Article

Efficacy, Feasibility, and Acceptability of Perinatal Yoga on Women's Mental Health and Well-Being

A Systematic Literature Review

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Introduction: Perinatal major depressive disorder affects 20% of women, while perinatal anxiety affects 10% of women. Although pharmacological treatment has shown effectiveness, many pregnant women are concerned about potential adverse effects on the fetus, maternal–infant bonding, and child development. Approximately 38% of American adults use complementary and alternative medicine, including yoga and other mind–body strategies. Although complementary and alternative medicine has been less studied in the perinatal population, it potentially offers women and their providers alternatives to traditional medication for treatment of perinatal depression and anxiety. Thus, the purpose of this systematic review was to examine existing empirical literature on yoga and its effects on women's health and well-being during the perinatal period. **Method:** Following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for systemic literature reviews, literature searches using relevant search terms were performed in four major electronic databases: CINAHL, PubMed, PsycINFO, and EMBASE. Thirteen publications met inclusion criteria. **Results:** Results indicated that yoga interventions are generally effective in reducing anxiety and depression in pregnant women. **Discussion:** The use of yoga in the perinatal period shows promise in improving mental health and well-being for women and infants. This review can inform future yoga intervention studies and clinical practice with the perinatal population.

Keywords: *maternal/child; yoga; psychosocial/mental health; women; women's health, meditation/mindfulness; holistic health, mothers, psychiatric nursing, psychological well-being*

Introduction

According to the National Alliance on Mental Illness, serious mental illness costs America $193.2 billion in lost earnings per year. Mood disorders such as depression are the third most common cause of hospitalization in the United States for both youth and adults aged 18 to 44 (National Alliance on Mental Illness, 2013). The prevalence of depression among the perinatal population is estimated to be between 11% and 26%, with subclinical levels of depression affecting as many as 20% to 49% (Orr, Blazer, & James, 2006). Studies have shown that perinatal major depressive disorder affects 20% of

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women and perinatal anxiety affects 10% (Muzik, Hamilton, Rosenblum, Waxler, & Hadi, 2012).

Comorbidity of major depressive disorders and anxiety is complex in the pregnant patient (Muzik et al., 2012). Although pharmacological treatment of perinatal depression and anxiety has been demonstrated to be effective, pregnant women are reluctant to take medication due to concern regarding safety and the potential adverse effects that medication may have on the fetus, maternal–infant bonding, and child development. Up to 50% of women taking antidepressants before conception stop taking such medication during pregnancy due to concerns; therefore, they potentially increase the risk of relapse of symptoms (Muzik et al., 2012).

Little is known about the teratogenicity or adverse postnatal effects from use of antidepressants during pregnancy or breastfeeding; however, evidence suggests that taking medication such as SSRIs (selective serotonin reuptake inhibitors; especially during the third trimester) may have adverse effects, referred to as "transient neonatal complications" (Oberlander et al., 2004). This includes jitteriness, increased muscle tone, irritability, disrupted sleep, and abnormal breathing (Kloos et al., 2010). Pregnant women with perinatal depression and/or anxiety face a dilemma when considering whether to take medications to manage their psychopathology. Likewise, studies have shown that providers do not feel that they were adequately trained to address psychiatric conditions and pharmacological management of these conditions in the pregnant patient (Dietrich et al., 2003). Consequently, both patient and provider may be unsure about how best to proceed when managing perinatal depression and/or anxiety.

The most recently available data from the National Health Interview Survey indicated that 38% of American adults use complementary and alternative medicine (CAM; National Center for Complementary and Alternative Medicine [NCCAM], 2012a). CAM includes more than 36 types of therapies (e.g., acupuncture, chiropractic, herbal supplements, yoga, and meditation). The most recent data indicate that American consumers spend $33.9 billion out-of-pocket each year on visits to CAM practitioners and purchases of CAM products, classes, and materials (NCCAM, 2012a). CAM has been studied extensively in the nonpregnant population with established medical and psychological benefit (Bussing, Michalsen, Khalsa, Telles, & Sherman, 2012; Ross & Thomas, 2010). Though CAM therapies have been less studied in the perinatal population, they potentially offer women and their providers alternatives to traditional medication for treatment of perinatal depression and anxiety.

Yoga is a mind–body practice with origins in ancient Indian philosophy. There are numerous yoga traditions. All styles typically combine physical postures, breathing techniques, and meditation or relaxation. Hatha yoga, the most commonly practiced yoga modality in the United States and Europe, emphasizes postures (*asanas*) and breathing exercises (*pranayama*; NCCAM, 2012b). The purpose of this review was to examine existing empirical literature on yoga interventions and yoga's effects on pregnant women's health and well-being. Of particular interest were primary outcomes of depression and anxiety. Secondary outcomes, such as pain, stress, and maternal–fetal attachment, were also examined.

Method

Studies included in this review were selected to investigate the effects of yoga on perinatal women's health and well-being. This systematic review was performed in accordance with guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009). Literature searches were performed in the electronic databases CINAHL, PubMed, PsycINFO, and EMBASE, using the following search terms: perinatal, peripartum, pregnancy, postpartum, antenatal, and yoga. Inclusion criteria for the study were perinatal women, all ages, English language, full-text intervention studies, and all years up to 2013. This review did not include other forms of CAM (e.g., massage, acupuncture). Exclusion criteria included any form of CAM that did not include yoga as part of the intervention, dissertations, textbooks, editorials, literature reviews, or studies that focused specifically on labor or perinatal outcomes.

The primary search identified 335 articles for review. After removal of duplicates, 230 articles remained for further evaluation. Hand searches, which included review of the reference lists of each article, were performed and did not reveal any missing pertinent articles. Articles were then reviewed by title, abstract, or both to discard clearly nonrelevant articles based on exclusion criteria. In all, 195 articles were discarded based on exclusion criteria

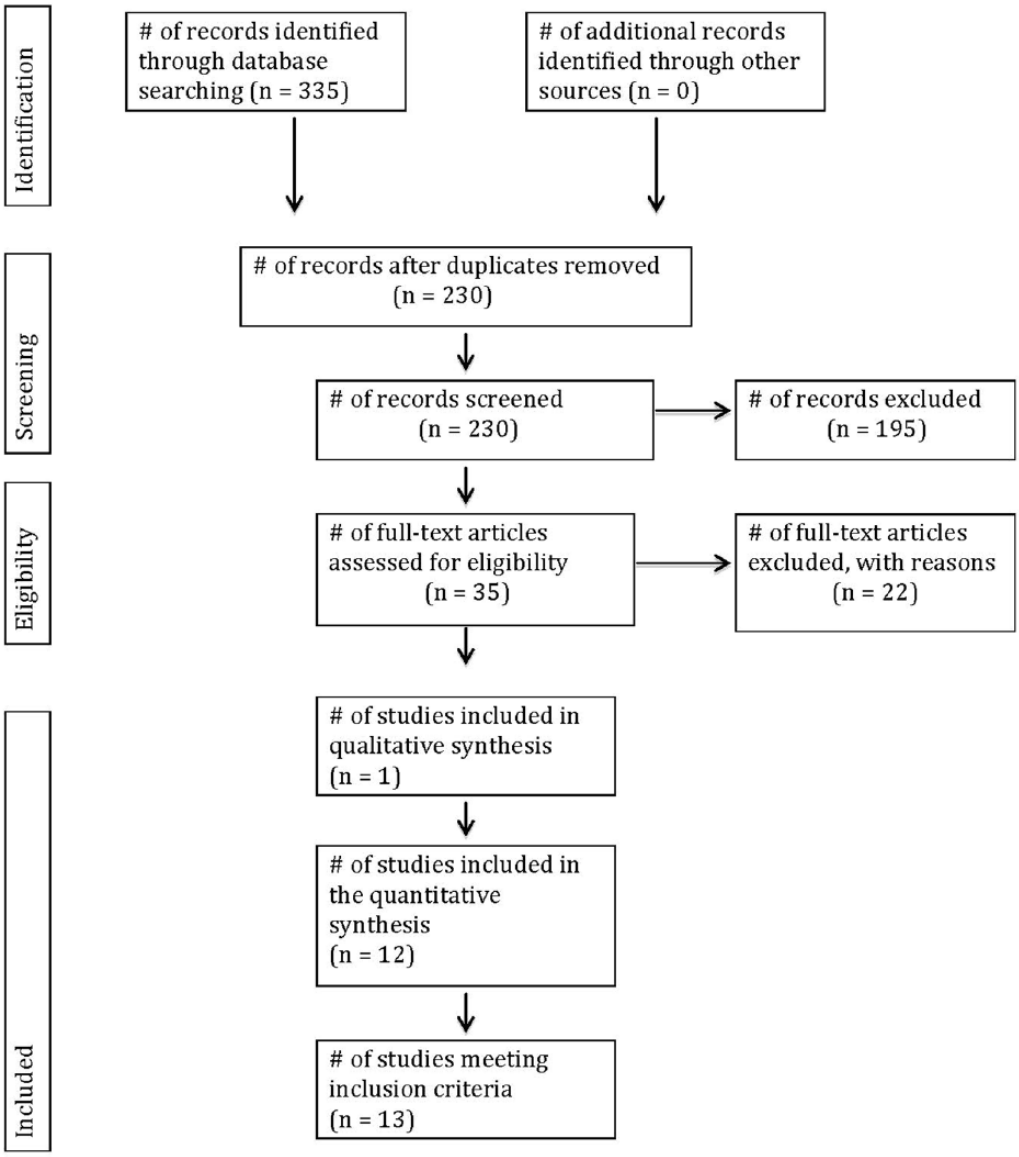

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Diagram

(e.g., dissertations, textbooks, editorials, etc.). A total of 35 full text articles were evaluated further if they used yoga as an intervention and addressed mental health or well-being outcomes in perinatal women. Thirteen articles remained that met inclusion and exclusion criteria (Figure 1).

The primary investigator developed a data extraction tool to assess the following article details: purpose, psychiatric disorder, intervention (type, duration, frequency, and setting), sampling, variables, measurement scale, data collection and analyses, recruitment technique, attrition, findings, and demographics (Table 1).

All studies were evaluated based on criteria including internal validity threats like participant selection, attrition, and researcher reporting bias, as well as external validity threats such as a large proportion of the recruited population declining to participate in the study or evidence that the intervention was difficult to implement or not implemented at all. Although no reports were excluded on the basis of quality, quality was considered in judgments concerning the strength of evidence for a particular finding. No restrictions were placed on the type of yoga performed.

Table 1. Characteristics of Included Studies

Author (Year of Publication)	Study Design	Intervention (Type of Yoga)	Duration and Frequency of Intervention	Measurement Scale(s)/Design	No. of Participants Enrolled (Included in Analysis)	Demographics
Beddoe, Paul Yang, Kennedy, Weiss, and Lee (2009)	One-group pre-/posttest	Combined elements of Iyengar yoga and mindfulness-based stress reduction	75 minutes once per week for 7 weeks	Perceived Stress Scale, Prenatal Psychosocial Profile, STAI-trait, STAI-state, Brief Pain Inventory, cortisol, acceptability questionnaire	*N* = 23 (16)	Average age = 30.4 years, middle-class income, college educated, married
Beddoe and Lee (2010)	Prospective two-group pre-/posttest	Combined elements of Iyengar yoga and mindfulness-based stress reduction	120 minutes once per week for 7 weeks	General Sleep Disturbance Scale, actigraphy	*N* = 23 (15), *n* = 7 (second trimester), *n* = 8 (third trimester)	Age range 25-37 years, middle class, college educated, 53% working full-time, married
Doran and Hornibrook (2013)	Qualitative interviews	Gentle yoga, meditation, and breath work	Length of intervention not specified intervention was done as part of the qualitative study (study not published)	Qualitative interviews	*N* = 23 (15)	Average age = 32 years, 14/15 participants born in Australia, 1 Indigenous, and 1 born in the Pacific
Field et al. (2012)	Prospective three-group pre-/posttest, randomized controlled	Yoga, massage or standard prenatal care	20-minute twice-weekly yoga or massage therapy sessions for 12 weeks (randomly assigned)	SCID:Sociodemographic/social support questionnaire, CES-D, STAI, STAXI, Relationship Questionnaire, birth outcome measures (gestational age at delivery and birth weight), back pain and leg pain	*N* = Unclear how many enrolled (84)	Average age = 26.6 years, lowSES, 38% Hispanic, 40% AA, 12% non-Hispanic White, 71% had a partner
Field, Diego, Delgado, and Medina (2013a)	Prospective two-group pre-/posttest randomized controlled	Yoga or social support	20-minute group sessions once/week for 12 weeks (for intervention and control group) randomly assigned	SCID, CES-D, Edinburgh Postnatal Depression Scale, profile of mood states, STAI, STAXI, Relationship Questionnaire, cortisol, estriol, progesterone	*N* = 92 (79); *n* = 46 (40) intervention; *n* = 46 (39), control	Average age = 24.5 years, low SES, 60% Hispanic, 38% AA, 2% non-Hispanic White, 60% had a partner
Field, Diego, Delgado, and Medina (2013b)	Prospective two-group pre-/posttest randomized controlled	Tai chi/yoga or waitlist	20-minute group sessions once/week for 12 weeks (for intervention) and(waitlist control group) randomly assigned	SCID, CES-D, STAI, Verran and Snyder-Halpern Scale (Sleep Disturbance Scale)	*N* = 92 (75), *n* = 46 (37), intervention, *n* = 46 (38), control	Average age = 26.0 years, low SES, 57% Hispanic, 40% AA, 3% non-Hispanic White, 70% had a partner
Ko, Yang, Fang, Lee, and Lin (2013)	Quasi-experimental one-group pre-/posttest	Exercise program—combo yoga, Pilates and aerobics	60-minute group session once per week for 12 weeks (one-group)	Self-designed structured questionnaire, body composition analyzer, Fatigue Symptoms Checklist, CES-D	*N* = 28 (23)	Average age = 34.07 years, 73.9% with college degree or higher, 60.9% "nuclear family"
Mitchell et al. (2012)	Prospective two-group pre-/posttest randomized controlled	Yoga treatment group or a parenting education attention	20-minute twice weekly yoga or parenting education attention sessions for 12 weeks (randomly assigned)	CES-D	*N* = Not specified how many enrolled (24)	Average age = 26.6 years, low SES, 25% Hispanic, 58% AA, 2% non-Hispanic White

(*continued*)

Table 1. (continued)

Author (Year of Publication)	Study Design	Intervention (Type of Yoga)	Duration and Frequency of Intervention	Measurement Scale(s)/Design	No. of Participants Enrolled (Included in Analysis)	Demographics
Muzik, Hamilton, Rosenblum, Waxler, and Hadi (2012)	Prospective two-group pre-/posttest	Mindfulness yoga, two-group	90-minute weekly sessions for 10 weeks	Structured Clinical Interview for *DSM* Disorders (SCID I N-P), Edinburgh Postnatal Depression Scale, Beck Depression Inventory–II, Five Facet Mindfulness Questionnaire–Revised, Maternal Fetal Attachment Scale, feedback acceptability survey	*N* = 22 (18) participants split into two-groups but not specified how many in each group	Average age = 32.41 years, 45% income >$50,000 72% Caucasian, college educated, 72% partnered
Rakhshani, Maharana, Raghuram, Nagendra, and Venkatram (2010)	Prospective two-group pre-/posttest randomized controlled	IAY or standard antenatal exercise	60-minute group session (3 days per week) for 4 weeks (randomly assigned); practiced at home 1 hour per day; 60-minute refresher class at antenatal visits up to 36 weeks	WHOQOL-100, FIRO-B	*N* = 111 (102), *n* = 56 (51) intervention, *n* = 55 (51) control	Average age 26.23 years, yoga, 25.47 years control, 64.71% working yoga, 38.18% working control
Reis and Alligood (2014)	Correlational one-group pre-/post assessment survey design	Healthy mom prenatal yoga program	60-minute group sessions once per week for 6 weeks (second trimester group (20-28 weeks) and third trimester group (>29 weeks)	Life Orientation Test–Revised, Power as Knowing Participation in Change Tool Version II, Well-Being Picture Scale, Short-Form 12 Version 2, self-report yoga journal	*N* = 27 (21)	Average age = 30.28 years (no other demographics specified)
Satyapriya, Nagendra, Nagarathna, and Padmalatha (2009)	Prospective two-group pre-/posttest randomized controlled	IAY or standard antenatal exercise	120 minutes/day (3 days/week) for 4 weeks (randomly assigned); practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	PSS, heart rate variability	*N* = 122 (90), *n* = 59 (45) intervention, *n* = 63 (45) control	Average age = 26.23 years yoga, 25.47 years control, 35.6% working yoga, 55.6 % working control
Satyapriya, Nagarathna, Padmalatha, and Nagendra (2013)	Prospective two-group pre-/posttest randomized controlled	IAY or standard antenatal exercise	120 minutes/day (3 days/week) for 4 weeks (randomly assigned); practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	Pregnancy Experiences Questionnaire, STAI-I, STAI-II, Hospital Anxiety Depression Scale	*N* = 122 (96), *n* = 53 (51) intervention, *n* = 52 (45) control	Average age = 26.41 years yoga, 24.96 years control, 65% working yoga, 49% working control

Note: STAI = State-Trait Anxiety Inventory; SCID = Structured Clinical Interview for Depression; STAXI = State-Trait Anger Expression Inventory; AA = American adults; CES-D = Center for Epidemiological Studies–Depression; SES = socioeconomic status; WHOQOL = World Health Organization Quality of Life assessment instrument; FIRO-B = Fundamental Interpersonal Relations Orientation Scale; IAY = integrated approach of yoga.

Results

Description of Included Studies

A total of 13 publications met inclusion criteria (Figure 1). All of the publications reported findings from intervention studies that used convenience sampling. One of the 13 publications reported qualitative findings. All studies incorporated yoga in some capacity as the intervention modality; the types of yoga used varied. Seven of the 13 studies were randomized control trials (RCTs).

The characteristics of included studies are presented in Table 1. Overall, studies included in this review represent 667 peripartum women. There was diversity across socioeconomic status (SES), marital/partnered status, employment status, and race/ethnicity. Three of the studies reported that most participants had middle-income status (most often described as >$50,000 yearly). Four of the articles reported that the participants considered themselves of low SES. Four of the studies reported that the participants were college educated and one study indicated that the participants had master's degrees. Four studies indicated that the participants were employed, and the rate of employment was approximately 25% to 68% across those four studies. Half of the studies indicated that the participants considered themselves partnered or married. In one study, more than 50% of the participants were identified as White, and in four studies less than 50% were identified as White. Two of the 13 studies did not address demographics of the participants other than stating the average age.

Intervention

Modalities Used With Yoga. Nine of the 13 studies incorporated yoga with another treatment modality, such as tai chi, exercise, and/or Pilates. Three of the 13 studies specified that they incorporated mindfulness meditation with the yoga treatment delivery. Another four studies incorporated meditation as part of the yoga intervention. Mindfulness and/or meditation were the most frequently used adjunct modalities used with yoga (7 of the 13 studies). Beddoe, Paul Yang, Kennedy, Weiss, and Lee (2009; Beddoe & Lee, 2010) used Iyengar yoga with a mindfulness-based stress reduction component, and Field, Diego, Delgado, and Medina (2013b) used yoga in combination with tai chi. All yoga interventions were tailored to meet the safety and comfort needs of perinatal women.

Types of Yoga Used. Types of yoga used included Iyengar yoga (Beddoe et al., 2009; Beddoe & Lee, 2010), mindfulness yoga (Muzik et al., 2012), integrated approach of yoga (Rakhshani, Maharana, Raghuram, Nagendra, & Venkatram, 2010; Satyapriya, Nagarathna, Padmalatha, & Nagendra, 2013; Satyapriya, Nagendra, Nagarathna, & Padmalatha, 2009), and gentle yoga (Doran & Hornibrook, 2013). For the remaining studies the specific type of yoga was not specified.

Dose, Duration, and Setting. All but one study specified the length of the intervention, which varied from 6 to 16 weeks, with an average of 11.5 weeks (Table 2). The publication reporting qualitative findings from a quantitative study (Doran & Hornibrook, 2013) did not address length of study, number of sessions, or number of minutes per session; therefore, it was not included in the calculations. For the 12 remaining studies analyzed, the time spent during each yoga session ranged from 20 to 120 minutes per session. Three of the 12 studies gave approximations for how often a participant received or performed an assigned intervention. For those studies, the total length of time (minutes) of the intervention ranged from 780 to 1,440 minutes (Table 2). The total number of minutes of the intervention across the length of the nine remaining studies ranged from 240 to 900 minutes, with an average length of 532 minutes (Table 2). Only 2 of the 13 studies reported details about the intervention setting. One took place at a university fitness center and the other at a yoga studio. All 13 studies reported that the yoga instructors were trained in their respective yoga modality with emphasis on safety of pregnant women.

Effectiveness of Interventions at Improving Outcomes

The two primary outcome variables of interest were depression and anxiety (Table 2). Secondary outcomes were evaluated separately (Table 3).

Depression. Seven of the 13 studies assessed depression as a psychological outcome. Multiple well-known depression measures were used across these studies, including the Center for Epidemiological Studies–Depression Scale (CES-D), Edinburgh

Table 2. Findings: Primary Outcomes: Depression and Anxiety

Author (Year of Publication)	No. of Weeks	No. of Sessions/ Week	Total No. of Sessions	No. of Min/Session	Total No. of Minutes (Hours)	Measure	Depression	Anxiety
Beddoe, Paul Yang, Kennedy, Weiss, and Lee (2009)	7	1	7	75	525 (8.75)	STAI-trait, STAI-state		S*[b], NS[b]
Beddoe and Lee (2010)	7	1	7	120	840 (14)	—	—	—
Doran and Hornibrook (2013)	Not specified	Not specified	Not specified	Not specified	Not specified	Qualitative interviews	—	—
Field et al. (2012)	12	2	24	20	480 (8)	CES-D, STAI	S****[a]	S****[a]
Field, Diego, Delgado, and Medina (2013a)	12	1	12	20	240 (4)	CES-D, EPDS, POMS, STAI	S**[b], S***[b], S****[b]	S****[b]
Field, Diego, Delgado, and Medina (2013b)	12	1	12	20	240 (4)	CES-D, STAI	S****[c]	S**[c]
Ko, Yang, Fang, Lee, and Lin (2013)	12	1	12	60	720 (12)	CES-D	NS[b]	
Mitchell et al. (2012)	12	2	24	20	480 (8)	CES-D	S*[a]	
Muzik, Hamilton, Rosenblum, Waxler, and Hadi (2012)	10	1	10	90	900 (15)	EPDS, BDI-II	S****[b], S*[b]	
Rakhshani, Maharana, Raghuram, Nagendra and Venkatram (2010)	16	60-minute group session (3 days/ week) for 4 weeks, then practiced at home 1 hour/day; 60-minute refresher class at antenatal visits up to 36 weeks	Not specified	60-minute group session (3 days/ week) for 4 weeks, then practiced at home 1 hour/day; 60-minute refresher class at antenatal visits up to 36 weeks	>780 (>13)	—	—	—
Reis and Alligood (2014)	6	1	6	60	360 (6)	—	—	—
Satyapriya, Nagendra, Nagarathna, and Padmalatha (2009)	16	120 minutes/day (3 days/week) for 4 weeks, then practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	Not specified	120 minutes/day (3 days/week) for 4 weeks, then practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	>1,440 (>24)	—	—	—
Satyapriya, Nagarathna, Padmalatha, and Nagendra (2013)	16	120 minutes/day (3 days/week) for 4 weeks, then practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	Not specified	120 minutes/day (3 days/week) for 4 weeks, then practiced at home 60 minutes/day, refresher class once in 3 weeks up to 28 weeks and every 2 weeks up to 36 weeks	>1,440 (>24)	HADS, STAI-I, STAI-II	S****[d]	S****[d] S****[d]

Note: STAI = State-Trait Anxiety Inventory; NS = not significant; CES-D = Center for Epidemiological Studies–Depression Scale; EPDS = Edinburgh Postnatal Depression Scale; POMS = profile of mood states; BDI-II = Beck Depression Inventory–II; HADS = Hospital Anxiety Depression Scale.
[a]Group by time interaction effects. [b]Pre- versus postintervention within group. [c]Group by treatment session interaction effects. [d]pre- versus postintervention between-group.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .005$. ****$p \leq .001$.

Table 3. Findings: Secondary Outcomes

Author (Year of Publication)	Total No. of Sessions	Total No. of Minutes (Hours)	Measure	Pain	Stress	Relationships	Anger	Mindfulness	Maternal–Fetal Attachment	Sleep	Quality of Life	Biomarkers	Fatigue	HRV	Birth Outcomes
Beddoe, Paul Yang, Kennedy, Weiss, and Lee (2009)	7	525 (8.75)	PPP, PSS, BPI, cortisol	S*[a]	NS[b], S*[b]							S****[b]			
Beddoe and Lee (2010)	7	840 (14)	GSDS, actigraphy							NS[d], NS[d]					
Doran and Hornibrook (2013)	Not specified	Not specified	Qualitative interviews												
Field et al. (2012)	24	480 (8)	Back and leg pain, Relationship Questionnaire, STAXI (anger), gestational age at delivery and birth weight	S***[a]		S****[a]	S****[a]								S***[a], S****[a]
Field, Diego, Delgado, and Medina (2013a)	12	240 (4)	Cortisol, progesterone, estriol									S****[b], S****[b], S****[b]			
Field, Diego, Delgado, and Medina (2013b)	12	240 (4)	Verran and Snyder-Halpern Scale (Sleep Disturbance Scale), Relationship Questionnaire, STAXI (anger)			S*[b]	S****[b]			S*[c]					
Ko, Yang, Fang, Lee, and Lin (2013)	12	720 (12)	Fatigue										NS[b]		
Mitchell et al. (2012)	24	480 (8)	—												
Muzik, Hamilton, Rosenblum, Waxler, and Hadi (2012)	10	900 (15)	FFMQ-R (mindfulness), Maternal–Fetal Attachment Scale					S**[b]	S****[b]						

(continued)

Table 3. (continued)

Author (Year of Publication)	Total No. of Sessions	Total No. of Minutes (Hours)	Measure	Pain	Stress	Relationships	Anger	Mindfulness	Maternal–Fetal Attachment	Sleep	Quality of Life	Biomarkers	Fatigue	HRV	Birth Outcomes
Rakhshani, Maharana, Raghuram, Nagendra and Venkatram (2010)	Not specified	>780 (>13)	FIRO-B, expressed inclusion, wanted inclusion, expressed control, wanted control, expressed affection, wanted affection; WHOQOL-100 (quality of life), physical, psychological, independence, social relationships, environment, spiritual, general health quality			S*[d], NS[d], NS[d], S**[d]NS[d], NS[d]					S****[d], S****[d],NS[d], S***[d], S****[d] NS[d], S****[d]				
Reis and Alligood (2014)	6	360 (6)	—												
Satyapriya, Nagendra, Nagarathna, and Padmalatha (2009)	Not specified	>1,440 (>24)	PSS, HRV		S****[d]									S****[d]	
Satyapriya, Nagarathna, Padmalatha, and Nagendra (2013)	Not specified	>1,440 (>24)	PEQ		S****[d]										

Note: HRV = heart rate variability; PPP = prenatal psychosocial profile; PSS = Perceived Stress Scale; FIRO-B = Fundamental Interpersonal Relations Orientation Scale; BPI = Brief Pain Inventory; GSDS = General Sleep Disturbance Scale; STAXI = State-Trait Anger Expression Inventory; FFMQ = Five Facet Mindfulness Questionnaire–Revised; WHOQOL = World Health Organization Quality of Life assessment instrument; PEQ = Pregnancy Experiences Questionnaire; NS = not significant.

[a]Group by time interaction effects. [b]Pre- versus postintervention within group. [c]Group by treatment session interaction effects. [d]Pre- versus postintervention between-group.

*$p \leq .05$. **$p \leq .01$. ***p $\leq .005$. ****$p \leq .001$.

Postnatal Depression Scale, profile of mood states, Beck Depression Inventory–II (BDI-II), and Hospital Anxiety Depression Scale (Table 4). Six of the seven studies found a statistically significant decrease in depression after completion of the intervention (Table 2). It is important to note that this statistical significance was present regardless of depression scale used. The only research team that did not report a decrease in depression (Ko, Yang, Fang, Lee, & Lin, 2013) was the only team that used exercise as the main intervention modality, with yoga, Pilates, and aerobics as adjuncts.

Anxiety. Five of the studies assessed and addressed anxiety using the same measure: State-Trait Anxiety Inventory (STAI; Table 4). This scale is often used to measure anxiety levels in individuals. It is well validated and has strong test–retest reliability. All five studies that used STAI found a statistically significant decrease in anxiety post yoga intervention. Of note, Beddoe et al. (2009) found that the decrease in STAI-trait scores was statistically significant ($p \leq .05$) but STAI-state scores was not statistically significant (Table 2).

Secondary Outcomes. Many of the studies evaluated additional outcomes such as pain, stress, maternal–fetal attachment, relationships, biomarkers, sleep, anger, fatigue, heart rate variability, birth outcomes, and mindfulness. Two of the 13 studies evaluated the acceptability of the yoga intervention (Beddoe et al., 2009; Muzik et al., 2012); both reported that participants found the intervention acceptable. In the Beddoe et al. (2009) study, 94% of the participants reported being satisfied with the yoga class and would recommend it to others; 81% said the class was important to them; and 63% reported feeling more hopeful and confident. In the Muzik et al. (2012) study, women reported that mindfulness yoga was a helpful coping strategy and felt that there was an element of social support in the yoga group that was beneficial.

Doran and Hornibrook (2013) reported qualitative findings from a quantitative intervention study that explored women's experiences of attending a yoga pregnancy and postnatal group. However, to the author's knowledge, this quantitative study has not been published and was not found when a database search was performed. The six major themes identified demonstrated the value of sharing birth stories and the ability of women to support one another in a way that was beneficial for their emotional and social well-being. Muzik et al. (2012) evaluated maternal–fetal attachment pre- and postintervention. In that study, mindfulness yoga was found to significantly increase maternal–fetal attachment scores (Table 3).

Three of the four studies that reported stress outcomes, showed statistically significant results using the Perceived Stress Scale and Pregnancy Experiences Questionnaire (Table 3). Beddoe et al. (2009) used the prenatal psychosocial profile stressor subscale. While this study did not report a statistically significant decrease in stress after intervention the authors did indicate that the p value (.10) trended toward significance (Beddoe et al., 2009). Two studies evaluated biomarkers. The biomarkers cortisol, estriol, and progesterone were found to be significantly ($p \leq .001$) increased postintervention. Beddoe et al. (2009) and Field, Diego, Delgado, and Medina (2013a) found that cortisol levels increased ($p \leq .001$) postintervention (Table 3). One study by Satyapriya et al. (2009) evaluated heart rate variability and concluded that there was a significant improvement in adaptive autonomic response to stress postintervention in pregnant women. Field et al. (2012, Field et al., 2013a) reported a statistically significant ($p \leq .001$) decrease in anger post yoga intervention.

Although not part of the inclusion criteria for this review, Field et al. (2012) also reported birth outcomes. They found that neonatal birth weights and gestational age at birth were both significantly greater ($p \leq .001$ and $p \leq .005$, respectively) post yoga intervention. Two studies evaluated sleep. Beddoe et al. (2009) used the General Sleep Disturbance Scale and actigraphy but did not find a statistically significant improvement in sleep. Field et al. (2013b) reported a decrease in sleep disturbance using the Verran and Snyder-Halpern Scale. Each study that evaluated sleep used different yoga modalities. Beddoe et al. (2009; Beddoe & Lee, 2010) used Iyengar yoga with a mindfulness-based stress reduction component, and Field et al. (2013b) used yoga in combination with tai chi.

Two studies addressed pain during the perinatal period after receiving yoga as an intervention. Both Beddoe et al. (2009) and Field et al. (2012) found a statistically significant reduction in pain postintervention (Table 4). Ko et al. (2013) assessed fatigue

Table 4. Findings by Outcome

Outcome	Author (Year of Publication)	Measure	Statistical Significance	Intervention
Depression	Field et al. (2012)	CES-D	S****[a]	Yoga or massage
	Field, Diego, Delgado, and Medina (2013a)	CES-D	S**[b]	Yoga or social support
		EPDS	S***[b]	
		POMS	S****[b]	
	Field, Diego, Delgado, and Medina (2013b)	CES-D	S****[c]	Yoga/tai chi
	Ko, Yang, Fang, Lee, and Lin (2013)	CES-D	NS[b]	Exercise program—combo yoga, Pilates, and aerobics
	Mitchell et al. (2012)	CES-D	S*[a]	Yoga
	Muzik Hamilton, Rosenblum, Waxler, and Hadi (2012)	EPDS	S****[b]	Mindfulness yoga
		BDI-II	S*[b]	
	Satyapriya, Nagarathna, Padmalatha, and Nagendra (2013)	HADS	S****[d]	IAY or standard antenatal exercise
Anxiety	Beddoe, Paul Yang, Kennedy, Weiss, and Lee (2009)	STAI-trait	S*[b]	Iyengar yoga and MBSR
		STAI-state	NS[b]	
	Field et al. (2012)	STAI	S****[a]	Yoga or massage
	Field et al. (2013a)	STAI	S****[b]	Yoga or social support
	Field et al. (2013b)	STAI	S**[c]	Yoga/tai chi
	Satyapriya et al. (2013)	STAI-I	S****[d]	IAY or standard antenatal exercise
		STAI-II	S****[d]	
Stress	Beddoe et al. (2009)	PPP	NS[b]	Iyengar yoga and MBSR
	Beddoe et al. (2009)	PSS	S*[b]	Iyengar yoga and MBSR
	Satyapriya, Nagendra, Nagarathna, and Padmalatha (2009)	PSS	S****[d]	IAY or standard antenatal exercise
	Satyapriya et al. (2013)	PEQ	S****[d]	IAY or standard antenatal exercise
Pain	Beddoe et al. (2009)	BPI	S*[a]	Iyengar yoga and MBSR
	Field et al. (2012)	Back and Leg pain	S****[a]	Yoga or Massage
Sleep	Beddoe and Lee (2010)	GSDS	NS[d]	Iyengar yoga and MBSR
		Actigraphy	NS[d]	
	Field et al. (2013b)	Verran and Snyder-Halpern Scale (sleep disturbance scale)	S*[c]	Yoga/tai chi
Relationships	Field et al. (2012)	Relationship Questionnaire	S****[a]	Yoga or massage
	Field et al. (2013a)	Relationship Questionnaire	S*[b]	Yoga or social support
	Rakhshani, Nagendra, Nagarathna, and Padmalatha (2010)	FIRO-B		IAY or standard antenatal exercise
		Expressed inclusion	S*[d]	
		Wanted inclusion	NS[d]	
		Expressed control	NS[d]	
		Wanted control	S**[d]	
		Expressed affection	NS[d]	
		Wanted affection	NS[d]	
Biomarkers	Beddoe and Lee (2010)	Cortisol (increased)	S****[b]	Iyengar yoga and MBSR
	Field et al. (2013a)	Cortisol (increased)	S****[b]	Yoga or social support
	Field et al. (2013a)	Estriol (increased)	S****[b]	Yoga or social support
	Field et al. (2013a)	Progesterone (increased)	S****[b]	Yoga or social support

(continued)

Table 4. (continued)

Outcome	Author (Year of Publication)	Measure	Statistical Significance	Intervention
	Doran and Hornibrook et al. (2013)	Qualitative interview themes: Building mental health and well being		Gentle yoga, meditation, and breath work
	Field et al. (2012)	STAXI (anger)	S****[a]	Yoga or massage
	Field et al. (2013a)	STAXI (anger)	S****[b]	Yoga or social support
	Field et al. (2012)	Birth weight (greater)	S****[a]	Yoga or massage
		Gestational age at birth (greater)	S***[a]	
	Ko et al. (2013)	Fatigue	NS[b]	Exercise program—combo yoga, Pilates, and aerobics
Other	Muzik et al. (2012)	FFMQ-R (Mindfulness)	S**[b]	Mindfulness yoga
	Muzik et al. (2012)	Maternal–Fetal Attachment Scale	S****[b]	Mindfulness oga
	Rakhshani et al. (2010)	WHOQOL-100 (Quality of Life)		IAY or standard antenatal exercise
		Physical	S****[d]	
		Psychological	S****[d]	
		Independence	NS[d]	
		Social relationships	S***[d]	
		Environment	S****[d]	
		Spiritual	NS[d]	
		General health quality	S****[d]	
	Reis and Alligood (2014)	LOTR	S****[b]	Healthy mom prenatal yoga, IAY, or standard antenatal exercise
		PKPCT V II	S***[b]	
		WPS	S*[b]	
		MCS	S***[b]	
		PCS	NS[b]	
	Satyapriya et al. (2009)	HRV	S****[d]	

Note: CES-D = Center for Epidemiological Studies–Depression Scale; EPDS = Edinburgh Postnatal Depression Scale; POMS = profile of mood states; BDI-II = Beck Depression Inventory–II; HADS = Hospital Anxiety Depression Scale; STAI = State-Trait Anxiety Inventory; PPP = prenatal psychosocial profile; PSS = Perceived Stress Scale; PEQ = Pregnancy Experiences Questionnaire; GSDS = General Sleep Disturbance Scale; FIRO-B = Fundamental Interpersonal Relations Orientation Scale; FFMQ = Five Facet Mindfulness Questionnaire–Revised; WHOQOL = World Health Organization Quality of Life assessment instrument; LOTR = Life Orientation Test Revised, PKPCT V II = Power as Knowing Participation in Change Tool Version II; WPS = Well-being Picture Scale; MCS = mental component summary; PCS = physical component summary; HRV = heart rate variability; IAY = Integrated approach of yoga.
[a]Group by time interaction effects. [b]Pre- versus postintervention within group. [c]Group by treatment session interaction effects. [d]Pre- versus postintervention between-group.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .005$. ****$p \leq .001$.

as an outcome of an exercise program that incorporated yoga, Pilates, and aerobics. There was no statistically significant reduction in fatigue in perinatal women as a result of that intervention (Table 4).

Muzik et al. (2012) used mindfulness meditation with yoga as their intervention and found an increase in mindfulness scores ($p \leq 0.01$) as measured by the Five Facet Mindfulness Questionnaire–Revised (Table 3). Three articles used measures to evaluate changes in relationships after intervention. Field et al. (2012, Field et al., 2013a) reported an improvement in relationships as measured by the results of a Relationship Questionnaire. Rakhshani et al. (2010) used a Fundamental Interpersonal Relations Orientation (FIRO-B) scale, which measures how much a person expresses to others and how much she or he wants

from others. There are six categories in this scale. The authors reported that of the six domains, only two (expressed inclusion and wanted control) were statistically significant (Table 3). They highlighted that this study was done in India and may therefore have unique cultural considerations. Rakhshani et al. (2010) also looked at quality of life scores pre- and postintervention using the World Health Organization Quality of Life assessment instrument. Five of the seven components in this measure indicated statistically significant improvements in the quality of life as reported by the participants. This was the only article to assess quality of life. Last, Reis and Alligood (2014) used multiple measures to assess optimism, power, and well-being. All but one (physical component summary) of the measures was found to be statistically significant from baseline for increasing optimism, power, and well-being.

Discussion

Summary of Major Findings

The demographics of the population across the 13 studies varied by race, SES, household income, and education. The studies reviewed were performed in the United States, India, and Taiwan. While there are limitations in terms of the power of statistical analysis of the findings given the small sample sizes of each study, the representativeness of the studied populations to the overall population does allow for some generalization.

Yoga interventions were generally effective in reducing depression and anxiety in pregnant women. Significant decreases in depression and anxiety were apparent regardless of yoga intervention style or outcome measure; however, only two of the studies reviewed reported between-group differences for those outcomes (Table 4). Both Field et al. (2012) and Mitchell et al. (2012) reported group by time interaction effects for symptoms of depression using the CES-D as a measurement tool (Table 2). In both studies, the intervention group reported decreased depression scores from pre- to postintervention. Mitchell et al. (2012) reported that depressive symptoms were reduced in 55% of the yoga group participants as compared to 11% in the control group participants. Additionally, yoga interventions appear to be safe during the perinatal period, as evidenced by no report of adverse effects to the mother or fetus postintervention in any of the reviewed studies. Yoga interventions also had a positive effect on secondary outcomes such as stress, pain, biomarkers (cortisol, progesterone, and estriol), anger, mindfulness, birth weight, gestational age, maternal–fetal attachment, heart rate variability, optimism and power, and well-being.

Studies that evaluated sleep, fatigue, and relationships reported mixed results. Two studies by the same researcher that evaluated relationships (Field et al., 2012, Field et al., 2013a) reported a statistically significant improvement in relationships; however, one study (Rakhshani et al., 2010) reported a mixture of nonsignificant and significant relationship results. Specifically, Field et al. (2012) found greater than a twofold increase in scores from the first day to the last day post yoga treatment on the Relationship Questionnaire used. Similarly, Field et al. (2013a) found improved relationship scores using the same relationship scale they used in the 2012 study. The questionnaire assessed positive aspects of relationships such as a sense of support and care and negative aspects such as irritability and criticisms. Rakhshani et al. (2010) found that integrated yoga enhanced certain aspects of the participant's interpersonal relationships but not all as measured by the FIRO-B instrument. FIRO-B measures expressed and wanted behavior via six different domains.

Previous studies have shown improved sleep and fatigue with yoga; however, Beddoe et al. (2009) and Ko et al. (2013) reported contradictory results. Specifically, Beddoe et al. (2009) noted differences in sleep for women in their second versus the third trimesters. Using actigraphy and the General Sleep Disturbance Scale, they found that women who began mindfulness yoga in the second trimester had improvement in sleep, while women who received the intervention in the third trimester did not. Ko et al. (2013) assessed sleep via a Fatigue Symptoms Checklist and found that there was a statistically nonsignificant decrease in fatigue post yoga/exercise intervention. Both researchers acknowledge limitations of each study including small sample size. In addition, neither study was an RCT, so generalizability is limited.

Cortisol is a stress-related hormone that is often used as a variable in stress research. Cortisol increases two- to threefold in the third trimester, which can make measuring cortisol levels in pregnancy challenging. Beddoe et al. (2009) and Field

et al. (2013a) found that cortisol levels increased ($p \leq .001$) postintervention, which was contrary to their expectations. Beddoe et al. (2009) noted that they measured first-rising cortisol levels, which represent peak concentrations. They studied 16 women between 12 and 32 weeks gestation for 7 weeks. They reported that the time of cortisol sampling may have been a limitation of the study and cited a study by Obel et al. (2005), which suggested that evening nadir cortisol levels may better reflect stress. Field et al. (2013a) sampled midmorning cortisol levels of 92 women at 22 weeks gestation for 12 weeks (46 in the intervention group and 46 in the control group). While cortisol levels decreased from pre- to postintervention on the first and last days, the groups showed increased cortisol levels from the first day of the study to the last (Field et al., 2013a). The findings in these two studies overall indicated that cortisol levels increased postintervention. More studies of this nature need to be performed to replicate Field et al.'s findings of a decrease in cortisol levels immediately postintervention. In addition, it may be useful to examine other stress biomarkers during the peripartum period.

Challenges With Evaluating Yoga Interventions

Challenges with evaluating yoga interventions include the following: (a) variability in yoga modality, (b) study design, (c) severity of depression and anxiety in baseline samples, and (d) measurement scales used.

Variability in Yoga Modality. Ten styles of yoga were used across the 13 interventions. In the nine studies that examined depression and anxiety outcomes, five different styles of yoga were used. Results were found to be significant regardless of the type of yoga.

Study Design. The research design for 12 of the 13 studies was a pretest–posttest intervention. One publication was a qualitative study based on earlier findings from a quantitative study; that study reported positive effects of gentle yoga on building mental health and well-being (Doran & Hornibrook, 2013).

Severity of Depression and Anxiety in Baseline Samples. The participants in the studies varied in baseline severity of depression and anxiety symptoms: from no history or current psychiatric disorder to diagnosed clinical depression and anxiety. The variations in baseline severity of anxiety and depressive symptoms could confound the results because baseline scores cannot be normalized in this setting.

Measurement Scales Used. Most studies used well-established measures that allowed for comparisons among studies in the outcomes of interest.

Threats to Validity

When evaluating individual studies, the following threats to validity should be considered: (a) publication bias, (b) absence of studies with random assignment, (c) attrition, (d) effect sizes, (e) sampling bias, (f) risk of bias, and (g) variations in content, dose, and duration.

Publication Bias. Publication bias may have resulted in only those studies that had statistically significant results getting published. In this review, 31% of the studies reported nonsignificant findings.

Absence of Studies With Random Assignment. Only half of the studies were RCTs. Lack of random assignment decreases the validity of the findings.

Attrition. The percentage of participants enrolled in studies that completed the intervention ranged from 65% to 92% (Table 1). The reasons for attrition included pregnancy complications, work schedule, transportation difficulties, relocation, and loss to follow-up. This relatively low attrition rate speaks to the feasibility and acceptability of the yoga interventions.

Effect Sizes. The sample size of the enrolled participant groups ranged from 22 to 122 (Table 1), with 7 studies having sample sizes below 50. There are limitations in terms of the power of statistical analysis of the findings given the small sample sizes overall.

Sampling Bias. There was clear sampling bias across all studies, given that all of them used convenience sampling. Further risk of bias stems from the lack of blinding in the reviewed studies. A study by Rakhshani et al. (2010) indicated mixed results regarding fundamental interpersonal relationships as reported by the participants in the study. These results did not support the expected conclusion

that yoga would improve interpersonal relationships as seen with the Field et al. (2012, Field et al., 2013a) studies. The authors postulated that the results may have been affected by cultural differences. The study was done in an Indian population. The FIRO-B scale, which measures relationships, has not been validated in this population and may not be culturally relevant.

Risk of Bias Due to Absence of Double Blinding. Provider and participant blinding is challenging when mind–body interventions are compared to treatment as usual.

Variations in Content, Dose, and Duration. Variation in intervention content, dose, and duration may affect outcomes and be threats to validity. Study periods ranged in length from 6 to 16 weeks. It appears that interventions that were longer than 7 weeks had more significant outcomes. Among the yoga interventions in the studies, attendance frequency (either required or suggested) varied widely from 1 day per week (required) to 7 days per week (suggested practice at home). None of the four studies that required at-home practice of the yoga intervention measured adherence to the intervention protocol. Of the eight studies that looked at the primary outcomes of depression and anxiety, there were significant decreases in both for studies that were for longer than 7 weeks, with the exception of the study by Ko et al. (2013), which had a 12-week duration but did not result in a statistically significant decrease in depression using the CES-D scale (Table 2). This study was the only study that examined exercise and Pilates as part of the intervention. There may be a unique factor regarding incorporation of exercise with yoga that influences the potentially calming effects of yoga alone.

Conclusions

Despite the limitations of the 13 studies considered in this review, the studies' findings support several conclusions regarding the appropriateness of yoga as a treatment for improvement of mental health and well-being. Yoga is significantly associated with decreases in anxiety and depression in perinatal women. This decrease seems to be optimized in studies longer than 7 weeks. There are additional secondary benefits for participating in yoga in the perinatal period—namely, improvement in pain, stress, anger, relationships, gestational age at birth, birth weight, maternal–infant attachment, power, optimism, and well-being. There does not appear to be an advantage of using of one type of yoga modality versus another, although yoga, Pilates, and exercise combined did not result in improved depression or fatigue (Ko et al., 2013; Table 4). Yoga is a safe CAM intervention for perinatal women. All yoga interventions were modified to meet the needs of the pregnant population, and no adverse events were reported. The diverse geographical location of sites (United States, Taiwan, and India) highlights yoga's appeal across cultures. The study participants' low attrition rate and good attendance demonstrate yoga's effectiveness, acceptability, and feasibility. The study samples included a range of SES, education, and income levels, providing evidence for the effectiveness and utility of yoga in various populations.

Implications for Future Research

This review reveals that participation in yoga during the perinatal period is associated with positive maternal–fetal outcomes, which are a critical public health area of interest as identified by the National Institute of Health and National Institute of Child Health and Development. This review can inform future yoga intervention studies, as well as clinical practice, with various perinatal populations in both inpatient and outpatient settings. While half of the studies were RCTs, more RCTs should be performed to validate the findings of this review. Future studies should include RCT designs with larger sample sizes to validate the existing findings and further demonstrate the promising potential of yoga for improving mental health and well-being for women and infants.

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