

Research Article

The Effect of Yoga on Women with Postpartum Depression: A Meta-Analysis

Bo Zhang; Jiewei MA; Haidong Chen; Wenpian Ruan*

South China Normal University Department of Physical Education, China

***Corresponding author: Wenpian Ruan**School of Sports Science, University Town Campus, South China Normal University, Panyu District, Guangzhou City, Guangdong Province, China.
Email: 1433345933@qq.com**Received:** June 20, 2024**Accepted:** July 17, 2024**Published:** July 22, 2024**Abstract****Background:** The effect of yoga on women with postpartum depression.**Objective:** Randomized controlled trials using the EPDS scale were included To evaluate the effect of yoga on postpartum depression.**Method:** The web of science, Pubmed, China National Knowledge Infrastructure (CNKI), Wanfang Data Knowledge Service Platform, and Vipo databases were searched. The search period was from the date of database establishment to the present, and randomized controlled trials of yoga in treating postpartum depression in women were included. Risk assessment was performed using rob2 and Revman 5.4.1 was used for meta-analysis. A total of 443 women diagnosed with postpartum depression were included in the study, including 222 yoga intervention participants and 221 control participants.**Results:** This meta-analysis found that yoga practice significantly improved postpartum depression in women; However, $I^2=95\%$ was included in 6 randomized controlled trials, showing high heterogeneity. Subgroup analysis showed that increasing the frequency of yoga practice and reducing the duration of yoga intervention significantly improved the incidence of postpartum depression.**Conclusion:** Postpartum depression is a major problem that afflicts women, and yoga can effectively improve the condition of depression. It is worthy of clinical extension to women with postpartum depression. The Registration Number in PROSPERO is CRD42023449120**Keywords:** Yoga postpartum depression meta-analysis**Background**

The postpartum period is a challenging transition period for mothers, leaving them highly susceptible to psychiatric disorders [1]. Since the last decade, Postpartum Depression (PPD) has been recognized as a significant public health problem [2]. at the same time Postpartum Depression (PPD) was identified as the number one complication that plagued one in seven women [3]. PPD usually occurs 6 to 8 weeks after childbirth, which may lead to a decrease in an individual's daily performance [4]. The main clinical manifestations are persistent sadness, depression, emotional instability, irritability and anxiety, etc. [5]. Even self-injury, suicide and harm to babies, etc [6]. According to statistics, the incidence rate of postpartum depression is about 15% to 30% [7]. Temperamentally, women with postpartum depression have more anticipatory anxiety; more fear of uncertainty, more shyness, and more fatigue and

weakness. They are also less responsible, less purposeful, less resourceful, less self-accepting, and have less impulse control in their personalities [8]. In line with experimental evidence linking postpartum depression to sexual function, the study shows that more than half of postpartum women are found to have sexual dysfunction, and about one-third are identified as being at risk for levels of depression [9]. Multiple studies explore evidence that postpartum women who are employed are less likely to report higher depressive symptoms than postpartum women who are not employed [10-12]. At the same time, there are experimental studies showing that early detection of PPD in the prenatal setting is crucial to promote maternal and neonatal health [13]. The birth of newborns through breastfeeding is associated with depression. Prospective studies analyzing the impact of postpartum depression on breastfeeding and the impact

of breastfeeding on postpartum depression have shown that postpartum depression and postpartum depressive symptoms predict the duration of breastfeeding shorten [14]. Therefore, postpartum depression affects a woman's ability to care for her child and may lead to an inability to function as a mother, that is, to breastfeed and care for her baby [15].

Currently, different countries and regions conduct different relevant surveys and studies on women with postpartum depression in the region. Risk factors for postpartum depression include psychiatric history, stress, marital conflict, pregnancy complications and financial difficulties [16]. Some studies indicate that. In Brazil, a meta-analysis of 14 studies conducted between 1998 and 2010 resulted in 3 studies assessing PPD prevalence and 11 evaluating PPD symptoms prevalence through clinical interview and scales, respectively. It revealed a prevalence of PPD symptoms between 7.8% and 39.4% [17]. Studies focused on the perinatal period found that depression during pregnancy is one of the strongest risk factors for postpartum depression [18]. Postpartum depression is the most common healthcare problem faced by pregnant women in India due to the potential consequences of untreated depression for women and their families [19]. Relevant studies in South Korea show that the prevalence of prenatal and postpartum depression ranges from 40.5% to 61.4%. Second- and third-trimester depression was significantly associated with postpartum depression. Unemployment and household income as risk factors for antenatal depression in the first and second trimester [20]. Eastern Turkey survey: Women without health insurance and not using contraception have twice the risk of postpartum depression [21]. A Case Report of Bedapu from Aceh Singkil shows that postpartum depression is generally related to psychosocial problems (marital problems, social support, cultural traditions, childhood difficulties) and pregnancy-related factors, and both interact with personality [22]. A Spanish pilot study that followed women with postpartum depression for a year shows that very high depression prevalence remains one year postpartum [23]. A community-based study on postpartum depression in Nepal showed that improvements in women's education and economic status, willingness to become pregnant, family care and support during pregnancy and postpartum period, and early diagnosis and management of health problems can reduce the severity of postpartum depression degree [24]. A study in Malaysia concluded that postpartum women with poor social support are more likely to suffer from postpartum depression than women with good social support [25]. In addition, studies have found correlations between race, ethnicity and depression rates, calling for additional research in specific populations [26]. One study found that compared with white women, nonwhite women were 12.1 times more likely to not seek help for depression (95% CI, 3.0-48.5) [27].

Table 1: Search strategies and dates of coverage for each database.

Database	Search Strategy	Coverage Date
Web of science	TS = (postpartum depression)) OR TS = (postnatal exercise)) OR TS=(Depressed)) AND TS = (Postpartum yoga)	create a database-January 2023
Pubmed	(yoga [ALL Fieds]) OR (yoga [MeSH Terms]) AND (postpartum depression [MeSH Terms])	create a database-January 2023
CNKI	(TS=postpartum depression) OR (TS=postnatal exercise) AND (TS=Yoga)	create a database-January 2023
Wanfang	(TS=postpartum depression) OR (TS=postnatal exercise) AND (TS=Yoga)	create a database-January 2023
Vipo	(TS=postpartum depression) OR (TS=postnatal exercise) AND (TS=Yoga)	create a database-January 2023

Many stress-causing factors can affect the development of postpartum depression. An increased risk of postpartum depression exists in people with depression following a past pregnancy. Untreated maternal depression can harm a baby's growth, and the mother-child attachment, and increase the risk that later kids will have anxiety and depressive symptoms [28]. Indeed, pregnancy and postpartum are associated with an increased risk for developing depressive symptoms in women. Postpartum depression affects approximately 10–15% of women and impairs mother–infant interactions that in turn are important for child development [29]. It can cause marital distress in a marriage, issues in mother child interaction, behavioral problems in children, etc. It can affect the mental health of the family indirectly [30].

Currently, treatments for postpartum depression at home and abroad are divided into drug treatments and non-drug treatments [31]. Drug treatment is the first commonly used method for postpartum depression. A 1997 randomized controlled trial study showed that fluoxetine is an anti-anxiety and antidepressant and is an effective drug for the treatment of postpartum depression [32]. At the same time, as early as 1995, Stowe Z N, Casarella J, Landry J, et al. studied that sertraline is an efficient and well-tolerated treatment for women with postpartum depression [33]. Isoflavones have been studied in the pharmacological treatment of postpartum depression [34]. In 2001, a pilot study showed that fluvoxamine was effective in treating postpartum depression [35]; A 2012 pilot study proposed the use of escitalopram to treat postpartum depression [36]; A 2022 U.S. patent and trademark proposes the use of ganexolone for the prevention and treatment of postpartum depression [37]. In 2023, the U.S. Food and Drug Administration (FDA) has approved the first-ever oral treatment for postpartum depression, zuranolone (brand name Zurzuvae) for adults, along with a safety warning [38]. Some of the literature on the application of drug trials to postpartum depression includes a small number of trials, which may not be feasible. A history of breastfeeding is associated with a lower risk of several diseases in both baby and mother [39], All psychotropic drugs enter breast milk with the same molecular mass, allowing them to cross the blood-brain barrier from the gut, allowing them to passively diffuse into breast milk [40]. Therefore, in order not to affect the normal development and growth of children. Most patients are unwilling to adhere to medication and prefer to seek alternative treatments [41].

Postpartum recovery care can be effective in relieving depression, a trial suggests[®] [42]. IPT therapy is suitable for treating women with postpartum depression [43], Miniati M, Callari A, Calugi S, et al. It is believed that Interpersonal Therapy (IPT) has an intervention effect on women with postpartum depression. If it is added with the support of relatives, it will have a sig-

nificant intervention effect [44]. In 2009, a study proposed the usefulness of a new type of An Ayurvedic Approach treatment for postpartum depression [45]. Not only the above intervention methods, but also the yoga movement originated from the ancient East has become the current world sports trend. There is growing evidence supporting the antidepressant effects of Yoga-Based Intervention (YBI), which has grown in popularity in the West over the past few decades [46]. Yoga a good candidate for possible innovative treatment for depression [47], Yoga, as a non-invasive, safe and effective complementary alternative therapy for relieving mental illness, has been widely recognized by domestic and foreign scholars and practitioners [48]. In addition, studies have shown that traditional practices can reduce the risk of postpartum depression, but in the limited data, the significant factor indicating that the use of traditional practices increases the risk of postpartum depression is the presence of regional differences [49]. Current yoga treatments for depression mainly focus on postures (asanas), breathing techniques (pranayama), gestures (mudras), meditation and relaxation techniques [50]. A trial using yoga to intervene in patients with depression shows that yoga training can effectively improve the mood of patients with depression [51]. Regarding the depression of pregnant women, there are already trials of intervention on pregnant women with depression, including prenatal yoga intervention trials [52], Yoga intervention for postpartum depression trial [53], Systematic review analysis of yoga in the treatment of depression [54,55]. In addition, other non-drug treatments for postpartum depression include electroconvulsive therapy, bright light therapy, acupuncture and massage, etc. [56]. There are a variety of interventions available to treat PPD, such as education, support, therapy, and medication. However, for unknown reasons, these interventions are underutilized [57].

Currently, there are issues related to depression in pregnant women. Mainly includes reviews and suggestions for preventing postpartum depression [58], A review of the causes and treatments of postpartum depression [59], A meta-analysis of the characteristics and effectiveness of yoga interventions during pregnancy [60], Research on the effect of yoga on perinatal depression [61], A systematic review of yoga in the treatment of prenatal depression [62], Yoga intervenes in maternal depression during pregnancy [63] and the first large GWAS analysis of postpartum depression in 2023 [64]. Among them, a meta-analysis compared the effects of yoga, music, massage and exercise on prenatal depression. The study showed that there was little to very low evidence that yoga, exercise, music and massage could reduce prenatal depression. Among them, music may be the most effective intervention, and comprehensive yoga other than simple yoga can improve prenatal depression [65].

However, meta-analyses of randomized controlled trials of yoga in women with postpartum depression have not yet been conducted. One of them was published in the Korean Journal of Occupational Therapy, This literature study is a systematic review type, combing through all relevant literature on three programs: yoga, social support groups and kangaroo care, to confirm and support yoga to reduce the symptoms of postpartum depression [66]. Currently, the current status of research on postpartum depression does not include systematic reviews and meta-analyses that use the EPDS scale alone to explore whether yoga has an impact on women with postpartum depression. The latest research on the EPDS scale shows that the EPDS and EPDS-3A can be used alone or in combination for preliminary screening of pregnancy anxiety. Under certain condi-

tions, it can even replace GAD-7 for anxiety screening, reduce the adverse effects of excessive screening on pregnant women, and improve survey data quality and clinical service efficiency [67]. In addition, there is no systematic integrated analysis of randomized controlled trials of yoga intervention for postpartum depression using the EPDS scale. Therefore, this study reviewed relevant randomized controlled trials of yoga therapy for women with postpartum depression. In addition, this study systematically reviews the current research status and future prospects of yoga intervention in improving postpartum depression.

Method

Agreement and Registration

This study was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines conduct [68]. and is already in the Prospero International Prospective Register of Systematic Reviews (Registration number: CRD: CRD42023449120) Registration. Which is available at https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42023449120.

Search Strategy

The web of science, Pubmed, China National Knowledge Infrastructure (CNKI), Wanfang Data Knowledge Service Platform, and Vipo databases were searched, and the search period was from the date of database establishment to the present. Randomized controlled trials of yoga in the treatment of postpartum depression in women were included, and the search language was English. The search strategy is as follows:

#1 yoga or postpartum depression

#2 postpartum yoga

#1 And #2 Table 1 shows the specific search strategies and coverage dates for each database.

Selection Criteria

The study population was women diagnosed with postpartum depression, and these groups received a yoga intervention versus no exercise and participation in psychological counseling. The following criteria were included: (1) Participants: healthy pregnant women, no pregnancy complications, no yoga experience or no yoga practice in the past year; (2) Intervention: any type of yoga practice; (3) Control group: participating in psychological counseling or No exercise; (4) Results: Edinburgh Postnatal Depression Scale (EPDS), trial period, trial frequency, intervention time; (5) Research design: randomized controlled trial.

Exclusion Criteria

The following limitations were excluded: (1) Prenatal yoga intervention; (2) Pregnant women diagnosed with depression before birth; (3) Non-randomized controlled trials; (4) The intervention was not yoga; (5) No data.

Screening Process

The screening work was carried out by two researchers, and the steps were as follows: (1) After searching, filter irrelevant topics and delete duplicate articles; (2) Two researchers screened article abstracts and keywords; (3) Full-text screening. Screening identifications were independently confirmed by two investigators, and reasons for exclusion were recorded. When uncertainty arose, a third researcher made the decision.

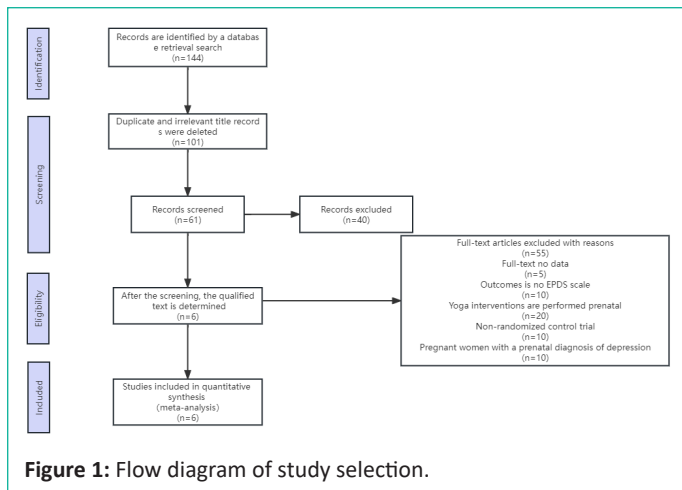


Figure 1: Flow diagram of study selection.

Literature Selection

One striking feature among the majority of studies is the tendency of investigators to conduct assessments with two widely used depression scales [69]: the Edinburgh Postnatal Depression Scale (EPDS) [70] and the Beck Depression Inventory (BDI) [71].

A total of 144 relevant articles were retrieved, and 6 Chinese RCT studies were finally included [72-77]. This article does not cite relevant research on yoga on postpartum depression from web or pubmed databases, because the research scales used are different and therefore were not included. For example, some studies in the literature used scales of the EPDS type included in this study, but there were no yoga interventions [78] Or use other intervention methods [79,80]. Therefore, it is not included in the use. The literature search process is shown in Figure 1.

Incorporate Basic Characteristics of the Literature

The included studies were published from the establishment of the database to January 2023. A total of 455 women with postpartum depression were included, and the intervention duration was 6-20 weeks. The basic characteristics of the included research documents are shown in Table 2. A total of 6 randomized controlled studies were included, all of which were about the effect of yoga on women with postpartum depressive symptoms, and the 6 studies were uniformly included in the Edinburgh Pregnancy Depression Scale.

Data Extraction and Data Synthesis

Data extraction: Data extraction: Two researchers conducted data extraction on the final selected documents, mainly extracting the author's name, publication date, number of people, trial period, intervention time and Edinburgh Postnatal Depression Scale (EPDS), extracting variable data (MD SD), and then mutually Check extracted data for completeness and accuracy. Inconsistencies were resolved through consultation with a third researcher:

Basic information: Extract the author's name, nationality, publication date, and number of participants, including first-time mothers and second-time mothers.

Interventions: Trial period of yoga intervention, frequency and timing of yoga intervention.

Results: MD/SD using the EPDS scale were extracted and counted.

Data synthesis: Statistical heterogeneity between studies

was analyzed using the I^2 statistics, a measure of how much variance between studies can be attributed to differences between studies rather than chance. The magnitude of heterogeneity was categorized as $I^2 = 0-24%$, low heterogeneity; $I^2 = 25-49%$, moderate heterogeneity; $I^2 = 50-74%$, substantial heterogeneity; and $I^2 = 75-100%$, considerable heterogeneity [81] (Higgins & Green, 2008). According to Cochrane Handbook 5.1, when $I^2 \leq 60%$, the homogeneity is moderate and controllable, the Fixed Effects model (FE) was used for meta-analysis; when $I^2 > 60%$, there was a statistically significant heterogeneity between studies, the random effects model (RE) was used to provide the most conservative estimate. If a statistically significant heterogeneity was found when using the fixed effects model, the reasons for the significant heterogeneity would be identified and analyzed by sensitivity analysis and sub-group analysis [82]. Statistical analyses were performed using the Review Manager software (RevMan, version 5.4.1).

Risk Quality Assessment

The literature quality risk assessment uses the risk assessment scale and the randomized controlled trial risk of bias assessment tool RoB2 (Figure 2). The overall quality of the study was classified as low risk if more than three items were assigned as low risk of bias; the overall quality of the study was classified as high risk if more than three items were assigned as high risk of bias or risk of bias was unclear [83]. Disagreements in the quality assessment of the literature were resolved by consensus among the researchers.

Result

Publication Bias Assessment

This study used Revman's funnel plot to analyze the publication bias of the included documents. It can be seen from the figure that most of the included documents are in the middle

Issue ID	Study ID	Essential	Comment	Outcome	Relat	D1	D2	D3	D4	D5	Overall	
1	Wu yunxia2021	Aerobics and Yoga	None	None	1	Low	Low	Low	Low	Low	Low	Low risk
2	Liu shirong2021	Yoga	None	None	1	Low	Low	Low	Low	Low	Low	Low risk
3	Shu liang2019	Psychological Care and Positive Thinking Yoga	None	None	1	Low	Low	Low	Low	Low	Low	Low risk
4	Li quanli2020	Mental resilience adjustment and mindfulness yoga	Mental elastic adjustment	None	1	Low	Low	Low	Low	Low	Low	Low risk
5	Liu tenafei2020	training and psychological care	mental nursing	None	1	Low	Low	Low	Low	Low	Low	Low risk
6	Li li 2019	Yoga and Counseling	Counseling	None	1	Low	Low	Low	Low	Low	Low	Low risk

Figure 2: Summary of risk of bias for each trial.

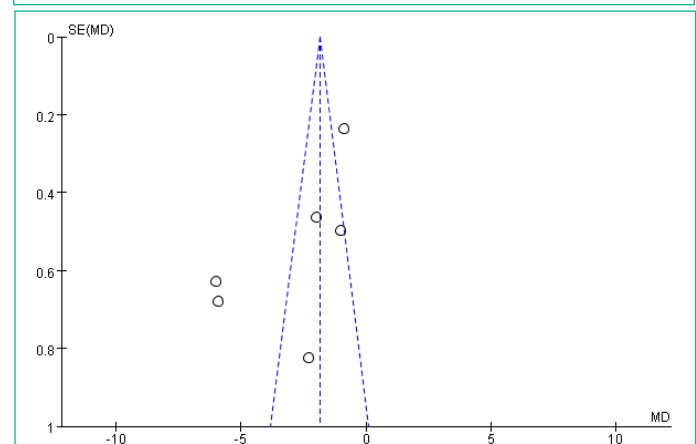


Figure 3: Funnel chart.

Egger's test					
Std_Eff	Coefficient	Std. err.	t	P> t	[95% conf. interval]
slope	.8517116	1.373497	0.62	0.569	-2.961727 4.66515
bias	-6.975833	3.202526	-2.18	0.095	-15.86747 1.915805

Figure 4: Publication bias test (egger's test).

Table 2: Characteristics of the six selected studies.

Author Year	Country	Sample size (Experimental/control)	Intervention (Experimental group/Control group)	Test cycle	Test frequency	Experimental group Duration	Outcome measures
Wu yuan xiu [84]	china	43 (22/21)	EG: Aerobics and Yoga CG: None	twelve weeks	three times a week	30 min	EPDS
Lin zhi yuan [85]	china	46 (23/23)	EG: Yoga CG: None	twenty weeks	three times a week	45 min	EPDS
Shu ling [86]	china	86 (43/43)	EG: Mindfulness yoga training and routine psychological care CG: Routine psychological care	six weeks	once a week	60 min	EPDS
Li quan li 2020 [87]	china	82 (41/41)	EG: Mental resilience adjustment and mindfulness yoga CG: Mental elastic adjustment	six weeks	once a week	不详	EPDS
Liu teng fei [88]	china	86 (43/43)	EG: Mindfulness yoga training and psychological care CG: Mental nursing	eight weeks	once a week	60 min	EPDS
Li li [89]	china	100 (50/50)	EG: Yoga and Counseling CG: Counseling	eight weeks	twice a week	60 min	EPDS

and lower sections. The results showed that the publication bias of the included documents was not significant. Due to the small amount of literature included in this study, stata's egger was used to further verify that there was no risk of publication bias in the included literature (Figure 3 & 4).

Results and Analysis

Through forest plot analysis of the six experimental results, compared with the control group, yoga has an impact on postpartum depression. However, the heterogeneity of 95% is not statistically significant, so further subgroup and sensitivity analyzes are needed (Figure 5).

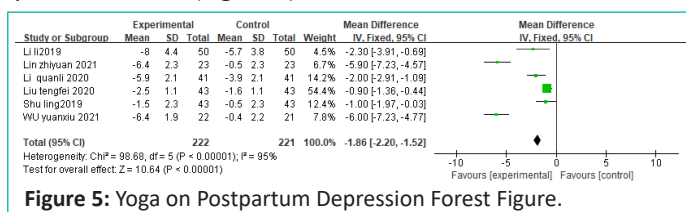


Figure 5: Yoga on Postpartum Depression Forest Figure.

Subgroup Analyses

1. In order to test whether yoga in the intervention group has statistical significance on the heterogeneity of postpartum depression, subgroup analysis will be conducted from the following three aspects. If statistical heterogeneity was present in the respective meta-analysis, subgroup and sensitivity analyses were also used to explore possible reasons for heterogeneity. The relevant yoga intervention methods are divided into two groups. One group is for yoga intervention period of more than twelve weeks; the other group is for less than twelve weeks.

2. Number of trials: Divide yoga intervention into 1-2 times per week and 3 or more times per week.

3. Trial time: Yoga intervention is divided into two groups: single intervention duration is more than 60 minutes and less than 60 minutes.

Through the above three subgroup analyses, the heterogeneity was analyzed and further research was conducted on whether yoga intervention has a significant impact on postpartum depression.

Test Cycle: This study was analyzed through two groups and a control group. A group of trials on yoga interfering with postpartum depression for less than 12 weeks and a trial on yoga

interfering with postpartum depression for more than 12 weeks showed that the experimental group was significantly stronger than the control group in inhibiting depression (MD=-1.17, 95%CI [-1.54 to -0.80], p<0.00001; MD=-5.95, 95%CI [-6.86 to -5.05], p<0.00001), one heterogeneity is within the controllable range, and the other does not have heterogeneity, and has significant statistical significance. (Figure 6 & 7).

Number of trials: Analyzes were conducted through time subgroup analysis of the two groups of yoga intervention versus the control group. One group has yoga intervention time 1-2 times a week and three times a week. The experimental group significantly inhibited depression more than the control group. The number of yoga interventions in the included literature was the same as the experimental period data, so the forest plot was not repeated (Figures 6 & 7).

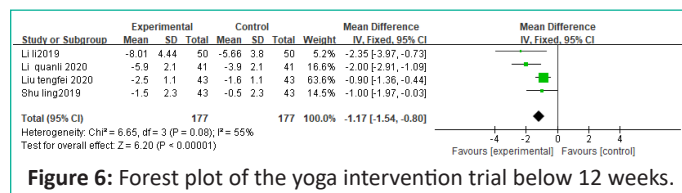


Figure 6: Forest plot of the yoga intervention trial below 12 weeks.

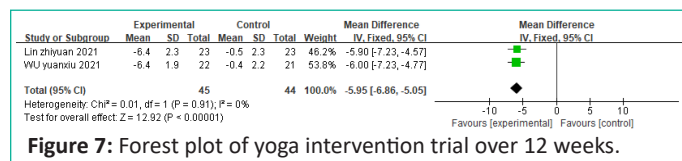


Figure 7: Forest plot of yoga intervention trial over 12 weeks.

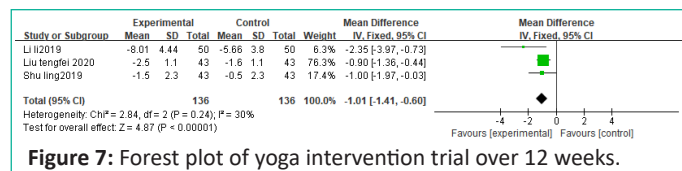


Figure 7: Forest plot of yoga intervention trial over 12 weeks.

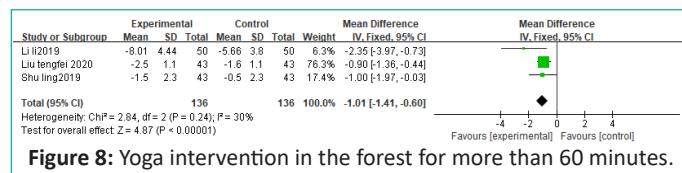


Figure 8: Yoga intervention in the forest for more than 60 minutes.

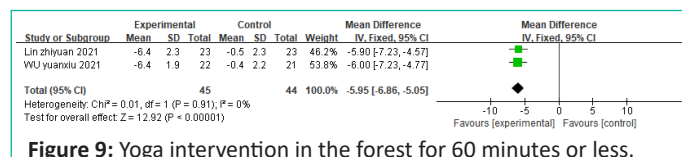


Figure 9: Yoga intervention in the forest for 60 minutes or less.

Test time: The time of the yoga single intervention experimental group was divided into two groups, one group was for yoga intervention for more than 60 minutes; the other group was for yoga intervention for less than 60 minutes. The experimental group was significantly less depressed than the control group (MD= -1.01, 95%CI [-1.41 to -0.60], $p < 0.00001$; MD= -5.95, 95%CI [-6.86 to -5.05], $p < 0.00001$), one article in the included data did not appear in a single yoga intervention time and was therefore not included in the forest plot (Figures 8 & 9).

Discussion

The meta-analysis of this study involved a total of 6 RCT research trials, with a total of 443 pregnant women participating in investigating the relationship between yoga and postpartum depression. The results showed that, even after subgroup analyses, women with postpartum depression who received yoga therapy experienced significant improvements compared with women who did not receive yoga therapy. This study included 6 trials. Since $P < 0.05$, $I^2 > 95\%$ (Figure 5), there is high heterogeneity. Therefore, it is necessary to further explore the optimal therapeutic effect of yoga on postpartum depression and the reasons for the high heterogeneity.

A subgroup analysis was conducted on 6 experimental studies, and statistical analysis of data was conducted from three types: yoga intervention cycle, yoga intervention frequency, and yoga intervention time. From the analysis of subgroup results, increasing the yoga intervention cycle (Figures 6 & 7) and increasing the frequency of yoga intervention (Figures 8 & 9) have significant effects on women with postpartum depression. Therefore, it is known that Postpartum Depressive Symptoms (PDS) can appear within a year after delivery and can peak four to six weeks after delivery. They usually go away on their own within two to six months after delivery, although they may linger longer [90].

Increasing the yoga intervention cycle may be consistent with the duration of depression in women after childbirth, thereby reducing the occurrence of postpartum depression symptoms; and experimental studies have shown that yoga can effectively improve mood [91]. By increasing the frequency of yoga intervention, the anxiety, depression and other emotions of postpartum women have been significantly improved; judging from the yoga intervention time of the subgroup (Figures 8 and 9), a single intervention time of more than 60 minutes has a significant effect on women with postpartum depression. effect. A subgroup analysis was performed and found that the results did not change between yoga intervention cycles and yoga intervention times, but women with postpartum depression who received yoga therapy showed significant improvement. Just like some studies believe that yoga exercise regulates the mental state of pregnant women and improves postpartum depression [92].

Although this article did not include trials of other depression-related scales, For example Hamilton Depressive Rating Scale (HDRS), Beck Depression Inventory (BDI), Structured Clinical Interview Depression (SCID), Center for Epidemiological Studies-Depression Scale (CES-D), Inventory of Depression and Anxiety Symptoms (IDAS) [93]. This study only included the representative EPDS scale. Although there are meta-analyses on yoga-related articles on postpartum depression, the control groups in these trials all received other treatments for comparison or other scales were added for analysis., which further proves that yoga has a significant effect on postpartum depression.

They did not consider whether a separate trial of yoga exercise and a representative scale had a significant effect on postpartum depression. The results of the subgroup analysis we made were consistent with the expected results and the larger results. The results of meta-analyses of some trials of yoga intervention for depression are consistent. The trials we included were all randomized control trials, and the control groups also included various therapies, but all of them had not received or had no knowledge about yoga's ability to treat postpartum depression. It is not a meta-analysis comparing the intervention of the control group with the experimental group of yoga intervention, but a yoga trial alone versus no yoga trial. Among the included articles, four articles were about second-pregnant women and two articles were about first-time mothers. However, this study cannot confirm which group is more likely to suffer from postpartum depression: second-time mothers or first-time mothers. The results of this study show that yoga treatment can significantly improve postpartum depression in both first-time and second-time mothers.

In the forest plot of the meta-analysis of this study, except for the yoga intervention period of more than twelve weeks, the frequency of yoga intervention three times a week (as shown in Figure 7), and the yoga intervention time of less than 60 minutes, there was no heterogeneity in the three subgroup trials. The meta-analysis forest plots all showed heterogeneity. $I^2 = 0$ for the above three subgroups. By repeatedly reading the two articles included in these three groups of trials, it can be seen that the yoga intervention trials of the two are of the same nature, so it also shows that the homogeneity is strong and there is no heterogeneity.

In addition, one article of the randomized controlled trial study included in this study did not show equivalence between the control group and the experimental group because the article included women with postpartum depression in the region and an EPDS scale of more than 13 points. This experiment is conducted with one less person because the number of people meets the conditions. There is no case of yoga interfering with injuries, and there are experimental studies showing that yoga postures and exercises can be adjusted to suit pregnant women and the risk of injury can be reduced [94].

Although the mechanism of yoga intervention has not been fully elucidated, it is currently believed that it works mainly through muscle and neural mechanisms [95]. Experimental studies have shown that yoga exercises have an impact on the endocrine system and autonomic nervous system of pregnant women, helping to regulate their hormone secretion and achieve the effect of relieving stress and negative emotions [96]. Since depression is accompanied by anxiety, irritability and other related emotions, relevant studies have shown that prenatal yoga is associated with a significant reduction in fear of childbirth and may prevent the increase in depressive symptoms [97]. Therefore, yoga as a complementary therapy may be effective in reducing symptoms of depression and anxiety in postpartum women, although not significantly more than usual care [98]. However, the practice of yoga has become widely popular in physical exercise. At the same time, yoga can effectively improve body shape and physiological functions [99]. Therefore, we suggest that yoga be included in the medical system, so as to train medical staff to exercise themselves and also teach it to women with postpartum depression. In this way, it can reduce the physical harm caused by drug treatment to pregnant women, and it is also a way to promote yoga.

Limitations

This meta-analysis has limitations. First, because only articles published in Chinese were used, the EPDS scale used in this study and related research on yoga on postpartum depression did not appear in the English search literature. Selection bias may occur. Secondly, due to the randomized nature of the trial, it is difficult for researchers to ensure that subjects and measurers understand the intervention measures and principles of the trial, so there is a risk of bias. Third, there were no clear statistics on the level of depression among the postpartum women who participated after the trial ended. Depression will occur in every postpartum pregnant woman, but whether it will reoccur after intervention requires further follow-up. Fourth, the content of the yoga intervention used is different, the frequency and frequency are consistent, but the content is different, which will lead to different recovery times. For example, there should be music therapy with or without music.

Therefore, in order to better explore and evaluate the effect of yoga on postpartum depression, it is necessary to further track whether depressive symptoms will reappear in women after recovery, and further detailed analysis is needed.

Conclusion

This study explores a meta-analysis of the effects of yoga in women with postpartum depression. Judging from EPDS, yoga has obvious effects. At the same time, yoga is an auxiliary physical therapy, and this study has certain research significance for the clinical practice of female postpartum depression. Women with postpartum depression should be encouraged to improve their psychological conditions and return to normal life through active connection yoga.

Author Statements

Conflict of Interest

There is no conflict of interest in this article.

Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

Author Contributions

Ruan wenpian is responsible for thesis writing and literature review and provided the thesis framework, knowledge system, and writing direction ideas.

Zhang Bo and Ma Jiewei are responsible for the literature search and table production.

Chen Haidong is responsible for data software processing including stata and other software.

References

- Shorey S, Chee CYI, Ng ED, Chan YH, Tam WWS, Chong YS. Prevalence and incidence of postpartum depression among healthy mothers: A systematic review and meta-analysis. *Journal of psychiatric research*, 2018, 104: 235-248.
- Che Wan Jasimah Bt Wan, Mohamed Radzi, Hashem SJ, Samudin N. Postpartum depression symptoms in survey-based research: A structural equation analysis. *BMC Public Health*. 2021; 21: 1-12.
- Mgonja S, Schoening A. Postpartum depression screening at well-child appointments: a quality improvement project. *Journal of Pediatric Health Care*. 2017; 31: 178-183.
- Rogathi JJ, Manongi R, Mushi D, Rasch V, Sigalla GN, Gammeltoft T, et al. Postpartum depression among women who have experienced intimate partner violence: A prospective cohort study at Moshi, Tanzania. *Journal of affective disorders*. 2017; 218: 238-245
- Gui Yun. Effect of group mindfulness yoga on patients with postpartum depression. *Nursing Practice and Research*. 2020; 17: 92-93.
- Li Qingqing, Fan Yingge, Yang Shichang. Current research status on the occurrence, treatment and intervention of postpartum depression. *Chinese Journal of Behavioral Medicine and Brain Sciences*. 2012; 21: 286-288.
- An Ruixia. Investigation and analysis of postpartum anxiety and depression in mothers with idiopathic diseases during pregnancy. *Nursing Practice and Research*. 2018; 15: 71-72.
- Josefsson A, Larsson C, Sydsjö G, Nylander PO. Temperament and character in women with postpartum depression. *Archives of Women's Mental Health*. 2007; 10: 3-7.
- Dagli E, Kul Uctu A, Özerdoğan N. Sexual dysfunction in the postpartum period: Its relationship with postpartum depression and certain other factors. *Perspectives in psychiatric care*. 2021: 57.
- Gjerdigen D, McGovern P, Attanasio L, Johnson PJ, Kozhimanil KB. Maternal depressive symptoms, employment, and social support. *The Journal of the American Board of Family Medicine*. 2014; 27: 87-96.
- Lewis BA, Billing L, Schuver K, Gjerdigen D, Avery M, Marcus BH. The relationship between employment status and depression symptomatology among women at risk for postpartum depression. *Women's Health*. 2017; 13: 3-9.
- Goyal D, Gay C, Lee KA. How much does low socioeconomic status increase the risk of prenatal and postpartum depressive symptoms in first-time mothers?. *Women's Health Issues*. 2010; 20: 96-104.
- Jeffcoat CA. Implementation of a risk factor screening tool for early detection of postpartum depression in the prenatal setting. 2019.
- Dias CC, Figueiredo B. Breastfeeding and depression: a systematic review of the literature[J]. *Journal of affective disorders*. 2015; 171: 142-154.
- Guintivano J, Manuck T, Meltzer-Brody S. Predictors of postpartum depression: a comprehensive review of the last decade of evidence. *Clinical obstetrics and gynecology*. 2018; 61: 591-603.
- Banti S, Mauri M, Oppo A, Borri C, Rambelli C, Ramacciotti D, et al. From the third month of pregnancy to 1 year postpartum. Prevalence, incidence, recurrence, and new onset of depression. Results from the Perinatal Depression–Research & Screening Unit study. *Comprehensive psychiatry*. 2011; 52: 343-351.
- Correa H, Couto TCE, Santos W, Romano-Silva MA, Santos LMP. Postpartum depression symptoms among Amazonian and Northeast Brazilian women. *J Affect Disord*. 2016; 204: 214-8.
- Banti S, Mauri M, Oppo A, Borri C, Rambelli C, Ramacciotti D, et al. From the third month of pregnancy to 1 year postpartum. Prevalence, incidence, recurrence, and new onset of depression. Results from the Perinatal Depression–Research & Screening Unit study. *Comprehensive psychiatry*. 2011; 52: 343-351.

19. Shelke A, Chakole S. A Review on Risk Factors of Postpartum Depression in India and Its Management. *Cureus*. 2022; 14: e29150.
20. Park J, Karmaus W, Zhang H. Prevalence of and risk factors for depressive symptoms in Korean women throughout pregnancy and in postpartum period. *Asian nursing research*. 2015; 9: 219-225.
21. Kirpinar I, Gözüm S, Pasinlioğlu T. Prospective study of postpartum depression in eastern Turkey prevalence, socio-demographic and obstetric correlates, prenatal anxiety and early awareness. *Journal of Clinical Nursing*. 2010; 19: 422-431.
22. Pinem BS, Effendy E. Postpartum Depression: A Case Report of Bedapu from Aceh Singkil. *Open Access Macedonian Journal of Medical Sciences*. 2019; 7: 2661-2663.
23. Prevalence of postpartum major depression and depressive symptoms in Spanish women: A longitudinal study up to 1 year postpartum.
24. Chalise A, Bhandari TR. Postpartum depression and its associated factors: a community-based study in Nepal. 2019; 17: 200-205.
25. Zainal NZ, Kaka AS, Ng CG, Jawan R, Gill JS. Prevalence of postpartum depression in a hospital setting among Malaysian mothers. *Asia-Pacific Psychiatry*. 2012; 4: 144-149.
26. Baker L, Oswalt K. Screening for postpartum depression in a rural community. *Community mental health journal*. 2008; 44: 171-180.
27. McGarry J, Kim H, Sheng X, Egger M, Baksh L. Postpartum depression and help-seeking behavior[J]. *Journal of midwifery & women's health*. 2009; 54: 50-56.
28. Bruce DF: An overview of postpartum depression. 2022.
29. Shorey S, Chee CYI, Ng ED, Chan YH, Tam WWS, Chong YS. Prevalence and incidence of postpartum depression among healthy mothers: A systematic review and meta-analysis. *Journal of psychiatric research*. 2018; 104: 235-248.
30. Slomian J, Honvo G, Emonts P, Reginster J-Y, Bruyère O. Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. *Women's Health*. 2019; 15: 1745506519844044.
31. Li Na, Wang Yaxin, She Guifang, Lei Qing, Sun Hongyan. Network Meta-analysis of the impact of non-drug interventions on postpartum depression. *Journal of Mudanjiang Medical College*. 2023; 44: 114-120.
32. Appleby L, Warner R, Whitton A, Faragher B. A controlled study of fluoxetine and cognitive-behavioural counselling in the treatment of postnatal depression. *Bmj*. 1997; 314: 932-6.
33. Stowe ZN, Casarella J, Landry J, Nemeroff C. Sertraline in the treatment of women with postpartum major depression. *Depression*. 1995; 3: 49-55.
34. Gorbach SL. Use of isoflavonoids in the treatment or prevention of postpartum depression: U.S. Patent 6,083,526. 2000-7-4.
35. Suri R, Burt VK, Altshuler LL, Zuckerbrow-Miller J, Fairbanks L, Angeles L. Fluvoxamine for postpartum depression. *American Journal of Psychiatry*. 2001; 158: 1739-1740.
36. Misri S, Abizadeh J, Albert G, Carter D, Ryan D. Restoration of functionality in postpartum depressed mothers: an open-label study with escitalopram. *Journal of Clinical Psychopharmacology*. 2012; 32: 729-732.
37. Aimetti A, Cashman C, Masuoka L, et al. Ganaxolone for use in prophylaxis and treatment of postpartum depression: U.S. Patent 11,266,662. 2022-3-8.
38. Mahase E. US approves daily pill for postpartum depression. 2023.
39. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding medicine*. 2009; 4: S-17-S-30.
40. Kim DR, Epperson CN, Weiss AR, Wisner KL. Pharmacotherapy of postpartum depression: an update. *Expert opinion on pharmacotherapy*. 2014; 15: 1223-1234.
41. Liu Lanjuan, Han Bin, Liu Cheng, Zhang Ruizhe, Wang Xin. Research progress on the intervention effect and mechanism of yoga on prenatal depression. *China Sports Science and Technology*. 2023; 59: 44-50.
42. Zhang S, Lu Z, Kang X, Zhang X. Analysis of the effect of postpartum rehabilitation nursing on the management of postpartum depression. *JPMA. The Journal of the Pakistan Medical Association*. 2020; 70: 9-15.
43. Stuart S, O'HARA MW. Interpersonal psychotherapy for postpartum depression: a treatment program. *The Journal of psychotherapy practice and research*. 1995; 4: 18-29.
44. Miniati M, Callari A, Calugi S, Rucci P, Savino M, Mauri M, et al. Interpersonal psychotherapy for postpartum depression: a systematic review. *Archives of women's mental health*. 2014, 17: 257-268.
45. Posmontier B, Teitelbaum M. An Ayurvedic approach to postpartum depression. *Holistic Nursing Practice*. 2009; 23: 201-214.
46. Nauphal M, Mischoulon D, Uebelacker L, Streeter C, Nyer M. Yoga for the treatment of depression: Five questions to move the evidence-base forward. *Complementary therapies in medicine*. 2019; 46: 153-157.
47. Uebelacker LA, Epstein-Lubow G, Gaudio BA, Tremont G, Battle CL, et al. Hatha yoga for depression: critical review of the evidence for efficacy, plausible mechanisms of action, and directions for future research. *Journal of Psychiatric Practice®*. 2010; 16: 22-33.
48. Liu Lanjuan, Si Huke, Liu Cheng. Sports competitive intelligence analysis of the evolution and frontier trends of international yoga research. *China Sports Science and Technology*. 2015; 51: 105-113+125.
49. Demirel G, Egri G, Yesildag B, Doganer A. Effects of traditional practices in the postpartum period on postpartum depression. *Health care for women international*. 2018; 39: 65-78.
50. Dhamodhini KS, Mahesh Kumar K, Silambanan S, Kantipudi SJ, Sathianathan R. Development and validation of yoga protocol for patients with depression. *Annals of Neurosciences*. 2023; 30: 96-99.
51. Woolery A, Myers H, Stemlieb B, Zelter L. A yoga intervention for young adults with elevated symptoms of depression. *Alternative Therapies in Health & Medicine*. 2004; 10: 60-3.
52. Lin IH, Huang CY, Chou SH, Shih CL. Efficacy of prenatal yoga in the treatment of depression and anxiety during pregnancy: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*. 2022; 19: 5368.
53. Buttner MM, Brock RL, O'Hara MW, Stuart S. Efficacy of yoga for depressed postpartum women: a randomized controlled trial. *Complementary therapies in clinical practice*. 2015; 21: 94-100.

54. Broughton MK. Yoga for depression and anxiety: a review of published research and implications for healthcare providers. *Rhode Island Medical Journal*. 2016; 99: 20-2.
55. Cramer H, Lauche R, Langhorst J, Dobos G. Yoga for depression: A systematic review and meta-analysis. *Depression and anxiety*. 2013; 30: 1068-1083.
56. Fitelson E, Kim S, Baker AS, Leight K. Treatment of postpartum depression: clinical, psychological and pharmacological options. *International journal of women's health*. 2011; 3: 1-14.
57. McGarry J, Kim H, Sheng X, Egger M, Baksh L. Postpartum depression and help-seeking behavior[J]. *Journal of midwifery & women's health*. 2009; 54: 50-56.
58. Werner E, Miller M, Osborne LM, Kuzava S, Monk C. Preventing postpartum depression: review and recommendations. *Archives of women's mental health*. 2015; 18: 41-60.
59. Flores DL, Hendrick VC. Etiology and treatment of postpartum depression. *Current Psychiatry Reports*. 2002; 4: 461-466.
60. Corrigan L, Moran P, McGrath N, Eustace-Cook, J, Daly D. The characteristics and effectiveness of pregnancy yoga interventions: a systematic review and meta-analysis. *BMC Pregnancy and Childbirth*. 2022; 22: 1-21.
61. Wang G, Liang C, Sun G. Yoga's Therapeutic Effect on Perinatal Depression: A Systematic Review and Meta-Analysis. *Psychiatra Danubina*. 2022; 34: 195-204.
62. Broughton MK. Yoga for depression and anxiety: a review of published research and implications for healthcare providers. *Rhode Island Medical Journal*. 2016; 99: 20.
63. Ng QX, Venkatanarayanan N, Loke W, Yeo WS, Lim DY, Chan HW, et al. A meta-analysis of the effectiveness of yoga-based interventions for maternal depression during pregnancy. *Complementary therapies in clinical practice*. 2019; 34: 8-12.
64. Adams JAM, Chandra P, Mehta D. The first large GWAS meta-analysis for postpartum depression. *American Journal of Psychiatry*. 2023; 180: 862-864.
65. Zhu Y, Wang R, Tang X, Li Q, Xu G, Zhang A. The effect of music, massage, yoga and exercise on antenatal depression: A meta-analysis. *Journal of affective disorders*. 2021; 292: 592-602.
66. Powder K, Fingerhut P, Hilton C. Effects of Yoga, Social Support Groups, and Kangaroo Care on Post Partum Depression: A Systematic Review. *Journal of Korean Academy of Occupational Therapy*. 2019; 27: 157-169.
67. Pan Y, Xu J. Can EPDS and EPDS-3A be used to replace GAD-7 to screen the anxiety of pregnant women during pregnancy examination?. *International Journal of Gynecology & Obstetrics*. 2024; 164: 902-911.
68. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*. 2015; 4: 1-9.
69. Affonso DD, De AK, Horowitz JA, Mayberry LJ. An international study exploring levels of postpartum depressive symptomatology. *J Psychosom Res*. 2000; 49: 207-16.
70. Pop VJ, Komproue JH, van Son MJ. Characteristics of the Edinburgh post-natal depression scale in The Netherlands. *J Affect Disord*. 1992; 26: 105-10.
71. Hopkins J, Campbell SB, Marcus M. Postpartum depression and postpartum adaptation: overlapping constructs?. *Journal of Affective Disorders*. 1989; 17: 251-254.
72. Wu Yuanxiu. Effect of aerobics combined with yoga on depression in postpartum women. Zhejiang Normal University. 2023.
73. Lin Zhiyuan. Research on the effect of yoga on postpartum women's depression. Shandong: Shandong Institute of Physical Education. 2021.
74. Shu Ling, Tan Chuang, Wu Chuanfang, Xi Mingxia, Tan Huimin, Zhao Wei, Qu Qunfang. Study on the intervention effect of group mindfulness yoga on postpartum depression in pregnant women with second children. *Chinese General Medicine*. 2019; 22: 2739-2743.
75. Li Quanquan, Li Miyun, Yang Jie. Analysis of the effect of psychological intervention on postpartum depression in pregnant women with second children. *Health Education and Health Promotion*. 2020; 15: 307-309,339.
76. Liu Tengfei, Zhang Shanshan. The preventive effect of mindfulness yoga training combined with psychological care on postpartum depression (PDD) in pregnant women with second children. *Journal of Shanxi Health Vocational College*. 2022; 32: 92-94.
77. Li Li, Gao Lin. Effects of yoga exercise combined with psychological counseling on the mental health, body shape and pelvic floor function recovery of primiparas with postpartum depression. *Chinese Journal of Health Psychology*. 2019; 27: 118-123.
78. Armstrong K, Edwards H. The effectiveness of a pram-walking exercise programme in reducing depressive symptomatology for postnatal women. *International journal of nursing practice*. 2004; 10: 177-194.
79. Bigelow A, Power M, MacLellan-Peters J, Alex M, Mc Donald C. Effect of mother/infant skin-to-skin contact on postpartum depressive symptoms and maternal physiological stress. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2012; 41: 369-382.
80. Herizchi S, Hosseini MB, Ghoreishzadeh M. The impact of kangaroo-mother care on postpartum depression in mothers of premature infants. *Int J Womens Health Reprod Sci*. 2017; 5: 312-7.
81. Cramer H, Lauche R, Anheyer D, Pilkington K, de Manincor M, Dobos G, et al. Yoga for anxiety: A systematic review and meta-analysis of randomized controlled trials. *Depression and anxiety*. 2018; 35: 830-843.
82. Rong L, Dai LJ, Ouyang YQ. The effectiveness of prenatal yoga on delivery outcomes: A meta-analysis. *Complementary therapies in clinical practice*. 2020; 39: 101157.
83. Rong L, Dai LJ, Ouyang YQ. The effectiveness of prenatal yoga on delivery outcomes: A meta-analysis. *Complementary therapies in clinical practice*. 2020; 39: 101157
84. Wu Yuanxiu. Effect of aerobics combined with yoga on depression in postpartum women. Zhejiang Normal University. 2023.
85. Lin Zhiyuan. Research on the effect of yoga on postpartum women's depression[D]. Shandong: Shandong Institute of Physical Education. 2021.
86. Shu Ling, Tan Chuang, Wu Chuanfang, Xi Mingxia, Tan Huimin, Zhao Wei, Qu Qunfang. Study on the intervention effect of group mindfulness yoga on postpartum depression in pregnant women with second children. *Chinese General Medicine*. 2019; 22: 2739-2743.
87. Li Quanquan, Li Miyun, Yang Jie. Analysis of the effect of psychological intervention on postpartum depression in pregnant women with second children. *Health Education and Health Promotion*, 2020; 15: 307-309,339.
88. Liu Tengfei, Zhang Shanshan. The preventive effect of mindfulness yoga training combined with psychological care on postpartum depression (PDD) in pregnant women with second children. *Journal of Shanxi Health Vocational College*. 2022; 32: 92-94.

89. Li Li, Gao Lin. Effects of yoga exercise combined with psychological counseling on the mental health, body shape and pelvic floor function recovery of primiparas with postpartum depression. *Chinese Journal of Health Psychology*. 2019; 27: 118-123.
90. Rathi A, Khapre S, Chavada J, Gupta S, Singla T. Postpartum Depression and Its Biological Biomarkers. *Cureus*. 2022; 14.
91. Wang S, Liu Y. Analysis of the Intervention of Yoga on Emotion Regulation Based on Big Data. *International Conference on Cognitive based Information Processing and Applications (CIPA 2021)*. Springer Singapore. 2022: 1: 402-409.
92. Xu Kai. Research on the intervention effect of yoga on pelvic floor function, body shape and mental health of postpartum women. Zhengzhou University. 2020.
93. Xu Kai. Research on the intervention effect of yoga on pelvic floor function, body shape and mental health of postpartum women. Zhengzhou University. 2020.
94. Narendran S, Nagarathna R, Narendran V, et al. Efficacy of yoga on pregnancy outcome[J]. *Journal of Alternative & Complementary Medicine*. 2005; 11: 237-244.
95. Rong L, Dai LJ, Ouyang YQ. The effectiveness of prenatal yoga on delivery outcomes: A meta-analysis. *Complementary therapies in clinical practice*. 2020; 39: 101157.
96. Taylor MJ. Yoga therapeutics: an ancient, dynamic systems theory. *Techniques in Orthopaedics*. 2003; 18: 115-125.
97. Newham J J, Wittkowski A, Hurley J, Aplin JD, Westwood M. Effects of antenatal yoga on maternal anxiety and depression: a randomized controlled trial. *Depression and anxiety*. 2014; 31: 631-640.
98. Davis K, Goodman SH, Leiferman J, Taylor M, Dimidjian S. A randomized controlled trial of yoga for pregnant women with symptoms of depression and anxiety. *Complementary therapies in clinical practice*. 2015; 21: 166-172.
99. Lauche R, Sibbritt D, Ostermann T, Fuller NR, Adams J, CramerH. Associations between yoga/meditation use, body satisfaction, and weight management methods: Results of a national cross-sectional survey of 8009 Australian women. *Nutrition*. 2017; 34: 58-64