

## Effect of integrated yoga on anxiety, depression & well being in normal pregnancy



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### A B S T R A C T

#### Keywords:

Integrated yoga  
Normal pregnancy  
Stress  
Anxiety  
Depression

**Objective:** To study the effect of integrated yoga on Pregnancy experience, anxiety, and depression in normal pregnancy.

**Methods:** This Prospective Randomized control study recruited 96 women in 20th week of normal pregnancy. Yoga group ( $n = 51$ ) practiced integrated yoga and control group ( $n = 45$ ) did standard antenatal exercises, one hour daily, from 20th to 36th week of gestation. Mann–Whitney and Wilcoxon's tests were used for statistical analysis.

**Results:** There was significant difference between groups (Mann–Whitney  $p < 0.001$ ) in all variables. There were significant changes within groups (Wilcoxon's  $p < 0.001$ ) in both groups. Pregnancy related experience (PEQ) reduced in yoga by 26.86%, State (STAI I) anxiety (decreased 15.65% in yoga, increased 13.76% in control), Trait (STAI II) anxiety (decreased 8.97% in yoga, increased 5.02% in control) and Depression (HADS) (decreased 30.67% in yoga, increased 3.57% in control).

**Conclusion:** Yoga reduces anxiety, depression and pregnancy related uncomfortable experiences.

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### 1. Introduction

Pregnancy is a unique state of physiological stress, which necessitates physical, mental and social adaptation. Animal experiments and human studies have shown that prenatal maternal stress is associated with increased risk for spontaneous abortion, preterm labor, fetal malformations, and asymmetric growth retardation [1]. Evidence of long-term functional disorders in the offspring after prenatal exposure to stress is limited. But retrospective studies [2] and two prospective studies support such effects [3] on the behavioral development with attentional deficits, hyper anxiety and disturbed social behavior [4].

Pregnant women respond differently to identical stressful stimuli, depending on genetic factors, personality traits, previous experience and social support. Anxiety and depression are two common responses to stressfully demanding situations that may affect healthy progression of pregnancy as observed by many researchers. Bennett et al. reported Prevalence rates of clinical depression at 7.4%, 12.8%, and 12.0% for the first, second, and third trimesters, respectively [5]. There are studies that have shown that high scores of Anxiety results in increased incidence of preterm labor [6], reduced birth weight and small fetal head size [7].

A review of preclinical and clinical studies on the deleterious effects of maternal depression showed that it affects not only the mother but also has short and long term effects on the offspring [8]. Depressed women had higher symptom frequency, more discomfort, flatulence and fatigue [9]. Postpartum weight retention in obese mothers was associated with psychological distress during early pregnancy [10]. Depression that continues in the Postpartum period is associated with negative childbirth experience [11] and when untreated, impairs the mother-infant attachments and results in cognitive, emotional and behavioral consequences in childhood [12]. Ventegodt et al. showed that the global quality of life of the mother during pregnancy is important for the quality of life of the child and their attitudes toward life and philosophy of life [13]. Studies on adolescent quality of life (HR-QOL) point to adversity in the neural pathways that are determined in their fetal developmental stage [14]. It is alarming to note that review articles say that there are no controlled studies on the safety of antidepressant use in pregnancy and lactation [8]. This points to an urgent need for non-pharmacological interventions.

Very simple interventions such as educating women by providing information about benefits and risks of prenatal physical activity motivates them to practice better health behaviors [15]. Cognitive-behavioral intervention led to improvement in the biological stress response of pregnant women with sub clinically elevated stress, anxiety, or depressive symptoms [16]. A controlled clinical trial on outpatient ante-partum women who met DSM-IV

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criteria for major depressive disorder, found significant improvement in mood after 16 weeks of Interpersonal psychotherapy [17].

Massage therapy showed reduced anxiety, improved mood and better sleep with fewer complications during labor and postnatal period [18] with lesser incidence of prematurity and low birth weight [19]. Exercise in the third trimester was associated with lesser state-anxiety [20]. Applied relaxation training showed significant reductions in state/trait anxiety and perceived stress [21]. 'Attending nurse-led relaxation education' reduced the need for cesarean section, and/or instrumental extraction and also the number of infants with low birth weight [22].

Yoga, with its holistic approach, has been used to promote positive health for centuries in India [23]. Several clinical trials point to the beneficial effects of yoga in Asthma [24,25], Hypertension [26,27], Pain Management [28,29], Diabetes [30], Cancer [31], and Mood Changes [32]. Yoga improves the Quality of life [33] and reduces stress as evidenced by reduced anxiety levels [34,35], serum cortisol levels [36,37] with lower metabolic rate in yoga practitioners [38].

To date there are a few publications on the effect of integrated approach of yoga (IAYT) on pregnancy outcome [39]. In a case control study Narendran et al. showed the positive effects of IAYT on mode of delivery, birth weight of the infant and pregnancy complications. Again, in those pregnancies with abnormal flow in umbilical and uterine arteries (observed in ultrasound Doppler scanning), there was improvement in birth weight, decrease in preterm labor and intrauterine growth restriction [40].

Sun et al. [41], observed that 12–14 week yoga program produced lesser scores on Discomforts of Pregnancy (DoPQ) in 38–40th week of gestation with higher self-efficacy and outcome expectancy in both the active and second stages of labor. It is known that Physiological stress reactivity is dampened during pregnancy [42]. We demonstrated improved autonomic adaptability (in heart rate variability) with reduced perceived stress levels [43] that resulted in better quality of life (WHOQoL 100) and interpersonal relationships (FIRO-B) after integrated yoga in pregnant women [44]. We hypothesized that these observations could be due to reduced anxiety and depressive responses to perceived stress and planned to document these variables in the same cohort in which we observed the above changes which is reported here.

## 2. Methods

### 2.1. Participants

#### 2.1.1. Sample size

A sample size of 88 was obtained by using the 'G power' software, ( $\alpha = 0.05$ , power = 0.8 and effect size = 0.54). The effect size was calculated from the mean and SD values of an earlier interventional study [45]. We recruited 122 women to provide for any dropouts.

Ninety six women (20–35 years) between 18th to 20th weeks of gestation who satisfied the selection criteria were randomized to yoga (51) and control groups (45). They were recruited from a pool of 200 subjects who had registered for antenatal care at Maiya multispecialty hospital in south Bengaluru, India. The following criteria were followed to ensure inclusion of only normal pregnancies and avoid those who may have high stress levels: (a) gestational age between 18 and 20 weeks, (b) prime gravidae and (c) multi gravidae with at least one live child. The exclusion criteria were: (a) associated medical problems, (diabetes, hypertension, etc), (b) multiple pregnancy, (c) IVF pregnancy, (d) previous history of IUGR, (e) maternal physical abnormalities, (f)

fetal abnormality on ultrasound scanning and (h) previous exposure to yoga.

### 2.2. Consent

Institutional ethical committee of the yoga university (S-VYASA) had cleared the project. Signed informed consent was obtained from all subjects before randomization.

### 2.3. Design

This was a prospective randomized two-armed control design with supervised practices for both groups from the time of recruitment till delivery.

### 2.4. Procedure

After obtaining the signed informed consent, the subjects were allocated to two groups (yoga and control) using a computer generated random number ([www.Randomizer.com](http://www.Randomizer.com)) table. Pre and post assessments were done at the time of recruitment (between 18 and 20 weeks of pregnancy) and at 36th week. Yoga group practiced specific set of integrated yoga. The control group practiced standard antenatal exercises. Both groups learnt the practices (in batches of 4–10) from trained instructors in sessions of 2 h/day (3 days/week) for one month. Subsequently, they continued the practices at home using a pre recorded instruction cassette for one hour each day. Both groups had refresher classes of 2 h each time they came for their antenatal obstetric assessment. (Once in 3 weeks up to 28 weeks and every two weeks up to 36 weeks). Compliance was ensured by phone calls and maintenance of an activity diary.

### 2.5. Masking

As this was an interventional study, the participants or the trainer could not be blinded. Attempts were made to mask wherever feasible to reduce the bias. The team who did the assessments was not involved in administering the intervention. The statistician who did the randomization and analysis was blind to the source of the data. Care was taken to avoid interaction and exchange of techniques between participants of the two groups by staggering the timings and venue of the classes for the two groups.

### 2.6. Intervention

The yoga module used for the experimental intervention called Integrated approach of yoga therapy (IAYT) during pregnancy which was developed specifically for the purpose culled out from original scriptures (Patanjali Yoga Sutras, and Mandukaya Karika) that highlight the concepts of a holistic approach to health management at physical, mental, emotional and intellectual levels with techniques to improve mental equilibrium. Table 1 shows the list of yoga practices used in three trimesters. The number of asanas (physical postures) performed in standing, sitting or lying prone or supine postures went on reducing with increasing gestational age. These asanas done with internal awareness (eyes closed) promotes full range of motion of the body part by graded gradually increasing stretches followed by relaxation, that results in flexibility of the joints and strengthening of the muscles. The breathing techniques (Pranayama) focus on conscious prolongation of all three components of breathing cycle (inhalation, effortless retention, and exhalation) that results in better vital capacity and balance of vital energy. Meditation included techniques such as listening to one's

**Table 1**  
Yoga and exercise intervention group practice details (60 min daily).

Yoga group	2nd Trimester	3rd Trimester	Control group	2nd Trimester	3rd Trimester
A. Lectures	15 min	10 min	A. Lectures	15 min	10 min
B. Breathing exercises	10 min	5 min	B. Loosening exercises	10 min	5 min
1. <i>Hasta ayama svasanam</i> (Hands in and out breathing)	Yes	Yes	1. Twisting	Yes	Yes
2. <i>Hasta vistara svasanam</i> (Hands stretch breathing)	Yes	Yes	2. Forward & backward bend	Yes	No
3. <i>Gulpha vistara svasanam</i> (Ankle stretch breathing)	Yes	Yes	3. Side bending	Yes	Yes
4. <i>Vyaghra svasanam</i> (Tiger breathing)	Yes	No	4. Calf-raise	Yes	Yes
5. <i>Setu bandha svasanam</i> (Bridge posture breathing)	Yes	No	5. Hamstring stretch	Yes	Yes
			6. Lateral Pulls- up & down	Yes	No
			7. Calf extension	Yes	No
			8. Hip Abduction	No	Yes
C. Asana Postures	15 min	10 min	C. Antenatal Exercises	15 min	10 min
<i>Standing Asanas</i>			<i>Standing exercises</i>		
1. <i>Tadasana</i> (tree pose)	Yes	Yes	1. Thigh stretch	Yes	Yes
2. <i>Ardhakati-chakrasana</i> (Lateral Arc Pose)	Yes	Yes	2. Push-up & Down	Yes	Yes
3. <i>Trikonasana</i> (triangle pose)	Yes	Yes	3. Pulls Downs	Yes	No
<i>Sitting Asanas</i>			4. Low-Back lift	Yes	No
4. <i>Vajrasana</i> (Ankle Pose)	Yes	Yes	<i>Sitting exercises</i>		
5. <i>Vakrasana</i> (spine twist pose)	Yes	No	5. Inner thigh Stretch	Yes	Yes
6. <i>Siddhasana</i> (sage pose)	No	Yes	6. Calf stretch	Yes	Yes
7. <i>BaddhaKonasana</i> (Bound Ankle Pose)	No	Yes	7. Dips	Yes	No
8. <i>UpavistaKonasana</i> (spread legs pose)	No	Yes	8. Squatting	No	Yes
9. <i>Squatting</i> (Garland pose)	No	Yes	9. Hip abduction	Yes	Yes
<i>Supine Asanas</i>			10. Shoulder-chest stretch	Yes	Yes
10. <i>Viparita karani</i> (half shoulder stand)	Yes	No	11. Neck and upper back stretch	Yes	Yes
11. <i>Ardha- pavanamuktasana</i> (folded leg lumbar stretch)	Yes	Yes	12. Seated Rowing	Yes	Yes
			13. Oblique curis	Yes	Yes
			14. Kick backs	Yes	Yes
			15. Pelvic floor exercise	Yes	Yes
			<i>Supine exercise</i>		
			16. Pelvic Tilt	Yes	Yes
D. <i>Pranayama and Meditation</i>	10 min	20 min	D. Slow Walking	10 min	20 min
1. Sectional breathing	Yes	Yes			
2. <i>Naadisuddhi</i>	Yes	Yes			
3. <i>Sheetali</i>	Yes	Yes			
4. <i>bharamari</i>	Yes	Yes			
5. <i>Nadanusandhana</i>	Yes	Yes			
6. <i>Om Meditation</i>					
E. Deep relaxation technique	10 min	15 min	E. Supine Rest (10 min)	10 min	15 min

own breath or repeating a mantra to bring about a state of self-awareness and inner calm [39].

The control group practiced the standard antenatal practices which included simple stretching exercises (Table 1) approved by the Executive Council of the society of Obstetrician and Gynecologists of Canada, and by the board of directors of the Canadian society for exercise physiology [46].

## 2.7. Assessments

### 1. PEQ: Pregnancy experiences Questionnaire

The Pregnancy experiences Questionnaire addresses Pregnancy-specific stressors and concerns experienced during pregnancy [47] PEQ has 41 questions related to somatic symptoms, Pregnancy, fetus/infant and parenting concerns, baby-image, and attitudes to sex. Women are asked to rate how severe each item has been for them in the past month on a three-point scale (1–3) with the total

scores ranging from 41 to 123 with higher scores indicating higher stress levels. PEQ has good internal consistency ( $\alpha = 0.87–0.91$ ) [48] with Test-retest reliability coefficients varying from 0.64–0.84 depending on the time period sampled (one to six months).

### 2. STAI: state trait anxiety inventory

The STAI [49] comprises two-self report scales for measuring two distinct anxiety concepts, the State anxiety and Trait anxiety. Both scales contain 20 statements that asks the respondent to describe how she feels at a particular moment (state anxiety) or how she generally feels (trait anxiety). State anxiety is conceptualized as a transitory emotional state, where as trait anxiety refers to relatively stable individual differences in proneness to anxiety. The respondents were required to rate themselves on a four point Lickert scale 'not at all' to 'very much so' on various anxiety related symptoms which they experience in the past weeks for the state scale or how they generally feel

for the trait scale [49]. STAI is widely used and has been shown to have high reliability and validity [49] with a Cronbach's alpha of 0.88 and 0.83 for state (STAI-I) and trait anxiety (STAI-II) respectively [50].

### 3. HADS: Hospital Anxiety Depression Scale

HADS is a self-assessment scale developed by Zigmond and Snaith [51]. It is a widely used self-report instrument designed to assess the dimensions of anxiety and depression in non-psychiatric population [52,53]. It has 14 items that consist of two subscales of seven items each, to measure the levels of anxiety and depression. Each item is rated on a scale from 0 (not at all) to 3 (very much). This is a widely used reliable scale with Cronbach's alpha of 0.89 [54].

### 3. Data analysis

Statistical analysis was done using SPSS Version 10.0. Chi squared test and independent samples 't' test were used for baseline comparisons and mean differences within groups. As the data were not normally distributed, Mann–Whitney test (between groups) and Wilcoxon's test (within groups) were used for statistical analysis.

### 4. Results

Fig. 1 shows the trial profile. 200 women who registered at the antenatal clinic of the institute were screened; 122 women who satisfied the selection criteria, 105 consented and the final data was available on 96 women (yoga 51 and control 45). There were 2 drop outs in yoga and 7 in control. The reasons for drop out included: (i) Irregular attendance (ii) shifts from control to yoga group because

of increasing popularity of yoga through the media, and (iii) social reasons: moved out of Bangalore for delivery and post partum care to mother's house as a sentimental social custom of south India.

The two groups were matched on maternal characteristics (Table 2) and baseline scores were not normally distributed.

Table 3 shows the results after the intervention. State (STAI I) anxiety reduced in yoga (15.65%,  $p < 0.001$ ) with significant difference between groups ( $P < 0.001$ ); it increased in the control group (13.76%,  $p < 0.007$ ); Trait (STAI II) anxiety also reduced in yoga (8.97%,  $p < 0.001$ ) and increased in the control group (5.02%,  $p < 0.09$ ) with significant difference between groups ( $p < 0.001$ ). Anxiety as measured by HADS also reduced in yoga (29.12%,  $p < 0.001$ ) with significant difference between groups ( $p < 0.001$ ). Depression (HADS) reduced in yoga (30.67%,  $p < 0.001$ ) with significant difference between groups ( $p < 0.001$ ). Pregnancy related experience questionnaire showed significant changes in the yoga (26.86%,  $p < 0.001$ ) group with significant difference between groups ( $p < 0.001$ ).

### 5. Discussion

This prospective randomized control study compared the effect of daily practice of integrated yoga program with standard antenatal exercises in normal pregnant women from 20th to 36th weeks. Anxiety and Depression reduced with improvement in pregnancy experience after yoga with significant difference between groups ( $P < 0.001$ ). There were no adverse effects in any of the cases.

Although the women in control group were doing the practices of physical activity as planned and were reporting the regularity of practices, there was significant increase in state (13.76%) and trait (5%) anxiety as pregnancy advanced. The reason for this increase could be: although it is well known that physical activity reduces

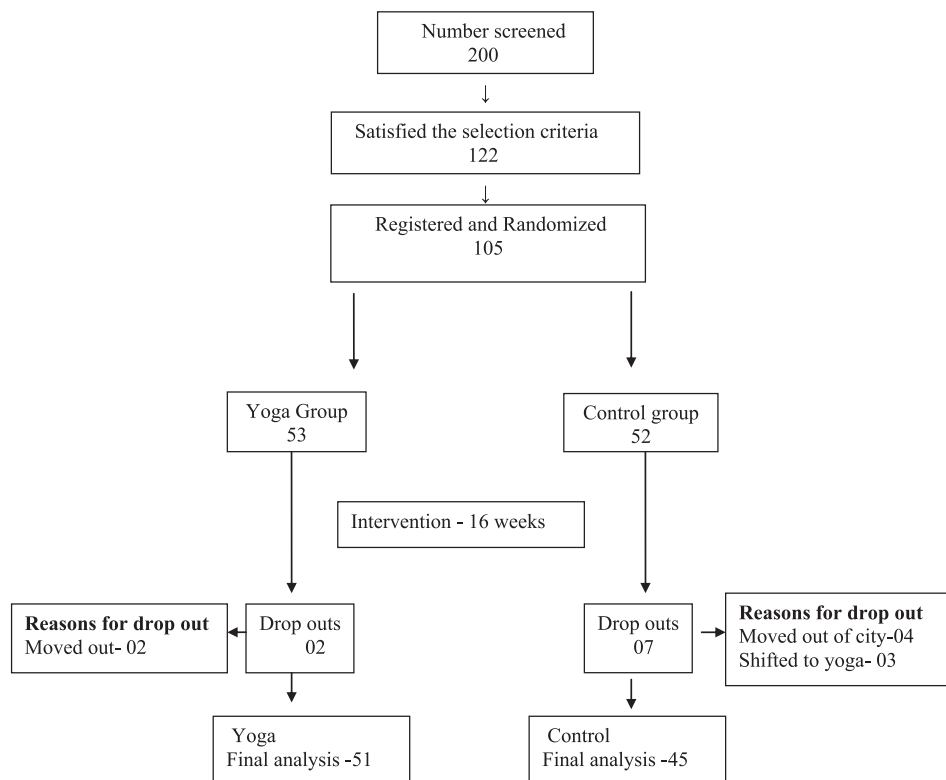


Fig. 1. Antenatal RCT profile.

**Table 2**  
Showing demographic characteristics of the subjects.

Variables		Yoga (N = 51) Mean ± S.D	Control (N = 45) Mean ± S.D
Age		26.41 ± 3.01	24.96 ± 2.58
Height (inches)		63.67 ± 1.81	62.84 ± 1.98
Gravida	G1	45 (88%)	40 (87%)
	G2	5 (12%)	6 (13%)
Occupation	Working	33 (65%)	21 (49%)
	Not working house wives	18 (35%)	24 (51%)
Weight (kg)	Pre	63.69 ± 9.67	61.56 ± 8.56
	Post	71.82 ± 9.90	69.91 ± 8.84
BMI	Pre	24.97 ± 3.52	25.05 ± 3.80
	Post	28.54 ± 3.60	28.55 ± 3.86
BP (systolic)	Pre	114.71 ± 14.74	115.07 ± 8.13
	Post	117.25 ± 9.61	118.00 ± 8.15
BP (diastolic)	Pre	73.12 ± 5.43	72.40 ± 6.56
	Post	75.06 ± 5.33	75.84 ± 6.24

Abbreviations: G1, Prima; G2, Secunda 2; W, Working; HW, Housewife; Wt, Weight; BMI, Body mass index; BP, Blood pressure.

Group means and SE's of all participant variables; all 20th week (= Pre) except where stated Post (= 36th week). No difference between groups was statistically significant on any Pre or Post variable (Gravidae and Work Chi square test; others independent samples 't' test).

stress and improves health, it appears that, this may not be sufficient to prepare the woman to manage the psychological response (anxiety) to demanding situations of life, i.e. anticipation of complications and pain of delivery. Yoga, by definition is mastery over the modifications of mind (*Patanjali – chitta vrtti nirodhah*) and offers techniques that invoke the inbuilt capability to manage the psychological and physiological challenges. Regular practice of integrated yoga leads to a balanced state of mind (*samatvam yoga* as stated in *bhagavadgita*) that does not get perturbed by these challenges [55] by improving neural plasticity [56].

### 5.1. Comparisons

There are very few studies that have looked at the effect of yoga on stress, anxiety or depression during pregnancy. Two studies have reported reduction in trait anxiety ( $p < 0.05$ ) in third trimester in healthy pregnant nulliparous women who practiced mindfulness-based yoga between 12 to 32 weeks [57,58]. We have earlier reported reduction in perceived stress and better autonomic

adaptability [43]. There are several studies that have looked at the effect of different types of yoga practices on anxiety, depression, wellness and quality of life in clinical conditions and normal healthy volunteers. To our knowledge this is the first study that has reported the effect of yoga on pregnancy experience, anxiety and depression.

Nidhi et al. reported significant reductions in both state [12.27%] and trait [14.97%] anxiety in adolescent girls with polycystic ovarian disease [59]. Subramanya et al. [60] observed a reduction in state anxiety (22.4%) immediately after Cyclic Meditation in normal volunteers. Rao et al. in their randomized control study on early breast cancer patients observed reduction in both state and trait anxiety by add-on yoga [61]. Twelve weeks of Iyengar yoga reduced the state and trait anxieties in normal volunteers [62] and in women with mental distress [63]. Our present study observed a 15.65% reduction in state anxiety and 9% reduction in trait anxiety in yoga group of pregnant women.

There was a 48.2% reduction in anxiety levels (HADS) after 6 weeks of add-on yoga in breast cancer patients undergoing radiation therapy [64]. Sudarshan Kriya and related practices reduced the scores on depression from  $4.11 \pm 2.99$  to  $2.73 \pm 2.19$  and Anxiety scores from  $7.60 \pm 3.71$  to  $5.87 \pm 3.18$  after yoga practice in adult volunteers [65]. In the present study, there was better reduction in anxiety score (HADS) in the yoga (29.12%) group compared to the control group (1.69%); reduction in Depression score was also higher in yoga (30.67%) than the control group (3.57%).

Looking at effect of yoga on the discomforts of pregnancy, we observed higher degree of improvement in the yoga (26.86%) group as compared to control group (13.55%) in their Pregnancy experience. Sun et al. [41]. studied the effects of a 12–14 week yoga program and showed significantly less discomfort in the 38–40th week of gestation with higher self-efficacy expectancy and outcome expectancy in both the active and second stages of labour than the women in the control group.

### 5.2. Mechanism: stress reduction

Anxiety and depression are the experiences that a person actually feels in response to perceived stress. Studies using ultrasound Doppler flow velocimetry have shown high resistance of the uterine arteries in women with high anxiety scores in the third trimester [66]. It has been reported that high scores on perceived stress and anxiety are related to increase in HPA-Axis-activity [67]. Based on our results we may hypothesize that yoga's benefits

**Table 3**  
Changes after intervention in both groups N = 51 (Y) and 45 = (C).

Variable	Group	20th Weeks	36th Weeks	Effect size	% Differ	Confidence intervals				Sig-P values <sup>a</sup>	
						20th Week		36th Week		Within Gps pre/post	Between Gps post/post
						LB	UB	LB	UB		
STAI-I	Y	35.71 ± 7.10	30.12 ± 5.72	0.993	15.65↓	33.89	37.74	28.75	32.04	0.001	0.001
	C	36.44 ± 5.99	39.71 ± 6.8	0.683	13.76↑	34.18	37.74	36.76	41.04	0.007	
STAI-II	Y	36.18 ± 6.81	31.20 ± 6.16	0.43	8.97↓	34.47	38.17	29.66	33.02	0.001	0.001
	C	37.64 ± 5.93	39.53 ± 7.20	0.26	5.02↑	35.36	38.85	36.40	40.83	0.090	
HADS anxiety	Y	7.35 ± 2.45	5.22 ± 1.36	0.910	29.12↓	6.66	8.04	4.83	5.60	0.001	0.001
	C	7.69 ± 2.84	7.82 ± 3.43	0.048	1.69↑	6.84	8.54	6.79	8.85	0.731	
HADS depression	Y	6.39 ± 2.55	4.43 ± 1.39	0.796	30.67↓	5.67	7.11	4.04	4.82	0.001	0.001
	C	6.73 ± 2.22	6.98 ± 2.91	0.091	3.57↑	6.07	7.40	6.10	7.85	0.592	
PES	Y	68.02 ± 5.47	49.75 ± 5.99	2.55	26.86↓	66.48	69.56	48.06	51.43	0.001	0.001
	C	68.20 ± 5.84	58.96 ± 8.81	1.37	13.55↓	66.45	69.95	56.31	61.60	0.001	

Abbreviations: LB: Lower Bound, UB: Upper Bound.

Note: There is significant difference between groups with better improvement in yoga group on all three variables.

<sup>a</sup> Wilcoxon's signed ranks test (within groups); Mann–Whitney U test (between groups).



would be mediated through reduction in the abnormal activity of the maternal sympathetic–adrenal–medullary system (SAM) and hypothalamic–pituitary–adrenocortical axis (HPA-axis) [42]. Better autonomic stability with reduced sympathetic arousal and increased parasympathetic tone has been demonstrated in normal adults [68] after yoga. Also, we have shown reduced perceived stress and better autonomic adaptability during normal pregnancy after integrated yoga [43] pointing to better plasticity of ANS and its ability to restore the basal state of relaxation quickly after a stress response.

Better psychological health resulting from stress reduction may have contributed to the improvement observed on PEQ in this study. We have published earlier that these women had much better quality of life and interpersonal relationships [44] that points to the positive psychological state that yoga can induce. Thus, these psychological changes may explain the physiological changes observed as better outcomes seen in our earlier studies on integrated yoga in both normal [39,43] and high risk pregnancies [44,69]. This may also promote a healthier ANS programming in the fetus [42,70] which may help in preventing diseases related to autonomic nervous system hyperactivity in the offspring.

The Word yoga comes from a Sanskrit root 'Yuj' that means 'to yoke', 'to join', to unite the mind, body and the spirit; and to direct and concentrate one's attention by calming down the restless mind [55]. Thus the deep physiological rest that is achieved by the components of pranayama, meditation and other mindfulness practices incorporated in the integrated yoga program could be the major aspects that could explain the observed benefits.

## 6. Conclusion

Regular practice of integrated yoga in second and third trimester is more effective than antenatal exercises in reducing anxiety, Depression and improving the pregnancy experience.

### 6.1. Limitations

- a. Possible interaction between the groups could not be avoided.
- b. Requests for shift from control to yoga group due to popularity of yoga through the media led to unexpected number of drop outs.

### 6.2. Generalizability

As yoga is widely accepted even in the west today and there are good number of centers round the globe which have been teaching yoga for pregnancy, this study offers the scientific evidence for the safety and benefits of this module of integrated yoga. Thus, we recommend that obstetricians incorporate these practices in all antenatal clinics in all sections of the society.

### 6.3. Suggestions for future research

More studies in different ethnic groups, in abnormal pregnancies and by use of different types of Yoga may throw more light on ANS modulations in pregnancy. Multi centric trials including a more comprehensive battery of variables to measure ANS functions and changes in hormonal levels may unravel the hidden mechanisms of yoga, since the exact nature of the autonomic changes involved in stress adaptation are poorly understood [70].

### Conflict of interest

We hereby declare that authors do not have any conflict of interest while carrying out this research.

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