Manuscript Details

Manuscript number	JAD_2019_3419_R1
Title	Psychosocial interventions on perinatal depression in China: a systematic review and meta-analysis
Article type	Review Article

Abstract

Background: The prevalence of perinatal depression is 16.3% in China and has shown a rising trend in the last decade. However, few studies summarized psychosocial interventions for perinatal depression in this country. This study aimed at evaluating and characterizing psychosocial interventions for perinatal depression in Mainland China. Methods: Ten major English and Chinese language electronic bibliographic databases were searched based on pre-defined criteria. Data was extracted by a standard form. Meta-analysis was conducted to obtain a summary measure of the effectiveness of the interventions in reducing perinatal depressive symptoms. The theoretical underpinnings and implementation processes of the interventions were also characterised. Results: A total of 6,857 articles were identified in the initial database searching, of which, 26 studies were eligible for data analysis, representing a sample size of 4,673. Meta-analysis indicated that psychosocial interventions in China significantly reduced perinatal depressive symptoms (standard difference in means 0.81, 95% confidence intervals -1.03 to -0.58, P<0.001). However, the overall evidence presented substantial heterogeneity (I2=91.12%). Most interventions were implemented in hospitals in urban areas by non-specialist health care providers. Few studies reported details of implementation procedures or scale-up strategies. Limitations: The evidence in this review is of moderate to low quality and therefore, should be interpreted with caution. Some of the trials were inadequately powered and tended to overestimate effect sizes. Conclusions: Current psychosocial interventions in China are somewhat effective in reducing perinatal depressive symptoms. High quality RCTs on scale-up interventions are required, especially in rural areas.

Keywords	Key words: Perinatal depression; China; psychosocial interventions; systematic review and meta-analysis
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Suggested reviewers	Alan Stein, Nusrat Husain, Siham Sikander, Alessandra Biaggi

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Dear Paolo,

My coauthors & I are very grateful to you for the great efforts on our manuscript. We also want to appreciate the reviewers for their valuable suggestions and comments. We have revised our manuscript in line with reviewers' suggestions and hope that it has greatly raised its quality. Please, find point by point responses to reviewers' comments in the rebuttal letter. Thank you.

We look forward to your decision in due time.

Best wishes,

Prof. Xiaomei Li

Reviewer 1

Comment 1: Among your Highlight bullets, the first would sound better if you state that psychosocial interventions for perinatal depression in China were meta-analyzed than simply summarized.

Reply: We have revised the first bullet according to your comment. Following is the modified bullet (Highlights, Page 1):

Psychosocial interventions for perinatal depression in China were meta-analyzed.

Comment 2: Introduction. There is no such a thing as a minor depressive episode, please reformulate.

Reply: This expression 'major or minor depressive episode' is cited from the following reference:

American College of Obstetricians and Gynecologists. Screening for Perinatal Depression. Committee opinion no. 757. Obstet & Gynecol 132, 1314-1316.

Perhaps the phrase "minor depressive episode" is not precise. We have made the following changes (Introduction, Page 3):

Perinatal depression is typically defined as major or mild depressive episodes, which occurs during pregnancy or within 12 months after delivery. Hope it is clear now.

Comment 3: Methods. Search strategy and selection criteria. Was publication recency a criterion for inclusion of a study whose sample overlapped with that of another (where you say more complete data)? It is not immediately apparent in the text which tools were employed to make diagnosis, how did your eligible studies diagnose their patients as having perinatal depression? You should state that in methods (e.g., Chinese version of the EPDS, Chinese Criteria for Mental Disorders-3 and so on).

Reply: In instances of repeat publications i.e. those published in a local Chinese language journal and in an international English language journal, we selected the publication reporting complete data for meta-analysis.

We have added information pertaining to the diagnosis of perinatal depression and the use of psychometric scales in the eligible studies. It reads as (Methods, Page 5),

Reference to justify perinatal depression had to be defined according to a diagnostic interview based on clinical criteria (CCMD-3, DSM-5 or ICD-10), or as a score above a cut-off on a self-rating depression scale (PHQ-9, SDS, HAMD, et al).

Also, the scales that were used in the studies were listed in the last column titled 'Outcomes' in Table 1.

Comment 4: Results. Just before Discussion, ...(five studies). While 24 studies... should be ...(five studies), while 24 studies.

Reply: We have now revised this statement. Please refer to the following (Result

section, page 8),
"The highest proportion of unclear risk of bias was exhibited in blinding of participants and personnel (24 studies). While five studies were rated as having a high risk of bias in reporting of incomplete outcome data."

Comment 5: Limitations. Add heterogeneity of assessment tools used in the 26 studies.
Reply: We have now addressed the heterogeneity pertaining to assessment tools in the limitation section (Limitation, page 10). It reads as,
We did not find any statistical heterogeneity based on different assessment tools for assessment of depressive symptoms among the intervention recipients in different studies. Nonetheless, use of different psychometric instruments with different psychometric properties introduces methodological heterogeneity in meta-analysis, therefore, these results should be interpreted with caution.

Comment 6: In Tables, what do the bracketed numbers in superscript stand for?
Reply: When drafting the paper, the bracketed numbers in superscript in the tables were used to note the reference number. According to the format of Journal of Affective Disorders, there are no reference numbers. We have deleted the bracketed numbers in tables. Thank you.

<u>Reviewer 2</u>

Comment 1: Pag 1 – "there are Few reviews"- please provide references and state what the current review adds to the literature – what specifically this review investigates that has not been investigated before in previous reviews.
Reply:
When conducting the review, we did not find any review summarizing the interventions on perinatal depression in China. In our companion SR paper (Prevalence of perinatal depression and its determinants in mainland China: A systematic review and meta-analysis), we only find one review on postpartum depressive mood among Chinese women (Mu TY, Li YH, Pan HF, et al. Postpartum depressive mood (PDM) among Chinese women: a meta-analysis. Archives of women's mental health 2019; 22(2): 279-87).

We wanted to express that we did not find any reviews that focused on theoretical underpinnings, effectiveness, and implementation processes of psychosocial interventions. To reflect this in a better way, we have amended this sentence as follows. Please refer to Introduction, Page 3.
However, to our knowledge, there are no systematic reviews and meta-analyses providing a synthesis of psychological and psychosocial interventions in mainland

China. This report aims to quantize evidence pertaining to effectiveness of psychological and psychosocial interventions for perinatal depression in China. In addition, we also summarize and critically evaluate the theoretical underpinnings of these interventions and their implementation processes.

Comment 2: In the abstract the authors state that studies written in English and Chinese have been considered but there is no information about this in the methods section of the paper. Also in the review protocol is written that there is no language restriction – please clarify this point in the methods.

Reply: We have added the language information in the methods section. The modified text is as follows (Methods, Page 3):

A bilingual team of two researchers systematically searched the following ten English and Chinese language electronic bibliographic databases. All the eligible full texts identified from the ten databases were either English or Chinese.

Comment 3: Can authors clarify whether they have looked at grey literature as well? If they haven't, this will need to be added to the limitations

Reply: The grey literature including reports, doctoral dissertation, and master's thesis was part of our database searches. The four Chinese database includes many kinds of references such as thesis, conference papers, and reports. However, no eligible study was found.

Comment 4: From the tables it appears that some studies have used multiple types of intervention. This can potentially bias the results. Can authors clarify how they have dealt with this point?

Reply: For quantitative analyses, we considered the dominant theoretical orientation of the interventions. This was guided by the studies' information and the extensive matching and distillation process, where we were able to identify individual therapeutic elements employed. Interestingly, these individual therapeutic elements especially the non-specific ones (e.g. engagement with the therapist or empathy) were consistent across all the studies. Take Li, 2018 as an example, the intervention includes empathy in nursing, identifying the auto-thoughts, discussing the unhealthy thoughts, changing the way of thinking, assigning homework. All of these elements are specific to CBT.

However, there are five studies that could not be categorized into one theoretical orientation (Jiang, 2014; Liu, 2012; Liu, 2018; Wu, 2018; Zhang, 2016). Jiang et al, adopted mailing knowledge manual besides counselling. Liu, 2012 combined exercise and psychoeducation. While Zhang 2016, music therapy was given combined with relaxation therapy, however, it was classified as music therapy in the meta-analysis. While the interventions classified as traditional Chinese practices also combined other non-specific elements such as support and relaxation. We have added these information in the results section and also discussed these limitation in the discussion section.

Results section has been updated as follows (Page 6 and 7):

The most commonly employed therapeutic approaches included cognitive behavioral ... and person-centered counseling (one study, the intervention combined counseling with education).

Other strategies not based on any established psychological theories ... music therapy (one study, combined exercise with relaxation therapy) and exercise (one study, combined exercise with psychoeducation).

Discussion section has been updated as follows (Page 8 and 9):

Though classified as exercise-based intervention, the study (Liu et al., 2012) actually combined psychoeducation, which surely will exaggerate the size effect of exercise.

Though classified as counselling and music therapy, Jiang 2014 and Zhang 2016 actually used multiple interventions in their studies.

"Interventions classified as traditional Chinese practices also combined other non-specific elements such as support and relaxation. Therefore, it is difficult to identify the sole effectiveness of these traditional Chinese practices".

Comment 5: "High/low quality studies" –which criteria have been considered for this definition? E.g., presence of randomization and blinding, sample size etc? Authors talk about them briefly in the discussion and there is a table at the end. However, these criteria should be clearly stated in the methods to improve clarity of the paper.

Reply: We have added the following information in the method part. Please also refer to the last paragraph of the methods section (Methods, Page 5).

Studies with two or less items ranked as high risk were classified as high quality, otherwise were classified as low quality.

Comment 6: Pag 3 - "Studies focusing on prevention" – can authors clarify what they mean with this? Have these studies targeted women based on specific risk factors? If so, which risk factors?

Reply: We realized that the original classification of intervention might lead to confusion without explanation and thus rewrite the subgroup analysis in Meta-analyses section. The modified text is as follows (Methods, Page 5).

Scope of intervention was classified as treatment and prevention. Studies focusing on perinatal depressed mothers, either identified with a diagnosis interview based on clinical criteria (CCMD-3, DSM-5 or ICD-10), or as a score above a cut-off on a self-rating depression scale (PHQ-9, SDS, HAMD, et al), were classified as "treatment". While the "prevention" intervention included studies that targeted respondents with either a) prodromal symptoms of depression identified as having high scores on screening instruments b) all mothers with baseline score below a cut-off on a self-

rating depression scale.

Comment 7: Pag 3- "The most commonly used psychometric scales for assessment of perinatal depression were the Edinburgh Postnatal Depression Scale (14 studies), followed by Zung Self-Rating Depression Scale (six studies), Hamilton depression scale (three studies) and Patient Health Questionnaire-9 (three studies)". – As some of these instruments such as the EPDS are meant to be used only as screening tools and not as diagnostic tools, can the authors state whether these instruments have been used alone or in conjunction with diagnostic interviews? If these have been used alone, this should be stated as a potential element of bias. Also, please provide references for these studies.

Reply: To define a mother as having perinatal depression, we used the study authors' specified criterion. We listed all of those studies as treatment interventions that either diagnosed the intervention recipients based on DSM/ICD/CCMD criteria of diagnoses or using cut-off points based on psychometric scales such as the EPDS. When identifying perinatal depression, some studies combined the clinical criteria with screening tools and others used only screening tools. We have updated our methods section with these statements. Please refer to Method section, page 5.
We have also added this limitation in the discussion section (Page 9) as follows:
Several studies employed only screening instruments such as the EPDS to classify intervention recipients as having depression. The process of diagnoses should be done using diagnostic interviews based on DSM/ICD criteria for diagnosis or SCID. The use of screening instruments for diagnosis without employing a diagnostic interview can add potential bias in the meta-analysis.

We added the references in the following text (As the scales were summarized in table 1, we did not list references in the main text to avoid exceeding word limit).
"The most commonly used psychometric scales for assessment of perinatal depression were the Edinburgh Postnatal Depression Scale (14 studies: Leung, 2016; Ngai, 2015; Ho, 2009; Jia, 2017; Lu, 2016; Sun, 2011; Ngai, 2009; Gao, 2010; Gao, 2015; Leung, 2012; Jiang, 2014; Wu, 2018; Liu, 2012; Cheng, 2016), followed by Zung Self-Rating Depression Scale (six studies: Dou, 2018; Wu, 2017; Zhao, 2018; Zhang, 2018; Liu, 2018; Zhang, 2016), Hamilton depression scale (three studies: Li, 2018; Lu, 2017; Guan, 2015) and Patient Health Questionnaire-9 (three studies: Huang, 2015; Mao, 2012; Yang, 2019)".

Comment 8: It would be helpful to the reader to add to the tables the time when the intervention was delivered exactly (if pregnancy or postpartum).
Reply: Yes, we have added the time point of delivery in table 1 in the 'Intervention' column. Please kindly refer to the modified table 1.

Comment 9: Few grammatical mistakes in the paper (e.g., the last paragraph of the introduction)- please amend

Reply: We have revised the use of English in the manuscript. Thank you. Please refer to Introduction, Page 3.

<u>Reviewer 3</u>

Comment 1:

In the Introduction, I miss a definition of 'psychosocial intervention'. This is an important point, as this definition will affect the types of interventions accepted in this meta-analysis. In fact, in p. 5 (2nd line) it is reported that the largest effect size was obtained by one study that applied exercise (d = -2.49). This means that this study only applied exercise? If it is so, can exercise be considered a psychosocial intervention? If one study only applied exercise, then it should be removed from the meta-analysis, as exercise alone cannot be considered a psychosocial intervention. Please, clarify this point.

Reply: In this review, the 'psychosocial intervention' means non-drug therapy. So exercise is one of psychosocial interventions. Though classified predominantly as exercise-based intervention, this study (Liu et al., 2012) actually combined exercise and psychoeducation. The author mentioned they also applied psychoeducation to mothers. However, no detailed information of delivery can be found. We have added this limitation in the discussion section. The modified text is as follows (Discussion, Page 8):

<u>Though classified as exercise-based intervention, Liu et al., 2012 combined exercise with psychoeducation, which surely will exaggerate the size effect of exercise.</u>

Comment 2: In the Introduction I also miss an operational definition of prenatal and postnatal depression. It is important to know how the participants in the samples were diagnosed as suffering prenatal or postnatal depression. A given diagnostic interview was applied? Or perhaps the decision was taken by a cutpoint applied on a depression scale? This point is related to other that refers to how the interventions were coded as 'for prevention' or 'for treatment'. In the first case, it is assumed that the participants have not yet developed depressive symptoms, whereas in the second one it is assumed that the participants had prenatal or postnatal depression. Thus, these two situations are referring to two different target populations of women. Please, clarify this point.

Reply:

To define a mother as having perinatal depression, we used the study authors' specified criterion. We listed all of those studies as treatment interventions that either diagnosed the intervention recipients based on DSM/ICD/CCMD criteria of diagnoses or using cut-off points based on psychometric scales such as the EPDS. When identifying perinatal depression, some studies combined the clinical criteria with screening tools and others used only screening tools.

We realized that the original classification of intervention might lead to confusion without explanation and thus rewrite the subgroup analysis in Meta-analyses section. The modified text is as follows (Methods, Page 5).

Studies focusing on perinatal depressed mothers, either identified with a diagnosis interview based on clinical criteria (CCMD-3, DSM-5 or ICD-10), or as a score above a cut-off on a self-rating depression scale (PHQ-9, SDS, HAMD, et al), were classified as "treatment". While the "prevention" intervention included studies that targeted respondents with either a) prodromal symptoms of depression identified as having high scores on screening instruments b) all mothers with baseline score below a cut-off on a self-rating depression scale.

Comment 3: In the Methods section, the first statement that the authors should make is that they followed the PRISMA checklist to warrant a good reporting quality of this meta-analysis. Please, apply the PRISMA checklist to assure a good quality.

Reply: Yes, we did check our paper according to the PRISMA checklist before submitting this review. We added this statement in the beginning of Methods section (Page 3). Please refer to the following text:

We documented the research process following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Comment 4: In the Methods section, I miss a structured description of the selection criteria of the studies. Please, apply the PICOS statement to describe the inclusion criteria.

Reply: We have amended the inclusion criteria following the PICOS formats. Please refer to the following text (Methods, Page 4):

The inclusion criteria are as follows:

Participants: Studies focused on pregnant women or women within 12 months after delivery in Mainland China.

Intervention: Studies examining the effect of psychosocial interventions, either prevention or treatment.

Control: Routine care or blank control.

Outcomes: Measurement and reporting of perinatal depression scores using a validated self-report scale (e.g., EPDS, SDS, PHQ-9) or clinician-administered measure.

Study design: Studies with randomized controlled trials (RCTs) or cluster RCTs design were included.

Comment 5: In the Methods section, it is said the data extraction process from the primary studies was accomplished by two independent coders. This is an excellent point, but I miss the reporting of reliability coefficients to assess the inter-coder agreement (e.g., by calculating kappa coefficients for categorical moderators and intraclass correlations for the continuous ones). At least, the average, minimum and maximum reliability coefficients should be reported. This analyses should also include the calculations of the standardized mean differences from the primary studies.

Reply: We assessed the inter-coder agreement by calculating Kappa coefficients of the elements and risk of bias. The result is as follows:

Taxonomy of intervention:

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
VAR00005	61	.35	.65	1.00	.9924	.04706
Valid N (listwise)	61					

Bias of risk:

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
bias	7	.16	.84	1.00	.9504	.06591
Valid N (listwise)	7					

We also added these two tables in the Appendix (table 8 and table 9).

Comment 6: In the Discussion section, the authors should emphasize the importance of distinguish between preventive and treatment interventions. In fact, the effect sizes were two times larger for treatment than for preventive interventions (d+ = -1.10 vs -0.65).

Reply:

As we have included studies with a score above a cut-off on a self-rating depression scale as "treatment", there are 12 studies classified as "treatment" and 14 as "prevention". Then we run the subgroup analysis again. And no significant difference was found between the size effect of treatment studies and prevention studies (Q statistic: χ^2=1.65, p=0.2). Please also refer to the modified Appendix Table 5. We have modified the Result section accordingly and discussed this result in the Discussion section. It reads as follows,

Result (Page 7)
Though the size effect of treatment studies was higher than that of prevention

studies, no statistical difference was found (χ^2=1.65, p=0.2).

Discussion (Page 9)

No significant difference was found between the size effect of treatment and prevention studies. However, the result should be interpreted with caution. Participants undergoing treatment interventions have higher scores on depression screening instruments at baseline than the counterparts in preventive interventions. Thus, the former group experiences a larger decrease in their scale scores post-intervention, reflecting higher effect size estimates.

Comment 7: Finally, my main concern is regarding the generalizability of these results. This is because this meta-analysis focused on Chinese population only. Thus, the authors must make some comment on this limitation, as well as to argument on the potential cultural differences that might affect the efficacy of psychosocial interventions on prenatal or postnatal depression.

Reply: We have added this limitation regarding to the generalizability of this review in the discussion section. Please refer to the following amends (Discussion, Page 10):

Thirdly, the implication of this review is limited in China as we only include psychosocial interventions on perinatal depression in China.

Minor point:

1. In the Abstract, Results section, 'standard difference in means -0.81' should be changed for 'standard difference in means 0.81'.

Reply: We have modified this error (Result, Page 7). Thank you.

Psychosocial interventions for perinatal depression in China were <mark>meta-analyzed</mark>.

Theoretical underpinnings and implementation processes were characterized.

High quality RCTs and scale-up interventions are required in China.

ABSTRACT

Background:
The prevalence of perinatal depression is 16.3% in China and has shown a rising trend in the last decade. However, few studies summarized psychosocial interventions for perinatal depression in this country. This study aimed at evaluating and characterizing psychosocial interventions for perinatal depression in Mainland China.

Methods:
Ten major English and Chinese language electronic bibliographic databases were searched based on pre-defined criteria. Data was extracted by a standard form. Meta-analysis was conducted to obtain a summary measure of the effectiveness of the interventions in reducing perinatal depressive symptoms. The theoretical underpinnings and implementation processes of the interventions were also characterised.

Results:
A total of 6,857 articles were identified in the initial database searching, of which, 26 studies were eligible for data analysis, representing a sample size of 4,673. Meta-analysis indicated that psychosocial interventions in China significantly reduced perinatal depressive symptoms (standard difference in means 0.81, 95% confidence intervals -1.03 to -0.58, P<0.001). However, the overall evidence presented substantial heterogeneity (I^2=91.12%). Most interventions were implemented in hospitals in urban areas by non-specialist health care providers. Few studies reported details of implementation procedures or scale-up strategies.

Limitations:
The evidence in this review is of moderate to low quality and therefore, should be interpreted with caution. Some of the trials were inadequately powered and tended to overestimate effect sizes.

Conclusions:
Current psychosocial interventions in China are somewhat effective in reducing perinatal depressive symptoms. High quality RCTs on scale-up interventions are required, especially in rural areas.

Key words:
Perinatal depression; China; psychosocial interventions; systematic review and meta-analysis

Psychosocial interventions on perinatal depression in China: a systematic review and meta-analysis

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Psychosocial interventions on perinatal depression in China: a systematic review and meta-analysis

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ABSTRACT

Background:

The prevalence of perinatal depression is 16.3% in China and has shown a rising trend in the last decade. However, few studies summarized psychosocial interventions for perinatal depression in this country. This study aimed at evaluating and characterizing psychosocial interventions for perinatal depression in Mainland China.

Methods:

Ten major English and Chinese language electronic bibliographic databases were searched for RCTs examining the effect of psychosocial interventions for perinatal depressed women in Mainland China. Studies meeting eligibility criteria and published before 25th February 2019 were included, while those focusing on a very specific sub-population or reporting non-psychosocial interventions were excluded. Data was extracted by a standard form. Meta-analysis was conducted to obtain a summary measure of the effectiveness of the interventions in reducing perinatal depressive symptoms. The theoretical underpinnings and implementation processes of the interventions were also characterised.

Results:

A total of 6,857 articles were identified in the initial database searching, of which, 26 studies were eligible for data analysis, representing a sample size of 4,673. Meta-analysis indicated that psychosocial interventions in China significantly reduced perinatal depressive symptoms (standard difference in means 0.81, 95% confidence intervals -1.03 to -0.58, P<0.001). However, the overall evidence presented substantial heterogeneity (I^2=91.12%). Most interventions were implemented in hospitals in urban areas by non-specialist health care providers. Few studies reported details of implementation procedures or scale-up strategies.

Limitations:

The evidence in this review is of moderate to low quality and therefore, should be interpreted with caution. Some of the trials were inadequately powered and tended to overestimate effect sizes.

Conclusions:

Current psychosocial interventions in China are somewhat effective in reducing perinatal depressive symptoms. High quality RCTs on scale-up interventions are required, especially in rural areas.

Key words:

Perinatal depression; China; psychosocial interventions; systematic review and meta-analysis

INTRODUCTION

Perinatal depression is typically defined as major or mild depressive episodes, which occurs during pregnancy or within 12 months after delivery (Gynecologists, 2018). Associated with a number of cultural, social and economic stressors, pregnancy and the postpartum period put women at a greater risk of depressive disorder (Biaggi et al., 2016). The prevalence of perinatal depression has been estimated at between 10% to 15% in High-Income Countries (HIC) and 19% to 25% in Low- and Middle Income countries (LMIC) (Gelaye et al., 2016; Woody et al., 2017).

Untreated perinatal depression is reported to be associated with various adverse health outcomes for the mothers, including poor nutrition, substance misuse, increased obstetric complications and suicide (Bauer et al., 2016; Evans et al., 2001). It has also been linked with impaired health of infants, including poor physical and mental development and increased risk for later common mental disorders in the off spring (Gelaye et al., 2016; Herba et al., 2016; Weissman et al., 2006). Besides, perinatal depression causes a significant medical cost to the family and society. It is estimated that the total lifetime costs of perinatal depression in UK were £75,728 per woman, aggregating to £6.6 billion (Bauer et al., 2016).

China, the world's most populous country, has seen remarkable improvement in maternal and infant health indicators in recent decades (Ministry of Foreign Affairs, July, 2015). In contrast, the prevalence of perinatal depression remains high (15-18%) and has increased during the last decades (Nisar et al., 2019). The high prevalence of perinatal depression indicates an urgent need for interventions in China, particularly psychosocial interventions that are acceptable, feasible and affordable (Richter et al., 2017). There has been some research exploring the management of perinatal depression in China. However, to our knowledge, there are no systematic reviews and meta-analyses providing a synthesis of psychological and psychosocial interventions in mainland China. This report aims to quantize evidence pertaining to effectiveness of psychological and psychosocial interventions for perinatal depression in China. In addition, we also want to summarize and critically evaluate the theoretical underpinnings of these interventions and their implementation processes.

METHODS

We documented the research process following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Search strategy and selection criteria

A bilingual team of two researchers systematically searched the following ten English and Chinese language electronic bibliographic databases: Medline, EMBASE, Scopus,

CINAHL, PsycINFO, Web of Science, Cochrane Central Register, the China National Knowledge Infrastructure, the VIP Database for Chinese Technical Periodicals, and the Wan Fang Database for Chinese Periodicals, using a pretested search strategy (Appendix Table 1). There was no restriction of publication date and all the studies available from the inception of the databases till 25th February, 2019 were incorporated. The inclusion criteria are as follows:

Participants: Studies focused on pregnant women or women within 12 months after delivery in Mainland China.

Intervention: Studies examining the effect of psychosocial interventions on perinatal depression, either prevention or treatment.

Control: Routine care or blank control.

Outcomes: Measurement and reporting of perinatal depression scores using a validated self-report scale (e.g., EPDS, SDS, PHQ-9) or clinician-administered measure.

Study design: Studies with randomized controlled trials (RCTs) or cluster RCTs design were included.

The exclusion criteria are: Studies with participants from a very specific sub-population (e.g., people with a specific disease or condition or epidemiological character); Studies with insufficient outcome data for meta-analysis. The protocol of this review can be found at https://www.crd.york.ac.uk/prospero/#record (CRD42018115934).

Duplicate articles were identified using EndNote, and the papers with more complete data were included for repeat publications. Two investigators worked independently screening the titles and abstracts for inclusion, followed by the full-text screening. Manual searching of the bibliography of all included articles was conducted lastly. Consensus on papers to be included was reached after discussion and a third researcher was involved when necessary.

Data extraction

Two independent reviewers extracted the following information with a standard form based on Cochrane handbook: (1)General information including study design, sample characteristics, geographical setting, details of intervention, type and training of delivery agent, outcome measures; (2)Data for meta-analysis including sample size, primary outcome, effect size; (3)Therapeutic techniques used in the intervention. Risk of bias of individual research was evaluated by two reviewers according to Cochrane risk of bias tool. Differences in data extraction and risk of bias were resolved by discussion between the reviewers and the principle author.

Besides the above information, the psychosocial interventions were thoroughly audited to identify the broader elements and techniques employed in them. For the phase of data extraction, taxonomy of elements of psychosocial interventions employed in common mental problems was adopted after discussion with two psychologists (Singla et al., 2017). The finalized taxonomy included 58 most

commonly utilized treatment elements that could be treatment specific or nonspecific. Definitions of therapeutic elements employed in psychosocial interventions are summarized in Appendix Table 2.

Meta-analyses

The effect sizes of individual study were listed by standard difference in means and 95% confidence intervals (95% CIs) in a forest plot. A fixed-effect model was used if no statistical difference in heterogeneity was found; otherwise, a random-effect model was adopted. The statistical heterogeneity was quantified by the I^2 statistic and formally tested by Cochrane's Q statistic. Publication bias was visually judged by the symmetry of a funnel plot and the result of Egger's linear regression test. Post-hoc sensitivity analyses were performed (using leave-one-out analysis) to test the impact of exclusion of a single trial with a disproportionately large effect. Subgroup analyses were used to explore the sources of heterogeneity according to quality of the study, scale, theoretical orientation, specificity, scope of intervention and elements of interventions. Studies with two or less items ranked as high risk were classified as high quality, otherwise were classified as low quality (Naveed, S. et al, 2019). Scope of intervention was classified as treatment and prevention. Reference to justify perinatal depression had to be defined according to a diagnostic interview based on clinical criteria (CCMD-3, DSM-5 or ICD-10), or as a score above a cut-off on a self-rating depression scale (PHQ-9, SDS, HAMD, et al). Studies focusing on perinatal depressed mothers with a clear diagnosis of "perinatal depression" (based on ICD-10, CCMD-3 or DSM-5) was classified as "treatment". Studies focusing on high risk mothers or mothers without perinatal depression (identified by screening with a validated scale, e.g., EPDS, SDS, PHQ-9, HAMD) was classified as "prevention". Studies focusing on all mothers (without diagnosis or screening for perinatal depression) was classified as others. Statistical significance was set at P value < 0.05 (two-tailed test). All the analyses were carried out by the Comprehensive meta-analysis software (version 3, BIOSTATS, 2014).

RESULTS

A total of 10,311 articles were found through database searching and 3,454 duplications were removed. After title and abstract screening, 198 articles were identified eligible for full text screen, and 26 studies were finally included in the data analysis. Study selection process is illustrated as a PRISMA flowchart in Figure 1.

A total of 26 trials of psychosocial interventions representing a sample size of 4,673 perinatal women were included. The age of perinatal women included in the studies

ranged from 17 to 45 years old (29.37±1.87). For the study design, 25 studies (Cheng

et al., 2016; Dou, 2018; Gao et al., 2010; Gao et al., 2015; Guan et al., 2015; Ho et al., 2009; Huang et al., 2015; Jia et al., 2017; Jiang et al., 2014; Leung et al., 2016; Leung and Lam, 2012; Li, 2018; Liu et al., 2012; Liu et al., 2018; Lu and Fan, 2017; Lu et al.,

2016; Mao et al., 2012; Ngai et al., 2015; Sun et al., 2011; Wu, 2018; Wu, 2017; Yang et al., 2019; Zhang et al., 2018; Zhang et al., 2016; Zhao, 2018) were RCTs and one (Ngai et al., 2009) reported cluster RCT. Nineteen studies focused on postnatal depression, three on prenatal depression and two on both prenatal and postnatal depression. The most commonly used psychometric scales for assessment of perinatal depression were the Edinburgh Postnatal Depression Scale (14 studies), followed by Zung Self-Rating Depression Scale (six studies), Hamilton depression scale (three studies) and Patient Health Questionnaire-9 (three studies). The primary time point of outcome assessment varied from after intervention to four-month post intervention, with ten studies reported follow-up data. Details can be found in Table 1 and Appendix Table 3.

Regarding to the intervention delivery, 22 studies were conducted in urban areas, two in semi-urban areas, and two did not indicate the research region. All studies delivered the interventions in hospitals or health care centers. The interventions were mostly provided by non-specialist health care workers, with six by nurses, four by midwives, and eight by multidiscipline health care workers (seven studies did not report the delivery agent). As for the type of interventions, 17 studies focused on preventive interventions while the rest on treatment. The duration of overall intervention program varied from one day to eight weeks. Nineteen out of the 26 studies had more than one intervention sessions. Two studies delivered brief interventions-a one-session education program before discharge with a follow-up session (Gao et al., 2015; Ho et al., 2009). Five studies did not report detailed information regarding to the duration or the number of sessions of the whole program. The interventions were delivered in a variety of ways. The most commonly used format was face-to-face or group. Two studies delivered the intervention by talking with women on the telephone (Cheng et al., 2016),(Ngai et al., 2015). Yang 2019 (Yang et al., 2019) and Zhao 2018 (Zhao, 2018) conducted the intervention on a popular Chinese smartphone APP named WeChat, with all sessions recorded and uploaded to the platform. Half of the studies integrated interventions into an existing health education program or routine care. With respect to the fidelity of implementation, only two studies (Leung and Lam, 2012; Ngai et al., 2015) reported detailed information regarding supervision of the intervention, with intervention sessions videotaped and reviewed (Leung and Lam, 2012; Ngai et al., 2015). Detailed information is listed in table 2.

The most commonly employed therapeutic approaches included cognitive behavioral (CBT, seven studies), psychoeducation (PE, seven studies), interpersonal therapy (IPT, three studies), mindfulness (two studies) and person-centered counseling (one study, combined counseling with education). Among cognitive strategies, the commonest elements were identifying thoughts, behaviors, and cognitive restructuring. Among behavioral theory-based interventions, the predominant elements included problem solving, relaxation techniques and emotional regulation. Interpersonal strategies included communication skills and inciting social support. Caregiver coping was the

most frequently reported element among parental skills-based strategies and birth procedures were most common psychoeducational component. The therapeutic elements comprising these interventions were heterogeneous and overlapped across different interventions. Other strategies not based on any established psychological theories included traditional Chinese practices (Liu 2018: acupoint massage, education and emotion release therapy; Wu 2018: acupoint massage, music therapy and diet nursing; Guan 2015: acupoint massage, music therapy and education), social support (one study), music therapy (one study, combined exercise with relaxation therapy) and exercise (one study, combined exercise with psychoeducation). The strategies included many non-specific elements such as prompting social support, involvement of family, active listening, involvement of significant others and so on. The most commonly used traditional Chinese practice was acupoint massage. Description of principles and rationale behind these interventions has been detailed in Figure 2 and Appendix Table 4.

The summary measure corresponded to a strong overall effect size of 0.81 (95% CI: -1.03 to -0.58, P<0.001), with five individual studies showing no significant difference in the effect size (Figure 3). The overall evidence, however, presented substantial heterogeneity (I^2=91.12%, P<0.001, Q=282.36). Sensitivity analysis did not reveal any changes in the pooled effect size when individual study was removed from the meta-analysis. The effectiveness of these interventions (n=10) remained significant (effect size: -0.87, 95% CI: -1.49 to -2.73, I^2= 97.45%) at follow-up (from 7 days to 6 months).

A series of subgroup analyses were conducted to ascertain differences in effect sizes among a priori defined groups of interventions (Appendix Table 5). High quality studies (Gao et al., 2010; Gao et al., 2015; Leung and Lam, 2012; Mao et al., 2012; Ngai et al., 2009; Ngai et al., 2015; Yang et al., 2019) yielded weaker effect sizes and performed better on heterogeneity measures than their counterparts. There was a significant difference in the effect sizes of different theoretical orientations, with exercise (n=1) showing the largest (-2.49, 95%CI: -3.26 to -1.71) and interpersonal therapy (n=3) the smallest (-0.22, 95%CI: -0.48 to 0.03). Though the size effect of treatment studies was higher than that of prevention studies, no statistical difference was found (χ^2=1.65, p=0.2). And no difference of effect size was found between interventions delivered by specialists and non-specialists. Multivariate meta-regression was used to assess differences in effect sizes of subgroups of studies with different theoretical orientations, while accounting for quality of the studies, and employing exercise-based therapy as a reference group. It yielded a significant model (P<0.001) that explained 69% of variation in heterogeneity in the effect size of studies, where exercise-based therapy yielded the highest effect size, followed by traditional Chinese practice, counseling, music therapy, social support, psychoeducation, cognitive behavioral therapy, mindfulness and interpersonal therapy. Details were shown in Appendix Figure 1 & Appendix Table 6. When the analysis was restricted to psychotherapies including CBT, IPT, PE and mindfulness, no significant differences in effect sizes were noted (P > 0.05) (Appendix Figure 1 & Appendix Table 7).

Maternal age did not account for variation in heterogeneity and effect sizes among the included trials (Beta= 0.06; P= 0.35).

The result demonstrated that most RCT studies (73.1%) included in the meta-analysis are of low quality. Visualization of funnel plot (Figure 4) and assessment of Egger's regression statistic (P=0.98) did not reveal any significant publication bias. The highest proportion of unclear risk of bias was exhibited in blinding of participants and personnel (24 studies). While five studies were rated as having a high risk of bias in reporting of incomplete outcome data. Detailed ratings of risk of bias have been presented in Appendix Figure 2.

DISSCUSSION

To the best of our knowledge, this is the first systematic review to provide an overview of psychosocial interventions, including traditional Chinese practices, for perinatal depression in China. The studies included in this review varied in the form, duration, theoretical orientation and delivery-agent of the interventions. Despite the diversity, it can be concluded that psychosocial interventions are relatively effective in reducing perinatal depressive symptoms. This result is consistent with the findings of other recent global reviews of evidence in the area (Dennis and Dowswell, 2013).

The analyses exhibited the highest effect size for exercise-based intervention, followed by psychological therapies embedded in traditional Chinese practices. This may indicate a cultural preference for interventions based on physical activity rather than conventional 'talking therapies'. However, these analyses may not present a true picture of the real treatment effects of these interventions, which may be a reflection of the quality and numbers of studies. There was only one intervention pertaining to exercise (Liu et al., 2012) and three to traditional Chinese practices (Guan et al., 2015; Liu et al., 2018; Wu, 2018). Besides, all the four above-mentioned studies were poorly designed according to the Cochrane risk of bias tool. Though classified as exercise-based intervention, the study (Liu et al., 2012) actually combined psychoeducation, which surely will exaggerate the size effect of exercise. In comparison, CBT (Mao et al., 2012; Ngai et al., 2015) and IPT based (Gao et al., 2010; Gao et al., 2015; Leung and Lam, 2012) studies showed low risk of bias and thus giving more precise estimates of treatment effects. Furthermore, interventions classified as traditional Chinese practices also combined other non-specific elements such as support and relaxation. Therefore, it is difficult to identify the sole effectiveness of these traditional Chinese practices. However, traditional Chinese practices in the management of perinatal depression should be an area of interest. For example, acupuncture, a traditional Chinese treatment, has been shown to significantly reduce postpartum depressive symptoms (Li et al., 2019). Thus, the role of traditional medicine as an adjunct to conventional approaches should be explored further and could be an important area for future research. Though classified as

counselling and music therapy, Jiang 2014 and Zhang 2016 actually used multiple interventions in their studies. This may exaggerate the size effect and lead a bias to the result.

In the subgroup analyses, high quality studies yielded a weaker effect size than their low quality counterparts. A large proportion of studies included in this review were rated as low quality and tended to overestimate treatment effect sizes. Small-scale trials lacking proper randomization procedures contribute to selection bias and systematic differences between the intervention and placebo arms. Similar biases are associated with poor or no allocation concealment because allocation to intervention and control groups can be related to prognosis and responsiveness to treatment (Kunz et al., 2007). Future trials should focus on removing these potential sources of biases. The subgroup analyses also demonstrated that the effect of interventions delivered by non-specialists was comparable to that by specialists, which is consistent with other literature reports (Liu et al., 2017). No significant difference was found between the size effect of treatment and prevention studies. However, the result should be interpreted with caution. Participants undergoing treatment interventions have higher scores on depression screening instruments at baseline than the counterparts in preventive interventions. Thus, the former group experiences a larger decrease in their scale scores post-intervention, reflecting higher effect size estimates. In this review, several studies employed only screening instruments such as the EPDS to classify intervention recipients as having depression. The process of diagnoses should be done using diagnostic interviews based on DSM/ICD criteria for diagnosis or SCID. The use of screening instruments for diagnosis without employing a diagnostic interview can add potential bias in the meta-analysis.

It is notable that almost all studies in this review delivered their interventions in hospitals in urban areas of China. However, perinatal depression is more prevalent in underdeveloped regions and associated with poor socioeconomic and living conditions (Nisar et al., 2019). This result indicated that more research should be done on how to bridge the urgent need of mental health care in rural areas and the shortage of medical human resource. It has been proven that mental health interventions delivered by non-specialist under supervision are more beneficial than routine care and can reduce the disease burden of perinatal depression (Liu et al., 2017). Though half studies in this review reported integrating their interventions into existing services, few reported the process, cost and scale-up strategies. Studies in other LMICs proved that maternal mental health interventions can be added to existing health care services at little additional cost (Richter et al., 2017). Based on the above evidence, task shifting from mental health specialists to the community healthcare system, which was successfully demonstrated in many studies from LMICs (Rahman et al., 2013), could be a potential way forward in integration of mental health interventions and services into existing healthcare system in China.

The application of technology could be another way to improve access to mental

health care. According to a recent systematic review (Ashford et al., 2016), computer- or web- based interventions could be a promising approach for accessing treatment for perinatal depression. In this review, two studies (Yang et al., 2019; Zhao, 2018) delivered mindfulness interventions through a popular Chinese mobile application named WeChat and both reported a significant positive result. However, adherence to intervention and quality control could limit the effectiveness of computer- or web- based interventions. Also, given that perinatal depression is more prevalent in under- developed regions, technological solutions must ensure equity for those who do not have access to this technology.

Limitation

There are some limitations in this review. Firstly, the evidence in this review is of moderate to low quality and therefore, should be interpreted with caution. The majority of the trials had high risk of bias with poor randomization and allocation concealment procedures. Secondly, some of the trials were inadequately powered and tended to overestimate effect sizes as demonstrated by a wide confidence interval for standard mean differences for those ten follow-up data. Thirdly, the implications of this review is limited in China as we only include psychosocial interventions on perinatal depression in China. Lastly, we did not find any statistical heterogeneity based on different assessment tools for assessment of depressive symptoms among the intervention recipients in different studies. Nonetheless, use of different psychometric instruments with different psychometric properties introduces methodological heterogeneity in meta-analysis. Therefore, these results should be interpreted with caution.

Conclusion

This review indicates that psychosocial interventions, particularly those involving psychoeducational and cognitive behavioral elements, are effective in reducing perinatal depressive symptoms. Traditional Chinese practices and exercise may add to the effectiveness of interventions. However, future high quality RCTs are required to supplement the evidence. Concurrently, strategies to scale-up effective interventions should be further developed and evaluated in a range of settings to reduce the treatment gap for perinatal depression.

Contributors

Juan Yin, Atif Rahman and Xiaomei Li conceived and designed the study; Anum Nisar and Juan Yin searched, screened and did the data extraction of the English studies; Yan Guo and Wenli Qi searched, screened and did the data extraction of the Chinese studies; Ahmed Waqas and Duolao Wang did the meta-analysis; Juan Yin first draft the paper and all the authors revised and approved it.

Declaration of interests

None.

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Records identified through database
searching (n=10,311)

Additional records identified through
other sources (n=0)

Records after duplicates removed
(n=6,857)

Records screened for title
and abstract (n=6,857)

Records excluded (n=6,659)

2,787 not RCT
2,146 specific population
1,030 not on perinatal depression
671 not psychosocial interventions
18 repeat studies
7 not in mainland China

Full-text articles assessed for
eligibility (n=198)

Articles excluded (n=154)

121 not RCT
18 not psychosocial interventions
6 repeat studies
4 not in mainland China
3 specific population
2 not on perinatal depression
18 not applicable for meta-analysis

Studies included in
quantitative synthesis
(Meta-analysis)
(n=26)
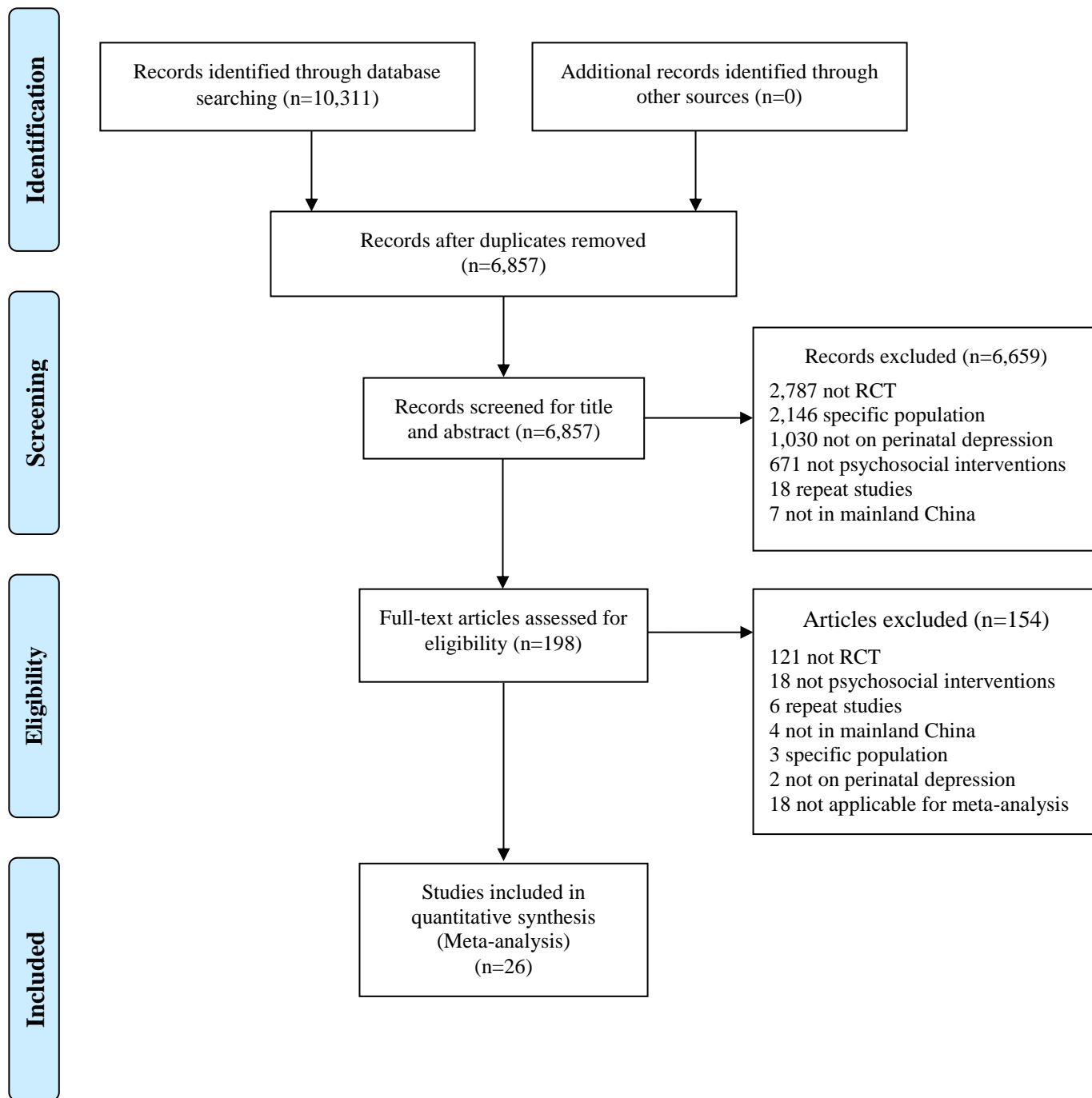
Figure 1. Study selection process for psychosocial interventions of perinatal depression in
women in China.

Specific therapeutic ingredients (N=26)
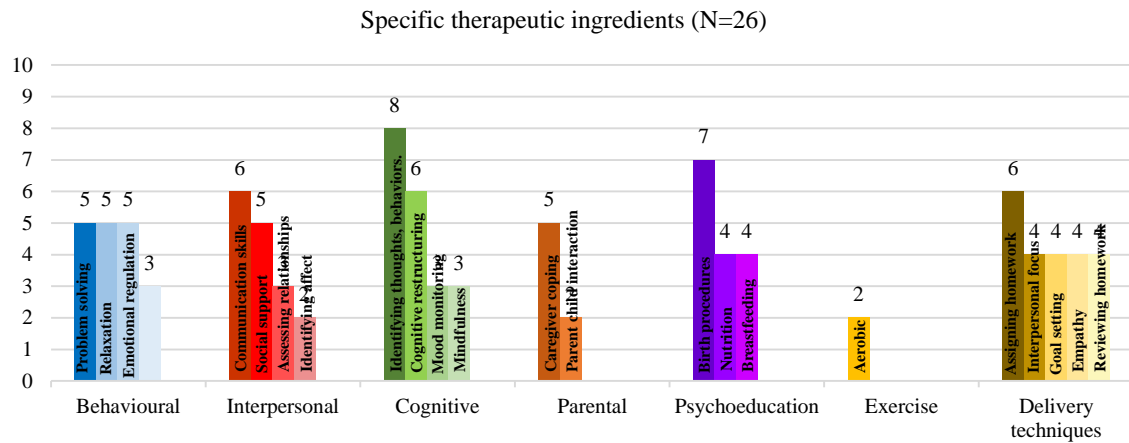
Figure 2 (a). Specific therapeutic ingredients of the included studies.

Non-specific therapeutic ingredients (N=26)
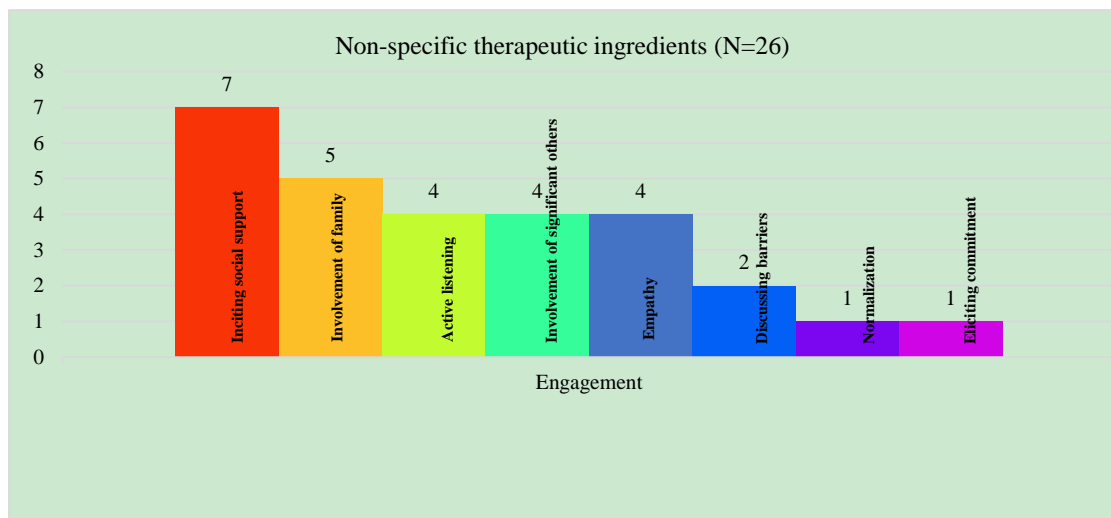
Figure 2 (b). Non-specific therapeutic ingredients of the included studies.

Note: color on the web only

Study name	Statistics for each study					Std diff in means and 95% CI
	Std diff in means	Standard error	Lower limit	Upper limit	p-Value	
Guan, 2015	-0 556	0 263	-1 072	-0 040	0 035	
Lu, 2016	-1 574	0 259	-2 081	-1 066	0 000	
Lu, 2017	-1 843	0 254	-2 342	-1 345	0 000	
Zhang, 2018*	-0 082	0 252	-0 576	0 412	0 745	
Gao, 2010*	-0 390	0 243	-0 866	0 086	0 108	
Wu, 2018	-2 058	0 240	-2 528	-1 587	0 000	
Li, 2018	-0 982	0 226	-1 425	-0 540	0 000	
Zhao, 2018	-0 754	0 221	-1 186	-0 322	0 001	
Jia, 2017	-1 037	0 220	-1 468	-0 607	0 000	
Wu, 2017	-0 498	0 218	-0 924	-0 071	0 022	
Zhang, 2016	-0 908	0 210	-1 320	-0 496	0 000	
Dou, 2018	-0 502	0 203	-0 900	-0 104	0 013	
Liu, 2018	-1 095	0 203	-1 493	-0 698	0 000	
Ho, 2009*	-0 309	0 193	-0 687	0 069	0 109	
Yang, 2019	-0 939	0 190	-1 311	-0 567	0 000	
Leung, 2012*	0 031	0 185	-0 331	0 393	0 867	
Cheng, 2016	-0 823	0 183	-1 181	-0 465	0 000	
Leung, 2016*	-0 253	0 157	-0 561	0 054	0 106	
Gao, 2015	-0 335	0 150	-0 629	-0 041	0 026	
Huang, 2015	-0 595	0 150	-0 889	-0 301	0 000	
Ngai, 2009	-0 404	0 149	-0 696	-0 112	0 007	
Liu, 2012	-2 485	0 147	-2 774	-2 196	0 000	
Sun, 2011	-0 538	0 146	-0 824	-0 251	0 000	
Mao, 2012	-0 589	0 132	-0 848	-0 331	0 000	
Ngai, 2015	-0 538	0 115	-0 763	-0 312	0 000	
Jiang, 2014	-1 056	0 083	-1 218	-0 894	0 000	
	-0 807	0 114	-1 031	-0 583	0 000	

-4 00 -2 00 0 00 2 00 4 00

Intervention   Control

Figure 3 Meta-analysis of psychosocial interventions of perinatal depression in women in China

Note: * represents no significance was found (p<0 1)
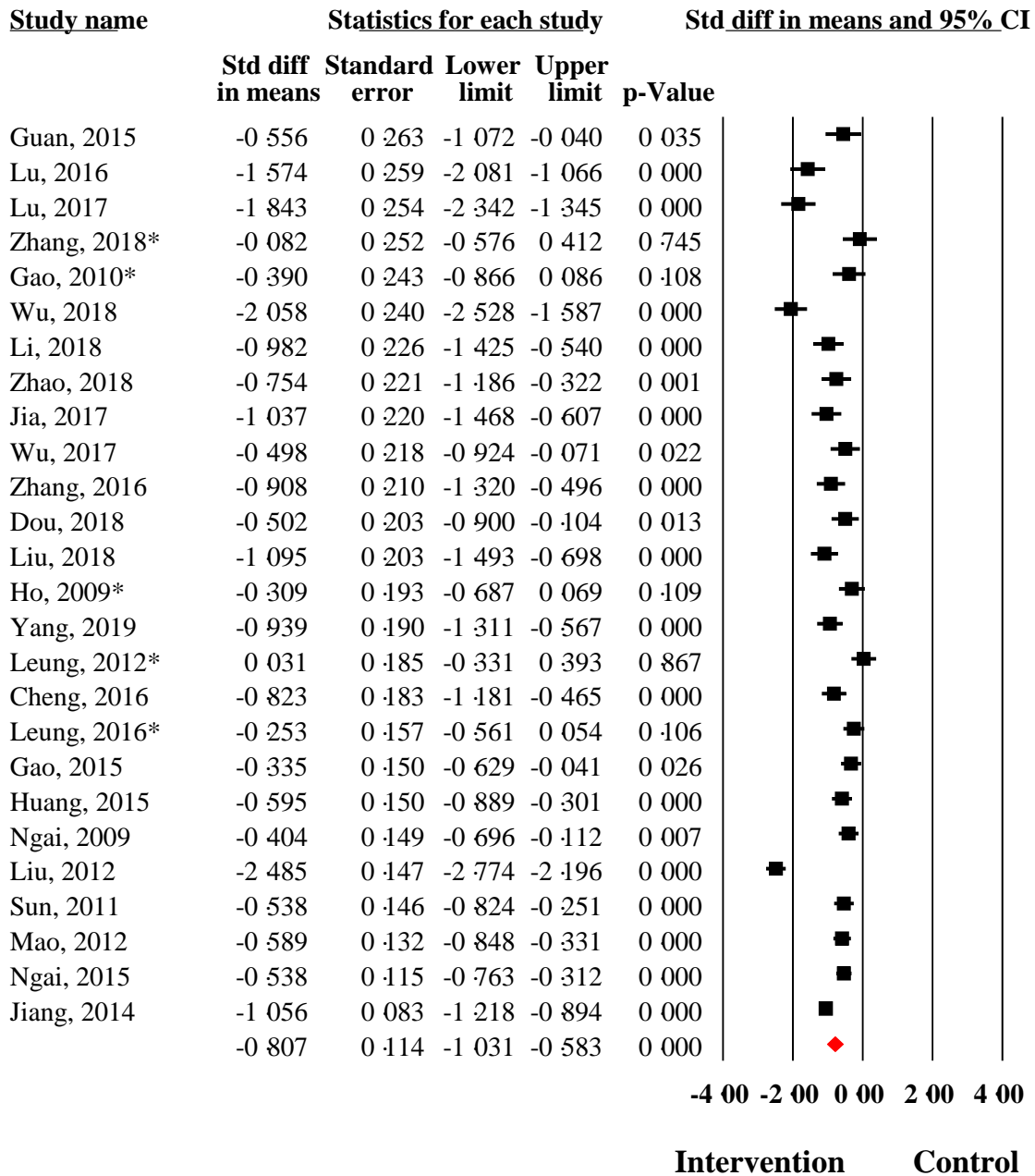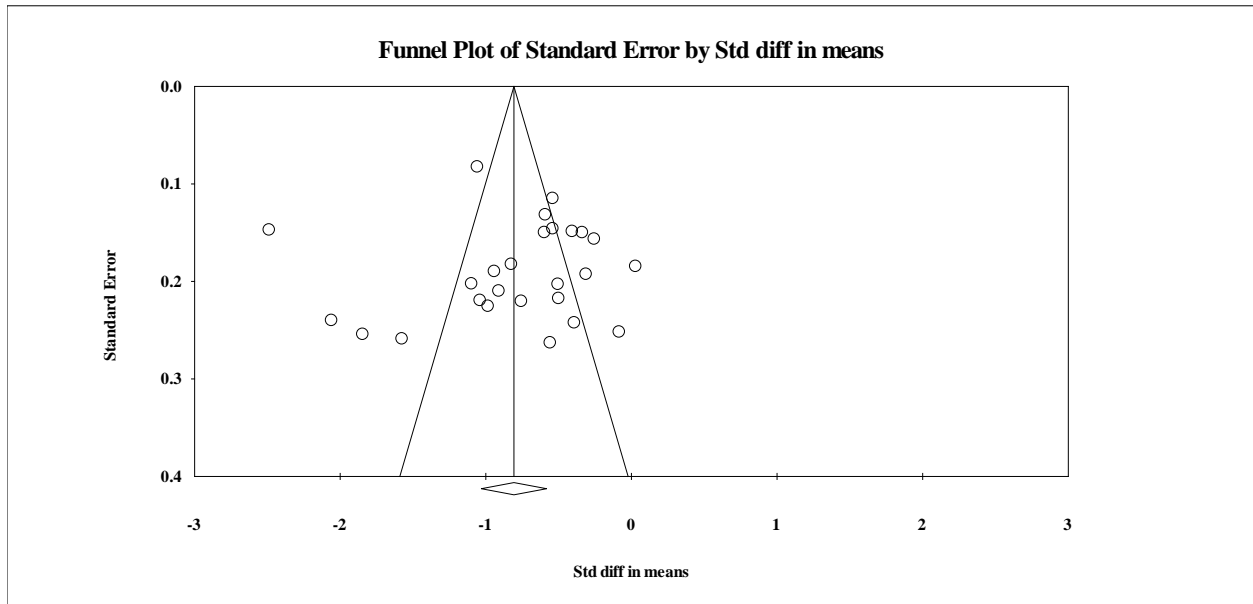
Figure 4: Funnel plot

Funnel Plot of Standard Error by Std diff in means

Table 1. Summary of the included articles (n=26)

Author, year	Study design	Theoretical basis	Sample size	Intervention	Delivery agent	Control	Outcome
Dou, 2018	Prevention RCT	CBT	100	Cognitive behavior treatment consisted of 30-min sessions twice a week from inclusion until 6 weeks postpartum.	NA	Routine care: antepartum health education	Postnatal depressive symptoms: 1, 1.5, 3 and 6 months postpartum using SDS
Huang, 2015	Prevention RCT	CBT	186	Emotional management based on CBT, delivered during pregnancy.	Obstetrician psychiatrist	Routine prenatal care and education on nutrition and health knowledge during pregnancy; various modes of delivery; breastfeeding benefits	Postnatal depressive symptoms: after intervention, 7 and 42 days postpartum using PHQ-9
Leung, 2016	Treatment RCT	CBT	164	Six-session group intervention aimed to change cognitions and subsequently reinforce coping skills to enhance psychological resources and responses, delivered during postpartum.	NA	A booklet that contained comprehensive information and education material about perinatal depression and a list of community resources	Postnatal depressive symptoms: 3 and 6 months after intervention using EPDS
Li, 2018	Treatment RCT	CBT	88	Empathy in nursing, identifying the auto-thoughts, discuss the unhealthy thoughts, change the way of thinking, assigning homework, delivered during postpartum.	Nurse	Routine nursing care	Postnatal depressive symptoms: after intervention using HAMD
Lu, 2017	Treatment RCT	CBT	88	Acceptance and commitment therapy consisted of 90-min session per week for 6 weeks, delivered during postpartum.	Researcher, Nurse, Psychiatrist	Routine care and education	Postnatal depressive symptoms: 6 weeks after intervention using HAMD-24

Mao, 2012	Prevention RCT	CBT	240	Emotional self-manage group training program consisted of four weekly group sessions and one individual counseling session, delivered from 32 weeks of pregnancy.	Nurses	Standard antenatal education focusing on childbirth consisted of four 90-min sessions.	Postnatal depressive symptoms: after intervention using EPDS and 6 weeks postpartum using PHQ-9
Ngai, 2015	Treatment RCT	CBT	397	Telephone-Based Cognitive-Behavioral Therapy involved 5-week telephone-administered CBT delivered weekly from 1 to 5 weeks postpartum.	Midwives	6-week postpartum follow-up at public hospitals and maternal and child health centers, respectively.	Postnatal depressive symptoms: 6 weeks and 6 months postpartum using EPDS
Ho, 2009	Prevention RCT	Psychoeducation	175	A discharge education program: postpartum depression informational booklet plus discussion with primary care nurses on the second day after delivery.	Nurses	General postpartum education	Postnatal depressive symptoms: 6 weeks and 3 months postpartum using EPDS
Jia, 2017	Treatment RCT	Psychoeducation	94	Recall positive feelings; build up positive thinking; social support, delivered during postpartum.	Nurse	Routine care: antepartum health education	Postnatal depressive symptoms: 3 days after intervention using EPDS
Lu, 2016	Treatment RCT	Psychoeducation	78	Health education on postpartum depression, exercise consisted of 60-min sessions for 8 weeks, delivered during postpartum	Nurses Doctors	Routine care: answering the questions	Postnatal depressive symptoms: 8 weeks after intervention using EPDS
Sun, 2011	Prevention RCT	Psychoeducation	194	Health education based on the principles of interpersonal psychotherapy, consisted of two 90-minute antenatal class during late pregnancy and a telephone follow-up within two weeks after delivery.	Nurse	Routine care: antepartum health education	Postnatal depressive symptoms: 6 weeks and 3 months postpartum using EPDS

Wu, 2017	Treatment RCT	Psychoeducation	110	Follow up education on recovery, newborn nursing, and breastfeeding through telephone call P, peer group discussion, delivered during postpartum.	Doctors Nurses	Routine care: postpartum health education	Postnatal depressive symptoms: after intervention using SDS
Zhao, 2018	TreatmentPrevention RCT	Psychoeducation	296	Follow-up education on perinatal depression, diet, emotion management by WeChat APP, delivered during pregnancy until postpartum.	NA	Routine care	Postnatal depressive symptoms: after intervention using SDS
Ngai, 2009	Prevention Cluster RCT	Psychoeducation	184	Childbirth psychoeducation program focused on cognitive restructuring, problem-solving and efficacy enhancement, consisted of three 1-h sessions, delivered during pregnancy.	Midwives	Routine childbirth education programs consisted of 6-weekly 2-h sessions focusing on prenatal care, labor, pain relief, breastfeeding, postnatal and infant care.	Prenatal and postnatal depressive symptoms: after intervention, 6 weeks and 6 months postpartum using EPDS
Gao, 2010	Prevention RCT	Interpersonal	194	Interpersonal-psychotherapy-oriented childbirth education program consisted of two 2-h group sessions during pregnancy and one telephone follow-up in the postpartum period.	Midwives	Routine antenatal education in the study venue, which consisted of two 90-min sessions conducted by midwives.	Postnatal depressive symptoms: 6 weeks postpartum using EPDS
Gao, 2015	Prevention RCT	Interpersonal	180	Interpersonal-psychotherapy-oriented postnatal psychoeducation program consisted of a 1-h education session before discharge and one telephone follow-up session after delivery.	Midwives	A brief visit from a nurse to give them a pamphlet on sources of assistance for mothers on discharge from hospital	Postnatal depressive symptoms: 6 weeks postpartum using EPDS
Leung, 2012	Treatment RCT	Interpersonal	156	Interpersonal psychotherapy oriented group intervention targeted interpersonal issues	First author Interventionist	Routine antenatal care including a brief individual	Prenatal and postnatal depressive symptoms:

				consisted of 4 weekly group sessions lasting 1.5 h per session, delivered during pregnancy.		interview with a midwife during which participants could raise any health or pregnancy related questions or concerns.	after intervention and 6-8 weeks postpartum using EPDS
Yang, 2019	Prevention RCT	Mindfulness	123	8-weeks online mindfulness intervention based on WeChat APP focusing on attention monitoring and acceptance, delivered during pregnancy.	Nurses midwife	Routine care: antepartum health education related to childbirth, breastfeeding, nutrition, and parenting.	Prenatal depressive symptoms: after intervention using PHQ-9
Zhang, 2018	Prevention RCT	Mindfulness	63	Mindfulness-based stress reduction program consisted of weekly 90-min sessions for 8 weeks, delivered during pregnancy.	Psychologist	Routine care: Prenatal care knowledge	Prenatal depressive symptoms: after intervention using SDS
Jiang, 2014	Treatment RCT	Counseling	729	Mailing postpartum depression prevention and treatment knowledge manual, face-to-face counseling, and telephone psychological counseling interventions, delivered during postpartum.	NA	Conventional methods	Postnatal depressive symptoms: 6 months postpartum using EPDS
Guan, 2015	Treatment RCT	Traditional Chinese medicine	60	Massage acupoint "thirteen ghost points", once daily for 2 weeks, delivered during postpartum.	NA	Routine nursing care	Postnatal depressive symptoms: after intervention using HAMD
Liu, 2018	Prevention RCT	Traditional Chinese medicine	112	Relaxation, acupoint massage, psychological hint, 15 min per time, 3 times per day for 4 weeks, delivered during pregnancy.	NA	Routine care: antepartum health education	Prenatal depressive symptoms: after intervention using SDS
Wu, 2018	Treatment	Traditional	106	Diet guidance, music therapy and massage	NA	Routine nursing care	Postnatal depressive

	RCT	Chinese medicine		acupoint based on traditional Chinese medicine theory, delivered during postpartum.			symptoms: after intervention using EPDS
Zhang, 2016	Prevention RCT	Music therapy; Relaxation therapy	100	Music therapy and relaxation therapy consisted of 30-min session, twice a day, delivered during postpartum.	Psychiatrist; Nurse	Routine care	Postnatal depressive symptoms: discharged from hospital using SDS
Liu, 2012	Prevention RCT	Exercise therapy Psychoeducation	326	Exercise under the guidance of specialist for 40-min, 3 times a week from pregnancy until delivery. Education on healthcare, nutrition, delivery and baby-caring.	Nurses; Doctors; Specialist	NA	Postnatal depressive symptoms: 7, 42 days and 3 months postpartum using EPDS
Cheng, 2016	Prevention RCT	Social support	130	Mobile application program communicating with postpartum women and providing information and emotional social support twice a week for about 10-15 minutes each time, delivered from 4 weeks after delivery.	Nurses	No intervention	Postnatal depressive symptoms: 1 months postpartum using EPDS

Note: NA, not available; RCT, Random controlled trial; EPDS, Edinburgh Postnatal Depression Scale; PHQ-9, Patient Health Questionnaire-9; CBT, cognitive behavior treatment; SDS, Zung Self-Rating Depression Scale; HAMD, Hamilton depression scale.

Table 2. Information of intervention delivery and delivery agent (n=26)

Author, year	Intervention delivery						Delivery agent			
	Integration	Technology	Location	Format	Duration	Fidelity	Profession	Qualification	Training	Supervision
Gao, 2010	Integrated into hospital routine childbirth education sessions	Face-to-face Telephone	hospital	Group	6 weeks	NA	Midwives	NA	Yes	Yes
Gao, 2015	Integrated into hospital discharge education	Face-to-face Telephone	hospital	Individual	2 weeks	NA	Midwives	NA	NA	NA
Guan, 2015	Integrated into routine care.	Face-to-face	hospital	Individual	2 weeks	NA	NA	NA	NA	NA
Ho, 2009	Integrated into hospital discharge education	Face-to-face	hospital	Individual	1 day	NA	Nurses	NA	NA	NA
Huang, 2015	Integrated into routine prenatal care and education	Face-to-face	hospital	NA	6 weeks	NA	Obstetrician psychiatrist	NA	NA	NA
Jia, 2017	Integrated into routine care.	Face-to-face	hospital	Group	NA	NA	Nurse	NA	NA	NA
Jiang, 2014	Integrated into hospital visits	Mail Face-to-face Telephone	Home visits	Individual	NA	NA	NA	NA	NA	NA
Leung, 2012	Integrated into a group community-based family	Face-to-face	Maternal and Child Health	Group	4 weeks	Yes	First author Interventionist	Yes	Yes	NA

	centered parenting program		Center							
Li, 2018	Integrated into routine care.	Face-to-face	hospital	Individual	NA	NA	Nurse	NA	NA	NA
Mao, 2012	Integrated into hospital visits	Face-to-face	hospital	Group	4 weeks	NA	Nurses	NA	Yes	NA
Wu, 2018	Integrated into routine care.	Face-to-face	hospital	Individual	NA	NA	NA	NA	NA	NA
Zhang, 2016	Integrated into routine care.	Face-to-face	hospital	Individual	NA	NA	Psychiatrist Nurse	NA	NA	NA
Ngai, 2009	Integrated into routine childbirth education program	Face-to-face	hospital	NA	3 weeks	NA	Midwives	NA	Yes	NA
Cheng, 2016	NA	Telephone	hospital	Individual	4 weeks	NA	Nurses	NA	Yes	NA
Dou, 2018	NA	Face-to-face	Community health care center	Individual	NA	NA	NA	NA	NA	NA
Leung, 2016	NA	Face-to-face	hospital	Group	6 weeks	NA	NA	NA	NA	NA
Liu, 2012	NA	Face-to-face	hospital	Individual	NA	NA	Nurses; Doctors; Specialist	NA	NA	NA
Liu, 2018	NA	Face-to-face	hospital	Individual	NA	NA	NA	NA	NA	NA
Lu,	NA	Face-to-face	hospital	Individual	8 weeks	NA	Nurses	NA	NA	NA

2016							Doctors			
Lu, 2017	NA	Face-to-face	hospital	NA	6 weeks	NA	Researcher, Nurse, Psychiatrist	Yes	Yes	NA
Ngai, 2015	NA	Telephone	hospital	Individual	5 weeks	Yes	Midwives	Yes	Yes	Yes
Sun, 2011	NA	Face-to-face Telephone	hospital	Group	NA	NA	Nurse	NA	NA	NA
Wu, 2017	NA	Face-to-face Telephone	hospital	Individual	NA	NA	Doctors Nurses	NA	NA	NA
Yang, 2019	NA	Mobile APP	hospital	Individual	8 weeks	NA	Nurses midwife	NA	Yes	NA
Zhang, 2018	NA	Face-to-face	hospital	Group	8 weeks	NA	Psychologist	NA	NA	NA
Zhao, 2018	NA	Mobile APP	hospital	Individual	NA	NA	NA	NA	NA	NA

Note: NA, not available.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Contributors

Juan Yin, Atif Rahman and Xiaomei Li conceived and designed the study; Anum Nisar and Juan Yin searched, screened and did the data extraction of the English studies; Yan Guo and Wenli Qi searched, screened and did the data extraction of the Chinese studies; Ahmed Waqas and Duolao Wang did the meta-analysis; Juan Yin first draft the paper and all the authors revised and approved it.

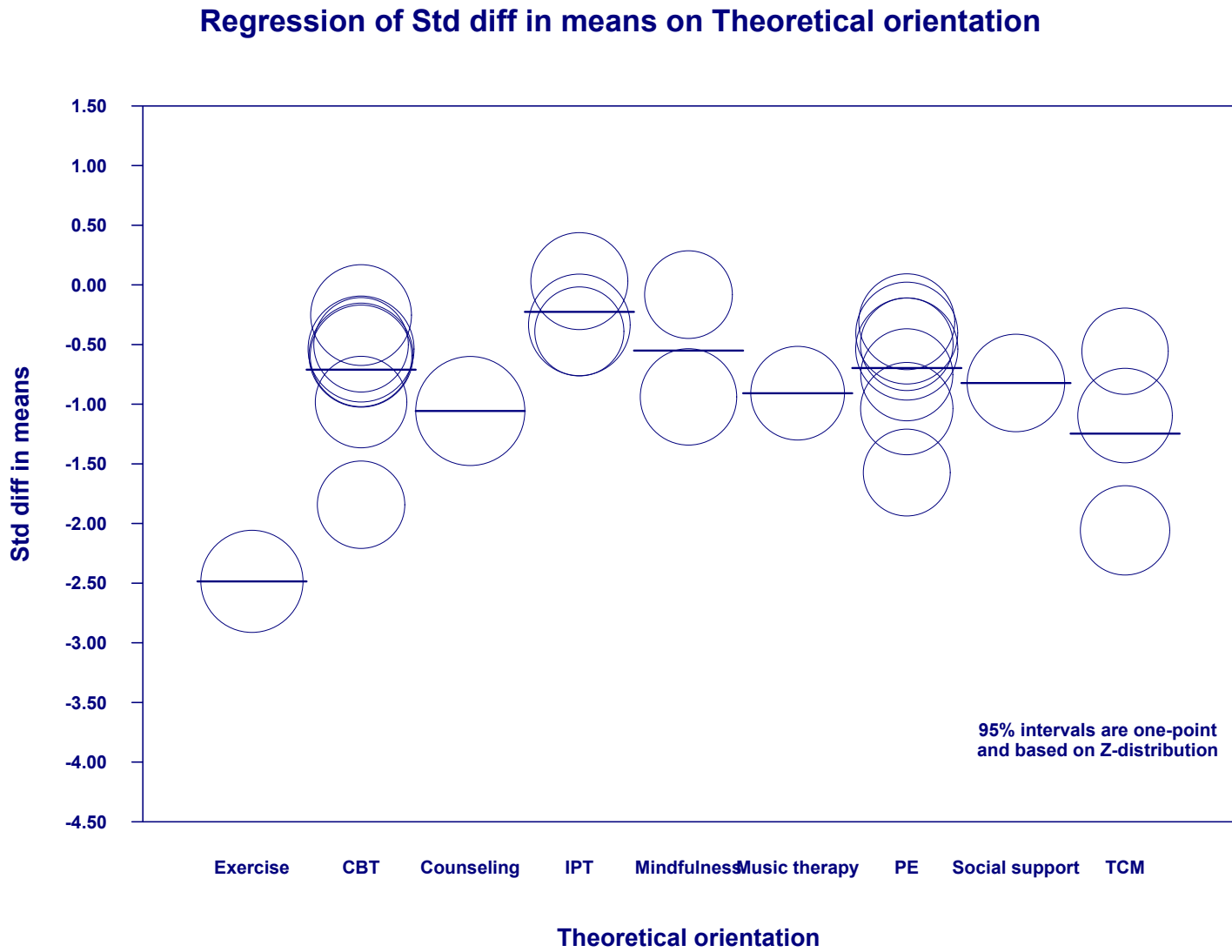Appendix Figure 1 Meta-regression analysis for theoretical orientation
(a)

Regression of Std diff in means on Theoretical orientation

95% intervals are one-point
and based on Z-distribution

(b)

Regression of Std diff in means on Theoretical orientation
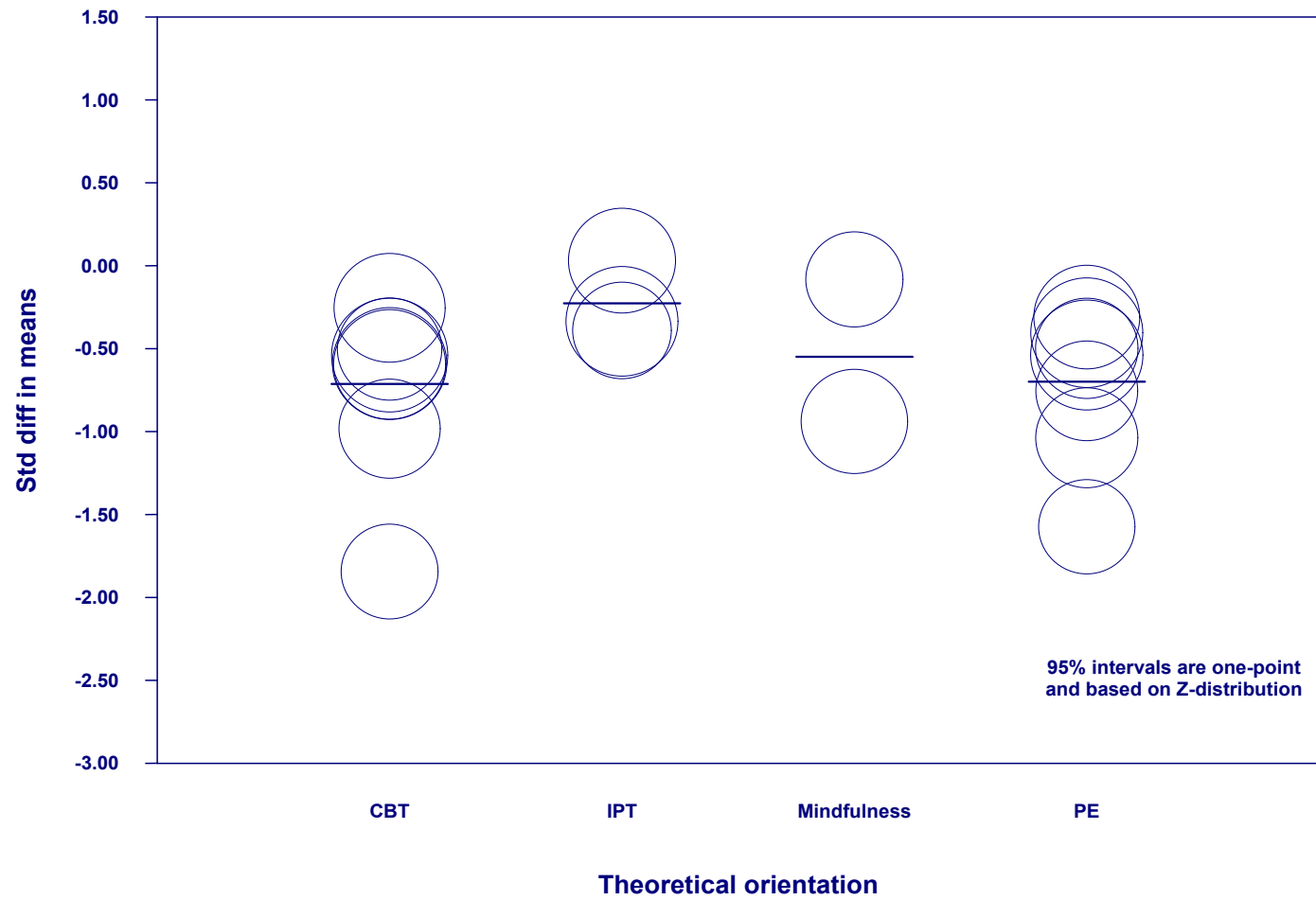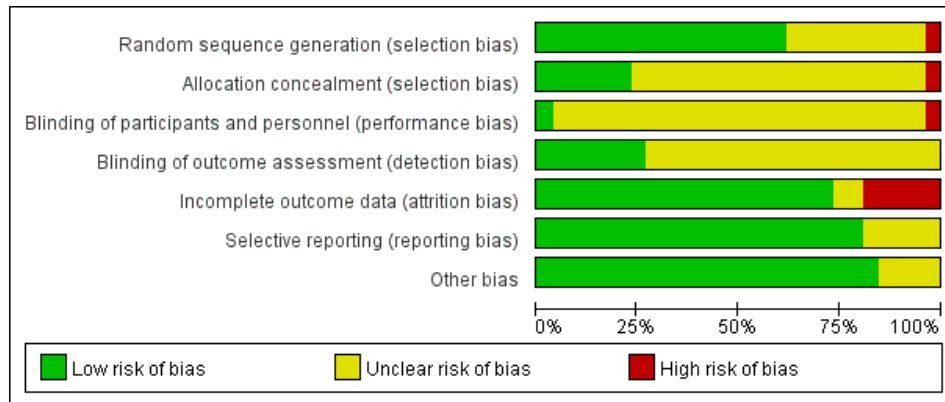
(a) Review authors' judgements about each risk of bias item presented as percentages across all included studies.

(b) Risk of bias items for each included study.

Appendix Figure 2 Risk of bias

Table 1 Search strategy

Search strategy in English databases:

(Perinatal[ti/ab] OR maternal[ti/ab] OR mother*[ti/ab] OR pregnancy[ti/ab] OR pregnant[ti/ab] OR intrapartum[ti/ab] OR postpartum[ti/ab] OR prenatal[ti/ab] OR postnatal[ti/ab] OR antenatal[ti/ab] OR antepartum[ti/ab]) AND (depression[ti/ab] OR depressive[ti/ab] OR depress*[ti/ab] OR "mental health"[ti/ab]) AND (China OR Chinese OR Guangxi OR "inner Mongolia" OR Ningxia OR Tibet OR Xizang OR Xinjiang OR Heilongjiang OR Jilin OR Liaoning OR Hebei OR Shanxi OR Shandong OR Shaanxi OR Gansu OR Qinghai OR Sichuan OR Hubei OR Hunan OR Henan OR Anhui OR Zhejiang OR Jiangsu OR Guangdong OR Jiangxi OR Fujiang OR Guizhou OR Yunnan OR Hainan OR Han OR Hui OR Mongolia OR Zhuang) AND (trial[ti/ab] OR RCT[ti/ab] OR randomized-controlled[ti/ab] OR intervention[ti/ab] OR controlled-trial[ti/ab] OR effectiveness[ti/ab] OR efficacy[ti/ab])

Search strategy in Chinese databases:

1. China National Knowledge Infrastructure (CNKI)

(TI=围产期 OR TI=产妇 OR TI=妊娠 OR TI=孕妇 OR TI=孕期 OR TI=产前 OR TI=产后 OR TI=分娩前 OR TI=分娩后 OR TI=产褥期) AND (TI=抑郁 OR TI=精神 OR TI=心理) AND (AB=试验 OR AB=RCT OR AB=随机对照 OR AB=干预 OR AB=对照   OR AB=效果)

2. VIP Database for Chinese Technical Periodicals

(M=围产期 OR M=产妇 OR M=妊娠 OR M=孕妇 OR M=孕期 OR M=产前 OR M=产后 OR M=分娩前 OR M=分娩后 OR M=产褥期) AND (M=抑郁 OR M=精神 OR M=心理) AND (M=试验 OR M=RCT OR M=随机对照 OR M=干预 OR M=对照 OR M=效果)

3. Wan Fang Database

题名或关键词:((围产期 OR 产妇 OR 妊娠 OR 孕妇 OR 孕期 OR 产前 OR 产后 OR 分娩前 OR 分娩后 OR 产褥期) AND (抑郁 OR 精神 OR 心理) AND (试验 OR RCT OR 随机对照 OR 干预 OR 对照 OR 效果))

Table 2   Definitions of therapeutic techniques employed in psychosocial interventions

	Name of Skill	Definition of skill
1.	Involvement of family	The family members are involved in the intervention.
2.	Involvement of significant other	The significant other or spouse is involved in the intervention.
3.	Active listening	The skillful listens to the speaker with full concentration to understand what is being said [1].
4.	Collaboration	Working with others
5.	Inciting social support	Providing insight of how others can provide help or support [2].
6.	Case management	Planning, facilitating and coordination of different options regarding the patient [3].
7.	Normalization	To communicate that the person's experiences also happen to other people [4].
8.	eliciting commitment	Motivating the client to take active part in intervention.
9.	Discussing advantages	Identifying advantages to take the intervention.
10.	Discussing barriers	Identifying difficulties to take the intervention.
11.	Identifying affect	Identifying feeling or emotion [5].
12.	identifying and eliciting social support	Providing consideration of how others could change their behaviour to offer the person help or support [6].
13.	Communication skills	These are set of skills which improve the dissemination, reception and exchange of information, opinions or ideas making sure that the intended message is completely understood by those involved [7].
14.	Assertiveness training	To train people for effective communication without being passive or aggressive.
15.	Assessing relationships	To assess the relationships with people around.
16.	Problem solving	To solve a problem by carefully defining problem and weighing different options to solve the problem.
17.	Relaxation	To apply various techniques for relaxation.
18.	Awarding positive behavior	Applying different methods to encourage recurrence of a positive behavior [8].
19.	Exposure	Confronting previously avoided objects, situations, unwanted thoughts or feelings while not avoiding or escaping from it [9].

20.	Emotional regulation	Tendency to manage and responding to emotional experience [10].
21.	Stress management	May involve a variety of techniques that do not target a specific behavior but seek to reduce anxiety and stress [6].
22.	Decision making	Process of making choices by identifying decision, gathering information, and assessing alternative resolutions [11].
23.	self-monitoring	The person keeps a record of one's own behavior [6].
24.	Delay awards	A process of deferring initial reward for a better reward later [12].
25.	Caregiver coping (e.g., management skills for the parents of children)	Mechanism through which the caregiver manages the stress [13].
26.	Parent-child Interaction Coaching (e.g., positive 1-on-1, attending to children modeling, etc)	The parent applies a new skill with the child and the therapist provides immediate feedback [14].
27.	Birth procedures	Knowledge about different ways of giving birth [15].
28.	Specific health areas of children (e.g., nutrition, breastfeeding, SRH, etc)	If the intervention targeted the specific dimensions of health areas in children.
29.	Nutrition	Education regarding recommended nutrition practices.
30.	Breastfeeding	Education regarding recommended breastfeeding practices.
31.	Sexual behavior	Avoidance of risky sexual behaviors.
32.	Identifying thoughts, behaviors, and their links (e.g., identifying negative thoughts, thought diary, etc.)	Realizing what thoughts cross one's mind by number of ways [16].
33.	Cognitive restructuring (e.g., reattribution, weighing evidence, logical questioning, etc.)	Identifying and disputing maladaptive thoughts [2].
34.	Distraction	Paying attention to some other stimuli rather than the unhelpful thoughts [17].

35.	Self-talk	Use of self-instruction and self-encouragement to support action [6].
36.	Self-praise	To boast one's self esteem by expressing approval or admiration [18].
37.	Mood monitoring	Paying attention toward one's mood states by means of different methods [19].
38.	Mindfulness	Paying attention towards experiences in the present moment within body and mind and accepting the happenings [20].
39.	Self-awareness	Conscious awareness of becoming the object of one's own awareness [21].
40.	Aerobics	Aerobic exercise also known as "cardio" exercises include running, swimming, walking, hiking, aerobics classes, dancing, cross country skiing, and kickboxing.
41.	Non-aerobic exercise	Anaerobic ("without oxygen") exercise is any physical activity that causes you to be quickly out of breath, like sprinting or lifting a heavy weight.
42.	Motivational enhancement	To increase internal motivation in order to make long lasting change [22].
43.	Praise	Praising for positive behavior or accomplishment.
44.	Role play	Performing role of a person in a situation [23].
45.	Behavioral contracting	Agreement of a contract specifying behavior to be performed so that there is a written record of the person's resolution witnessed by another [6].
46.	Assigning homework	Assigning tasks pertaining to interventions, to be performed at home.
47.	Interpersonal focus	Focus on maintaining relationships with other people [24].
48.	Behavioral experiments	To test out the negative thoughts and re-evaluate underlying beliefs by performing an action [25].
49.	Motivational interviewing	Prompting the person to provide self-motivating statements and evaluation of their own behavior to minimize resistance [6].
50.	Direct suggestions	Providing directions of how to act, behave or handle a situation [26, 27].
51.	Goal setting	Identifying an aim or goal to achieve in a session or therapy [28].
52.	Giving sick role	Assigning role of a sick person to the participant, to understand the circumstances, particular rights and responsibilities of those who are ill.
53.	Empathy	To understand and share other's feeling or situation [29].

54.	Macronutrients	Food groups needed in large amounts [30].
55.	Micronutrient	Food groups needed in small amounts [30].
56.	Eating behaviors	The food choices and eating practices [31],
57.	Alcohol use	Education about minimal use and harms of alcohol misuse.
58.	Substance misuse	Harmful use of substances for non-medical purposes [32].

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Table 3 Demographic characteristics of participants in the researches included

Author, year	Age of mothers Mean age (SD) (years)	Principle of intervention	Geographical scope	Study Settings	Outcome	Outcome measures
Gao, 2010	28·47 (2·8)	Prevention	NA	hospital	Postnatal depression	EPDS
Gao, 2015	28·49 (2·7)	Prevention	NA	hospital	Postnatal depression	EPDS
Ho, 2009	intervention group: 29·2 (3·4) control group:29·4 (3·2)	Prevention	urban	hospital	Postnatal depression	EPDS
Jiang, 2014	27·9 (4·36)	Treatment	urban	Home visits	Postnatal depression	EPDS
Mao, 2012	intervention group: 28·5 (2·4) control group:28·8 (2·5)	Prevention	urban	hospital	Postnatal depression	EPDS, PHQ-9
Cheng, 2016	intervention group: 33·48 (4·12) control group: 32·82 (4·93)	Prevention	urban	hospital	Postnatal depression	EPDS
Huang, 2015	intervention group: 28·5 (2·4) control group: 28·8 (2·5)	Prevention	urban	hospital	Postnatal depression	PHQ-9
Leung, 2016	21 to 45	Treatment	urban	hospital	Postnatal depression	EPDS
Leung, 2012	intervention group: 31·3 (4·02) control group: 31·15 (4·12)	Treatment	urban	Maternal and Child Health Centers	Prenatal and postnatal depression	EPDS
Ngai, 2009	intervention group: 32·1 (3·7) control group: 30·5 (3·7)	Prevention	urban	hospital	Prenatal and postnatal depression	EPDS
Ngai, 2015	intervention group: 31·1 (3·8) control group:30·4 (4·4)	Treatment	urban	hospital	Postnatal depression	EPDS
Yang, 2019	intervention group: 31·31(4·97)	Prevention	urban	hospital	Prenatal depression	PHQ-9

	control group: 30·38 (3·91)					
Zhang, 2018	intervention group: 25·7 (2·79)	Prevention	urban	hospital	Prenatal depression	SDS
	control group: 25·58 (2·33)					
Lu, 2016	20 to 38	Treatment	urban	hospital	Postnatal depression	EPDS
Sun, 2011	intervention group: 28·38 (2·73)	Prevention	urban	hospital	Postnatal depression	EPDS
	control group: 28·55 (2·82)					
Liu, 2018	20 to 44	Prevention	urban	hospital	Prenatal depression	SDS
Wu, 2017	21 to 39	Treatment	urban	hospital	Postnatal depression	SDS
Li, 2018	22 to 38	Treatment	urban	hospital	Postnatal depression	HAMD
Jia, 2017	intervention group: 27·62 (3·15)	Treatment	urban	hospital	Postnatal depression	EPDS
	control group: 27·94 (3·28)					
Dou, 2018	intervention group: 28·81 (4·25)	Prevention	semi-urban	Community	Postnatal depression	SDS
	control group: 29·04 (4·61)			health care center		
Zhao, 2018	20 to 42	Treatment	urban	hospital	Postnatal depression	SDS
Lu, 2017	intervention group: 28·5 (4·7)	Treatment	urban	hospital	Postnatal depression	HAMD;
	control group:28·9 (4·6)					
Zhang, 2016	24 to 39	Prevention	urban	hospital	Postnatal depression	SDS
Guan, 2015	intervention group: 28·8 (15·8)	Treatment	semi-urban	hospital	Postnatal depression	HAMD
	control group: 29·6 (16·1)					
Wu, 2018	20 to 40	Treatment	urban	hospital	Postnatal depression	EPDS
Liu, 2012	intervention group: 28 (5)	Prevention	urban	hospital	Postnatal depression	EPDS
	control group: 27 (6)					

Note: NA, not available; EPDS, Edinburgh Postnatal Depression Scale; PHQ-9, Patient Health Questionnaire-9; SDS, Zung Self-Rating Depression Scale; HAMD, Hamilton depression scale.

Table 4. Scope and taxonomy of interventions

Author year	Type	Major elements	Elements
Gao, 2010	Prevention	Engagement	Active listening, inciting social support
		Interpersonal skills	Identifying and eliciting social support, communication skill, assessing relationships Problem solving, stress management
		Behavior coping	Caregiver coping, parent-child interaction coaching
		Parenting skill	Birth procedure, nutrition, breastfeeding, sexual behavior
		Psychoeducation	Motivational enhancement, role play, interpersonal focus, direct suggestion, goal setting
		Techniques used by delivery agent	
Gao, 2015	Prevention	Engagement	Active listening, inciting social support
		Interpersonal skill	Identifying affect, identifying and eliciting social support, Communication skill, assessing relationships
		Behavior coping	Problem solving
		Parenting skill	Parent-child interaction coaching
		Psychoeducation	Breastfeeding
		Techniques used by delivery agent	Interpersonal focus
Ho, 2009	Prevention	Cognitive coping	Mood monitoring, self-awareness
Mao, 2012	Prevention	Engagement	Involvement of significant others, inciting social support
		Interpersonal skill	Communication skill
		Behavior coping	Problem solving, relaxation, self-monitoring
		Psychoeducation	Birth procedure
		Cognitive coping	Identifying thoughts, cognitive restructuring, self-talk, self-praise, mood monitoring, self-awareness

		Techniques used by delivery agent	Role paly, assigning homework, interpersonal focus, reviewing homework
Jiang, 2014	Treatment	--	--
Cheng, 2016	Prevention	Engagement	Empathy
		Interpersonal skills	Identifying and eliciting social support
		Psychoeducation	Birth procedure, breast feeding
		Techniques used by delivery agent	Empathy
Huang, 2015	Prevention	Engagement	Involvement of family, inciting social support
		Interpersonal skills	Identifying and eliciting social support
		Behavior coping	Relaxation, exposure, emotional regulation, eliciting social support
		Psychoeducation	Birth procedure
		Cognitive coping	Cognitive restructuring
Leung, 2016	Treatment	Cognitive coping	Identifying thoughts, cognitive restructuring, distraction
		techniques used by delivery agent	Assigning homework
Leung, 2012	Treatment	Interpersonal skills	Communication skills, assertiveness training, assessing relationship
		techniques used by delivery agent	Role play, assigning homework, interpersonal focus, reviewing homework, goal setting
Ngai, 2009	Prevention	Behavior coping	Problem solving, stress management, decision making
		Reinforcement	Awarding positive behavior
		Parenting skill	Caregiver coping
		Cognitive coping	Cognitive restructuring
		Techniques used by delivery agent	Goal setting
Ngai, 2015	Treatment	Interpersonal skills	Communication skills
		Behavior coping	Problem solving, exposure, stress management, decision making
		Reinforcement	Awarding positive behavior

		Parenting skill	Caregiver coping
		Cognitive coping	Identifying thoughts, cognitive restructuring
		Techniques used by delivery agent	Goal setting
Yang, 2019	Prevention	Engagement	Discussing barriers to treatment
		Interpersonal skills	Identifying affect
		Behavior coping	Relaxation, stress management
		Cognitive coping	Identifying thoughts, mood monitoring, mindfulness
		Techniques used by delivery agent	Assigning homework, reviewing homework
Zhang, 2018	Prevention	Engagement	Discussing barriers to treatment
		Cognitive coping	Mindfulness
		Exercise	Aerobics
		Techniques used by delivery agent	Assigning homework, reviewing homework
Lu, 2016	Treatment	Engagement	Involvement of family, active listening, empathy
		Exercise	Others
		Techniques used by delivery agent	Empathy
Sun, 2011	Prevention	Engagement	Inciting social support
		Interpersonal skills	Identifying and eliciting social support, communication skills
		Behavior coping	Stress management
		Parenting skill	Caregiver coping
Liu, 2018	Prevention	--	--
Wu, 2017	Treatment	Parenting skill	Caregiver coping
		Psychoeducation	Birth procedure, breast feeding
Li, 2018	Treatment	Engagement	Active listening, empathy

		Cognitive coping	Identifying thoughts, cognitive restructuring
		Techniques used by delivery agent	Assigning homework, empathy
Jia, 2017	Treatment	Engagement	Involvement of family, involvement of significant others
		Behavior coping	Emotional regulation
		Psychoeducation	Birth procedure
		Cognitive coping	Identifying thoughts
Dou, 2018	Prevention	Engagement	Inciting social support
		Behavior coping	Relaxation
		Cognitive coping	Identifying thoughts
Zhao, 2018	Treatment	Engagement	Involvement of family
		Behavior coping	Emotional regulation
		Psychoeducation	Nutrition
Lu, 2017	Treatment	Engagement	Empathy, normalization, eliciting commitment
		Cognitive coping	Identifying thoughts, mindfulness
		Techniques used by delivery agent	Empathy
Zhang, 2016	Prevention	Behavior coping	Relaxation
Guan, 2015	Treatment	--	--
Wu, 2018	Treatment	Psychoeducation	Nutrition
Liu, 2012	Prevention	Engagement	Involvement of family
		Psychoeducation	Birth procedure, nutrition
		Exercise	Aerobics

Table 5 Subgroup analysis of the psychosocial interventions

Moderators	No· of studies	Point estimate (95% CI)	I^2	χ^2 (Q statistic)	P
Quality					
High	7	-0·45 (-0·85 to -0·05)	61·83%	4·13	0·04
Low	19	-0·94 (-1·19 to -0·69)	91·78%		
Scale					
EPDS	14	-0·83 (-1·19 to -0·48)	94·67%	1·32	0·73
SDS	6	-0·66 (-0·93 to -0·38)	60·28%		
HAMD	3	-1·13 (-1·84 to -0·41)	84·67%		
PHQ-9	3	-0·68 (-0·87 to -0·48)	23·81%		
Theoretical orientation				29·17	<0·001
CBT	7	-0·72 (-1·00 to -0·43)	81·30%		
Psychoeducation	7	-0·70 (-0·98 to -0·42)	73·72%		

TCM	3	-1·24 (-2·05 to -0·40)	89·38%		
Interpersonal treatment	3	-0·22 (-0·48 to 0·03)	31·46%		
Mindfulness	2	-0·53 (-1·37 to 0·31)	86·43%		
Counseling	1	-1·06 (-1·79 to -0·32)	0%		
Exercise	1	-2·49 (-3·26 to -1·71)	0%		
Social support	1	-0·82 (-1·62 to -0·02)	0%		
Music Therapy	1	-0·90 (-1·73 to -0·08)	0%		
Specificity				0·11	0·74
Non-specificity	7	-0·87 (-1·14 to -0·60)	74·66%		
specificity	19	-0·78 (-1·08 to -0·49)	92·85%		
Scope of intervention				1.65	0.20
Treatment	12	-0.97(-1.31 to -0.63)	92.97%		
Prevention	14	-0.67(-0.98 to -0.36)	87.59%		
Elements of interventions					

Engagement				0·78	0·38
No	11	-0·69 (-0·98 to -0·40)	88·89%		
Yes	15	-0·90 (-0·99 to -0·55)	92·74%		
Interpersonal skills				3·78	0·05
No	17	-0·96 (-1·29 to -0·64)	92·65%		
Yes	9	-0·53 (-0·69 to -0·37)	57·52%		
Behavioral coping				2·47	0·12
No	14	-0·97 (-1·37 to -0·57)	94·26%		
Yes	12	-0·60 (-0·71 to -0·48)	31·24%		
Reinforcement				0·77	0·39
No	24	-0·84 (-1·08 to -0·59)	91·43%		
Yes	2	-0·49 (-0·67 to -0·31)	0%		
Parenting skills				0·10	0·76
No	19	-0·83 (-1·04 to -0·61)	85·23%		

Yes	7	-0·75 (-1·35 to -0·15)	96·26%		
Psychoeducation				1·05	0·31
No	16	-0·71 (-0·93 to -0·49)	85·02%		
Yes	10	-0·96 (-1·44 to -0·47)	94·73%		
Cognitive coping				1·44	0·23
No	14	-0·93 (-1·30 to -0·57)	93·61%		
Yes	12	-0·65 (-0·86 to -0·44)	76·85%		
Delivery agents				0.41	0.52
Non-specialist*	15	-0.89(-1.23 to -0.56)	93.26%		
Specialist^	5	-0.67(-1.26 to -0.08)	90.45%		

Note: EPDS, Edinburgh Postnatal Depression Scale; HAMD, Hamilton depression scale; PHQ-9, Patient Health Questionnaire-9; SDS, Zung Self-Rating Depression Scale;

CBT, Cognitive behavior treatment; TCM, Traditional Chinese medicine.

* includes multidisciplinary teams with no specialists

^ includes multidisciplinary teams with at least one specialist

Table 6   Meta-regression analyses for theoretical orientation of psychosocial therapies

Covariate	Coefficient	S·E	95% CI		Z-value	*p*
			Lower	Upper		
Intercept	-2·37	0·39	-3·13	-1·60	-6·05	0
Quality	-0·12	0·19	-0·49	0·26	-0·62	0·53
CBT	1·74	0·37	1·01	2·47	4·67	<0·001
Counseling	1·43	0·47	0·51	2·34	3·06	<0·001
IPT	2·17	0·42	1·35	3·00	5·14	<0·001
Mindfulness	1·87	0·45	0·10	2·74	4·19	<0·01
Music therapy	1·58	0·51	0·59	2·57	3·12	<0·01
Psychoeducation	1·77	0·37	1·04	2·49	4·79	<0·001
Social support	1·66	0·49	0·69	2·63	3·36	<0·001
TCM	1·24	0·41	0·44	2·04	3·04	<0·01

Q=31.20, df=8, p= 0.0001; R^2= 69%; n=26 studies

Table 7 Meta-regression analyses for psychotherapies only

Covariate	Beta	Standard Error	95% CI		Z-value	2-sided
			Lower	Upper		P-value
Intercept	-0·71	0·14	-0·99	-0·44	-5·11	0
Interpersonal therapy	0·49	0·26	-0·02	0·99	1·88	0·06
Mindfulness	0·16	0·31	-0·44	0·77	0·53	0·60
Psychoeducation	0·01	0·20	-0·38	0·41	0·07	0·95

Q=4.08, df=3, p=0.2529; R^2= 24%

Table 8 Inter-coder agreement of the taxonomy of interventions

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Elements	61	.35	.65	1.00	.9924	.04706
Valid N (listwise)	61					

Table 9 Inter-coder agreement of risk of bias

	N	Range	Minimum	Maximum	Mean	Std. Deviation
bias	7	.16	.84	1.00	.9504	.06591
Valid N (listwise)	7					

Table 10 PRISMA 2009 check list

Section/topic	#	Checklist item

TITLE		
Title	1	Identify the report as a systematic review, meta-analysis, or both.
ABSTRACT		
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.
INTRODUCTION		
Rationale	3	Describe the rationale for the review in the context of what is already known.
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).
METHODS		
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.
RESULTS		
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).

DISCUSSION		
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.
FUNDING		
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.