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Research Article

Impact of a Structured Yoga Program on Anxiety in Infertility Patients: A Feasibility Study

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Abstract

Background: Anxiety has been shown to worsen over time during infertility treatment. The psychological burden of treatment itself can lead to patient drop out. Yoga has been used as a stress reliever in other areas of health care.

Objective: The objective of this study is to assess whether a structured yoga intervention can decrease anxiety levels measured by the Spielberger StateTrait Anxiety Inventory (STAI) in patients with infertility. **Study design:** A prospective feasibility study was conducted. One hundred eleven participants undergoing infertility treatment at a large infertility practice were recruited and enrolled. All subjects self-selected to participate in the control group or the yoga group and completed the Spielberger StateTrait Anxiety Inventory at baseline and at a six week follow up. Seventy-nine participants completed both time points. "State" and "trait" anxiety scores were compared between the control and yoga groups. Paired t-tests and multivariate logistics regression were performed for statistical analysis via the SPSS software.

Results: Mean state and trait anxiety scores were significantly lower in the yoga group versus the control group ($p<0.014$ and $p<0.001$ respectively).

Conclusion: Mean state and trait anxiety levels were significantly lower after a structured six week yoga intervention in patients with infertility. These results suggest that yoga may have a beneficial role in reducing anxiety in patients with infertility. Ideally this may translate to decreased drop out and increased ability for patients to be successful.

Keywords: Infertility; Anxiety; Stress; Yoga; Mind-body

Introduction

The stress of infertility is significant and comparable to a recent cancer diagnosis [1]. Assisted reproductive technology (ART) is considered an arduous process due to the involvement of injection medication, multiple visits and invasive procedures [2-4]. A review article of 22 studies revealed that psychological burden is one of the most common reasons for patient discontinuation [2].

The psychological impact of infertility treatment itself can lead to increased stress and anxiety, potentially affecting clinical outcomes due to stress's impact on pathophysiology [4-9] and treatment adherence [10-12]. Approximately 23% of patients discontinue treatment prematurely due to treatment burden, with 33% of patients ending treatment without achieving pregnancy [13]. Specifically within the IVF patient population, it is estimated that 30% suffer from depression and anxiety [14-16] and that these symptoms can worsen overtime after failed IVF cycles [11]. Measures of stress and anxiety in repeat IVF cycles have shown to be persistently elevated and in addition, self-efficacy and resilience may decline in repeat IVF cycles [5]. Methods aimed at reducing the stress of treatment can therefore play an adjunctive role in enhancing treatment success.

The relationship between stress and infertility is complex. Increased stress may lead to inferior IVF outcomes [17]; however, mixed results as to the true impact of stress and anxiety on infertility outcomes exist [3,5,8,18,19]. Data examining fertility preservation patients as compared to infertility patients demonstrates that anxiety in fact increases during treatment in infertile patients as compared to fertility preservation patients [11] suggesting that treatment itself can be a cause of stress. Through the IVF process, the most stressful components include: the 10 day window prior to pregnancy test, failed IVF cycles and pregnancy loss [7]. Many women utilize exercise for coping, but this is limited during ovarian hyperstimulation. Thus meditative and psychotherapy are key tools to be assessed during this time. The mind-body model has been championed by Domar and shown to improve IVF success [20,21].

Research into stress reduction techniques has examined the utility of yoga in stress reduction and adaptation enhancement in health care workers [22], patients with post-traumatic stress disorder [23], breast cancer patients [24], and in healthy pregnant patients [17,25,26]. Yoga has also demonstrated a potential anxiety reduction benefit in the infertile population [17,18,27] however at the present time there is no evidence-based method that has been developed to utilize in infertility. The objective of this study is to assess whether a structured yoga intervention can decrease anxiety levels measured by the Spielberger StateTrait Anxiety Inventory (STAI) in patients with infertility.

Materials and Methods

Study design and population

A prospective feasibility study was conducted at a large clinical infertility practice. One hundred eleven participants who reported current use of infertility treatment were recruited and enrolled in this

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study. Subjects were given the choice to initiate either the control group or yoga program. Subjects were recruited on line and in person at Fertility Centers of Illinois (FCI). Pulling Down the Moon holistic center in Chicago and Washington DC area was utilized for yoga recruitment (40 and 15 from the Chicago and DC locations respectively). Controls were recruited exclusively from FCI. Participant consent was obtained prior to participation. This study was approved by the Institutional Review Board protocol#2014-26.

Yoga intervention

Yoga subjects participated in a six-week yoga intervention based on the Pulling Down the Moon Yoga for Fertility Program™. This program is based on the kosha model from traditional yoga therapy that suggests there are five different "bodies" available to the yoga practitioner-the physical body, the breath body, the mental emotional body, the wisdom body and the bliss body. Each week the class would focus on a kosha that included 30 min of discussion, 45 min of gentle Vinyasa-style yoga and 10-15 min of relaxation (svasana). The kosha-based discussion focused on using elements of yoga practice (postures, breathing, meditation, and working with negative thoughts and emotions) to manage the specific challenges of the infertility process. The posture practice included 3-4 rounds of the Moon Salutes sequence (Figure 1) followed by standing and seated poses based on the needs/medical restrictions of the participants.

Data and statistical analysis

Of the initial one hundred eleven participants, seventy-nine completed the Spielberger StateTrait Anxiety Inventory (STAI) at baseline and at a six-week follow up (24 in the control and 55 in the yoga group). Only those who completed both baseline and follow up surveys were included in our statistical analysis. Surveys were assessed using an online program mindbodygarden.com. Baseline demographics and clinical characteristics were obtained as part of the STAI. State and trait anxiety scores were compared between the control group and intervention using paired T-tests. Multivariate logistics regression analysis was performed to examine if any variables were independently associated with changes in state and trait anxiety scores. SPSS statistical program was utilized.

Results

Participant recruitment and loss to follow up

One hundred eleven participants were recruited. Within the yoga group, 65 participants were recruited however only 55 were analyzed (10 were excluded because they did not complete both survey time points). Within the control group, 46 were recruited however only 24 were analyzed (22 were excluded because they did not complete both survey time points) (Figure 2).

Figure 1: Pulling down the mood salute sequence (Salute sequence illustrated was performed by participants in the yoga group).

Demographic and clinical characteristics

Demographic information and clinical characteristics were obtained as part of the STAI (Table 1). Mean weight, BMI, time attempted at conceiving and average time in infertility treatment between the control group versus yoga group did not differ clinically and were as follows: 24.1 kg/m^2, 141.9 lbs, 24 months, 6 months versus 24.2 kg/m^2, 144.3 lbs, 24 months, 7.7 months. Age did seem to differ clinically between the control and yoga group (33 years and 37 years, respectively). There was no clinical difference between previous history of miscarriage between the control and yoga groups (38% *versus* 40%) and no participants within this study reported a history of a stillbirth. A majority of participants in both groups denied having a diagnosis of depression, however a majority of participants in the yoga group did report a diagnosis of anxiety. Most the participants in both groups denied using pharmacologic agents for either anxiety or depression. A majority of participants did report utilizing an adjunctive holistic measure during their infertility treatment.

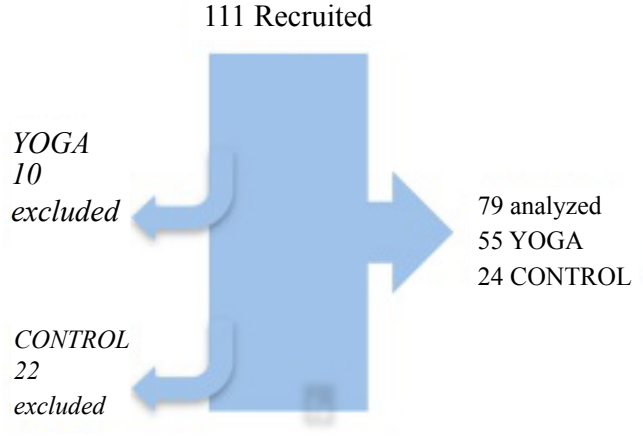

Figure 2: Participant recruiting flowchart (Diagram demonstrating total participants recruited, number excluded, and number included in statistical analysis.

Anxiety scores

Mean state and trait anxiety scores were statistically significantly lower in the yoga group versus the control group (Figure 3). Mean baseline and follow up state anxiety scores between the control and yoga groups were as follows: 45.6 and 44.5 *versus* 48.2 and 38.4 ($p<0.001$) corresponding to a 20% reduction in the yoga group. Mean baseline and follow up trait anxiety scores between the control and yoga group are as follows: 42.2 and 41.0 *versus* 44.6 and 39.1 ($p<0.014$) corresponding to a 12% reduction in the yoga group. Multivariate regression was performed to identify any independent associations between measured baseline characteristics and change in scores; no significant independent associations were found.

CHARACTERISTICS	CONTROL (N=24)	YOGA (N=55)
Ethnicity	Native American 4.2 Asian/Pacific Islander 4.2 Black/African American 0 Caucasian/White 83.2 Hispanic/Latino 4.2 Multiracial 0 Other 0 Prefer not to answer 4.2	Native American 0 Asian/Pacific Islander 18.1 Black/African American 3.6 Caucasian/White 74.5 Hispanic/Latino 0 Multiracial 1.9 Other 1.9 Prefer not to answer 0
Weight (lbs)	141.9 (SD 33.6)	144.3 (SD 31.5)
BMI (kg/m^2)	24.1 (SD 6.2)	24.2 (SD 4.3)
Education	High school 16.7 College/Undergraduate 33.3 Master 41.7 PhD/MD 8.3	High school 0 College/Undergraduate 34.5 Master 52.8 PhD/MD 12.7
History of depression (%)	Yes 16.7 No 83.3	Yes 38.1 No 61.9
History of taking depression medications (%)	Yes 12.5 No 87.5	Yes 23.6 No 76.4
History of anxiety (%)	Yes 20.8 No 79.2	Yes 56.4 No 43.6
History of taking anxiety medications (%)	Yes 16.7 No 83.3	Yes 21.8 No 78.2
Currently taking depression or anxiety medications (%)	Yes 12.5 No 87.5	Yes 14.5 No 85.5
History of using holistic measures (%)	Yes 62.5 Acupuncture 86.7 Massage 13.3 Nutrition 66.7 Psychotherapy 13.3 Other 0 No 37.5	Yes 58.1 Acupuncture 87.5 Massage 21.9 Nutrition 62.5 Psychotherapy 25.0 Other 15.6 No 41.9
Currently doing yoga (%)	Yes 8.3 No 91.7	Yes 23.6 No 76.4
History of miscarriage (%)	Yes 37.5 No 62.5	Yes 40 No 60
History of stillbirth (%)	Yes 0 No 100	Yes 0 No 100
Current length of infertility treatment at FCI (months)	6	7.7

Table 1: Basic demographic and clinical characteristics.

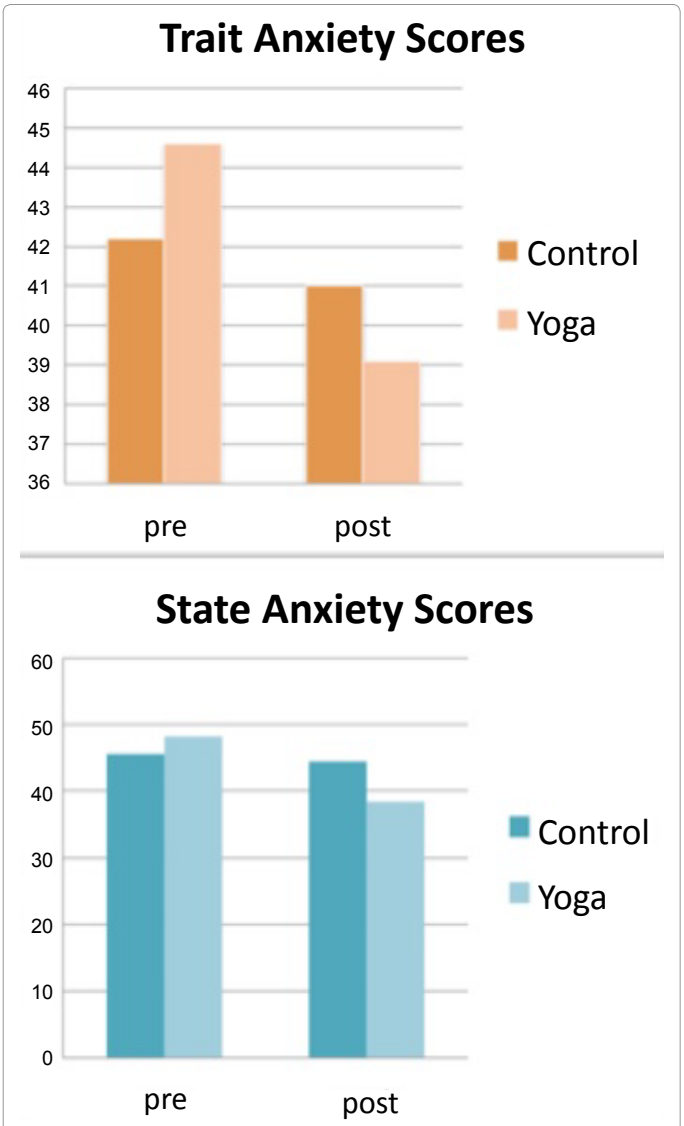

Figure 3: Mean STAI scores for trait and state anxiety between control and yoga groups. The difference between both trait and state anxiety only within the yoga group were statistically significant ($p<0.05$).

Discussion

Previous studies have demonstrated increased levels of anxiety and depression in infertility patients [28-31] and our study is consistent with this finding. Mean state and trait anxiety scores were both statistically significantly lower in the yoga group versus the control group after our structured yoga program; our study demonstrated a 20% reduction in state anxiety and a 12% reduction in trait anxiety scores after a 90 min 6 week yoga intervention. We controlled for possible confounders related to the differences between baseline demographics and clinical characteristics analyzed within our study using multivariate regression and did not demonstrate any independent associations.

STAI is a widely used measure of trait anxiety (a person's disposition towards being anxious over time) and state anxiety (how anxious a person feels at the present time). It is a 40-question survey that uses a 4-point Likert scale per question [32,33]. A score of 20 corresponds to low anxiety and a score of 80 corresponds to high anxiety [18]; higher anxiety scores exist in the infertility population [32]. Mean STAI scores in the infertility population range between 30-50 [5] with a cut-off of 39 in the non-infertility population indicating clinically significant anxiety [11,34]. Mean state and trait anxiety scores in our study were elevated (45.6 control and 48.2 yoga) demonstrative of higher levels of anxiety in our infertility patients [17,18] consistent with these previous findings. Follow up state anxiety scores in our yoga group fell below this clinically significant level of 39. This finding is especially important in the IVF population as a short intervention can be applied during the treatment protocol to acutely impact "state" anxiety during these stressful events.

Our structured yoga intervention is unique when compared to other studies [17,18] in that it was short in duration making it very accessible for patients to perform. The rationale for the large impact in anxiety reduction shown by our study is potentially related to the specific skills acquisition and directed concentration/mindfulness specific to the practice of yoga. The practice of yoga is aimed at aiding the body and mind to distinguish between "effort" and "non effort" and to utilize this knowledge to achieve a state of deliberate relaxation through the "rebound effect" in addition to "synchronization" where the individual is concentrated on one point of focus [27]. Additionally it is plausible that yoga may affect the underlying biologic and genetic mechanisms leading to anxiety. Reductions in serum markers of stress and improved immune function have been demonstrated in those who practice yoga [35-38]. Implementation of yoga in patients with post-traumatic stress disorder (PTSD) has suggested improvement in resilience, stress and anxiety [23] and the use of yoga among healthy mental health care workers resulted in improved stress adaptation and work related stress [22]. More recently, the epigenetic factors associated with anxiety have been examined. Increased global DNA methylation and cytokines, specifically IL-6 has been seen in anxious individuals [39]. It is possible that the differences in serum markers of those who practice yoga may be related to influencing these epigenetic regulators of anxiety and inflammation. Yoga interventions have been implemented specifically in the infertility population resulting in potential benefits in higher quality of life, lower STAI scores, and reduction in depression measures [17] in addition to lower general distress [18].

Stress reduction techniques that are not only simple but also empowering can potentially have a profound impact on clinical outcomes and patient success. ART processes that are associated with the highest stress and decreased coping are the 10 days prior to pregnancy test, previous failed IVF cycles and pregnancy loss [5,7]. Many common stress reducers like exercise are limited during ovarian stimulation indicating the need for specialized and safe techniques, such as yoga.

Of note a majority of participants in the yoga group as compared to the control group did report a previous history of anxiety (56.4% *versus* 20.8% respectively) though the majority of participants denied the use of pharmacologic treatment of anxiety or depression during our study period. Majority of participants in both groups reported the use of adjunctive holistic measures during the ART process (62.5% control *versus* 58.1% yoga group), the most popular being acupuncture and nutritional supplements. Psychological factors as well as infertility treatments have been cited as a major cause for premature discontinuation of treatment [2,11,40]. Our study revealed that though a majority of patients in the yoga intervention reported an underlying anxiety diagnosis, the use of pharmacologic therapies was lower than expected.

The limitations of our study include the non-randomized nature of our design that may have led to selection bias. Our study design allowed for patients to self select their study group because minimal data exists

as to the true nature of yoga's utility in anxiety in infertility and the authors did not want to impart any unforeseen stressors by imposing the yoga intervention on study participants prior to obtaining initial data regarding the utility of this intervention. Selection bias may have also influenced the reductions in both state and trait anxiety scores secondary to a greater proportion of participants in the yoga group versus in the control group reporting a diagnosis of anxiety (56.4% *versus* 20.8%). Given the non-randomized nature of this feasibility study and the potential for selection bias, we performed multivariate logistics regression analysis to examine if the differences between baseline demographics or clinical characteristics accounted for the statistically significant results obtained. No independent associations were seen suggesting that though selection bias exists within this study, it did not solely account for the statistically significant reduction in anxiety scores that we demonstrated.

Future directions include a follow up randomized control trial, examining the long-term effects of our yoga intervention and examining the optimal time during the ART process that yoga can be most beneficial in. This pilot project will assist in creation of a subsequent trial.

ART in and of itself is considered a stressful process and infertility patients already demonstrate higher levels of anxiety as compared to the general population. Yoga has been examined as a potential anxiety reducer. Our study demonstrated that a structured 6 week yoga intervention performed for 90 min once a week significantly reduced both state and trait anxiety levels in patients with infertility. Ideally this may translate to decreased drop out and increased ability for patients to be successful.

Author Roles

Sona Jasani was involved in patient recruitment, execution, data collection, data analysis, manuscript drafting and critical discussion. Beth Heller was involved with study design, patient recruitment, execution and development and implementation of our structured yoga intervention. Sue Jasulaitis and Marie Davidson were involved in study design and execution. Jennifer Hirshfeld-Cytron was involved in study design, execution, manuscript drafting and critical discussion.

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