

Research

The Effects of Prenatal Yoga on Birth Outcomes: A Systematic Review of the Literature

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Abstract:

Importance There are limited data to demonstrate the potential impact of prenatal yoga on birth outcomes such as maternal comfort, labor duration, and infant gestational age and weight.

Objective To examine the published evidence on prenatal yoga, identify the gaps in this field of study, and to explore avenues for further research.

Design Two electronic databases, CINAHL and PubMed were searched using combinations of the keywords yoga, health, women, pregnant, and prenatal. Studies were included if they evaluated a yogic intervention in a sample of pregnant women. Both controlled and qualitative studies were included due to the limited body of research. A total of eleven studies were included for review.

Main Outcomes and Measures The most commonly measured variables were psychosocial outcomes, such as maternal depression, anxiety, and quality of life. However, several studies evaluated physical measurements such as pain, length of labor, infant birth weight, and gestational age.

Results All studies found that prenatal yoga provided significant benefits, and no adverse effects were reported. Significant findings from the randomized studies included an increase in infant birth weight, lower incidence of pregnancy complications, shorter duration of labor, and less pain among yoga practitioners. Significant findings from the non-randomized and qualitative studies included decrease in pain, improved quality of sleep, increased maternal confidence, and improved interpersonal relationships among pregnant women who practiced yoga.

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Conclusions and Relevance Although the body of research is limited, preliminary studies suggest that yoga may be effective in improving a myriad of birth outcomes for both mother and infant. Clinicians should feel confident in recommending yoga as a safe, healthy practice to achieve the recommended 30 minutes of daily exercise during pregnancy. Further randomized controlled trials are needed to enhance our understanding of the benefits of yoga, and how to best incorporate the practice into prenatal care.

Keywords: Prenatal Yoga, Pregnancy, Birth Outcomes, Complementary and Alternative Therapy

Yoga is a mindfulness-based practice most widely praised for its potential to balance the physical, emotional, mental, and spiritual aspects of wellness (Curtis, Weinrib, & Katz, 2012). The physical benefits of yoga have been well studied and include reduction in blood pressure (Chung, Brooks, Rai, Balk, & Rai, 2012), weight management (Kristal, Littman, Benitez, & White, 2005), and blood glucose stabilization (Bijlani et al., 2005). Yoga has also been shown to have a myriad of psychosocial benefits such as reducing depressive symptoms (Javnbakht, Kenari, & Ghasemi, 2009) and anxiety (Smith, Hancock, Blake-Mortimer, & Eckert, 2006). These studies are critical to the application of yoga for pregnant women as many of the conditions that yoga has been indicated as effective in alleviating, are often associated with poor pregnancy outcomes.

Pregnancy is a state of unique physiological changes that can tax a woman's physical, emotional, and mental health. Optimal maternal wellness is critical for a safe, meaningful pregnancy for both the mother and the fetus. A disruption in any dimension of health, physical or psychosocial, can have adverse effects on the mother and infant. Maternal anxiety has been linked with spontaneous abortion and intrauterine growth restriction (IUGR) (Mulder et al., 2002), premature delivery (Manusco, Schretter, Rini, Roesch, & Hobel, 2004), and pre-eclampsia (Kurki, Hillesmaa, Raitasalo, Mattila, & Ylikorkala, 2000). Maternal stress has also been associated with an increased use of analgesics during delivery and unplanned cesarean sections (Saunders, Lobel, Veloso, & Meyer, 2006). An imbalanced autonomic nervous system has been correlated with a higher risk for pre-eclampsia (Yang, Chao, Kuo, Yin, & Chen, 2000). Lastly, poor quality of sleep has been linked to higher incidences of

unplanned cesarean sections and a longer duration of labor (Lee & Gay, 2004).

The union of physical movement and breathing, combined with mental strength gained from meditation is essential for successful childbirth. Therefore, the practice of yoga would appear to complement the physical state of pregnancy more intuitively than any standard obstetric advice. Despite its increasing popularity among this population, little research has been conducted to establish the benefits of yoga in pregnant women. The objective of this systematic review is to examine the published evidence on prenatal yoga, identify the gaps in this field of study, and to explore avenues for further research.

Methods

An electronic literature search was conducted using the CINAHL and PubMed databases. To identify relevant articles, a combination of the following terms was utilized: “yoga”, “health”, “women”, “pregnant”, and “prenatal.” Due to the limited number of studies involving prenatal yoga, narrow parameters restricting articles by publication date were not utilized. The reference lists of selected articles were also examined to extract relevant articles.

Studies were included if they employed a yogic intervention in a sample of pregnant women. There are many schools of yoga philosophy, however, for this review the yogic intervention had to primarily focus on the “asanas”, or physical postures. The intervention may or may not have also included an integration of yogic breath awareness, meditation, chanting, or mindfulness based stress reduction (MBSR). We included randomized and nonrandomized controlled trials as well as qualitative studies due to the limited body of research. Studies were excluded if they did not provide any data analysis, were not written in English, or if no full text was available. This may have excluded important studies. Studies were also excluded if they reviewed other complementary and alternative therapies such as aromatherapy, acupuncture, and massage unless they were directly compared to a yogic intervention.

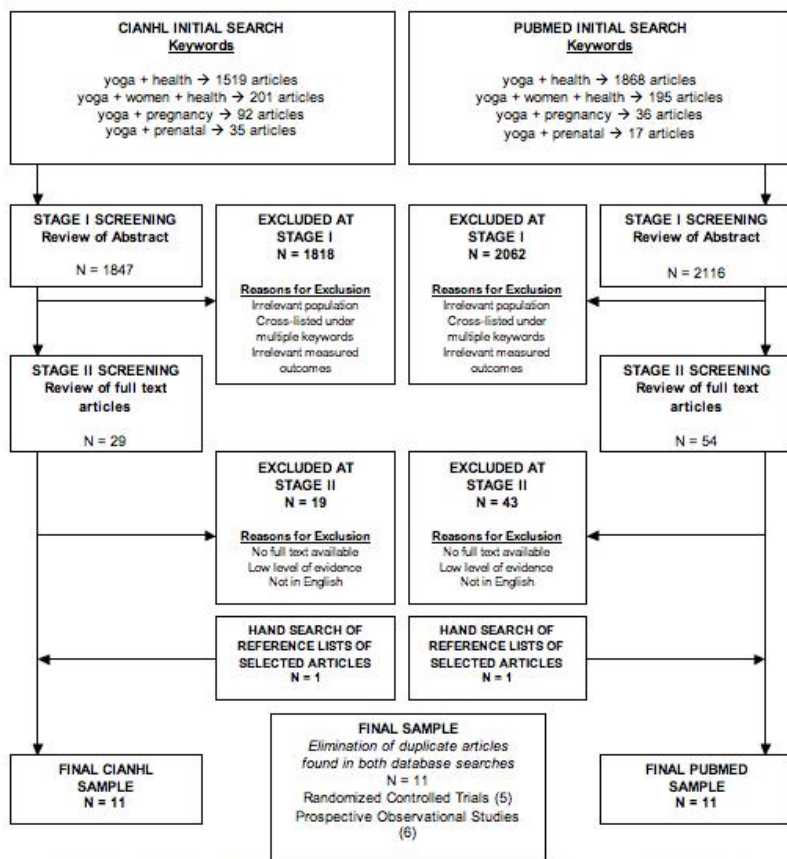


Figure 1. Literature search for prenatal yoga using the CIANHL and PubMed electronic databases. Keywords: "yoga" and "pregnancy", "prenatal", "health", and "women".

Results

The initial CIANHL search resulted in 1,847 articles for screening. After reviewing the title and abstract, 1,818 articles were excluded because the study appeared under multiple searches or because of an irrelevant sample population. Twenty-nine articles were accepted for a full-text review. After review, eight articles were excluded. The initial PubMed search resulted in 2,116 articles for screening, of which 2,062 were excluded for irrelevant population, irrelevant measured outcomes, or appearing under multiple keywords. A full text review was conducted of 54 articles, and 18 were excluded. After adjusting for overlap of

selected articles between the two databases, a sample of ten research studies involving prenatal yoga was procured. One additional article was included after reviewing the reference lists of the selected studies, resulting in a final selection of 11 articles. The studies were conducted in the United States (5), India (4), Taiwan (1), and Thailand (1). The selection includes five randomized controlled trials (RCTs), three controlled prospective studies, and three prospective observational studies. See table-1 and table-2 for citations and details.

The intervention in the RCTs was integrated yoga involving physical practice and meditation. The control for all the RCTs was standard obstetric advice, which included 30 minutes of daily walking. One RCT also included a comparison intervention of twice weekly massage therapy (Field et al., 2012). The intervention in the six prospective studies was integrated yoga and meditation. Three of these studies used a single sample with a pre/post-test design and three utilized a control group that followed standard prenatal advice, including 30 minutes of daily walking. The studies varied in length and intensity of the intervention, the degree of supervision of the intervention, measurement tools utilized, sample population, and outcomes measured.

Discussion

The ancient practice of yoga involves the synthesis of slow, dynamic movement, controlled breathing, and meditation. It has become increasingly popular in the United States, and its benefits to the general population have been thoroughly studied. However, the benefits of prenatal yoga are not well known due to limited research. The major finding of this review is that there are limited published data on yoga during pregnancy, and all of the published studies have demonstrated statistically significant benefits to pregnant women. Several themes were identified through the course of this review.

Benefits May Not Be Dose-Dependent

The studies varied greatly on the length and intensity of the yoga intervention. Three studies required participants to practice yoga and meditation one hour daily until they went into labor (Narendran, Nagarathna, Narendran, Gunasheela, & Nagendra, 2005), (Rashkani, Maharana, Raghuram, Nagendra, &

Venkatram, 2010), (Satyapriya, Nagendra, Nagarathna, & Padmalatha, 2009). One RCT required participants to practice yoga for one hour, three times a week for 17 weeks (Rakhshani et al., 2012). Another study by Field et al. (2012) had participants practice a 20-minute yoga routine twice a week for 12 weeks. Regardless of the length and intensity of the intervention, all studies revealed demonstrative benefits to the participants, indicating that the effects of yoga may not necessarily be dependent upon the length and intensity of practice.

Benefits Extend to a Variety of Pregnant Women

While seven of the studies restricted their samples to healthy pregnant women with no co-morbidities or mood disorders, three demonstrated benefits of yoga in pregnant women with a history of depressive conditions and/or anxiety issues. A study by Rakhshani et al. (2012) was the first to explore the benefits of yoga for at-risk pregnant women. The researchers included women with a personal or family history of poor obstetrical outcomes, women carrying multiple fetuses, pregnant women at risk due to age and/or obesity. Five studies were limited to primigravidas, while the others included women irrespective of parity. All quantitative studies except for Rakhshani et al. (2012) were limited to women carrying a single fetus, thus limiting our knowledge on how yoga may benefit women carrying multiple fetuses. The studies were conducted in five countries with different cultures, and among participants of different ethnicities. Therefore, prenatal yoga appears to be beneficial to women with varied medical and obstetric histories, and of different ethnicities and cultural beliefs.

A Focus on Maternal Psychosocial Benefits During Pregnancy

The majority of the studies measured primarily the effects of prenatal yoga on maternal outcomes. The most common maternal outcomes measured were psychosocial measurements such as: anxiety levels, stress perception, depression, sleep disturbance, quality of life, and satisfaction from interpersonal relationships. In a small sample of 31 pregnant women with a history of mood concerns, Vieten and Astin (2008) demonstrated significantly reduced anxiety and perception of negative affect as

measured by the Perceived Stress Scale (PSS), State-Trait Anxiety Inventory (STAI), Center for Epidemiologic Studies Depression Scale (CES-D), and Positive and Negative Affect Schedule (PANAS). Field et al. (2012) also utilized the STAI, CES-D, as well as the Structured Clinical Inventory for DSM-IV Diagnosis (SCID) and found that yoga decreased depressive symptoms and anxiety levels in a large sample of prenatally depressed women. A third pilot study found that yoga significantly decreased depressive symptoms as measured by the Beck Depression Inventory, and increased maternal-fetal attachment as measured by the Maternal Fetal Attachment Scale (MFAS) in psychiatrically at-risk pregnant women (Muzik, Hamilton, Rosenblum, Waxler, & Hadi, 2012).

A similar study demonstrated significant reductions in perceived stress and trait anxiety in healthy, pregnant women using the STAI, PSS, and Prenatal Psychosocial Profile (PPP) (Beddoe, Yang, Kennedy, Weiss, & Lee, 2009). A study by Satyapriya et al. (2009) showed that yogic relaxation decreased perceived stress by 31.57% as measured by PSS in healthy pregnant women. Thus yoga is efficacious in reducing psychological distress in both healthy women and women with a history of mood disorders. Utilizing continuous wrist actigraphy and the General Sleep Disturbance Scale (GSDS), Beddoe et al. (2010) found that yoga improved sleep quality in pregnant women in the second trimester by reducing nighttime awakenings. A study by Raskshani et al. (2010) demonstrated that a yogic intervention in healthy pregnant women led to significant improvements in quality of life and enhanced interpersonal relationships as measured by the World Health Organization Quality of Life (WHOQOL) and Fundamental Interpersonal Relationships Orientation (FIRO). Additionally, research has also shown that yoga may increase a woman's confidence during pregnancy and ability to cope with childbirth as demonstrated by improved rating on the Childbirth Self-Efficacy Inventory (Sun, Hung, Chang, & Kuo, 2010).

A few studies examined physical outcomes such as pain and heart rate variability during pregnancy. Sun et al. (2010) concluded that yoga practice might decrease the discomforts of pregnancy such as pain, edema, headache, and fatigue, as measured by the Discomforts of Pregnancy Questionnaire. Additionally, Satyapriya et al. (2009) determined that yogic relaxation increased the parasympathetic band and decreased the

sympathetic band of heart rate variability, thus improving autonomic response to stress. This is critical, as Vempati & Telles (2002) determined that increased sympathetic response might be linked to a higher risk of pre-eclampsia.

Two studies measured the prevalence of pregnancy-induced hypertension (PIH), a precursor of pre-eclampsia, and significant risk factor for poor maternal-fetal outcomes. Narendran et al. (2005) defined PIH as a blood pressure value of greater than or equal to 140/90 on two separate occasions six hours apart, or an increase of 15 mm Hg from baseline after the 20th week gestation. The researchers found that the incidence of PIH tended to decrease in the yoga group, but the data was not statistically significant. However, Rakhshani et al. (2012) found a statistically significant decrease in hypertensive disorders among at-risk pregnant women who practiced yoga. There were fewer incidences of PIH, pre-eclampsia, and eclampsia among yoga practitioners. The researchers also found a decreased incidence of gestational diabetes mellitus among the yoga group (Rakhshani et al., 2012).

Little Emphasis on the Role of Yoga During the Birthing Process

Most of the research on prenatal yoga has focused on the benefits during pregnancy, while very few studies have explored benefits during the actual process of childbirth and into the postpartum period. This seems counterintuitive, as the very process of labor, the pairing of mindful breathing with physical movement, shares the same fundamental principles as yoga. Only one study examined the effects of prenatal yoga on comfort during the labor process (Chuntharapat, Petpichechian, & Hatthakit, 2008). The researchers utilized the Visual Analogue Scale to Total Comfort (VASTC), the Maternal Comfort Questionnaire (MCQ), the Visual Analogue Sensation of Pain Scale (VASPS), and the Pain Behavioral Observational Scale (PBOS) to assess maternal comfort during labor. The researchers found that the yoga group reported significantly higher comfort during labor and up to two hours after birth, experienced less pain during labor, and a shorter duration of the first stage of labor. Sun et al. (2010) found that yoga practitioners had higher rates of childbirth self-efficacy, indicating that the mothers felt more

confident in the delivery room. Prenatal yoga and meditation should be further researched as safe, non-pharmacological means of reducing the pain of childbirth, and as sources of empowerment for the mother.

Less Focus on Fetal Outcomes as Primary Measurement

Although only two studies measured primarily fetal outcomes, both demonstrated statistically significant benefits for the infant.

Narendran et al. (2005) found that in the yoga intervention group, there was a significant decrease in the number of preterm deliveries, small-for-gestational age (SGA) babies, and decreased incidence of intrauterine growth retardation. The yoga group had an average gestational age at delivery of 38 weeks, while the control group had an average gestational age at delivery of 37 weeks. The yoga group had a preterm delivery rate of 14%, while the control group had a preterm delivery rate of 29%. The infants born to mothers in the yoga group had a mean birth weight of 2790 grams, 100 grams greater than the average birth weight of the infants born to mothers in the control group. The rate of intrauterine growth retardation, defined as an estimated weight <10th percentile, in the yoga group was 21%, while it was 36% in the control group. These findings are significant, and indicate the need for further study into the effects of prenatal yoga on the developing fetus.

Rakhshani et al. (2012) further demonstrated that prenatal yoga improves infant outcomes in at-risk pregnant women. The researchers found that significantly fewer infants born to the mothers in the yoga group had low Apgar scores at birth, and there were significantly fewer small for gestational age infants when compared to a control group.

Conclusions

There are limited data to demonstrate the benefits of yoga during pregnancy. However, preliminary studies suggest that yoga might improve pregnancy outcomes by reducing the incidence of maternal depression and anxiety, premature delivery, and low-birth weight infants, which are all contributing factors to

the high infant mortality rate in the United States (Kochanek, Kirmeyer, Martin, Strobino, & Guyer, 2012).

Limitations

Many of the studies were limited by a small sample size and lack of randomization. The majority of the studies were conducted in healthy pregnant women, so there is little evidence to demonstrate benefits in women with co-morbidities or complications of pregnancy. These women are at high risk for poor pregnancy outcomes, and therefore may benefit the most from prenatal yoga. The studies are also limited by a lack of supervision. Most researchers initially supervised the intervention, but after a few weeks the women continued the intervention at home. In many studies, the participants only received follow-up via telephone. This leads to uncertainty about participant compliance. It is possible that this lack of oversight may have resulted in the benefits of yoga being underrepresented. However, more research is required to determine in stricter adherence to a yoga regimen yields even greater benefits for mother and infant. Additionally, more than half of the studies were conducted in Eastern countries where yoga is often a cultural practice.

Recommendations for Future Research

Six prospective studies have demonstrated statistically significant benefits, but should be replicated as RCTs with larger sample sizes to validate the data. The RCTs should also be replicated with a more extensive sample population to add confidence to the data.

There are very few published studies examining the benefits of prenatal yoga, however, there are four main areas in which the literature on prenatal yoga is especially lacking. Future researchers should focus on contributing to the literature in these areas.

Only one study examined the benefits of prenatal yoga in women who were at risk for poor pregnancy outcomes. Future studies should focus on benefits in this population, as at-risk pregnant women may have the most to gain from the practice of yoga.

Likewise, only one study has focused on the benefits of prenatal yoga during childbirth, but this study found that the yoga group experienced less pain and had a shorter overall duration of labor. These benefits might lead to fewer unnecessary medical interventions and to a more positive experience for the mother. The potential link between the mental strength and body awareness gained from yoga, and increased confidence during childbirth has only been addressed by one study (Sun et al., 2010). Future research should examine how the practice of yoga might impact the childbirth experience by increasing confidence and empowering mothers.

Only two studies primarily researched benefits to the infant. However, the researchers determined that there were measurable health benefits for the infant, which might help in reducing infant mortality. These studies were conducted in Eastern countries, and there are no studies conducted in the United States that primarily explore benefits of prenatal yoga during childbirth and to the infant.

Lastly, there have been no studies that examined the benefits of a yoga intervention extending into the postpartum period. Prenatal yoga was shown to reduce depressive symptoms and anxiety during pregnancy, and future research should determine whether these benefits extend through the postpartum period.

Clinical Implications

Yoga is a safe, low-cost modality that can be easily modified to adjust for the unique needs and contraindications of pregnancy. Although yoga studios facilitate a sense of community that may be helpful during pregnancy, yoga can be practiced at any place and time. Pregnant women could practice with their partners as a bonding activity, or use their practice as a medium to interact with their unborn, sentient child.

The literature has provided some guidance for the incorporation of yoga into childbirth education classes. A qualitative study by Doran et al. (2013) described the incorporation of yoga into a maternal group offered at an Australian women's health center. The group meeting began with yoga, and then transitioned into personal discussions and educational sessions. The program was highly regarded by participants. Similarly, Remer (2012) recommends beginning childbirth classes with 10 minutes of yoga to "frame" the class.

Remer hypothesizes that most people spend time “living in their heads” and thus incorporating yoga into classes will emphasize the physical actions of labor.

Although the study of prenatal yoga is limited, every published trial has demonstrated significant benefits in pregnancy, and has not shown any adverse effects. Therefore, clinicians should feel confident in recommending yoga as a safe practice to achieve the 30 minutes of daily exercise during pregnancy recommended by the American Congress of Obstetricians and Gynecologists (ACOG), and to potentially reduce risk factors that contribute to adverse pregnancy outcomes.

Table 1		Yoga Intervention Studies in Healthy Pregnant Women		Control	Outcomes Measured	Results
Author (Year)	Sample Size and Characteristics	Study Design	Yoga Intervention, Duration	Duration		
Narayan et al. (2005, India)	N = 336 (180 yoga, 186 control) •18-20 wks pregnant, respectively of parity, singleton pregnancy •18-35 yrs old •No significant obstetric risk factors	•Prospective observational study	•Yoga poses, controlled breathing, meditation, chanting •1 hr daily from date of entry in study to delivery	•Control: Waited 30 min twice daily until delivery	•Gestational age at delivery •Birth weight •Mode of delivery •IUGR, PIH, IUFD	•Increase in birth weight ≥ 2500 g among yoga group ($p < 0.01$) •Lower incidence of preterm labor ($p < 0.0008$) and PIH and IUGR in yoga group ($p < 0.025$)
Chunhara et al. (2008, Thailand)	N = 74 (37 yoga, 37 control) •26-28 wks pregnant, primigravida, singleton pregnancy •At least 18 yrs old •No significant obstetric risk factors	•RCT	•Yoga poses, controlled breathing, meditation, chanting •Six 1 hr guided sessions at prescribed weeks of gestation and individual practice 3x/week for 10-12 wks	•Control: Standard prenatal care	•Fetal Analogue Scale to Total Comfort •Maternal Comfort •Questionnaire •Visual Analogue Sensation of Pain Scale •Agar scores •Length of labor	•Yoga group experienced higher levels of comfort during and 2 hours post labor ($p < 0.05$) •Yoga group reported less pain and had less observed pain during labor ($p < 0.05$) •Yoga group had a shorter total labor duration ($p < 0.05$) •Agar scores, or augmentation of labor •No significant differences were found in infant birth weight, Apgar scores, or supplementation of labor
Beddoe et al. (2009, United States)	N = 16 •12-32 wks pregnant, primigravida, singleton pregnancy •No significant obstetric risk factors	•Prospective observational study •Pre/post intervention	•Yvenger yoga and MBSR •75 min guided sessions weekly for 7 wks	•Single group, pre/post intervention design	•Perceived Stress Scale •Prenatal Psychosocial Profile •Stressor subscale •State-Trait Anxiety Inventory •Brief Pain Inventory •Salary control	•Decrease in Trait Anxiety in 3 rd trimester ($p = 0.03$) •Less pain in the 2 nd trimester ($p = 0.02$) •Trend of decreased perceived stress post-intervention •No significant change in salivary cortisol levels
Satyaputra et al. (2009, India)	N = 80 (45 yoga, 45 control) •18-20 wks pregnant, respectively of parity, singleton pregnancy •20-35 yrs old •No significant obstetric risk factors	•RCT	•Integrated yoga •2 hr guided sessions 3x/week for 1 month, then 1 hr daily at home until delivery	•Control: Standard prenatal exercise 1 hr daily	•Perceived Stress Scale •Heart Rate Variability •Heart rate measured through electrocardiogram	•Perceived stress decreased by 31.57% among yoga practitioners and by 6.60% in control group ($p = 0.001$) •Yoga appeared to improve autonomic response to stress as measured through electrocardiogram
Rakshshani et al. (2010, India)	N = 102 (51 yoga, 51 control) •18-20 wks pregnant, respectively of parity, singleton pregnancy •20-35 yrs old •No significant obstetric risk factors	•RCT	•Integrated yoga •1 hr guided sessions, 3x/week for 1 month, then practiced 3x/week at home •16 wks duration	•Control: Standard prenatal exercise for 16 wks	•World Health Organization Quality of Life-100 •Fundamental Interpersonal Relationships Orientation-B	•Yoga group experienced improvements in Physical ($p = 0.001$), Psychological ($p < 0.001$), Social Relationships ($p < 0.01$), and General Health ($p < 0.01$) domains of WHOQOL •The yoga group improved in all domains of FRC-B, the control group did not experience improvements
Beddoe et al. (2010, United States)	N = 15 •12-32 wks pregnant, primigravida, singleton pregnancy •No significant obstetric risk factors	•Prospective observational study •Pre/post intervention	•Yvenger yoga and MBSR •75 min guided sessions weekly for 7 wks	•Single group, pre/post intervention design	•General Sleep Disturbance •Scale •Wrist actigraphy	•Post intervention ESSDS scores showed women in 2nd trimester experienced improved sleep ($p = 0.04$), and fewer nights with poor sleep ($p = 0.03$) •Actigraphy showed women in 2nd trimester had fewer nighttime awakenings ($p = 0.03$)
Sun et al. (2010, Taiwan)	N = 88 (45 yoga, 43 control) •26-28 wks pregnant, primigravida, singleton pregnancy •At least 18 yrs old •No significant obstetric risk factors	•Prospective observational study	•Yoga poses and meditation •30 min, 3x/week for 12-14 wks	•Control: Standard prenatal care •Questionnaire •Childbirth Self-Efficacy Inventory	•Discomforts of Pregnancy •Questionnaire •Childbirth Self-Efficacy	•Yoga group reported fewer discomforts at 38-40 weeks gestation than the control group ($p = 0.01$) •Yoga group had a significant increase in childbirth self-efficacy compared to the control group

Note. IUGR, intrauterine growth restriction; PIH, pregnancy induced hypertension; IUFD, intrauterine fetal demise; MBSR, mindfulness based stress reduction

Table 2

Yoga Studies in At-Risk Pregnant Women						
Author (Year, Setting)	Sample Size and Characteristics	Study Design	Yoga Intervention, Duration	Control and/or Comparison Group, Duration	Outcomes Measured	Results
Vieten et al. (2008, United States)	N=31 (13 yoga, 18 control) •12-30 wks pregnant, singleton pregnancy •At least 18 yrs old •Self reported mood concern, no other significant obstetric risk factors	•Randomized pilot study	•Hatha yoga, breath awareness, meditation, self reflection •2 hrs/wk for 8 wks and 20 min daily meditation	•Control: Standard prenatal care	•Perceived Stress Scale •Center for Epidemiological Studies Depression Scale (CES-D) •State Trait Anxiety Inventory (STAI) •Positive and Negative Affect Schedule •Affect Regulation Measure •Mindful Attention Awareness Scale	•Yoga group showed decreases in state anxiety (p<0.05) and negative affect (p<0.04)
Field et al. (2012, United States)	N=64 (28 yoga, 28 massage, 28 control) •18-22 wks pregnant, singleton pregnancy •At least 18 yrs old •Diagnosed depression, no other significant obstetric risk factors	•RCT	•20 min guided yoga session 2x/wk for 12 weeks	•Comparison: 20 min massage therapy session 2x/wk for 12 wks •Control: Standard prenatal care	•Structured Clinical Inventory for DSM-IV Diagnosis (SCID) •Social Support Questionnaire •CES-D •STAI •State Anger Inventory •Relationship Questionnaire •Infant gestational age and birth weight •Back Depression Inventory (BDI-II)	•Yoga and massage groups experienced significant improvements on all variables (p<0.001) •Control group did not experience significant changes •Yoga and massage groups had higher birth weight infants and fewer incidences of preterm delivery than control group •Self reported depression symptoms were significantly decreased post-intervention (p=0.025) •Mindfulness (p=0.007) and Maternal Fetal Attachment (p=0.000) significantly increased post intervention
Muzik et al. (2012, United States)	N=18 •12-26 wks pregnant, primigravida, singleton pregnancy •Baseline elevated score (>9) on Edinburgh Postnatal Depression Screen	•Prospective observational study •Single group prepost test design	•60 minute guided mindfulness based yoga sessions 1x/wk for 10 wks	•Single group prepost test design	•Five Facet Mindfulness Questionnaire-Revised •Maternal Fetal Attachment Scale	•The yoga group had fewer incidences of hypertensive disorders (p = 0.02), intrauterine growth restriction (p=0.05), and preterm delivery (p= 0.04) •Fewer infants born to yoga group had low Apgar scores at 1 minute (p=0.01) and 5 minutes (p=0.04) •Fewer small for gestational age infants were born to the yoga group (p=0.03)
Rakshamani et al. (2012, India)	N=68 (30 yoga, 38 control) •Within 12 wks gestation •Inclusion criteria: personal or family history of poor obstetric outcomes, twin pregnancy, extreme of age (< 20 yrs, > 35 yrs), obesity (Body Mass Index >30)	•RCT	•1 hour guided yoga session 3x/wk between wks 13-28 of pregnancy •Included Yoga poses, meditation, and controlled breathing	•Control: Standard prenatal care, 30 mins walking twice daily until delivery	•Incidence of hypertensive disorders of pregnancy (PIH, pre-eclampsia, eclampsia) •Incidence of gestational diabetes mellitus •Incidence of premature rupture of membranes •Rates of premature delivery •Infant birth weight, Apgar scores	•The yoga group had fewer incidences of hypertensive disorders (p = 0.02), intrauterine growth restriction (p=0.05), and preterm delivery (p= 0.04) •Fewer infants born to yoga group had low Apgar scores at 1 minute (p=0.01) and 5 minutes (p=0.04) •Fewer small for gestational age infants were born to the yoga group (p=0.03)

Note: PIH, pregnancy induced hypertension.

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