interventions, and those delivered by specialists, were

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effective. Although interventions delivered electronically and through specialists had slightly higher effect sizes, this did not reach statistical significance (Q=4.05, p=0.26).

1.3.8. Moderator analysis: Participant-level characteristics

Higher effect sizes were associated with interventions recruiting perinatal women with higher age (b= -0.07, SE= 0.01, p=<0.001) (Supplementary Table 9). While interventions with a higher proportion of perinatal women belonging to minorities, low-income levels, reporting poorer education, and recurrent episodes of depression yielded smaller effect sizes. The proportion of married or primiparous women in trials was not associated with effect sizes yielded by included interventions. Interventions delivered during postnatal had a higher effect size than those delivered during the antenatal period, or during both periods; however, this was statistically non-significant.

1.3.9. Moderator analysis: Active ingredients

When considering the theoretical underpinnings of included interventions, dose of intervention was inversely associated with effect sizes (b= 0.016, p<0.01). Most of the trial evidence included in this review tested CBT interventions (n=42), which yielded strong effect sizes (SMD= -0.70, 95% CI: -0.91 to -0.49). PST was tested in five trials and yielded comparable effect sizes (-0.71, 95% CI: -1.32 to -0.11). BA yielded moderate strength effect sizes (SMD= -0.32, 95% CI: -1.05 to 0.42). However, evidence about these was inconclusive due to overlapping effect sizes, despite reaching statistical significance.

Among intervention ingredients, using more behavioural ingredients in CBT interventions yielded high effect sizes (b= -0.079, p< 0.01). An inverse trend was noted for interventions including reinforcement-related ingredients (b= 0.2, p<0.01). Interventions including a higher number of cognitive and interpersonal ingredients, parenting skills, psychoeducation, exercise, in-session techniques, nutrition, and substance use-related counselling did not yield statistical significance (Table 4-9). When individual active ingredients were considered, the presence or absence of interpersonal, cognitive, and behavioural ingredients did not alter effect sizes. Interventions utilizing *identifying affect* and *self-awareness* strategies yielded larger effect sizes than their counterparts (Table 4-10).

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1.4. Discussion

The present systematic review presents up-to-date evidence regarding the effectiveness of CBT for PND. It delineates several interesting insights for optimizing CBT-based interventions for PND. We found that CBT interventions, including third-wave cognitive therapies, are highly effective in preventing and treating PND. CBT can be delivered effectively to individuals and in groups or online web or app-based software. The delivery of CBT can also be tailored according to the resources available, for instance, by employing specialists or non-specialists' delivery agents. Interventions integrated into healthcare settings and utilizing the available infrastructure may be less effective than stand-alone programmes. Perinatal women experiencing adverse events and health inequalities report smaller effect sizes when treated with CBT. The effectiveness of CBT also depends on several intervention-level characteristics.

CBT interventions yielded strong effect sizes for treatment and moderate strength effect sizes for preventing PND. These findings are corroborated by previous meta-analyses, which have yielded similar effect sizes for CBT interventions for PND (Rahman et al., 2013; Rahman et al., 2018; Sockol, 2015; Waqas et al., 2022b). CBT interventions are also recommended by the US Preventive Services Taskforce and the WHO (Curry et al., 2019; Rahman et al., 2018). Previous evidence has shown that CBT-based interventions are effective for PND and generally acceptable to stakeholders, delivery agents, and end-consumers (Morrell et al., 2009; Rahman et al., 2018). CBT interventions can be tailored to settings depending on the availability of resources. Both the NICE and the WHO recommend a stepped-care approach to treating PND (Delgadillo et al., 2022; National Institute for Health and Care Excellence, 2020; Rahman et al., 2018), ranging from self-help psychoeducational materials to low-intensity and high-intensity psychotherapies.

There has been an increasing focus on preventing PND. Recently, based on evidence from high income countries, the USPSTF has recommended the use of CBT and counselling interventions for PND (Curry et al., 2019). While the WHO have recommended that all perinatal women should be offered psychosocial interventions to develop coping, stress management and social skills (Guidelines Review Committee, 2022). Whereas women at high risk of developing PND should be offered psychological interventions such as CBT and interpersonal therapy. The provision of these interventions should be allowed as per availability of resources and women's preference. Our systematic review corroborates this evidence and presents CB-based approaches (both specialist and non-specialist delivered) as effective in preventing depression during the perinatal period. We also found that CB based approaches yield good effect sizes across all modes of delivery (electronic,

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individual or group). This flexibility in delivery increases the utility of CB-based approaches in different settings.

While reviewing the intervention level characteristics, several valuable insights were revealed. Firstly, these interventions work when delivered antenatally or postnatally, with little difference in effect sizes. This finding does not agree with our previous systematic review on preventive interventions where a higher effect size was demonstrated for interventions starting early during the antenatal period (Waqas et al., 2022b). This finding also contradicts Sockol's meta-analysis of 26 treatment interventions, where more considerable reductions were noted for interventions initiated during the postpartum period or across the perinatal period (Sockol, 2015). Secondly, CBT interventions delivered either to individuals or groups or online yield similar strength of effect sizes, also corroborated by previous systematic reviews (Sockol, 2015).

Interventions integrated into healthcare settings and utilizing the available infrastructure may be less effective than stand-alone programmes. This interesting insight emphasizes the importance of effective implementation measures to ensure adequate implementation, supervision, and competency measures (Ahmad et al., 2020; Zafar et al., 2016). A critical case study in this context is that of the Thinking Healthy Programme developed by one of the co-authors (Rahman et al., 2008). It is a highly effective low-intensity CBT-based intervention that has been endorsed by the WHO for the treatment of PND (World Health Organization, 2015). Integrated into the primary healthcare system, it employed lady health workers as the delivery agents (Rahman et al., 2008). In the following years, a trial was run to test the effectiveness of THP delivered by peers with lived experience of PND (Sikander et al., 2019a). These innovations ensured that the THP remained cost-effective and acceptable to the stakeholders. In addition to innovations in delivery, newer approaches in enhanced supervision, competency assessments, and training at a large scale were also tested to ensure seamless implementation of the THP in communities (Ahmad et al., 2020; Zafar et al., 2016).

While reviewing the active ingredients of included interventions, several insights emerged. In comparison with the face-to-face delivered CBT programmes, the ingredient of empathy was missing in electronically delivered interventions. However, this collection of interventions yielded pooled effect sizes comparable to the interventions delivered face to face. This is an important finding as empathy is the foundation for an effective therapeutic patient alliance (Morrell et al., 2009). Therefore, there is a need to open further the black box of the causal mechanisms at play that drive the effectiveness of electronic interventions without the opportunity to build an empathy-based therapeutic relationship. Another interesting finding was that longer interventions were associated with a decrease in effect size. This association may be driven by burnout among either the patient or therapist. We also investigated the dosage density of therapeutic strategies and their association with effect sizes. Only one significant association emerged, where an increase in behavioural ingredients in

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a therapeutic programme led to an increase in effect size. This strengthens the previous notion that (Kahl et al., 2012) efficacy of the cognitive therapy depends critically on the behavioural activation component rather than its content-oriented cognitive approaches. However, this is inconclusive and warrants further investigation, especially for PND, due to the lack of RCTs, for instance, those comparing efficacy of BA with classical CBT therapies. This is indeed an important area for further research.

Lastly, we found that younger perinatal women reported poor education and belonging to lower economic, and minority ethnic classes reported a lower reduction in PND symptoms. This finding is significant and highlights the importance of contextual factors affecting community health and community-oriented policies and initiatives. Multidisciplinary approaches, such as mass education and poverty alleviation initiatives, are required to tackle this issue. In this regard, Banerjee and colleagues' Nobel prize-winning multifaceted program rooted in developmental economics is a crucial case study (Banerjee et al., 2015). Such initiatives are necessary to curb the effects of societal adversities impeding the efficacy of psychological treatments. This has been shown in a huge body of literature demonstrating the complexity of perinatal depression among women facing adversities (Ashman et al., 2008; Bao et al., 2016; Chae et al., 2020).

Meta-regression analyses revealed weakly inverse association between proportion of women with history of mental health problems and intervention effect size. There is unequivocal evidence that complex presentations of PND (increased severity, relapsing and recurrent) is associated with poorer treatment response (Ahmed Waqas, 2022). A recent systematic review of observational studies demonstrates that perinatal women with complex and more severe forms of PND report more psychosocial adversities (Ahmed Waqas, 2022). Moreover, if left untreated, such PND symptoms contribute to intergenerational transfer of inequities; whereby children born to women with complex PND report poorer academic, mental, and physical health outcomes. Despite a plethora of observational research evidence, investigators have not yet focused on development of bespoke interventions for either preventing relapse or treating recurrent episodes of perinatal depressive disorder. This is also true for pharmacological trials where little evidence is present for prevention of relapse of depression during the perinatal period (Molyneaux et al., 2018). Evidence is emerging however, where a recent two arm, parallel design RCT tested a parenting video-feedback therapy intervention added to CBT in treatment of persistent postpartum depression (Stein et al., 2018). The NICE recommends high intensity psychotherapies or antidepressants for women at a high risk of relapse (National Institute for Health and Care Excellence, 2020).

1.5. Strengths and limitations

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This systematic review has several strengths. Firstly, this systematic review and meta-regression analysis provide a comprehensive and up-to-date estimate of the effectiveness of CBT. It provides reliable estimates of the effectiveness of CBT delivered by specialist and non-specialist workforces. Furthermore, this review utilizes a large pool of RCTs. This allowed us to investigate the moderating effects of intervention and patient-level characteristics in detail. We also present novel findings on the active ingredients of CB-based approaches by leveraging the distillation and matching framework. Effects of dose density and active ingredients comprising CB interventions yielded valuable insights.

However, despite its strengths, this review has several limitations. Firstly, conducting distillation and matching framework exercises to map active ingredients of therapies is complex. The accuracy of this endeavour depends on the information regarding the content of interventions provided in primary studies. Interventions such as the THP (developed by the co- author AR) (Rahman et al., 2008) provided details and content of the intervention in open-access manuals (World Health Organization, 2015). This approach is important and aids in future evidence synthesis studies and reproducibility and adaptability in different cultures. These analyses are also limited by the observational nature of meta-regression analyses used to study moderators of CB interventions. Therefore, this evidence should be interpreted with caution.

The present meta-analysis utilized subgroup analyses to compare effectiveness of CB-based approaches utilizing specific active ingredients. These analyses can be improved by using meta-analytic structural equation modeling approaches (Harrer et al., 2021). The use of these complex methods can aid in our understanding of causal mediation mechanisms in psychotherapies.

Another key limitation inherent to using meta-regression analyses is the use of across-trial data and aggregated values for the participant and intervention-level characteristics for analyses. Such analyses are limited due to inherent aggregation bias and may not reflect actual treatment-covariate interactions (Huh et al., 2019; Kelley and Kelley, 2012). These limitations, in theory, can be offset by using two-stage Individual Participant Data Meta-analysis (IPDMA) approaches which use within-trial information to estimate treatment-covariation interactions (Kelley and Kelley, 2012). IPDMAs involving a large pool of datasets are time and resource intensive; however, we encourage researchers to utilize these approaches in the future. A recent example of this approach is Furukawa and colleagues' work (Furukawa et al., 2021), which presents a web application to estimate relative efficacies, and additive and synergistic effects yielded through combinations of specific and nonspecific components in internet-delivered CBT interventions in the context of patient-level variables. Future meta-investigations should also consider utilizing realist evaluation using both quantitative and qualitative approaches to distill important insights on CBT for PND.

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Furthermore, the subgroup and meta-regression analyses in this systematic review were run for a limited number of participant-level and intervention-level factors. Many other factors such as experience of intimate partner violence (Keynejad et al., 2020), family structure, social support networks and chronicity of PND are important moderators and should be considered in future reviews (Waqas et al., 2022a). Moreover, researchers should consider collecting detailed data on moderators of treatment for perinatal depression in their future trials. We focused on CB-based approaches to meta-analyze a homogeneous set of interventions in the present systematic review. Other psychotherapeutic modalities should be reviewed in future meta-analyses, keeping in mind the clinical and statistical heterogeneity often encountered in psychotherapy literature.

1.6. Conclusion

Cognitive behavioural therapies are highly effective in reducing the severity of PND. Most of the trial evidence included in this review tested classical CBT approaches. And there is limited evidence for third-wave CBT for PND. CBT is effective when delivered across individual, group, and electronic platforms and thus can be tailored according to the financial and human resources available. Longer duration CBT interventions may not necessarily be more effective than shorter ones. Furthermore, CBT-based interventions should consider including various behavioural ingredients to maximize intervention benefits.

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Author Contribution Statement

This systematic review and meta-analysis was conceived by AW and AR. AW and AR wrote the protocol and registered it in PROSPERO. AW & PA searched the databases and performed screening of titles and abstracts and full texts for eligibility. AW and SN extracted data on characteristics of intervention and population. AW, PA and SWZ extracted data pertaining to components of interventions. AW and SN extracted quantitative data. AW conducted the meta-analysis. AW wrote the initial draft of the manuscript. All authors critically reviewed the manuscript and approved it for submission.

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The authors have no conflict of interest to report.

Ethics statement

Not applicable.

Data Availability Statement

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References

Abraham, C., Michie, S., 2008. A taxonomy of behavior change techniques used in interventions. Health Psychol 27, 379-387.

Ahmad, I., Suleman, N., Waqas, A., Atif, N., Malik, A.A., Bibi, A., Zulfiqar, S., Nisar, A., Javed, H., Zaidi, A., Khan, Z.S., Sikander, S., 2020. Measuring the implementation strength of a perinatal mental health intervention delivered by peer volunteers in rural Pakistan. Behav Res Ther 130, 103559.

Ahmed Waqas, M.N., Atif Rahman, , 2022. Heterogeneity in perinatal depression: A systematic review. PROSPERO.

Ammerman, R.T., Putnam, F.W., Altaye, M., Stevens, J., Teeters, A.R., Van Ginkel, J.B., 2013. A clinical trial of in-home CBT for depressed mothers in home visitation. Behav Ther 44, 359-372.

Anderson, F.M., Hatch, S.L., Comacchio, C., Howard, L.M., 2017. Prevalence and risk of mental disorders in the perinatal period among migrant women: a systematic review and meta-analysis. Arch Womens Ment Health 20, 449-462.

Ashman, S.B., Dawson, G., Panagiotides, H., 2008. Trajectories of maternal depression over 7 years: relations with child psychophysiology and behavior and role of contextual risks. Dev Psychopathol 20, 55-77.

Austin, M.P., Frilingos, M., Lumley, J., Hadzi-Pavlovic, D., Roncolato, W., Acland, S., Saint, K., Segal, N., Parker, G., 2008. Brief antenatal cognitive behaviour therapy group intervention for the prevention of postnatal depression and anxiety: A randomised controlled trial. Journal of Affective Disorders 105, 35-44.

Banerjee, A., Duflo, E., Goldberg, N., Karlan, D., Osei, R., Pariente, W., Shapiro, J., Thuysbaert, B., Udry, C., 2015. Development economics. A multifaceted program causes lasting progress for the very poor: evidence from six countries. Science 348, 1260799.

Bao, P., Jing, J., Jin, Y., Hu, X., Liu, B., Hu, M., 2016. Trajectories and the influencing factors of behavior problems in preschool children: a longitudinal study in Guangzhou, China. BMC Psychiatry 16, 178.

Betts, K.S., Williams, G.M., Najman, J.M., Alati, R., 2015. The relationship between maternal depressive, anxious, and stress symptoms during pregnancy and adult offspring behavioral and emotional problems. Depress Anxiety 32, 82-90.

Bittner, A., Peukert, J., Zimmermann, C., Junge-Hoffmeister, J., Parker, L.S., Stöbel-Richter, Y., Weidner, K., 2014. Early Intervention in Pregnant Women With Elevated Anxiety and Depressive Symptoms. Journal of Perinatal & Neonatal Nursing 28, 185-195.

Borenstein, M., Hedges, L., Higgins, J., Rothstein, H., 2021. Introduction to meta-analysis. John Wiley & Sons.

Bowers, K., Ding, L., Yolton, K., Ji, H., Nidey, N., Meyer, J., Ammerman, R.T., Van Ginkel, J., Folger, A., 2021. Pregnancy and Infant Development (PRIDE)-a preliminary observational study of maternal adversity and infant development. BMC Pediatr 21, 452.

Brown, J.V.E., Wilson, C.A., Ayre, K., Robertson, L., South, E., Molyneaux, E., Trevillion, K., Howard, L.M., Khalifeh, H., 2021. Antidepressant treatment for postnatal depression. Cochrane Database Syst Rev 2, CD013560.

Brugha, T.S., Wheatley, S., Taub, N.A., Culverwell, A., Friedman, T., Kirwan, P., Jones, D.R., Shapiro, D.A., 2000. Pragmatic randomized trial of antenatal intervention to prevent post-natal depression by reducing psychosocial risk factors. Psychol Med 30, 1273-1281.

Burns, A., O'Mahen, H., Baxter, H., Bennert, K., Wiles, N., Ramchandani, P., Turner, K., Sharp, D., Thorn, J., Noble, S., Evans, J., 2013. A pilot randomised controlled trial of cognitive behavioural therapy for antenatal depression. BMC psychiatry 13, 33-33.

Chabrol, H., Teissedre, F., Saint-Jean, M., Teisseyre, N., RogÉ, B., Mullet, E., 2002. Prevention and treatment of post-partum depression: a controlled randomized study on women at risk. Psychological Medicine 32, 1039-1047.

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Chae, H.K., East, P., Delva, J., Lozoff, B., Gahagan, S., 2020. Maternal Depression Trajectories Relate to Youths' Psychosocial and Cognitive Functioning at Adolescence and Young Adulthood. J Child Fam Stud 29, 3459-3469.
Cho, H.J., Kwon, J.H., Lee, J.J., 2008. Antenatal cognitive-behavioral therapy for prevention of postpartum depression: a pilot study. Yonsei Med J 49, 553-562.
Chorpita, B.F., Daleiden, E.L., Weisz, J.R., 2005. Identifying and selecting the common elements of evidence based interventions: a distillation and matching model. Ment Health Serv Res 7, 5-20.
Chowdhary, N., Sikander, S., Atif, N., Singh, N., Ahmad, I., Fuhr, D.C., Rahman, A., Patel, V., 2014. The content and delivery of psychological interventions for perinatal depression by non-specialist health workers in low and middle income countries: a systematic review. Best Pract Res Clin Obstet Gynaecol 28, 113-133.
Christine Puckering, E.M., Anne Hickey & Janice Longford., 2010. Mellow Babies: A group intervention for infants and mothers experiencing postnatal depression. Counselling Psychology Review 25, 28-40.
Cooper, P.J., Murray, L., Wilson, A., Romaniuk, H., 2003. Controlled trial of the short- and long-term effect of psychological treatment of post-partum depression. British Journal of Psychiatry 182, 412-419.
Cuijpers, P., Reijnders, M., Huibers, M.J.H., 2019. The Role of Common Factors in Psychotherapy Outcomes. Annu Rev Clin Psychol 15, 207-231.
Curry, S.J., Krist, A.H., Owens, D.K., Barry, M.J., Caughey, A.B., Davidson, K.W., Doubeni, C.A., Epling, J.W., Jr., Grossman, D.C., Kemper, A.R., Kubik, M., Landefeld, C.S., Mangione, C.M., Silverstein, M., Simon, M.A., Tseng, C.W., Wong, J.B., 2019. Interventions to Prevent Perinatal Depression: US Preventive Services Task Force Recommendation Statement. JAMA 321, 580-587.
Delgadillo, J., Ali, S., Fleck, K., Agnew, C., Southgate, A., Parkhouse, L., Cohen, Z.D., DeRubeis, R.J., Barkham, M., 2022. Stratified Care vs Stepped Care for Depression: A Cluster Randomized Clinical Trial. JAMA Psychiatry 79, 101-108.
Dimidjian, S., Goodman, S.H., Felder, J.N., Gallop, R., Brown, A.P., Beck, A., 2014. An open trial of mindfulness-based cognitive therapy for the prevention of perinatal depressive relapse/recurrence. Archives of Women's Mental Health 18, 85-94.
Dimidjian, S., Goodman, S.H., Felder, J.N., Gallop, R., Brown, A.P., Beck, A., 2016. Staying well during pregnancy and the postpartum: A pilot randomized trial of mindfulness-based cognitive therapy for the prevention of depressive relapse/recurrence. Journal of consulting and clinical psychology 84, 134-145.
Dimidjian, S., Goodman, S.H., Sherwood, N.E., Simon, G.E., Ludman, E., Gallop, R., Welch, S.S., Boggs, J.M., Metcalf, C.A., Hubley, S., Powers, J.D., Beck, A., 2017. A pragmatic randomized clinical trial of behavioral activation for depressed pregnant women. J Consult Clin Psychol 85, 26-36.
Dubowitz, H., Papas, M.A., Black, M.M., Starr, R.H., Jr., 2002. Child neglect: outcomes in high-risk urban preschoolers. Pediatrics 109, 1100-1107.
Duffecy, J., Grekin, R., Hinkel, H., Gallivan, N., Nelson, G., O'Hara, M.W., 2019. A Group-Based Online Intervention to Prevent Postpartum Depression (Sunnyside): Feasibility Randomized Controlled Trial. JMIR Ment Health 6, e10778-e10778.
England, M.J., Butler, A.S., Gonzalez, M.L., 2015. Psychosocial Interventions for Mental and Substance Use Disorders: A Framework for Establishing Evidence-Based Standards. Committee on Developing Evidence-Based Standards for Psychosocial Interventions for Mental Disorders; Board on Health Sciences Policy; Institute of Medicine.
Eyesenck, H., 1955. The effects of psychotherapy: A reply. The Journal of Abnormal and Social Psychology 50, 147-148.
Fanti, K.A., Kimonis, E., 2017. Heterogeneity in externalizing problems at age 3: Association with age 15 biological and environmental outcomes. Dev Psychol 53, 1230-1241.
Fonseca, A., Alves, S., Monteiro, F., Gorayeb, R., Canavarro, M.C., 2020. Be a Mom, a Web-Based Intervention to Prevent Postpartum Depression: Results From a Pilot Randomized Controlled Trial. Behavior Therapy 51, 616-633.
Forsell, E., Bendix, M., Holländare, F., Szymanska von Schultz, B., Nasiell, J., Blomdahl-Wetterholm, M., Eriksson, C., Kvarned, S., Lindau van der Linden, J., Söderberg, E., Jokinen, J.,

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Wide, K., Kaldo, V., 2017. Internet delivered cognitive behavior therapy for antenatal depression: A randomised controlled trial. Journal of Affective Disorders 221, 56-64.
Furukawa, T.A., Suganuma, A., Ostinelli, E.G., Andersson, G., Beevers, C.G., Shumake, J., Berger, T., Boele, F.W., Buntrock, C., Carlbring, P., Choi, I., Christensen, H., Mackinnon, A., Dahne, J., Huibers, M.J.H., Ebert, D.D., Farrer, L., Forand, N.R., Strunk, D.R., Ezawa, I.D., Forsell, E., Kaldo, V., Geraedts, A., Gilbody, S., Littlewood, E., Brabyn, S., Hadjistavropoulos, H.D., Schneider, L.H., Johansson, R., Kenter, R., Kivi, M., Björkelund, C., Kleiboer, A., Riper, H., Klein, J.P., Schröder, J., Meyer, B., Moritz, S., Bücker, L., Lintvedt, O., Johansson, P., Lundgren, J., Milgrom, J., Gemmill, A.W., Mohr, D.C., Montero-Marin, J., Garcia-Campayo, J., Nobis, S., Zarski, A.-C., O'Moore, K., Williams, A.D., Newby, J.M., Perini, S., Phillips, R., Schneider, J., Pots, W., Pugh, N.E., Richards, D., Rosso, I.M., Rauch, S.L., Sheeber, L.B., Smith, J., Spek, V., Pop, V.J., Ünlü, B., van Bastelaar, K.M.P., van Luenen, S., Garnefski, N., Kraaij, V., Vernmark, K., Warmerdam, L., van Straten, A., Zagorscak, P., Knaevelsrud, C., Heinrich, M., Miguel, C., Cipriani, A., Efthimiou, O., Karyotaki, E., Cuijpers, P., 2021. Dismantling, optimising, and personalising internet cognitive behavioural therapy for depression: a systematic review and component network meta-analysis using individual participant data. The Lancet Psychiatry 8, 500-511.
Futterman, D., Shea, J., Besser, M., Stafford, S., Desmond, K., Comulada, W.S., Greco, E., 2010. Mamekhaya: a pilot study combining a cognitive-behavioral intervention and mentor mothers with PMTCT services in South Africa. AIDS Care 22, 1093-1100.
Gelaye, B., Rondon, M.B., Araya, R., Williams, M.A., 2016. Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. The Lancet Psychiatry 3, 973-982.
Graciela Rojas, R.F., Jaime Solis, Enrique Jadresic, Cristóbal Castillo, Marco González, Viviana Guajardo, Glyn Lewis, Tim J Peters, Ricardo Araya., 2007. Treatment of postnatal depression in low-income mothers in primary-care clinics in Santiago, Chile: a randomised controlled trial. The Lancet 370, 1629–1637.
Guidelines Review Committee, 2022. WHO recommendations on maternal and newborn care for a positive postnatal experience. World Health Organization,.
Hagan, R., Evans, S.F., Pope, S., 2004. Preventing postnatal depression in mothers of very preterm infants: a randomised controlled trial. BJOG: An International Journal of Obstetrics and Gynaecology 111, 641-647.
Harrer, M., Cuijpers, P., Furukawa, T.A., Ebert, D.D., 2021. Doing Meta-Analysis With R: A Hands-On Guide, 1st ed. Chapman & Hall/CRC Press, Boca Raton, FL and London.
Hayden, T., Perantie, D.C., Nix, B.D., Barnes, L.D., Mostello, D.J., Holcomb, W.L., Svrakic, D.M., Scherrer, J.F., Lustman, P.J., Hershey, T., 2012. Treating prepartum depression to improve infant developmental outcomes: a study of diabetes in pregnancy. J Clin Psychol Med Settings 19, 285-292.
Higgins, J., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M., Welch, V., 2019. Cochrane handbook for systematic reviews of interventions. John Wiley & Sons.
Hou, Y., Hu, P., Zhang, Y., Lu, Q., Wang, D., Yin, L., Chen, Y., Zou, X., 2014. Cognitive behavioral therapy in combination with systemic family therapy improves mild to moderate postpartum depression. Revista Brasileira de Psiquiatria 36, 47-52.
Howard, L.M., Khalifeh, H., 2020. Perinatal mental health: a review of progress and challenges. World Psychiatry 19, 313-327.
Huh, D., Mun, E.Y., Walters, S.T., Zhou, Z., Atkins, D.C., 2019. A tutorial on individual participant data meta-analysis using Bayesian multilevel modeling to estimate alcohol intervention effects across heterogeneous studies. Addict Behav 94, 162-170.
Huibers, M.J.H., Lorenzo-Luaces, L., Cuijpers, P., Kazantzis, N., 2020. On the Road to Personalized Psychotherapy: A Research Agenda Based on Cognitive Behavior Therapy for Depression. Front Psychiatry 11, 607508.
Husain, N., Bevc, I., Husain, M., Chaudhry, I.B., Atif, N., Rahman, A., 2006. Prevalence and social correlates of postnatal depression in a low income country. Arch Womens Ment Health 9, 197-202.
Jannati, N., Mazhari, S., Ahmadian, L., Mirzaee, M., 2020. Effectiveness of an app-based cognitive behavioral therapy program for postpartum depression in primary care: A randomized controlled trial. International Journal of Medical Informatics 141, 104145.

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Jesse, D.E., Gaynes, B.N., Feldhousen, E.B., Newton, E.R., Bunch, S., Hollon, S.D., 2015. Performance of a Culturally Tailored Cognitive-Behavioral Intervention Integrated in a Public Health Setting to Reduce Risk of Antepartum Depression: A Randomized Controlled Trial. J Midwifery Womens Health 60, 578-592.

Kaaya, S.F., Blander, J., Antelman, G., Cyprian, F., Emmons, K.M., Matsumoto, K., Chopyak, E., Levine, M., Fawzi, M.C.S., 2013. Randomized controlled trial evaluating the effect of an interactive group counseling intervention for HIV-positive women on prenatal depression and disclosure of HIV status. AIDS Care 25, 854-862.

Kahl, K.G., Winter, L., Schweiger, U., 2012. The third wave of cognitive behavioural therapies: what is new and what is effective? Curr Opin Psychiatry 25, 522-528.

Kelley, G.A., Kelley, K.S., 2012. Statistical models for meta-analysis: A brief tutorial. World J Methodol 2, 27-32.

Keynejad, R.C., Hanlon, C., Howard, L.M., 2020. Psychological interventions for common mental disorders in women experiencing intimate partner violence in low-income and middle-income countries: a systematic review and meta-analysis. Lancet Psychiatry 7, 173-190.

Khamseh, F., Parandeh, A., Hajiamini, Z., Tadrissi, S.D., Najjar, M., 2019. Effectiveness of applying problem-solving training on depression in Iranian pregnant women: Randomized clinical trial. J Educ Health Promot 8, 87.

Kordi, M., Nasiri, S., Gharavi, M., Lotfabadi, M., 2018. Effect of problem-solving therapy and relaxation on the severity of postpartum depressive symptoms: A randomized controlled trial. Nursing and Midwifery Studies 7, 6-11

Kozinszky, Z., Dudas, R.B., Devosa, I., Csatordai, S., Toth, E., Szabo, D., Sikovanyecz, J., Barabas, K., Pal, A., 2012. Can a brief antepartum preventive group intervention help reduce postpartum depressive symptomatology? Psychother Psychosom 81, 98-107.

Lara, M.A., Navarro, C., Navarrete, L., 2010. Outcome results of a psycho-educational intervention in pregnancy to prevent PPD: a randomized control trial. J Affect Disord 122, 109-117.

Le, H.-N., Perry, D.F., Stuart, E.A., 2011. Randomized controlled trial of a preventive intervention for perinatal depression in high-risk Latinas. Journal of Consulting and Clinical Psychology 79, 135-141.

Leung SS, L.A., Wong DF, Wong CM, Leung KY, Chiang VC, et al, 2016. A brief group intervention using a cognitive-behavioural approach to reduce postnatal depressive symptoms: a randomised controlled trial. Hong Kong Medical Journal 22, S4-S8.

Leung, S.S.K., Lee, A.M., Chiang, V.C.L., Lam, S.K., Kuen, Y.W., Wong, D.F.K., 2013. Culturally sensitive, preventive antenatal group cognitive-behavioural therapy for Chinese women with depression. International Journal of Nursing Practice 19, 28-37.

Li, X., Laplante, D.P., Paquin, V., Lafortune, S., Elgbeili, G., King, S., 2022. Effectiveness of cognitive behavioral therapy for perinatal maternal depression, anxiety and stress: A systematic review and meta-analysis of randomized controlled trials. Clin Psychol Rev 92, 102129.

Loughnan, S.A., Butler, C., Sie, A.A., Grierson, A.B., Chen, A.Z., Hobbs, M.J., Joubert, A.E., Haskelberg, H., Mahoney, A., Holt, C., Gemmill, A.W., Milgrom, J., Austin, M.-P., Andrews, G., Newby, J.M., 2019a. A randomised controlled trial of 'MUMentum postnatal': Internet-delivered cognitive behavioural therapy for anxiety and depression in postpartum women. Behaviour Research and Therapy 116, 94-103.

Loughnan, S.A., Sie, A., Hobbs, M.J., Joubert, A.E., Smith, J., Haskelberg, H., Mahoney, A.E.J., Kladnitski, N., Holt, C.J., Milgrom, J., Austin, M.-P., Andrews, G., Newby, J.M., 2019b. A randomized controlled trial of 'MUMentum Pregnancy': Internet-delivered cognitive behavioral therapy program for antenatal anxiety and depression. Journal of Affective Disorders 243, 381-390.

Mao, H.J., Li, H.J., Chiu, H., Chan, W.C., Chen, S.L., 2012. Effectiveness of antenatal emotional self-management training program in prevention of postnatal depression in Chinese women. Perspect Psychiatr Care 48, 218-224.

McKee, M.D., Zayas, L.H., Fletcher, J., Boyd, R.C., Nam, S.H., 2006. Results of an Intervention to Reduce Perinatal Depression Among Low-Income Minority Women in Community Primary Care. Journal of Social Service Research 32, 63-81.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M.P., Cane, J., Wood, C.E., 2013. The behavior change technique taxonomy (v1) of 93 hierarchically

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med 46, 81-95.
Milgrom, J., Danaher, B.G., Gemmill, A.W., Holt, C., Holt, C.J., Seeley, J.R., Tyler, M.S., Ross, J., Ericksen, J., 2016. Internet Cognitive Behavioral Therapy for Women With Postnatal Depression: A Randomized Controlled Trial of MumMoodBooster. J Med Internet Res 18, e54-e54.
Milgrom, J., Negri, L.M., Gemmill, A.W., McNeil, M., Martin, P.R., 2005. A randomized controlled trial of psychological interventions for postnatal depression. British Journal of Clinical Psychology 44, 529-542.
Molyneaux, E., Telesia, L., Henshaw, C., Boath, E., Bradley, E., Howard, L., 2018. Antidepressants for preventing postnatal depression. Cochrane Database of Systematic Reviews 4, 1465-1858.
Morrell, C., Warner, R., Slade, P., Dixon, S., Walters, S., Paley, G., Brugha, T., 2009. Psychological interventions for postnatal depression: cluster randomised trial and economic evaluation. The PoNDER trial. Health Technology Assessment 13.
Muñoz, R.F., Le, H.-N., Ippen, C.G., Diaz, M.A., Urizar, G.G., Soto, J., Mendelson, T., Delucchi, K., Lieberman, A.F., 2007. Prevention of Postpartum Depression in Low-Income Women: Development of the Mamás y Bebés/Mothers and Babies Course. Cognitive and Behavioral Practice 14, 70-83.
National Institute for Health and Care Excellence, 2020. Antenatal and postnatal mental health: clinical management and service guidance.
Nejad, F.K., Shahraki, K.A., Nejad, P.S., Moghaddam, N.K., Jahani, Y., Divsalar, P., 2021. The influence of mindfulness-based stress reduction (MBSR) on stress, anxiety and depression due to unwanted pregnancy: a randomized clinical trial. J Prev Med Hyg 62, E82-E88.
Netsi, E., Pearson, R.M., Murray, L., Cooper, P., Craske, M.G., Stein, A., 2018. Association of Persistent and Severe Postnatal Depression With Child Outcomes. JAMA Psychiatry 75, 247-253.
Ngai, F.-W., Wong, P.W.-C., Leung, K.-Y., Chau, P.-H., Chung, K.-F., 2015. The Effect of Telephone-Based Cognitive-Behavioral Therapy on Postnatal Depression: A Randomized Controlled Trial. Psychotherapy and Psychosomatics 84, 294-303.
Ngai, F.W., Wong, P.C., Chung, K.F., Chau, P.H., Hui, P.W., 2019. Effect of couple-based cognitive behavioural intervention on prevention of postnatal depression: multisite randomised controlled trial. BJOG: An International Journal of Obstetrics & Gynaecology 127, 500-507.
O'Mahen, H., Himle, J.A., Fedock, G., Henshaw, E., Flynn, H., 2013a. A pilot randomized controlled trial of cognitive behavioral therapy for perinatal depression adapted for women with low incomes. Depression and Anxiety 30, 679-687.
O'Mahen, H.A., Woodford, J., McGinley, J., Warren, F.C., Richards, D.A., Lynch, T.R., Taylor, R.S., 2013b. Internet-based behavioral activation—Treatment for postnatal depression (Netmums): A randomized controlled trial. Journal of Affective Disorders 150, 814-822.
Page, M.J., Moher, D., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hrobjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., McGuinness, L.A., Stewart, L.A., Thomas, J., Tricco, A.C., Welch, V.A., Whiting, P., McKenzie, J.E., 2021. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. BMJ 372, n160.
Paul G, 1967. Strategy of outcome research in psychotherapy. Journal of Consulting Psychology 31, 109-118.
Prendergast J, A.M., 2001. Early childhood nurse-delivered cognitive behavioural counselling for postnatal depression. Australasian Psychiatry 9, 255-259.
Rahman, A., Fisher, J., Bower, P., Luchters, S., Tran, T., Yasamy, M.T., Saxena, S., Waheed, W., 2013. Interventions for common perinatal mental disorders in women in low- and middle-income countries: a systematic review and meta-analysis. Bull World Health Organ 91, 593-601I.
Rahman, A., Fisher, J., Waqas, A., Hamdani, S.U., Zafar, S., Suleman, N., Zill-e-Huma, Renee Zeng, Sara Holton, Minh Le, 2018. World Health Organization recommendation on psychotherapeutic interventions for common maternal mental health problems among women to improve early childhood development in low and middle income countries:
Report of systematic review and meta-analysis of RCTs. World Health Organziation, Geneva.

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Rahman, A., Malik, A., Sikander, S., Roberts, C., Creed, F., 2008. Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural Pakistan: a cluster-randomised controlled trial. The Lancet 372, 902-909.

Rosenzweigh, S., 1936. Some implicit common factors in diverse methods of psychotherapy. American Journal of Orthopsychiatry 6, 412.

Sikander, S., Ahmad, I., Atif, N., Zaidi, A., Vanobberghen, F., Weiss, H.A., Nisar, A., Tabana, H., Ul Ain, Q., Bibi, A., Bilal, S., Bibi, T., Sharif, M., Zulifiqar, S., Fuhr, D.C., Price, L.N., Patel, V., Rahman, A., 2019a. Delivering the Thinking Healthy Programme for Perinatal Depression Through Volunteer Peers: A Cluster Randomised Controlled Trial in Pakistan. The Lancet Psychiatry 6, 128-139.

Sikander, S., Ahmad, I., Bates, L.M., Gallis, J., Hagaman, A., O'Donnell, K., Turner, E.L., Zaidi, A., Rahman, A., Maselko, J., 2019b. Cohort Profile: Perinatal depression and child socioemotional development ; the Bachpan cohort study from rural Pakistan. BMJ Open 9, e025644.

Silverstein, M., Feinberg, E., Cabral, H., Sauder, S., Egbert, L., Schainker, E., Kamholz, K., Hegel, M., Beardslee, W., 2011. Problem-solving education to prevent depression among low-income mothers of preterm infants: a randomized controlled pilot trial. Arch Womens Ment Health 14, 317-324.

Singla, D.R., Kohrt, B.A., Murray, L.K., Anand, A., Chorpita, B.F., Patel, V., 2017. Psychological Treatments for the World: Lessons from Low- and Middle-Income Countries. Annu Rev Clin Psychol 13, 149-181.

Singla, D.R., MacKinnon, D.P., Fuhr, D.C., Sikander, S., Rahman, A., Patel, V., 2021. Multiple mediation analysis of the peer-delivered Thinking Healthy Programme for perinatal depression: findings from two parallel, randomised controlled trials. Br J Psychiatry 218, 143-150.

Sockol, L.E., 2015. A systematic review of the efficacy of cognitive behavioral therapy for treating and preventing perinatal depression. J Affect Disord 177, 7-21.

Stein, A., Netsi, E., Lawrence, P.J., Granger, C., Kempton, C., Craske, M.G., Nickless, A., Mollison, J., Stewart, D.A., Rapa, E., West, V., Scerif, G., Cooper, P.J., Murray, L., 2018. Mitigating the effect of persistent postnatal depression on child outcomes through an intervention to treat depression and improve parenting: a randomised controlled trial. Lancet Psychiatry 5, 134-144.

Tandon, S.D., Leis, J.A., Mendelson, T., Perry, D.F., Kemp, K., 2014. Six-month outcomes from a randomized controlled trial to prevent perinatal depression in low-income home visiting clients. Matern Child Health J 18, 873-881.

Tandon, S.D., Ward, E.A., Hamil, J.L., Jimenez, C., Carter, M., 2018. Perinatal depression prevention through home visitation: a cluster randomized trial of mothers and babies 1-on-1. Journal of Behavioral Medicine 41, 641-652.

Thornton, A., Lee, P., 2000. Publication bias in meta-analysis: its causes and consequences. . Journal of clinical epidemiology 53, 207-216.

Trevillion, K., 2014. Depression: an exploratory parallel-group randomised controlled trial of Antenatal guided self help for WomeN (DAWN), http://isrctn.org/>. Springer Science and Business Media LLC.

Van Horne, B.S., Nong, Y.H., Cain, C.M., Sampson, M., Greeley, C.S., Puryear, L., 2021. A promising new model of care for postpartum depression: A randomised controlled trial of a brief home visitation program conducted in Houston, Texas, USA. Health & Social Care in the Community.

Van Lieshout, R.J., Layton, H., Savoy, C.D., Brown, J.S.L., Ferro, M.A., Streiner, D.L., Bieling, P.J., Feller, A., Hanna, S., 2021. Effect of Online 1-Day Cognitive Behavioral Therapy-Based Workshops Plus Usual Care vs Usual Care Alone for Postpartum Depression: A Randomized Clinical Trial. JAMA psychiatry 78, 1200-1207.

Van Lieshout, R.J., Layton, H., Savoy, C.D., Haber, E., Feller, A., Biscaro, A., Bieling, P.J., Ferro, M.A., 2022. Public Health Nurse-delivered Group Cognitive Behavioural Therapy for Postpartum Depression: A Randomized Controlled Trial. The Canadian Journal of Psychiatry, 070674372210744.

Van Ravesteyn, L.M., Kamperman, A.M., Schneider, T.A.J., Raats, M.E., Steegers, E.A.P., Tiemeier, H., Hoogendijk, W.J.G., Lambregtse-van den Berg, M.P., 2018. Group-based multicomponent treatment to reduce depressive symptoms in women with co-morbid psychiatric and psychosocial problems during pregnancy: A randomized controlled trial. Journal of Affective Disorders 226, 36-44.

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Waqas, A., Rahman, A., 2022. Cognitive behavioural therapies for perinatal depression: a critical systematic review and meta-regression analysis. PROSPERO CRD42022308205.

Waqas, A., Sikander, S., Malik, A., Atif, N., Karyotaki, E., Rahman, A., 2022a. Predicting Remission among Perinatal Women with Depression in Rural Pakistan: A Prognostic Model for Task-Shared Interventions in Primary Care Settings. Journal of Personalized Medicine 12.

Waqas, A., Zafar, S.W., Meraj, H., Tariq, M., Naveed, S., Fatima, B., Chowdhary, N., Dua, T., Rahman, A., 2022b. Prevention of common mental disorders among women in the perinatal period: a critical mixed-methods review and meta-analysis. Global Mental Health, 1-16.

World Health Organization, 2015. Thinking Healthy: A manual for psychological management of perinatal depression.

Wozney, L., Olthuis, J., Lingley-Pottie, P., McGrath, P.J., Chaplin, W., Elgar, F., Cheney, B., Huguet, A., Turner, K., Kennedy, J., 2017. Strongest Families™ Managing Our Mood (MOM): a randomized controlled trial of a distance intervention for women with postpartum depression. Archives of Women's Mental Health 20, 525-537.

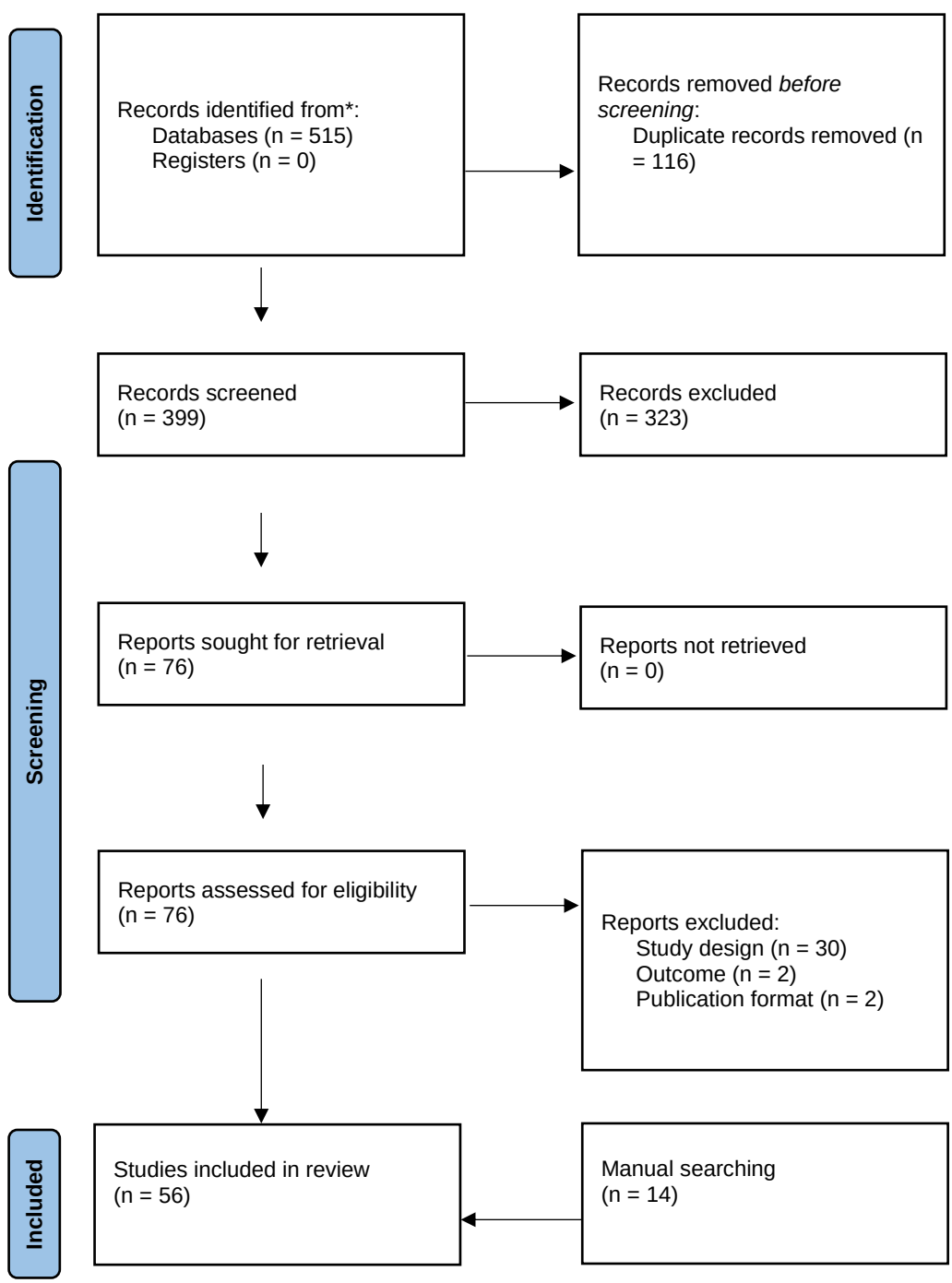
Yazdanimehr, R., Omidi, A., Sadat, Z., Akbari, H., 2016. The Effect of Mindfulness-integrated Cognitive Behavior Therapy on Depression and Anxiety among Pregnant Women: a Randomized Clinical Trial. J Caring Sci 5, 195-204.

Zafar, S., Sikander, S., Hamdani, S.U., Atif, N., Akhtar, P., Nazir, H., Maselko, J., Rahman, A., 2016. The effectiveness of Technology-assisted Cascade Training and Supervision of community health workers in delivering the Thinking Healthy Program for perinatal depression in a post-conflict area of Pakistan - study protocol for a randomized controlled trial. Trials 17, 188.

Zemestani, M., Fazeli Nikoo, Z., 2019. Effectiveness of mindfulness-based cognitive therapy for comorbid depression and anxiety in pregnancy: a randomized controlled trial. Archives of Women's Mental Health 23, 207-214.

https://doi.org/10.1017/gmh.2023.8 Published online by Cambridge University Press

Figure 1: PRISMA flowchart demonstrating the process of inclusion of studies



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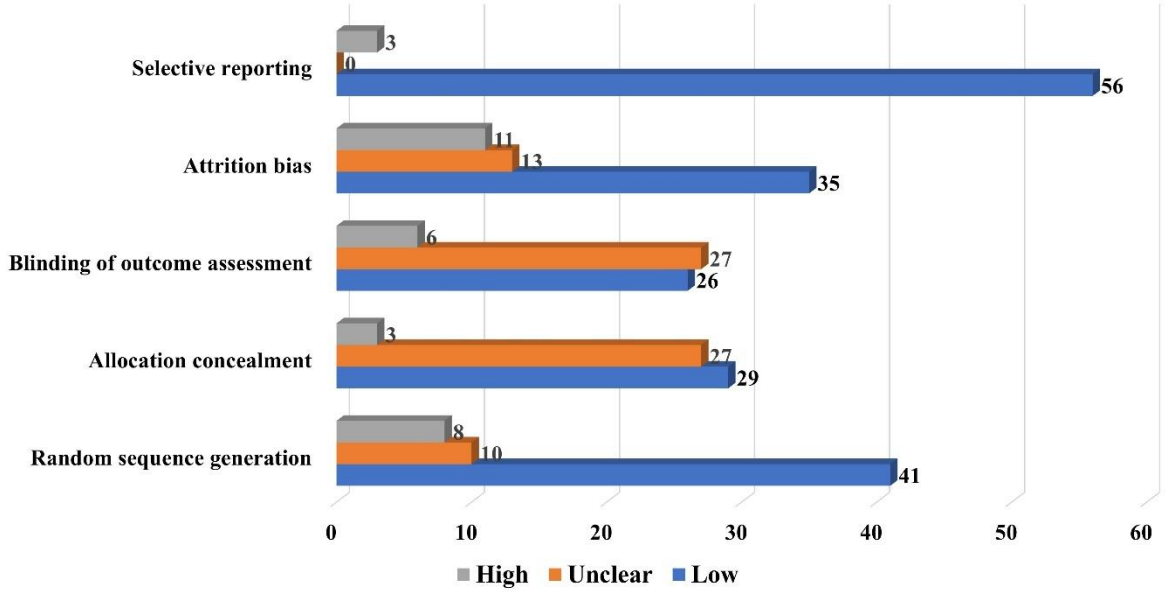
1014 **Figure 2: Risk of bias in included studies**



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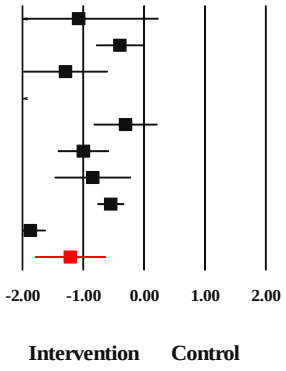
1017 Figure 3: Forest plot visualizing effect sizes for interventions delivered online (n=9)

Study name	Subgroup within study	Outcome	Std diff in means	Lower limit	Upper limit	Intervention	Control	Relative weight
Duffecy, 2019	Antenatal	PHQ-9	-1.075	-2.383	0.233	7	4	7.71
Fonseca, 2020	Postpartum	EPDS	-0.397	-0.787	-0.007	98	96	11.97
Forsell, 2017	Antenatal	EPDS	-1.292	-1.984	-0.600	21	18	10.73
Jannati, 2020	Postpartum	EPDS	-3.833	-4.595	-3.070	38	37	10.39
Loughnan, 2019	Antenatal	PHQ-9	-0.304	-0.825	0.217	23	36	11.49
Loughnan, 2019	Postpartum	PHQ-9	-0.998	-1.416	-0.580	50	47	11.88
Milgrom, 2016	Postpartum	BDI-II	-0.844	-1.468	-0.220	21	22	11.04
O'Mahen, 2013	Postpartum	EPDS	-0.548	-0.764	-0.332	181	162	12.44
Van Lieshout, 2021	Postpartum	EPDS	-1.870	-2.119	-1.620	165	192	12.37
			-1.213	-1.794	-0.632	604	614	



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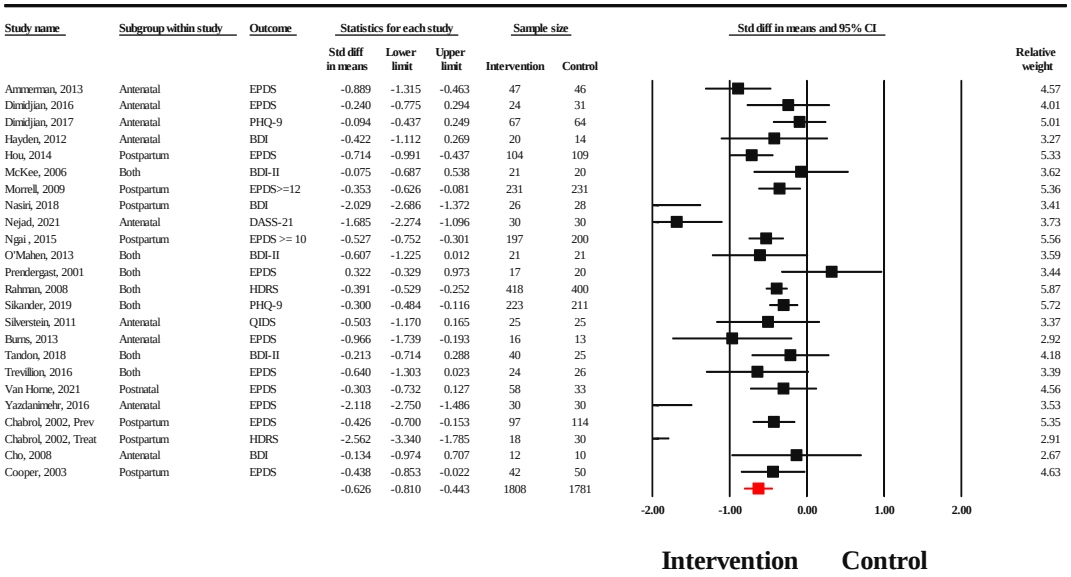
1020 Figure 4: Forest plot visualizing effect sizes for interventions delivered to individuals (n=24)



Study name	Subgroup within study	Outcome	Statistics for each study			Sample size		Relative weight
			Std diff in means	Lower limit	Upper limit	Intervention	Control	
Ammerman, 2013	Antenatal	EPDS	-0.889	-1.315	-0.463	47	46	4.57
Dimidjian, 2016	Antenatal	EPDS	-0.240	-0.775	0.294	24	31	4.01
Dimidjian, 2017	Antenatal	PHQ-9	-0.094	-0.437	0.249	67	64	5.01
Hayden, 2012	Antenatal	BDI	-0.422	-1.112	0.269	20	14	3.27
Hou, 2014	Postpartum	EPDS	-0.714	-0.991	-0.437	104	109	5.33
McKee, 2006	Both	BDI-II	-0.075	-0.687	0.538	21	20	3.62
Morrell, 2009	Postpartum	EPDS>=12	-0.353	-0.626	-0.081	231	231	5.36
Nasiri, 2018	Postpartum	BDI	-2.029	-2.686	-1.372	26	28	3.41
Nejad, 2021	Antenatal	DASS-21	-1.685	-2.274	-1.096	30	30	3.73
Ngai , 2015	Postpartum	EPDS >= 10	-0.527	-0.752	-0.301	197	200	5.56
O'Mahen, 2013	Both	BDI-II	-0.607	-1.225	0.012	21	21	3.59
Prendergast, 2001	Both	EPDS	0.322	-0.329	0.973	17	20	3.44
Rahman, 2008	Both	HDRS	-0.391	-0.529	-0.252	418	400	5.87
Sikander, 2019	Both	PHQ-9	-0.300	-0.484	-0.116	223	211	5.72
Silverstein, 2011	Antenatal	QIDS	-0.503	-1.170	0.165	25	25	3.37
Burns, 2013	Antenatal	EPDS	-0.966	-1.739	-0.193	16	13	2.92
Tandon, 2018	Both	BDI-II	-0.213	-0.714	0.288	40	25	4.18
Trevillion, 2016	Both	EPDS	-0.640	-1.303	0.023	24	26	3.39
Van Horne, 2021	Postnatal	EPDS	-0.303	-0.732	0.127	58	33	4.56
Yazdanimehr, 2016	Antenatal	EPDS	-2.118	-2.750	-1.486	30	30	3.53
Chabrol, 2002, Prev	Postpartum	EPDS	-0.426	-0.700	-0.153	97	114	5.35
Chabrol, 2002, Treat	Postpartum	HDRS	-2.562	-3.340	-1.785	18	30	2.91
Cho, 2008	Antenatal	BDI	-0.134	-0.974	0.707	12	10	2.67
Cooper, 2003	Postpartum	EPDS	-0.438	-0.853	-0.022	42	50	4.63
			-0.626	-0.810	-0.443	1808	1781	

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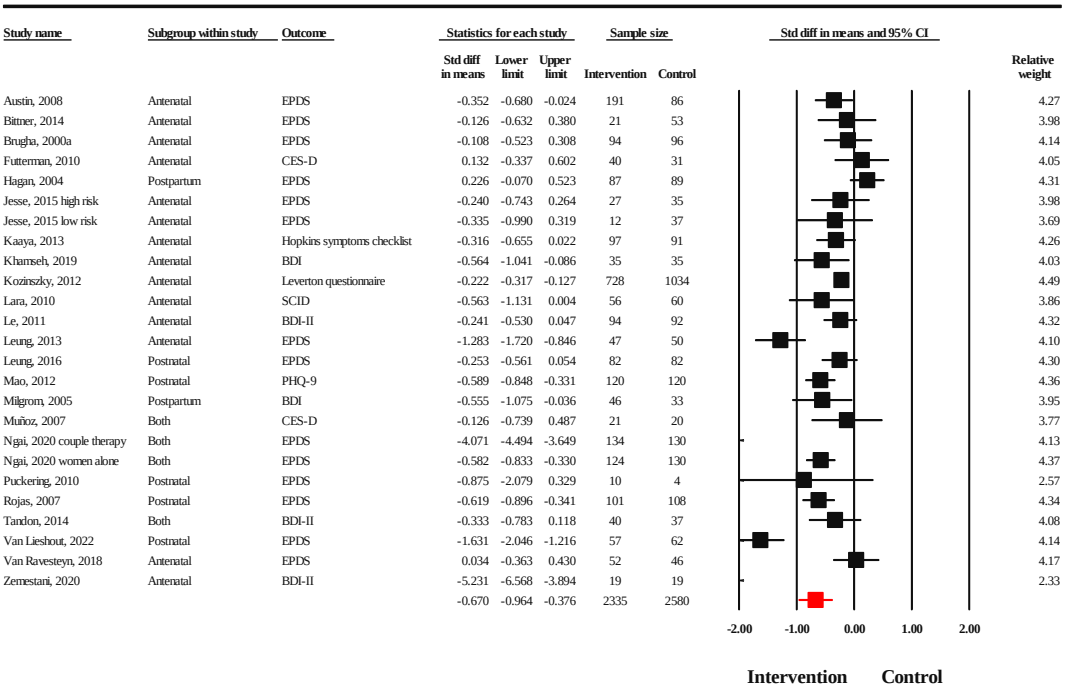
1023 **Figure 5: Forest plot visualizing effect sizes for interventions delivered to groups (n=25)**



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