

# Research

## Knowledge and Attitudes Toward Prenatal Yoga Among Women with High-Risk Pregnancies

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### Abstract

This study sought to evaluate attitudes and knowledge about prenatal yoga and to investigate barriers and facilitators to yoga participation in high-risk pregnant women receiving prenatal care in an academic tertiary care center. We surveyed a convenience sample of women receiving prenatal care through the Maternal-Fetal Medicine practice at Brigham and Women's Hospital. We classified participants as yoga-experienced or yoga-naïve depending on self-report. We compared differences between the two groups using the appropriate nonparametric tests and compared bivariate odds ratios for survey results using logistic regression. Of the 100 respondents, 53% had practiced yoga previously. Women with yoga experience were older (age  $34.9 \pm 5.6$  vs.  $31.0 \pm 6.0$  years,  $p = 0.004$ ), more likely to be college graduates (94% vs. 68%,  $p = 0.002$ ), and more likely to be White (77% vs. 47%,  $p = 0.002$ ) than women without previous yoga experience. Previous yoga experience was associated with participant agreement that yoga was safe during their current pregnancy (odds ratio 5.9, 95% confidence interval 1.9–17.7). Of the women surveyed, 56% agreed that they would like to attend a prenatal yoga class. In a multivariate model including age, race, and education, previous yoga experience was the only significant predictor associated with willingness to participate in prenatal yoga classes during current pregnancy (odds ratio 3.1, 95% confidence interval 1.1–8.6). Prior yoga experience was the strongest predictor of willingness to attend a prenatal yoga class in our population. Our results suggest that women with high-risk pregnancies who may benefit from prenatal yoga interventions but lack prior yoga experience may need

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### Introduction

Yoga is an ancient discipline grouping physical, mental, and spiritual practices that originated in the Indian subcontinent and are now becoming increasingly popular in many parts of the world. The 2016 Yoga in America Study conducted by *Yoga Journal* and Yoga Alliance reported that 36.7 million people in the United States are practicing yoga, up from 20.4 million in 2012.<sup>1</sup> There is tremendous interest both in the general population and healthcare community about the potential health benefits of yoga.

Current literature suggests yoga as adjunctive treatment for chronic conditions such as chronic pain, depression, and diabetes in nonpregnant adults.<sup>2–5</sup> Yoga is a promising intervention for common concerns in normal pregnancies, including low-back pain<sup>6</sup> and depressive symptoms.<sup>7</sup> Studies focused on women with high-risk pregnancy suggest yoga may also reduce risks for hypertensive complications of pregnancy<sup>8,9</sup> and improve measures of glycemic control in women with gestational diabetes.<sup>10</sup>

Although several groups are investigating the potential benefits of yoga during pregnancy, current data are limited in applicability to a high-risk population. Furthermore, previous clinical trials of yoga as an intervention have been limited by difficulties recruiting and retaining subjects.<sup>11</sup> Few have investigated the current practices and attitudes of

pregnant women, particularly in those with high-risk pregnancies.<sup>12</sup>

We therefore sought to evaluate the attitudes and knowledge of prenatal yoga in women receiving high-risk prenatal care at Brigham and Women's Hospital, an academic tertiary care center. We also studied potential barriers and facilitators to practicing prenatal yoga in this population to inform recruitment efforts for future studies.

## Methods

An anonymous, voluntary, self-administered paper questionnaire was offered to all English-speaking women at the time of checking in at our institution's Maternal-Fetal Medicine practice in 2016. This practice, at Brigham and Women's Hospital, exclusively provides care to high-risk pregnant women. Brigham and Women's Hospital is an urban, academic, tertiary care center with the largest delivery volume in Massachusetts. Pregnant women with any high-risk condition, irrespective of age, were included in the study. A collection box was made available in the waiting room for patients to deposit the completed questionnaires.

A convenience sample of 100 completed surveys was selected for analysis. This sample size was estimated based on expert consensus, given the lack of comparable reference studies in this population available to guide sample-size calculations. All 100 surveys were included in the descriptive analysis (Table 1), but those with any missing answers were excluded from the statistical analysis.

The questionnaire was formulated by the authors. Questions were selected based on both expert consensus through consultation with authorities in the fields of yoga, diabetes, and high-risk pregnancy and on a review of current literature. The 28 questions included 6 questions on demographics, 5 questions pertaining to obstetric history, and 17 questions on attitudes and knowledge about yoga. (The full questionnaire is available from the authors.) Most questions were multiple-choice.

Data were collected on demographics, pregnancy information, attitudes and knowledge about yoga, and barriers and facilitators to practicing yoga. Demographic questions included age, race, ethnicity, education, primary language, parity, and gestational age. Obstetric information included a self-report of high-risk conditions such as pregestational diabetes mellitus, gestational diabetes mellitus, hypertension, cardiac disease, and pregnancy complications like multiple gestation, history of preterm birth, pregnancy loss, cardiac condition, or other adverse obstetric history. Data on gestational age were collected, as women may not be comfortable doing certain exercises or yoga postures in later stages of pregnancy. Participants were asked to identify potential benefits of yoga and potential barriers to its

**Table 1.** Demographics, *n* (%)

	Yoga-Experienced 53 (53%)	Yoga-Naive 47 (47%)	<i>p</i> Value
Mean age, <i>y</i> ± SD	34.9 ± 5.6	31.0 ± 6.0	0.004
Race			
American Indian or Alaskan Native	0	0	
Asian	5 (9.4)	3 (6.3)	NS
Black or African-American	3 (5.6)	11 (23.4)	0.019
Native Hawaiian or other Pacific Islander	0	0	
White	41 (77.3)	22 (46.8)	0.002
Hispanic	0	8 (17.0)	0.001
Highest education			0.003
Did not complete high school	0	1 (2.1)	
Completed high school	1 (1.8)	9 (19.1)	
Some college	5 (9.4)	9 (19.1)	
Associate's degree	2 (3.7)	4 (8.5)	
Bachelor's degree	19 (35.8)	10 (21.2)	
Graduate degree	24 (45.2)	9 (19.1)	
Primary language English	49 (92.4)	36 (76.5)	0.047
Nulliparous	22 (41.5)	17 (36.1)	NS
Gestational age			
< 12 wk	5 (9.4)	3 (6.3)	NS
12–20 wk	13 (24.5)	8 (17.0)	NS
20–30 wk	13 (24.5)	8 (17.0)	NS
> 30 wk	22 (41.5)	22 (46.8)	NS
Postpartum	0	5 (10.6%)	0.010
Complications			
Diabetes (gestational or pregestational)	8 (15.0)	12 (25.0)	NS
Cardiac condition	4 (7.5)	4 (8.5)	NS
Hypertension	3 (5.6)	7 (14.8)	NS
History of pregnancy loss	16 (30.1)	12 (25.5)	NS

SD = standard deviation; NS = not statistically significant.

practice (e.g., lack of previous yoga experience and logistical difficulties, including preferences for different locations). Participants were classified as yoga-experienced if they had attended any yoga class in the past; those who denied prior yoga experience were classified as yoga-naive.

## Statistical Analysis

We compared differences between the two groups using the appropriate nonparametric tests. Fisher's exact test was used for categorical variables, and the Wilcoxon rank-sum test was used for continuous variables as appropriate, with statistical significance defined as a two-sided *p* value < 0.05. We calculated bivariate odds ratios (OR) for survey results

using logistic regression. Univariate logistic regression to model the odds of willingness to participate in a yoga program was performed, followed by multivariate logistic regression to model the odds of willingness to participate in a yoga program controlling for age, race, education, and previous yoga experience. These covariates were selected based on known associations with yoga use as described in studies with populations other than high-risk pregnant women.<sup>13–15</sup>

Study data were stored and managed with REDCap electronic data-capture tools hosted by Harvard University. Statistical analyses were performed using SPSS for Windows, version 24.0. The protocol was submitted to the Partners Institutional Review Board, which deemed the study to be exempt from review, as only deidentified data were collected.

### Results

We obtained surveys from 100 women. Of the respondents, 53% had practiced yoga previously. Women with yoga experience were older (age 34.9 ± 5.6 vs. 31.0 ± 6.0 years, *p* = 0.004), more likely to be college graduates (94% vs. 68%, *p* = 0.002), and more likely to be White (77.3% vs. 46.8%, *p* = 0.002) than women without previous yoga experience. The distribution of gestational age was similar in the two groups. Women reported a variety of prepregnancy conditions and pregnancy complications (Table 1); 20% of the sample reported a pregnancy complicated by gestational or pregestational diabetes.

Women’s responses to a series of reasons they might be interested in prenatal yoga are shown in Table 2. Compared to yoga-naïve women, those with prior yoga experience were more likely to believe that prenatal yoga may reduce stress (81.1% vs. 48.9%, *p* = 0.001) and anxiety (62.2% vs. 34.0%, *p* = 0.006). Significantly higher numbers of women with yoga experience believed that prenatal yoga may

improve flexibility (77.3% vs. 46.8%, *p* = 0.002), improve childbirth (75.4% vs. 38.2%, *p* < 0.001), improve pain during pregnancy (73.5% vs. 34.0%, *p* < 0.001), and reduce weight gain during pregnancy (52.8% vs. 31.9%, *p* = 0.04). Similar numbers of women in both groups believed that prenatal yoga is safe for most women (37.7% in yoga-experienced women vs. 23.4% in yoga-naïve women).

Potential barriers to attending a hospital-based prenatal yoga class are described in Table 3. The most common reason given for not attending a prenatal yoga class at the hospital in yoga-naïve women was lack of prior yoga experience (57.4%). Women with previous yoga experience were most likely to cite not wanting to come to the hospital for a yoga class if they did not have an appointment that day (47.1%) as a barrier. Lack of time was a barrier mentioned by respondents in both groups (22.6% in the yoga-experienced group and 34.0% in the yoga-naïve group). Overall, 35% of women surveyed said they would not want to come to the hospital and 32% of women surveyed said that they would not want to pay for parking if they did not have an appointment that day. Only two women cited safety as a barrier to hospital-based yoga participation. Of the alternative sites identified by women, 47% responded that they would prefer to attend a yoga class at a studio; only 26% of women preferred the hospital.

Although 88% of the women surveyed agreed that yoga was safe during pregnancy, previous yoga experience was associated with increased odds of agreement that yoga was safe during their own pregnancy (OR 5.9, 95% confidence interval [CI] 1.9–17.7). More than half (56%) of the women surveyed agreed that they would like to attend a yoga class during pregnancy. In a multivariate model including age, race, and education, yoga experience was the only predictor significantly associated with willingness to attend yoga class during the current pregnancy (OR 3.1, 95% CI 1.1–8.6).

**Table 2.** Facilitators of Participation in a Prenatal Yoga Program, *n* (%)

Which, if any, of the following reasons made you or would make you interested in prenatal yoga?	Yoga-Experienced <i>n</i> = 53 (53%)	Yoga-Naïve <i>n</i> = 47 (47%)	<i>p</i> Value
Prenatal yoga may reduce stress	43 (81.1)	23 (48.9)	0.001
It may provide benefits of mild to moderate exercise	34 (64.1)	19 (40.4)	0.027
It’s safe for most women	20 (37.7)	11 (23.4)	NS
It may reduce anxiety	33 (62.2)	16 (34.0)	0.006
It may improve childbirth	40 (75.4)	18 (38.2)	< 0.001
It may reduce depression	26 (49.0)	14 (29.7)	NS
It may improve flexibility	41 (77.3)	22 (46.8)	0.002
It may improve pain during pregnancy	39 (73.5)	16 (34.0)	< 0.001
It may reduce weight gain during pregnancy	28 (52.8)	15 (31.9)	0.044

NS = not statistically significant.

**Table 3.** Barriers to Participation in a Prenatal Yoga Program, *n* (%)

Barriers to attending a prenatal yoga class	Yoga-Experienced <i>n</i> = 53 (53%)	Yoga-Naive <i>n</i> = 47 (47%)	<i>p</i> Value
I have never done yoga	0	27 (57.4)	< 0.001
I don't like yoga	0	6 (12.7)	0.009
I don't think yoga is safe for me	1 (1.8)	1 (2.1)	NS
I don't think I can do yoga	0	2 (4.2)	NS
I haven't had time	12 (22.6)	16 (34.0)	NS
I'm not interested in yoga	0	8 (17.0)	0.002
I don't have childcare	3 (5.6)	1 (2.1)	NS
I don't want to come to BWH if I don't have an appointment that day	25 (47.1)	10 (21.2)	0.011
I don't want to pay for parking if I don't have an appointment that day	19 (35.8)	13 (27.6)	NS
I would like to but haven't gone yet	9 (16.9)	6 (12.7)	NS

NS = not statistically significant; BWH = Brigham and Women's Hospital.

## Discussion

A majority of the participants (56%) were interested in attending prenatal yoga classes. Our study showed that women who practiced yoga were mainly older, White, and college-educated. These demographic differences are similar to those reported in other studies.<sup>13,14</sup> Lack of prior yoga experience was the most common reason cited by yoga-naive women for not attending a yoga class despite controlling for known demographic confounders.<sup>13–15</sup> This finding is unique to our study and has not been previously investigated. The study illustrates a key role of exposure to yoga in influencing willingness to engage in future yoga practice.

To our knowledge, there are no previous studies surveying attitudes and knowledge of yoga among high-risk pregnant women. In a survey of 500 pregnant women in Virginia, 65% of women believed that prenatal yoga is beneficial, and 40% had attempted yoga before pregnancy.<sup>12</sup> Although that sample was larger, it was not exclusive to high-risk pregnant women, who may be less receptive to interventions that include physical activity during pregnancy.<sup>16</sup> Importantly, our study shows a high rate of perceived safety with prenatal yoga (with 88% saying they believed yoga to be safe during pregnancy), and few of the high-risk

pregnant women cited safety specifically as a barrier to practice.

Although the safety of yoga has not been specifically studied in high-risk pregnant women, a randomized controlled trial done in 68 patients to evaluate the role of yoga in high-risk pregnancy did not report any adverse events.<sup>8</sup> A previous single-blinded randomized controlled trial with 56 patients recommending yoga in non-high risk pregnant women showed no significant change in fetal blood flow acutely after performing yoga for the first time.<sup>17</sup> Another study of 25 healthy pregnant women examined 26 yoga postures and found that yoga was well-tolerated, with no acute adverse maternal physiological or fetal heart rate changes.<sup>18</sup>

There has been a recent interest in evaluation of the benefits of yoga as a nonpharmacological therapy to improve outcomes in several conditions like diabetes, hypertension, depression, and chronic pain in nonpregnant populations and gestational diabetes and prenatal hypertensive disorders in pregnant women.<sup>2,3,6,8,10</sup> Current literature supports potential benefits and minimal harm from yoga therapy.<sup>8,9,17,18</sup>

Despite these potential benefits, yoga remains underutilized and is not widely accepted as standard care because of lack of evidence.<sup>19</sup> Most studies on the potential benefits of yoga in high-risk pregnancy are constrained by small sample sizes or lack of randomization.<sup>19</sup> This may be in part due to difficulties in recruitment and retention in this population.<sup>11</sup> A 2014 review highlights logistical challenges among other barriers to patient participation.<sup>11</sup> In that study, demographics (age, income, and education), transportation and access to the study site, time to participate, pregnancy-related health problems, and social factors like spouse/partner preferences were found to influence patient recruitment and retention in pregnant women.<sup>11</sup> The present study also identified important logistical barriers such as not wanting to attend yoga class without a concurrent prenatal appointment (35%), parking fees (32%), and time constraints (28%). Furthermore, 47% of our study participants preferred to attend prenatal yoga classes at a yoga studio, whereas only 26% preferred to attend at a hospital.

## Limitations

Our study findings must be interpreted in the context of the design and its limitations. The questionnaire was administered in a tertiary care center and was not validated. Only English-speaking women were offered the survey. These factors may limit the generalizability of our findings to other populations.

According to the Research Patient Data Registry (RPDR), the Partners Healthcare research query tool,

approximately 61% of women seen in the Maternal-Fetal Medicine clinic at Brigham and Women's Hospital during the study period were White, and 9.5% of women were Hispanic. (Additional RPDR data on the demographics of the 2016 Maternal-Fetal Medicine clinic patients are available from the authors.) In our study, 63% of women who filled out the survey were White, and 8% were Hispanic. Although only English-speaking women were offered the survey, our study population was demographically comparable to the clinic population. We were unable to collect data on women who opted not to complete the survey, and we did not measure the response rate for filling out the survey. However, based on the clinic census during the study period, we estimate that approximately 10 patients were offered the survey each day; it took approximately 6 months to collect 100 complete surveys.

The study also relied on participant self-report of high-risk conditions. Nevertheless, our results suggest an opportunity to engage women who might previously not have considered yoga as a possible intervention during pregnancy. Although our study showed that prior yoga experience was associated with willingness to practice prenatal yoga, we did not quantify the number of previous yoga classes that would be required to influence patient behavior. Although 56% of women surveyed said they would like to attend a prenatal yoga class, willingness to attend may differ from actual attendance at yoga class. Despite these limitations, our study provides a unique insight into the perceptions of prenatal yoga in high-risk pregnant women, which have not been previously investigated.

## Conclusions

Our study highlights the lack of prior yoga experience as an important and potentially modifiable barrier to yoga participation among women with high-risk pregnancies. Future steps to address this challenge may include focus group discussions. This would include administering the questionnaire in a targeted population, in a controlled setting that would allow several aspects of the questionnaire to be discussed with those filling out the survey.<sup>20</sup> Such groups could help formulate and validate a survey. Additionally, the potential role of a brief introductory yoga session offered to yoga-naïve patients, with the aim of familiarizing them with yoga and therefore influencing participation in prenatal yoga programs, can be investigated. Our study also provides a valuable understanding about logistical barriers to participation in prenatal yoga programs. We hope this knowledge will help inform future recruitment and retention efforts in prenatal yoga programs and clinical studies involving high-risk pregnant women.

Prior yoga experience was the strongest predictor of willingness to attend a prenatal yoga class in our population. Our results suggest that women with high-risk pregnancies who may benefit from prenatal yoga interventions but lack prior yoga experience may need additional education to facilitate participation.

## Conflict-of-Interest Statement

The authors report that there are no conflicts of interest to declare.

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