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REVIEW

The effect of yoga on maternal stress and anxiety: A systematic review

Richard N. Schlegel

Melbourne Clinical School, The University of Notre Dame, Werribee, VIC, Australia

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Corresponding Author:
Richard N. Schlegel
300 Princess Highway, Werribee, VIC, 3030, Australia
richard.schlegel1@my.nd.edu.au

SUMMARY
No strong evidence exists to suggest that yoga practice during pregnancy reduces maternal stress or anxiety. This systematic review revealed that reported findings of studies included should be interpreted with caution due to paucity and methodological inadequacies; and these studies were subject to numerous factors that affected the validity of the results, including subjectively measured outcomes, variable yoga experience of participants, and the type and duration of yoga interventions. Further investigations involving rigorous study design are needed to properly evaluate and assess the impact of yoga on maternal stress and anxiety.

Key Words
Maternal, pregnancy, anxiety, stress, yoga

ABSTRACT

Background

Maternal stress and anxiety are risk factors for mental illness, obstetric complications, and preterm birth. Yoga remains a popular choice of exercise during pregnancy, particularly with women suffering from stress or anxiety. However, no systematic review has thoroughly evaluated the influence of yoga on maternal stress or anxiety.

Aims

To evaluate the evidence for yoga in reducing maternal stress and anxiety during pregnancy.

Method

A systematic review was conducted to investigate the effect of yoga on maternal stress and anxiety during pregnancy. The total number of articles retrieved from the search strategy was 2,216; 158 duplicates were removed. After applying a primary relevance assessment (title and abstract), 1,977 papers were excluded, leaving 81 papers for further analysis. Inclusion and exclusion criteria were applied, and a further 69 papers were removed. Twelve papers remained for analysis.

Conclusion

Analysis of the studies included in this systematic review revealed no strong evidence to suggest that yoga practice during pregnancy reduces maternal stress or anxiety. This lack of strong evidence is due to numerous factors, including methodological inadequacies that confounded the validity of the results, subjectively measured outcomes, variable yoga experience of participants, and the type and duration of yoga interventions. This systematic review indicates that evidence regarding the influence of yoga on maternal stress and anxiety is currently limited. Further investigations involving rigorous study design are needed to properly evaluate and assess the impact of yoga on maternal stress and anxiety.

BACKGROUND

Approximately 17 per cent of pregnant women are clinically diagnosed with antenatal anxiety,[1] and 9 per cent of women self-report anxiety-like symptoms during pregnancy.[2] To date, maternal stress is broadly defined and includes psychological distresses such as anxiety and life events (eg, the result of a traumatic event), and during pregnancy they are significant risk factors for the development of psychiatric illness, obstetric complications, preterm birth, cognitive impairment, and psychopathology in offspring.[3,4] Maternal perturbations during pregnancy can be detrimental to fetal growth and are associated with reduced birth weight and increased susceptibility to diseases such as hypertension and diabetes during later adult life.[5] Alleviating maternal stress may therefore prevent deleterious outcomes for both mother and child.

Currently, antidepressant medications, including selective serotonin reuptake inhibitors (SSRIs), are the first-line treatment for alleviating psychological symptoms during pregnancy.[6,7] The Royal Australian and New Zealand College of Psychiatrists' (RANZCP) clinical practice guidelines recommend that the risks associated with maternal psychological stressors (eg, suicidality) and its consequences must be carefully balanced against the risks of medications to both the mother and infant during pregnancy and the antenatal period.[8] The use of such medications is associated with an increased risk of birth defects, preterm birth, low birth weight, abnormal growth, impairment of motor skills and cognition, and other adverse pregnancy outcomes.[9–12] A large proportion of women perceive and associate medication use of any kind during pregnancy with an unacceptable risk of teratogenicity, leading to many women choosing not to use medications during pregnancy.[13] Due to the inherent risks of using antidepressant medications, women are exploring alternatives such as yoga and other mind-body therapies to improve psychological health during pregnancy.[14,15] In particular, patients suffering from anxiety are more likely to access mind-body therapies as an adjunct to medical treatment as they are perceived to improve mental health outcomes.[16]

Maternal psychological stressors may be reduced through the practice of specific mindfulness techniques such as yoga to promote a state of deep relaxation and calmness.[17] Currently, an estimated 13 per cent of women practice yoga throughout maternity.[18] Yoga primarily focuses on achieving balance between the mind and body through physical poses (asana), breathing methods (pranayama), and meditation.[19] Furthermore, yoga has many variations, including Hatha, Dru, and Vinyasa, which have similarities and key differences. For instance, Hatha yoga focuses on more traditional elements, including breathing, posture, and meditation. Dru yoga similarly focuses on breathing, posture, and meditation, but also incorporates elements of relaxation. Conversely, Vinyasa focuses on movement and the flow of transition between postures. The physical postures held during these yoga styles can be adapted to low-impact variations suitable for pregnancy.[17]

The reported benefits of these types of yoga include reduced levels of anxiety, depression, prenatal disorders, pain, stress, and increased relationship scores, gestational age, and birth weight.[20–22] The proposed mechanism by which yoga facilitates these changes is suggested to occur through self-regulation and maintenance of behavioural changes by inhibiting both higher and lower level brain networks when faced with stress-related physical or emotional challenge.[23] However, many of these outcomes were reported in studies that combined yoga with other forms of intervention (eg, mindfulness),[24] and it is therefore difficult to attribute these findings regarding mental health to yoga alone. No systematic review

exists that has thoroughly evaluated the literature regarding the practice of yoga during pregnancy and the influence on maternal stress and anxiety. This study's objective was to synthesise the best available evidence of whether yoga is an effective intervention in reducing stress and anxiety during pregnancy.

METHOD

Search strategy

A systematic review was conducted using EBSCOhost to simultaneously search three library databases (MEDLINE, CINAHL Plus, and PsycINFO) for literature regarding yoga and its influence on maternal stress and anxiety outcomes. Literature published in English up to March 2018 were considered. Subject headings (MeSH terms and descriptors) were identified to cover the key concepts of maternal anxiety, stress, and yoga practice to identify relevant studies. This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statement.

Databases were searched using the following key terms:

MH "Meditation" OR "meditation" OR MH "Yoga+" OR "yoga" OR MH "Mindfulness" OR MH "Mind-Body Therapies+" OR "mindfulness" OR MH "Exercise+" OR "exercise" OR MH "Therapeutic Exercise+" OR MH "Exercise Positions+", DE "Yoga" OR DE "Mindfulness" OR DE "Meditation" OR DE "Exercise" OR DE "Movement Therapy"

AND

MH "Maternal Health" OR MH "Expectant Mothers" OR MH "Mothers+" OR MH "Pregnancy+" OR "pregnan*" OR MH "Maternal Health" OR MH "Pregnancy+" OR MH "Pregnant Women" OR DE "Pregnancy" OR DE "Mothers" OR "Pregnan*" OR "Matern*" OR "Postpartum", DE "Pregnancy" OR DE "Pregnancy Outcomes" OR DE "Prenatal Care" OR DE "Mothers"

AND

MH "Anxiety+" OR "anx*" OR MH "Anxiety Disorders+" OR MH "Stress+" OR "stress*" OR MH "Stress, Physiological" OR MH "Stress, Psychological+", DE "Anxiety" OR DE "Anxiety Disorders" OR DE "Acute Stress Disorder" OR DE "Anxiety Management" OR DE "Stress" OR DE "Chronic Stress" OR DE "Psychological Stress" OR DE "Stress and Coping Measures" OR DE "Stress Management" OR DE "Physiological Stress"

Inclusion and exclusion criteria

A primary relevance assessment of papers by title and abstract was used to identify papers where the effects of yoga on maternal stress or anxiety was a primary focus. Inclusion and exclusion criteria were applied to identify the final yield of papers. All studies chosen for this review were primary research articles that had undergone peer review. Outcome measures for anxiety were limited to maternity and effects on the mother (ie, excluding infant and childhood outcomes) and were only included if yoga classes were conducted by a trained instructor. This inclusion criteria limited the heterogeneity of results from women practicing yoga as a home exercise or from untrained instructors. Outcome measures for anxiety were validated quantitative scales such as the State Trait Anxiety Inventory (STAI) or measuring salivary cortisol

levels following the yoga intervention. Yoga also had to be included as an individual group for comparison with stress or anxiety as a quantifiable outcome measure. That is, if yoga was combined with other forms of intervention and did not include a "yoga-only" group, the study was excluded from this review. Similarly, qualitative-only analyses and studies that were published in a language other than English were excluded.

Study selection

In total, our search strategy (search conducted 10 March 2018) yielded 2,216 articles. A total of 158 duplicates were removed. After applying a primary relevance assessment (title and abstract), 1,977 papers were excluded, leaving 81 papers for further analysis. Inclusion and exclusion criteria were applied (as above) and a further 69 papers were removed. This yielded a total of 12 papers to be included for the systematic review (Figure 1).

Data extraction and study appraisal

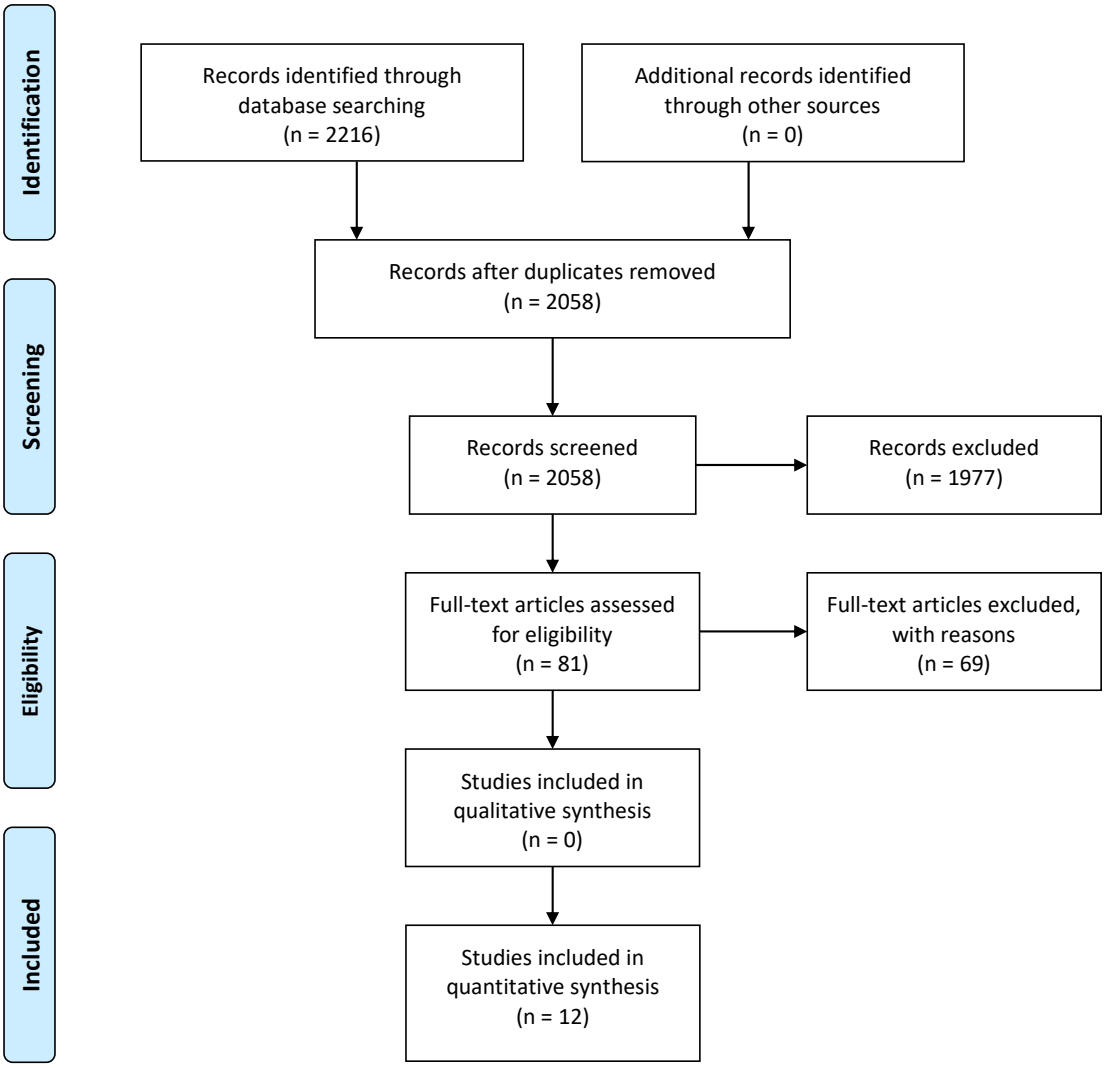
The PRISMA Checklist (2009) was used for data extraction and quality checking of included studies. Bias was assessed as per the Cochrane Handbook for Systematic Reviews of Interventions, and studies that were deemed as having a high-risk of bias (eg, concerns in multiple domains such as bias arising from the randomisation process, deviation from intended interventions, missing outcome data, or bias in measurement of the outcome) were excluded from this review. Data extraction was conducted by one reviewer. Participant characteristics, study design, and results were extracted. The Critical Appraisal Skills Programme (CASP) was used as a tool for appraisal of the selected studies in this systematic review. A meta-analysis was not possible due to heterogeneity in yoga interventions and outcome measures.

RESULTS

Study characteristics

Characteristics of the 12 included studies have been summarised in Table 1. Included studies (N=12) were published between 2009 and 2017. Overall, a total of 829 participants were included in this review. The sample sizes of studies ranged from 32 to 96. Most studies included in this review were of similar socioeconomic status. One study, however, stated that yoga participants differed sociodemographically to the relaxation (control) participants, with the relaxation group having lower annual household income and fewer university graduates than the yoga group.[25] This study also stated that the difference in sociodemographic group differences point to the lower availability and affordability of yoga to pregnant women of lower socioeconomic status and may have posed a threat to the internal validity of their findings.

Figure 1: Prisma flow diagram of the study selection process



Study design

Evaluating the design of each study was critical in determining the validity of outcomes and potential biases in this review. Ten of the 12 studies included in this review randomised participants to control or yoga intervention groups. This particular aspect of study design positively contributed to the internal validity of these studies by removing allocation bias. However, due to the nature of the interventions, it was impossible to blind participants to their allocated group. This may have affected the participants' judgement and perceived level of stress or anxiety by not receiving the yoga intervention as part of the study. Although the inability to blind participants may also be considered a form of performance bias, it is impossible to avoid the influence that this particular style of intervention may have on measured outcomes.

Additionally, control and comparison group(s) varied substantially between studies that were included in this review. The comparisons included routine prenatal care, relaxation, standard prenatal exercises (eg, stretching), social support, or massage. One study used a pre-post test design,[21] and another study used a

mixed-within and between-subject design.[25] Although most of these studies randomised participants to control or yoga intervention groups, it was difficult to compare outcomes due to varying control groups (eg, standard antenatal exercises, prenatal stretching, social support, treatment–as–usual, routine prenatal care) and a meta-analysis could not be conducted.

Quantitative outcomes

Evaluating the quantitative methods used in each study included in this review also provided valuable information regarding the subjectivity/objectivity of outcomes regarding maternal stress and anxiety. Studies included in this review used a range of quantitative methods, including participant questionnaires such as the State-Trait Anxiety Inventory (STAI), The Inventory of Depression and Anxiety Symptoms (IDAS), the Perceived Stress Scale (PSS), or more physiological-based parameters such as salivary cortisol levels or electrocardiogram (ECG) monitoring for heart rate variability (HRV).

Eleven studies surveyed participants who self-reported reduced stress and anxiety levels by questionnaire. STAI, used by five studies,[26–30] was the most common questionnaire used. Three studies used the PSS,[31–33] making it the second most common questionnaire. One study used the IDAS questionnaire.[34]

Salivary cortisol was the most common physiological parameter used to measure stress and was used by five studies. These studies reported reductions in either salivary cortisol, salivary alpha-amylase, or an increase in long-term salivary immunoglobulin A levels, indicating a reduction in stress and anxiety and improved immune function.[21,25,28,30,35] Although Bershadsky *el al*[25] reported an immediate reduction in salivary cortisol levels following yoga intervention, there was no significant long-term effect on salivary cortisol levels. A single study[32] using ECG (HRV) reported improvements in the adaptive autonomic response to stress.

As stress and anxiety are often influenced by individual circumstances, self-reported questionnaires become a subjective measure of emotional wellbeing and reduced the objectivity of study findings. These subjective measures of emotional wellbeing are opposed to more objective measures of stress and anxiety (ie, salivary cortisol) that eliminate subjective perspectives of measured outcomes. As most studies included in this review evaluated stress and anxiety by (subjective) self-reported questionnaires, these studies raised concerns regarding the validity of findings and conclusions drawn from these studies.

The time between yoga intervention and anxiety measurements varied substantially between studies. Bershadsky *et al*[25] conducted a single yoga session before measuring cortisol levels but did not investigate the long-term effects of the yoga intervention. Conversely, the total duration of interventions from other studies ranged between 4 to 36 weeks.[31,33] Only four studies[21,28,30,35] compared stress or anxiety levels following a single yoga session to stress or anxiety levels at the completion of the yoga intervention.

Conversely, the differences reported in long-term outcomes regarding yoga and its influence on maternal stress and anxiety highlight a clear need for further investigation to resolve potentially conflicting evidence, particularly with regard to salivary cortisol and immunoglobulin A levels. Chen *et al*[35] reported immediate reductions in salivary cortisol and immunoglobulin A levels after a single yoga session but found no long-term effect on salivary cortisol level and reported significantly higher long-term salivary immunoglobulin A levels in the yoga intervention group compared to the control group (after a 20–week

intervention). However, Kusaka *et al*[21] found that yoga practice reduced salivary cortisol and alpha-amylase concentrations significantly (at 34–37 gestational weeks; intervention commenced at 20 gestational weeks). These outcomes, however, may have been confounded by variations in the timing of collection of salivary samples, as cortisol levels are known to significantly vary both diurnally and as pregnancy advances.[36]

Yoga experience of participants

Participants' past experience of yoga was also evaluated in this review as it may have contributed to variations in perceived stress and anxiety outcomes. Here, it was identified that participants' past experience with yoga significantly varied between studies. Three studies stated that participants had previous yoga experience prior to the intervention.[25,28,34] Buttner *et al*[34] reported that nearly half of participants in the yoga intervention group had previous yoga experience, yet Newham *et al*[28] reported that only two participants had practiced yoga outside of the intervention. Bershadsky *et al*[25] stated that women recruited were already enrolled in prenatal yoga classes prior to intervention.

These findings were further confounded by numerous studies providing participants with a yoga DVD or pre-recorded instruction cassette for home yoga practice.[21,29,32–34] The use of a home DVD/cassette for additional yoga practice may have contributed to a performance bias in the intervention groups, as investigators had no control over participants' home practice of yoga. Practicing yoga independently outside of prescribed yoga classes is likely to have led to variations in antenatal stress and anxiety levels following the respective interventions. However, since the participants' actual use of the yoga DVD/cassette was unrecorded by participants in four of these studies,[21,29,32,34] it is impossible to estimate the influence of this variable on stress and anxiety outcomes. Furthermore, selection bias was also present in studies using women that were already enrolled in prenatal yoga classes prior to the intervention. Women already enrolled in prenatal yoga classes prior to the intervention may also have influenced stress and anxiety levels, but specific details regarding previous exposure and experience with yoga was unquantified in these studies. Collectively, the variability in home practice and selection bias in participants' past experience of yoga are both likely contributors to variations in antenatal stress and anxiety outcomes.

Yoga intervention characteristics

Evaluating the specific yoga characteristics used by each study in this review provided valuable information regarding the type, duration, and length of each intervention. The studies included for analysis used a variety of yoga interventions and techniques, including postures, breathing, and meditation. These included Hatha (N=2),[25,28] Vinyasa (N=2),[26,34] Dru (N=1),[33] and other forms (N=3)[29,31,32] based on concepts from yoga scriptures (derived from yoga sutras, including Patanjali and Mandukya Karika). Although yoga techniques were often described as being adapted for pregnancy, four studies did not mention where core yoga techniques were derived, and so the specific form of yoga used as their intervention was unknown.[21,27,30,35] Two studies focused on balance and posture exercises,[25,30] whereas two other studies focused on breathing and relaxation.[34,35] Furthermore, three studies that derived yoga classes from scriptures did not specifically state which components were used.[29,31,32]

Each of these forms of yoga emphasises self-awareness achieved through mindful coordination of breathing and body movement. Despite the numerous similarities between these individual forms of yoga,

each type varies in its components, including breathing, posture, meditation, and relaxation. Both Hatha and Dru yoga share elements of breathing, posture, and meditation, but Dru yoga also incorporates elements of relaxation. However, Vinyasa yoga focuses heavily on the flow and transition of movement between postures. In addition, these fundamental elements of yoga are further modified during the antenatal period as yoga styles are often adapted for pregnancy.[17] These key differences in yoga components between studies and exercise modifications for pregnancy create variability both between and within yoga forms that cannot be compared directly. It is therefore difficult to draw conclusions regarding the effectiveness of each intervention due to the inability to conduct a meta-analysis. Currently, the published literature does not clearly indicate which specific forms of yoga are most effective in reducing maternal stress and anxiety, but it may also prove difficult to develop comparison groups to control these individual elements and inconsistencies throughout each intervention.

The yoga interventions used for each study also varied significantly in intensity, duration, and exercises conducted. The duration of yoga classes ranged from 20 minutes to two hours.[27,28,30,32] Furthermore, the number of yoga classes attended also varied, as some interventions were continued twice weekly for 12 weeks,[27] whereas other interventions measured outcomes after a single session of yoga.[25] This large variability in class length and total duration of each intervention created even further difficulty in comparing the findings of each study. Field *et al*[30] suggested that some of these findings are not readily comparable to other yoga interventions due to yoga sessions being shorter (only 20 minutes total duration) than previous research that had documented the anxiolytic effects of yoga.

DISCUSSION

Summary of key findings

This systematic review provides a summary of clinical studies regarding the effectiveness of yoga in pregnancy to reduce maternal psychological stress. The results of this review indicate that currently there is limited evidence regarding the influence of yoga on maternal stress and anxiety. Further and more robust studies are needed to clinically support the practice of yoga during pregnancy as an alleviator of stress and anxiety.

Comparison to the wider literature

To date, multiple studies have investigated the influence of yoga on mental health outcomes, such as stress and anxiety, in non-pregnant adult populations.[37,38] Although these studies reported yoga may be effective in alleviating stress and anxiety, reviews of this evidence have collectively shown that these studies should be interpreted with caution due to paucity and methodological inadequacies.[39,40] Furthermore, studies investigating mental health outcomes in non-pregnant adult populations following yoga interventions have been subject to numerous criticisms. These reviews have highlighted that interpretation of the literature regarding the practice of yoga in non-pregnant adult populations for the treatment of mental health disorders is often constrained by methodological limitations, including small numbers, variations in measurement tools and interventions, poor documentation of procedures, and blinding methods.[41,42] These criticisms from the wider literature regarding yoga and its influence on mental health outcomes are consistent with the findings of this systematic review. Likewise, this review has highlighted that the studies included in this review should also be interpreted with caution due to similar methodological inadequacies.

Strengths and limitations

There were limitations identified within this systematic review. Firstly, despite searching numerous databases (MEDLINE, CINAHL Plus, and PsycINFO) using a thorough search strategy, only 12 studies met the inclusion criteria. This review included only a narrow definition of yoga (as per inclusion criteria) that excluded practices containing yoga as part of a wider intervention (eg, mindfulness-based stress reduction programs that commonly incorporated aspects of yoga in the intervention). It was difficult to delineate clearly the impact of yoga in these combined interventions regarding maternal stress and anxiety due to a lack of a yoga-only comparison group. The yoga component(s) of these wider interventions were often poorly defined or unclear and were therefore excluded from the final review. These exclusions significantly limited the total number of studies that could be included for analysis. Furthermore, as previously discussed there was significant heterogeneity in quantitative methods of studies included in this review, as well as time between yoga interventions and recorded anxiety measurements. The variability in yoga interventions, quantitative outcomes and lack of detail in yoga descriptions made comparison and interpretation of the included studies difficult and precluded a meta-analysis from being conducted. Furthermore, the specific type and level of training of instructors from each study included in this review was also unclear, and it was therefore difficult to draw conclusions regarding the consistency and delivery of yoga classes to participants. This review also excluded qualitative studies as part of the selection criteria. Although this exclusion allowed for the selection of studies that were potentially more objective in measured outcomes, this approach may also have precluded valuable information and insight into women's individual perceptions of yoga and its perceived influence on stress and anxiety during pregnancy. Similarly, studies in languages other than English were excluded, which may have also contributed to language bias. However, despite these limitations, this systematic review has successfully described the state of research regarding the influence of yoga on maternal stress and anxiety and can help direct future investigations.

Future directions

Based on the findings of this systematic review, there are numerous suggested future directions which can influence the state of research regarding maternal yoga and its influence on stress and anxiety.

First, concerns were raised regarding the use of self-reported questionnaires as a subjective measure of emotional wellbeing, which reduced the objectivity of study findings. Future investigations therefore need to specifically use more physiological parameters such as plasma or salivary cortisol, alpha-amylase or HRV as primary measures of stress and anxiety to reduce subjectivity with regard to outcomes measured.

Second, it was difficult to compare outcomes between studies due to varying control groups. To allow for a clearer comparison between studies and meta-analysis of results, future investigations need to use a standardised and commonly accepted control. Arguably, control groups such as "routine prenatal care" as discussed by Chen *et al*[35] may prove to be an appropriate baseline and comparator for measured outcomes regarding antenatal stress and anxiety. This choice of control is due to its minimal intervention and has no measurable effect on maternal stress as measured by salivary cortisol.[35]

Third, there were numerous other confounders that affected the validity of results, including variable yoga experience of participants, and varying type and duration of yoga interventions. The discrepancies in outcomes between these studies highlight the need for future investigations to rectify and/or validate

current findings regarding the influence of yoga on maternal stress and anxiety. These studies need to specifically investigate how altering the duration and frequency of yoga practices influences its anxiolytic effect and which yoga practices are most beneficial for alleviating stress and anxiety during maternity. Furthermore, future studies also need to use more stringent inclusion/exclusion criteria for participants by controlling (or excluding) for patients with prior yoga experience and home practice during interventions. These studies could also benefit from investigating the influence of providing participants with a home yoga DVD/cassette, and whether its usage is inversely correlated with antenatal stress and anxiety in these individuals.

Finally, there were issues regarding poor documentation of procedures and defining yoga interventions. In particular, the lack of description regarding the methods and components of yoga classes for numerous studies created difficulties in defining the specific yoga intervention in these particular studies. Future investigations should therefore aim to provide a more adequate description of included intervention(s) to improve the reproducibility of the study. Future studies will benefit from these aforementioned improvements in measurement tools and interventions. These changes will lead to the design of more rigorous and robust studies with reduced methodological inadequacies that will enhance the state of research regarding the practice maternal yoga and its influence on stress and anxiety.

CONCLUSION

This review has highlighted that the evidence regarding maternal yoga and its influence on stress or anxiety is currently limited. Furthermore, the reported findings of studies included in this systematic review should be interpreted with caution due to paucity and methodological inadequacies. Collectively, the studies included in this review were subject to numerous factors that affected the validity of the results, including subjectively measured outcomes, variable yoga experience of participants, and varying type and duration of yoga interventions. As a result, strong and objective conclusions regarding the influence of yoga on maternal stress and anxiety cannot be made. Further investigations involving rigorous study design are needed to properly evaluate and assess the impact of yoga on maternal stress and anxiety.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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ETHICS COMMITTEE APPROVAL

Not required.

Table 1: Studies included for systematic review after applying inclusion and exclusion criteria

Author, Year	Study Sample Characteristics (N, age)	Yoga Intervention	Quantitative Measure	Summary of Results
Bershadsky et al. 2014[24]	n=51; 43 women were retained; 34 women completed the postpartum questionnaire (retention rate: 64%). At least 18 years old, nulliparous, 12–19 weeks gestational age.	Women participated in a 90–min session of prenatal Hatha yoga. Each session was taught by studio-specific certified prenatal yoga instructors. Classes emphasized squat and balance poses, chest and hip openers, and restorative postures with props. Women who did not practice yoga or other relaxation techniques during pregnancy (control group) were also recruited.	Salivary cortisol level Derogatis Affects Balance Scale (DABS)	Cortisol was lower (p<0.01) and positive affect higher (p<0.001) on yoga compared to usual activity days. Negative affect and contentment (p<0.05) improved more in response to the yoga session.
Buttner et al. 2015[33]	N=57; postpartum women with scores 12 on the Hamilton Depression Rating Scale; randomly assigned to yoga (n=28) or wait-list control (n=29) group; women ages 18 to 45 who gave birth within the past 12 months.	A Gentle Vinyasa Flow class was developed by certified yoga instructors with expertise in yoga for postpartum women. The yoga intervention consisted of 16 one–hour yoga classes over the course of eight weeks. Participants in the yoga intervention were asked to practice at home at least once a week using a DVD that offered a 30–min yoga sequence modelled after the class taught in the studio. Wait-list-control (WLC) participants were asked to refrain from practicing yoga with an instructor and/or seeking other treatments during the eight–week waiting period.	The Inventory of Depression and Anxiety Symptoms (IDAS) The Panic, Social Anxiety, and Traumatic Intrusions scales	The yoga group experienced significantly greater rate of improvement in depression, anxiety, and HRQOL, relative to the control group with moderate to large effects.
Chen et al. 2017[34]	n=94; 16 weeks gestational age; Participants randomly assigned to yoga (n=48) or control (n=46) groups.	20–week intervention; comprised two weekly 70–min yoga sessions led by a midwife certified as a yoga instructor; the control group received only routine prenatal care; yoga included physical postures/stretching, deep breathing, guided imagery, and deep relaxation.	Salivary cortisol level Immunoglobulin A level	The intervention group had lower salivary cortisol (p<0.001) and higher immunoglobulin A (p<0.001) levels immediately after yoga than the control group. However, there was no significant long-term effect on salivary cortisol levels. The intervention group had significantly higher long-term salivary immunoglobulin A levels than the

				control group (p=0.018). Prenatal yoga significantly reduced pregnant women's stress and enhanced their immune function.
Davis et al. 2015[25]	n=46; pregnant women with elevated depression or anxiety symptoms, up to 28 weeks' gestation, 18–45 years of age. Randomly assigned 46 pregnant women with symptoms of depression and anxiety to an eight–week yoga intervention or treatment-as-usual (TAU).	Ashtanga Vinyasa system of yoga modified for pregnancy led by an expert prenatal yoga instructor; eight consecutive 75–min weekly group classes; each yoga class included a series of postures designed for pregnancy and included 5 min of introductory breathing practice, 10 min of synchronising breath, gaze and movement, 20 min of synchronised standing postures, 20 min of synchronised seated postures, and 20 min of cool down and sitting.	The state-trait anxiety inventory (STAI). The positive and negative affect schedule-negative subscale (PANAS-N).	Associated with reductions in symptoms of anxiety and depression; however, prenatal yoga only significantly outperformed TAU on reduction of negative affect.
Deshpande et al. 2013[30]	n=68; 38 in the control group with standard antenatal care and 30 in the YT group, mean age=27.2±5.2.	The YT module used in this study and was selected carefully by the investigators based on previous studies. This module was a holistic approach to well-being at physical, mental, emotional, intellectual, and spiritual levels and was designed to reduce chronic psychological stress experienced during HRP. The practices for the control group involved standard simple prenatal stretching exercises.	Perceived Stress Scale (PSS) scores.	Women who took part in the YT module reported significantly decreased PSS (p=0.02) than the control group where the stress level was increased.
Field et al. 2013[29]	n=92 depressed pregnant women randomly assigned to a yoga (n=46) or a social support group (n=46) at 22 weeks' gestation; age from 20 to 38 years old (mean=24.9±5.2).	The women in the yoga group participated in 20–min sessions once per week for 12 weeks. A trained yoga instructor led group participants through a routine that was specifically designed for women in their second and third trimester of pregnancy. The social support group (a leaderless discussion group) met on the same schedule.	State Anxiety Inventory (STAI) Salivary cortisol level	The yoga group reported less depression, anxiety, anger, back and leg pain as compared to the social support group. At the end of the last session, the yoga group and the

				support group did not differ. Cortisol levels decreased for both groups following each session.
Field et al. 2012[26]	n=84 prenatally depressed women randomly assigned to yoga, massage therapy or standard prenatal care control groups; age 18–40 years old.	12 weeks of twice weekly yoga or massage therapy sessions (20 min each). The yoga and massage sessions began after group assignment at approximately 20 weeks' gestation and continued for 12 weeks until 32 weeks' gestation when the second assessment was made. For the yoga sessions, a trained yoga instructor provided a 20–min yoga routine. The massages were conducted by licensed massage therapists who massaged the women for 10 min lying on each side.	State Anxiety Inventory (STAI)	Both therapy groups versus the control group had a greater decrease on depression, anxiety and back and leg pain scales and a greater increase on a relationship scale.
Kusaka et al. 2016[20]	n=60; mean age 34.4 years. Recruited 60 healthy primiparas without complications.	A one group pre–post test was conducted. The prenatal yoga classes were conducted twice a month. Researchers and a certified yoga instructor held the classes. Each class lasted 60 min, consisting of 15 min of warm-up, 40 min of poses, and 5 min of meditation and breathing with guided instruction. Participants were asked to attend yoga classes twice a month and to practice yoga at their homes using DVD 3 times a week from 20 gestational weeks until childbirth.	Salivary cortisol level Salivary a-amylase level Profiles of Mood States (POMS) Salivary cortisol and alpha-amylase concentration were measured before and after yoga classes at time 1 (27–32 gestational weeks) and time 2 (34–37 gestational weeks).	The mean salivary cortisol and salivary alpha-amylase concentrations declined significantly after each yoga class. The scores for negative dimensions of mood (Trait-Anxiety, Depression, Anger-Hostility, Fatigue, and Confusion) decreased significantly.
Newham et al. 2014[27]	n=59; healthy women (18+ years old) in the second or early third trimester of an uncomplicated, singleton first pregnancy (that had lasted more than 13 weeks); 31 women randomized to the yoga group and 28 to the TAU group.	Participants were randomized (using the sealed envelope system) to receive either an eight–week course of antenatal yoga or treatment-as-usual (TAU). The yoga group attended an eight–week course, designed and taught by a trained antenatal yoga teacher. Antenatal yoga was based on the mild, hatha form of yoga.	State Trait Anxiety Inventory-Trait (STAI-T) and State (STAI-S). Salivary cortisol level	A single session of yoga reduced both subjective and physiological measures of state anxiety (STAI-S and cortisol); and this class- induced reduction in anxiety remained at the final session of the intervention.
Satyapriya et al. 2013[28]	n=96; women in 20th week of normal pregnancy. Yoga group (n=51) practiced integrated yoga and	The yoga module used was developed from original scriptures (Patanjali Yoga Sutras, and Mandukaya Karika). The yoga group practiced specific set	State Anxiety Inventory (STAI)	Yoga reduces anxiety, depression and pregnancy related

	control group (n=45) did standard antenatal exercises, one hour daily, from 20th to 36th week of gestation.	of integrated yoga. The control group practiced standard antenatal exercises which included simple stretching exercises. Both groups learnt the practices from trained instructors in sessions of 2 h/day (3 days/week) for one month. Practices were continued at home using a pre-recorded instruction cassette for one hour each day.	Hospital Anxiety Depression Scale (HADS)	uncomfortable experiences.
Satyapriya et al. 2009[31]	n=90; aged 20 to 35 years, between 18–20 weeks of pregnancy, randomized to the yoga (n=45) or the control group (n=45).	Participants were randomised to practicing yoga and deep relaxation or standard prenatal exercises one hour daily. The Integrated Approach to Yoga module used in the yoga group was based on concepts from yoga scriptures (Patanjali yoga sutras). In the first month both groups learned the movements (in exercise routines of 4 to 10) from trained instructors, in two–hour sessions three days per week. After one month, the participants continued to practice for one hour at home using a pre-recorded instruction cassette. Both groups also had 1-hour re-fresher classes each time they came for their prenatal visit, once every four weeks up to the 28th week and every two weeks up to the 36th week.	Perceived Stress Scale (PSS) Electrocardiogram (ECG) monitoring for heart rate variability (HRV)	Yoga reduces perceived stress and improves adaptive autonomic response to stress in healthy pregnant women.
Timlin and Simpson, 2017[32]	n=32; first-time mothers with a baby between the ages of 6 weeks and one-year-old; participants randomly allocated to either the intervention (n=16) or the control group (n=16); mean age 28; mean weeks postpartum 23 weeks.	The participants in the intervention group attended for a one–hour Dru yoga session, once a week, for four weeks. A trained Dru yoga teacher, taught the yoga classes to participants. The intervention group were also offered a 20–minute Dru yoga DVD to take home and practice at least twice a week. Participants were asked to keep a diary and write in it each week how many times they completed the DVD. The control group did not take part in any intervention, and participants in the control group were asked not to practice yoga during the intervention period.	Perceived Stress Scale (PSS)	The Dru yoga intervention group had reductions in stress, negative affect, and dysfunctional coping and increases in problem focused coping at follow-up.