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Review Article

Mindfulness-Based Interventions for Postpartum Depression: A Systematic Review and Meta-Analysis

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Abstract

Background: We aimed to investigate the intervention effect of mindfulness-based interventions (MBIs) in patients with postpartum depression.

Methods: The method of computer and manual keyword retrieval was used to search PubMed, Web of Science, Cochrane Library. Literature included in the study was assessed for quality and meta-analysis was performed using RevMan 5.3 software.

Results: Twelve articles were finally included in the study and the meta-analysis showed that 6 articles used the Edinburgh Postnatal Depression Scale (EPDS) to compare MBIs with conventional therapy, and the statistical heterogeneity between the combined results was low (P=0.18, I^2=32%). The level of depression in postpartum depression patients was lower in the MBIs group than in the conventional group [MD=3.13, 95%CI (2.57, 3.70), P<0.00001]. Based on the Beck Depression Inventory (BDI), the comparison between MBIs and conventional therapy had low statistical heterogeneity between the combined results (P=0.56, I^2=0%). The level of depression in patients with postpartum depression who received MBIs was significantly lower than in the conventional care group [MD=5.89, 95%CI (4.88, 6.91), P<0.00001]. Subgroup analysis showed that the best intervention duration for MBIs for postpartum depression was within 4 weeks (SMD=-1.785), each session≦60 minutes (SMD=-1.435), and participants had to complete the best three times per week (SMD=-2.185).

Conclusion: MBIs can alleviate depression in women, thereby facilitating their adjustment to new life. It is recommended to practice mindfulness meditation for 30 minutes per day.

Keywords: Mindfulness; Postpartum depression; BDI; Edinburgh postnatal depression scale (EPDS)

Introduction

Postpartum depression (PPD) refers to a range of symptoms caused by changes in a woman's body, emotions and mind after childbirth under the influence of multiple factors. Symptoms typically

include sleeplessness, irritability, anxiety, depression, crying for no apparent reason, anger, loss of faith in life, decreased self-esteem and unhappy relationships with family members, as well as physical symptoms such as dizziness, headaches, nausea and stomach pain. In severe cases, it can even lead to suicide or infanticide (1).

Reducing the psychological distress and anxiety of pregnant women has become an urgent public health issue. Currently, the incidence of postpartum depression in China is slightly higher than the world average, with foreign reports of about 13% and domestic reports of about 14.4% (2). Postpartum depression not only seriously endangers women's physical and mental health, but can also lead to suicide or infanticide. Therefore, it is necessary to actively identify the causes and prevent it (3). The main method for preventing maternal depression in clinical practice is through drug treatment (4, 5). However, according to incomplete statistics, more than 7% of women worldwide use antidepressants (6), and the relapse rate among women treated with antidepressants is up to 70% (7).

Antidepressants are prone to drug resistance, which can reduce their effectiveness, and patient compliance is poor, so there is an urgent need to explore new treatment options, suggesting that a more appropriate way to prevent the harm of postpartum depression to women and their families is urgently needed. At present, some researchers have studied the mindfulness intervention for treating the postpartum depression (8,9).

Compared with other non-pharmacological interventions, mindfulness intervention can help understand the causes of maternal depression, provide targeted training based on the causes, and help patients change their role through mindfulness intervention. Relaxation training can also provide psychological counselling and treatment for patients, thereby improving their psychological state. Currently, mindfulness intervention usually contains two type of, which is MBSR and MBCT (5). The specific mechanism of mindfulness intervention may be that mindfulness intervention has a direct positive effect on the brain, can reduce cortisol levels in the blood, reduce adverse psychological symptoms and negative emotional responses, increase subjective well-being, and improve behavioral regulation (10, 11). It may also lower blood pressure, improve cardiovascular and immune function, and may affect gene expression and enhance the ability of brain circuits to adjust, leading to more positive and optimistic emotional states (6).

Although the retrospective studies (12,13) have evaluated the effectiveness of mindfulness intervention for postpartum depression, many clinical randomized controlled trials have shown significant differences in the intervention effects of mindfulness intervention on postpartum depression patients (14,15), and some recent systematic reviews are RCT studies that revealed the positive effectiveness of mindfulness intervention for postpartum depression (16,17), which have also found that the quality of the studies referenced is generally low, usually at a C level. On the other hand, the traditional treatment of postnatal depression has been based on antidepressant drugs, which have adverse side effects on the health of the infant. Therefore, it is necessary to review more recent and higher-quality clinical studies to evaluate systematically whether mindfulness intervention has a positive therapeutic effect on postpartum depression.

We conducted a meta-analysis of the effectiveness of mindfulness intervention in postpartum depression patients, exploring whether mindfulness intervention has a certain therapeutic effect on postpartum depression patients.

Methods

Literature search

The literature search was performed in the databases as follows: Web of science, PubMed. The searching time will set: the first available year to December 2022. The following search strategy was developed by combining the terms: [Mindfulness] AND [Postnatal Depression] OR [Depression, Postnatal] OR [Post-Partum Depression] OR [Depression, Post-Partum] OR [Post-Partum Depression] OR [Post-Partum Depres-

sion] OR [Post-Natal Depression] OR [Post-Partum Depression] OR [Mindfulness] OR [Postnatal Depression].

Literature inclusion and Exclusion Criteria

The inclusion criteria was based on the PICOS model. Population: patients aged 18 or above, diagnosed with either the International Classification of Diseases 10th Edition or Diagnostic Criteria of Mental Disorders 3th Edition, or diagnosed based on depression rating scales. The exclusion criteria: 1) case reports, conference abstracts, reviews, non-Chinese or English articles, and duplicate publications; 2) articles that do not provide original research data and cannot obtain original data; 3) articles with inadequate or inappropriate descriptions of the experimental design; and 4) studies on one-time mindfulness intervention or exercise training, which are not rigorous enough. Intervention measures: The intervention group uses mindfulness intervention as the main or adjunctive therapy for psychological guidance, including mindfulness therapy, meditation, and group training. The control group uses general therapy as the main therapy, including routine methods and mindfulness intervention. Outcome indicators: 1) Dinburgh Postnatal Depression Scale (EPDS); 2) Beck Depression Inventory (BDI); 3) the Mandarin translation of the PHQ-9, a validated instrument for the evaluation of depression; 4) the DASS, which evaluates depression, anxiety, and stress individually; and the BDI-II; 5) the BDI-II, a 21-item self-report questionnaire designed to gauge the severity of depressive symptoms.

Quality Assessment of Literature

Two researchers independently conducted a literature quality evaluation, and the results were compared and discussed. When no consensus was reached, the third researcher participated in the discussion and made the final decision. All the randomized controlled trials were evaluated the quality by the Cochrane bias risk assessment, including seven items, and each item was evaluated as "low bias risk," "high bias risk," or "unclear." When all criteria are fully met, the possibility of bias is minimal, and it is rated as A; when some criteria are partially met, the possibility of bias is moderate, and it is rated as B; when not all criteria are met, the possibility of bias is high, and it is rated as C. This study excluded C-level literature. The Joanna Briggs Institute's evaluation tool was used to evaluate the quality of quasi-experimental studies, which includes nine evaluation items, and evaluators need to make judgments of "yes," "no," "unclear," or "not applicable" for each item.

Statistical method

RevMan 5.3 was used for meta-analysis. Relative risk and standardized mean difference were used for statistical analysis within a 95% confidence interval (CI). SMD within a 95%. I-square statistics and heterogeneity chi-square tests were performed to assess statistical heterogeneity among the included studies before integrating the study data. I^2>50% or P<0.10 were regarded as signs of significant study heterogeneity. With a 95% accuracy, the overall RR or SMD score was determined. When heterogeneity was different, a fixed-effects model and a random-effects model were utilized. The continuous variables used as the result evaluation indicators in this study were mean square deviation or weighted mean square deviation, both of which were reported with a 95% confidence interval.

Results

Search results

There were 2767 articles related to the initial screening. By using Endnote software and manual checking, duplicate articles were removed. After reading the titles and abstracts, 65 articles were initially screened. Further reading of the full text resulted in 12 articles for final screening. Twenty-four articles were excluded. Finally, 12 English articles were included. Eleven randomized controlled trials and 1 self-controlled trial were included (Fig. 1).

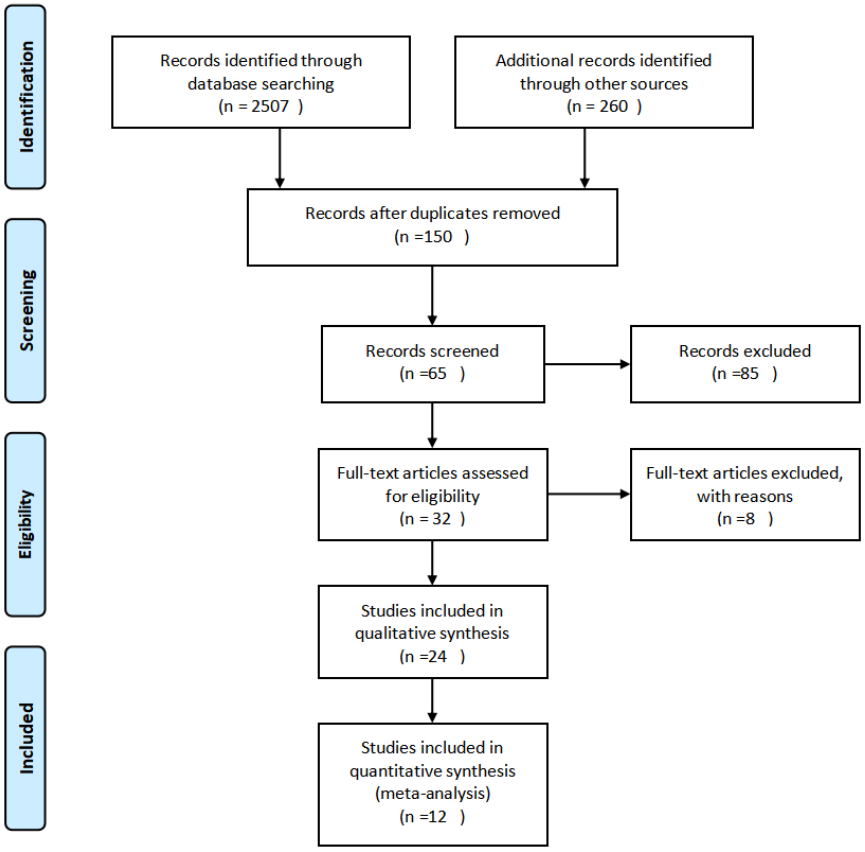

Fig. 1: PRISMA flowchart detailing the study selection process

Quality assessment of included studies

Among the 12 papers included in this study, 5 papers (18,19,25,26,29) had a high methodological quality rating of A, 5 papers had a medium quality rating of B, and 2 papers (20,23) had a low quality rating of C. Three papers described specific methods, 2 papers reported concealed allocation methods, and 6 papers (18,20-26) had comparable outcome indicators, of which 8 studies (18-22,24-26) were randomized controlled trials (Fig. 2).

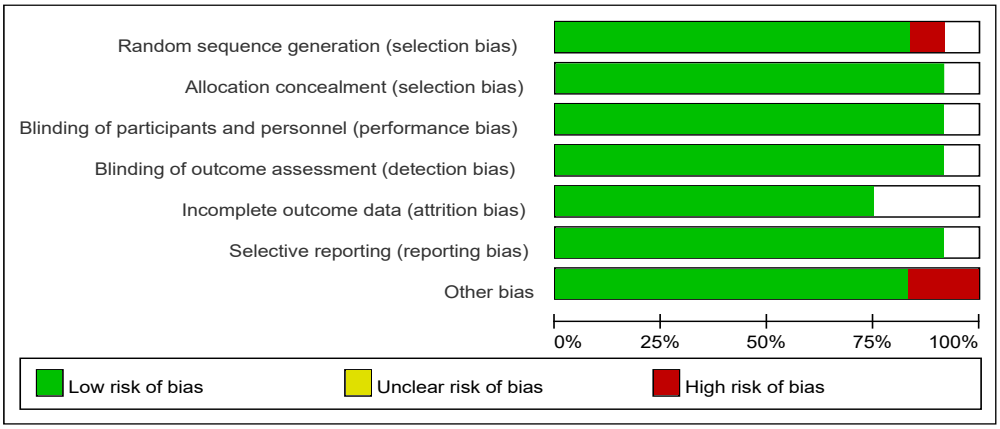

Fig. 2: Literature quality evaluation

Basic characteristics of included studies

A total of 11 RCTs and 1 self-controlled trial were included. The control group received conventional treatment, while the intervention group received mindfulness intervention, with 3 papers (18,19,20) using mindfulness intervention as the main intervention method, including mindfulness yoga and mindfulness intervention techniques. The duration of intervention ranged from 30 minutes to 6 hours per week, and the follow-up time ranged from a minimum of 3 weeks to a maximum of 2 months. The main outcome indicators for efficacy evaluation were EPDS and BDI, and the secondary outcome indicator was patients' emotional anxiety. In addition to using EPDS and BDI, the study by Baggett et al. (18) also used the Montgomery-Asberg Depression Rating Scale (MADRS) (Table 1).

Table 1: Characteristics of included studies

References	*Year*	*Location*	*Sample size*	*Age*	*Intervention content*	*Outcome*	*Intervention frequency,times per week*	*Intervention Period ,week*	*Intervention duration, min*	*Value of reference*
Baggett KM (18)	2020	America	32/31	≧18	MBCT/Conventional interventions	①②③	1	4	120	A
Dimidjian S (19)	2016	Netherlands	31/24	≧18	Mindfulness/Conventional interventions	①②	2	6	360	A
Goetz M (20)	2020	America	22/24	≧18	Mindfulness/MBCT	①②	1	6	100	C
Guo L (21)	2020	China	25/25	≧18	Mindfulness/Conventional interventions	①②	2	8	180	B
Liu C (22)	2022	China	30/31	≧30	MBCT	①②	3	3	180	B
Miklowitz, D. J (23)	2015	Germany	30/35	≧18	Mindfulness/MBCT	①	3	6	90	C
Zhang, H (24)	2015	China	49/40	18-50	MBCT	②	2	6	360	B
Luberto, C.M. (25)	2018	United Kingdom	19/14	≧22	Mindfulness	①②	1	8	30	A
Mei R (26)	2022	China	15/17	30-60	Mindfulness/MBCT	①②③	1	8	30	A
Pan, W. L. (27)	2019	China	22/22	≧50	Mindfulness	①②	2	8	120	B
Sheydaei H (28)	2017	America	32/32	unknown	MBCT/Conventional interventions	①②④	1	6	120	B
Sun Y (29)	2021	China	17/17	≧18	MBCT/Conventional interventions	②	4	3	120	A

Note: ①Edinburgh Postnatal Depression Scale (EPDS); ②Beck Depression Inventory (BDI); ③Montgomery-Asberg Depression Rating Scale (MADRS); ④Self-Rating Depression Scale (SDS). MBCT: Mindfulness-Based Cognitive Therapy

EPDS analysis of the results of mindfulness intervention and conventional therapy comparison

To evaluate the effectiveness of mindfulness-based interventions on postpartum depression (PPD) compared to usual care, EPDS was used for comparing the outcomes. In the 7 English literature on mindfulness intervention for postpartum depression, 6 studies (18-23) compared mindfulness intervention with conventional therapy using EPDS. Because we found that reference 19 would have an impact on heterogeneity

by proposing a literature sensitivity test, so we excluded it from the analysis. The analysis of these 7 RCT studies showed low statistical heterogeneity in the combined results (P=0.18, I^2=32%), therefore, a fixed-effect model was used for data analysis. The results showed that postpartum depression level of the mindfulness intervention group was lower than that of the conventional group [MD=3.13, 95%CI(2.57, 3.70), P<0.00001] (Fig. 3).

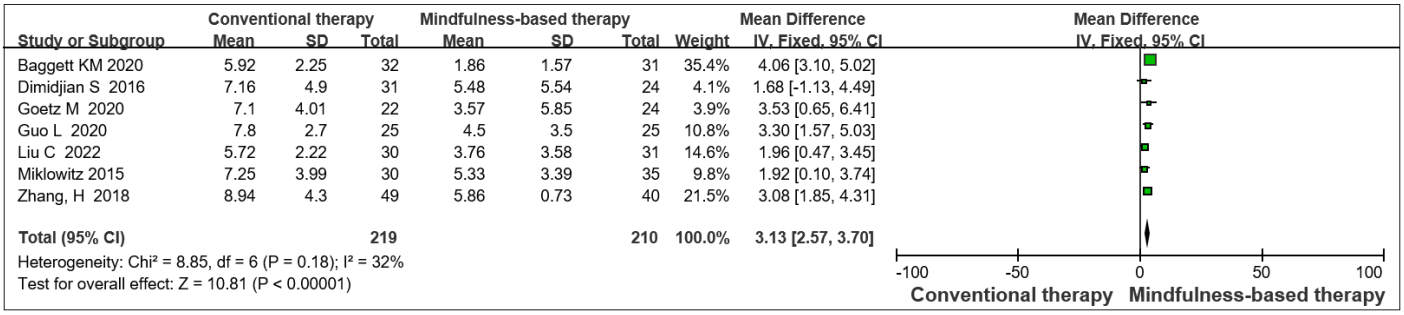

Fig. 3: Forest plot analysis results based on EPDS

Comparison results of mindfulness intervention and conventional therapy in BDI

To evaluate the efficacy of interventions on postpartum depression (PPD) compared to usual care, BDI was used for comparing the outcomes. In the 5 literature on mindfulness intervention (24-29). We did not find a significant change in heterogeneity in our sensitivity analysis, which was all below 50%. Analysis of these trials showed low statistical heterogeneity in the combined results (P=0.56, I^2=0%), so a fixed-effects model was used. Postpartum depression level of patients who received mindfulness intervention was significantly lower than that of the conventional care group [MD=5.89, 95%CI (4.88, 6.91), P<0.00001] (Fig. 4).

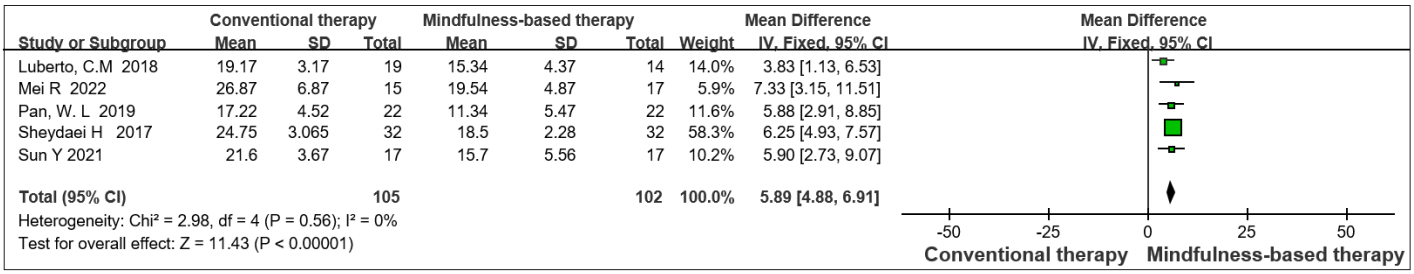

Fig. 4: Forest plot analysis results based on BDI

Subgroup analysis

Based on the type of intervention, the timing of the intervention, how long the intervention lasted, and other parameters, this action was done. The MBCT intervention had the best intervention impact on postpartum depression, with the optimal intervention duration within 4 weeks (SMD=-1.785), and each session lasting ≤60 minutes (SMD=-1.435), according to the results of subgroup analysis. For the greatest results (SMD=-2.185), participants were required to complete the intervention three times each week (Table 2).

Table 2: Subgroup analysis of the effect mindfulness meditation on depression during pregnancy

Group	*Study*	*Heterogeneity*		*Result of meta-analysis*		
		I^2	*P*	SMD, 95%CI	*Z*	
Length of each intervention session, min						
≤60	4	88.0%	0.000	-1.435 (-2.275,0.1456)	1.78	0.074
60-120	4	0.0%	0.000	-0.978 (-2.455,0.1574)	1.57	0.137
>120	3	64.0%	0.785	-0.475 (-0.655,0.356)	3.76	0.000
Intervention duration, week						
<4	3	90.0%	0.000	-1.265 (-4.985,0.798)	1.45	0.176
4-6	3	0.0%	0.000	-1.785 (-1.345,0.798)	0.23	0.798
>6	4	64.9%	0.000	-0.875 (-2.365,0.1464)	3.45	0.001
Intervention frequency, times/week						
<3	6	92.8%	0.000	-2.185 (-3.076,-0.265)	2.32	0.045
=3	2	0.0%	0.436	0.078 (-0.687,0.1765)	0.21	0.978
>3	2	56.8%	0.000	-0.653 (-1.354,-0.086)	2.34	0.018

Discussion

Postpartum depression is a type of postpartum psychological disorder that is often overlooked and is associated with many factors, including physiological, psychological, family and social, physical factors, and personality traits, among others. Therefore, several studies (2, 6, 8) have investigated postpartum intervention measures.

The meta-analysis showed that there was improvement in postpartum depression symptoms in the experimental group compared with control, suggesting that mindfulness intervention can improve negative emotions of control group.

For example, the MBCT intervention group had a significantly lower relapse rate and severity of depression symptoms compared to the control and MBCT was proved acceptable program that helps reduce the risk of postpartum depression.

These findings may be related to lifestyle changes in postpartum women, as mindfulness interventions can reduce impulsive behavior in many ways and strengthen control over impulsive behavior. Mindfulness training does not view life stressors as difficulties, but rather as modifiable sources of emotional relief through stress reduction techniques (30).

Mindfulness training can lead to a shift in emotional information processing among postpartum depression patients, where negative memories are replaced with positive emotions such as love and compassion. Moreover, our meta-analysis showed that the level of depression in the mindfulness intervention group was lower than that of patients in the conventional group. Furthermore, the subgroup analysis reported that the MBCT therapy had the best intervention effect on postpartum depression when the intervention period was within 4 weeks, with each session lasting ≤60 minutes, and participants were required to complete it three times a week.

Interventions lasting longer than 4 weeks can cause aversion in patients, which can have an impact on the efficacy of the intervention (24). Interventions lasting 60 minutes can have a reverse effect, so this again supports the specific interventions that have been developed in this paper (8). Why some articles reach different conclusions may be a function of individual differences, as well as differences in the individual abilities of the intervening health care professionals. Previous studies (15,18,21) have used electroencepha-

logram (EEG) technology to measure participants in the mindfulness group and the control group, researchers discovered that meditation practitioners had significantly higher levels of left frontal cortex activation, and that the size of the enhancement could predict an increase in antibody concentration, demonstrating how mindfulness training may enhance awareness to sensory cues and enhance responses. During the period of postpartum depression, mothers are more prone to anger and emotional fluctuations. Dunn et al (31) provided personalized psychological counseling for postpartum depression patients, provided patients and their families with information about postpartum depression, social support and dietary advice. The results showed a significant improvement in the mothers' depressive state.

Limitation

Both positive intervention behavioral therapy and counseling are effective for postpartum depression individual counseling is superior to group counseling psychological interventions are better than usual care for postpartum depression (32). However, this study has the following limitations: i) the number of outcome indicators included in the literature makes less literature available for combined analysis; ii) there is variability in the research methods of the included literature, and the overall outcome analysis differs to some extent; iii) the small size of the included literature has low power and possible publication bias, which will affect the feasibility and accuracy of the study results; iv) there is still a need for more participants Some characteristics are not clear enough, such as subgroups for conducting MCBT, which, in addition to ethnic and geographic disparities, may have an impact on the validity and viability of subgroup analysis. Age and illness status are further factors that may influence subgroup analysis, and some subgroups have small sample sizes.

Conclusion

Mindfulness interventions can alleviate postpartum stress in pregnant women, reduce impulsive behavior, and promote their adjustment to a new life. Based on the study above, particular training methods have been suggested to improve the efficacy of mindfulness interventions. Pregnant women with depression symptoms are advised to participate in a 4-week mindfulness intervention-training program due to the fluctuating nature of women's emotions after giving birth, starting 4 weeks before childbirth, with each session lasting ≤60 minutes. It is also recommended that they practice mindfulness meditation for 30 minutes a day.

Journalism Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Stewart DE, Vigod SN (2019). Postpartum Depression: Pathophysiology, Treatment, and Emerging Therapeutics. *Annu Rev Med*, 70: 183-196.
2. Wan EY, Moyer CA, Harlow SD, et al (2009). Postpartum depression and traditional postpartum care in China: role of zuoyuezi. *Int J Gynaecol Obstet*, 104(3): 209-213.
3. Leduc D, Senikas V, Lalonde A B, et al (2009). Active management of the third stage of la-

bour: prevention and treatment of postpartum hemorrhage. *J Obstet Gynaecol Can*, 31(10): 980-993.
4. Zhao L, Chen J, Lan L, et al (2021). Effectiveness of Telehealth Interventions for Women with Postpartum Depression: Systematic Review and Meta-analysis. *JMIR Mhealth Uhealth*, 9(10): e32544.
5. Eustis EH, Ernst S, Sutton K, Battle CL (2019). Innovations in the Treatment of Perinatal Depression: the Role of Yoga and Physical Activity Interventions during Pregnancy and Postpartum. *Curr Psychiatry Rep*, 21(12): 133.
6. Jakobsen J C, Gluud C, Kirsch I (2020). Should antidepressants be used for major depressive disorder? *BMJ Evid Based Med,* 25(4):130.
7. Majeed MH, Ali AA, Sudak DM (2018). Mindfulness-based interventions for chronic pain: Evidence and applications. *Asian J Psychiatr*, 32: 79-83.
8. Werneke U, Northey S, Bhugra D (2006). Antidepressants and sexual dysfunction. *Acta Psychiatrica Scandinavica,* 114(6): 384-397.
9. Shulman B, Dueck R, Ryan D, et al (2018). Feasibility of a mindfulness-based cognitive therapy group intervention as an adjunctive treatment for postpartum depression and anxiety. *J Affect Disord*, 235: 61-67.
10. Nyklíček I, Kuijpers K F (2008). Effects of mindfulness-based stress reduction intervention on psychological well-being and quality of life: is increased mindfulness indeed the mechanism?. *Ann Behav Med*, 35(3): 331-340.
11. Shapiro S L, Carlson L E, Astin J A, et al (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, 62(3): 373-386.
12. Hofmann SG, Gómez AF (2017). Mindfulness-Based Interventions for Anxiety and Depression. *Psychiatr Clin North Am*, 40(4): 739-749.
13. Tomfohr-Madsen LM, Campbell TS, Giesbrecht GF, Letourneau NL, Carlson LE, Madsen JW, Dimidjian S (2016). Mindfulness-based cognitive therapy for psychological distress in pregnancy: study protocol for a randomized controlled trial. *Trials*, 17(1): 498.
14. Duncan LG, Cohn MA, Chao MT, Cook JG, Riccobono J, Bardacke N (2017). Benefits of preparing for childbirth with mindfulness training: a randomized controlled trial with active comparison. *BMC Pregnancy Childbirth*, 17(1): 140.
15. Tabi K, Bhullar M, Fantu L, et al (2022). Feasibility of online mindfulness-based interventions for families affected with postpartum depression and anxiety: study protocol. *BMJ Open*, 12(9): e051935.
16. Dhillon A, Sparkes E, Duarte RV (2017). Mindfulness-based interventions during pregnancy: a systematic review and meta-analysis. *Mindfulness (N Y)*, 8: 1421-1437.
17. Matvienko-Sikar K, Lee L, Murphy G, Murphy L (2016). The effects of mindfulness interventions on prenatal well-being: A systematic review. *Psychol Health*, 31(12): 1415-1434.
18. Baggett KM, Davis B, Sheeber LB, et al (2020). Minding the Gatekeepers: Referral and Recruitment of Postpartum Mothers with Depression into a Randomized Controlled Trial of a Mobile Internet Parenting Intervention to Improve Mood and Optimize Infant Social Communication Outcomes. *Int J Environ Res Public Health*, 17(23): 8978.
19. Dimidjian S, Goodman SH, Felder JN, Gallop R, Brown AP, Beck A (2016). Staying well during pregnancy and the postpartum: a pilot randomized trial of mindfulness-based cognitive therapy for the prevention of depressive relapse /recurrence. *J Consult Clin Psychol*, 84 (2): 134-145.
20. Goetz M, Schiele C, Müller M, et al (2020). Effects of a Brief Electronic Mindfulness-Based Intervention on Relieving Prenatal Depression and Anxiety in Hospitalized High-Risk Pregnant Women: Exploratory Pilot Study. *J Med Internet Res*, 22(8): e17593.
21. Guo L, Zhang J, Mu L, Ye Z (2020). Preventing Postpartum Depression with Mindful Self-Compassion Intervention: A Randomized Control Study. *J Nerv Ment Dis*, 208(2): 101-107.
22. Liu C, Chen H, Zhou F, et al (2022). Positive intervention effect of mobile health application based on mindfulness and social support theory on postpartum depression symptoms of puerperae. *BMC Womens Health*, 22(1): 413.
23. Miklowitz DJ, Semple RJ, Hauser M, Elkun D, Weintraub MJ, Dimidjian S (2015). Mindfulness-based cognitive therapy for perinatal women with depression or bipolar spectrum disorder. *Cognit Ther Res*, 39: 590–600.
24. Zhang H, Emory EK (2015). A Mindfulness-Based Intervention for Pregnant African-

American Women. *Mindfulness*, 6: 663-674.
25. Luberto CM, Park ER, Goodman JH (2018). Postpartum Outcomes and Formal Mindfulness Practice in Mindfulness-Based Cognitive Therapy for Perinatal Women. *Mindfulness*, 9: 850-859.
26. Mei R, Peng F, Xiong J, et al (2022). Mindfulness-Based Interventions for the Occurrence of Postpartum Depression in Elderly 14. Primiparas. *Contrast Media Mol Imaging*, 2022: 4202676.
27. Pan WL, Chang CW, Chen SM, Gau ML (2019). Assessing the effectiveness of mindfulness-based programs on mental health during pregnancy and early motherhood—a randomized control trial. *BMC Pregnancy Childbirth,* 19(1): 346.
28. Sheydaei H, Ghasemzadeh A, Lashkari A, Kajani PG (2017). The effectiveness of mindfulness training on reducing the symptoms of postpartum depression. *Electron Physician*, 9(7): 4753-4758.
29. Sun Y, Li Y, Wang J, Chen Q, Bazzano AN, Cao F (2021). Effectiveness of Smartphone-Based Mindfulness Training on Maternal Perinatal Depression: Randomized Controlled Trial. *J Med Internet Res*, 23(1): e23410.
30. Vieten C, Astin J (2008). Effects of a mindfulness-based intervention during pregnancy on prenatal stress and mood: results of a pilot study. *Arch Womens Ment Health*, 11: 67-74.
31. Dunn C, Hanieh E, Roberts R, Powrie R (2012). Mindful pregnancy and childbirth: effects of a mindfulness-based intervention on women's psychological distress and well-being in the perinatal period. *Arch Womens Ment Health*, 15(2): 139-43.
32. Rayan A, Ahmad M (2017). Effectiveness of Mindfulness-Based Intervention on Perceived Stress, Anxiety, and Depression among Parents of Children with Autism Spectrum Disorder. *Mindfulness*, 8: 677–690.