

The Pregnancy Tele-yoga Module to Combat Stress, Anxiety, and Depression Associated with Pregnancy: An Exploratory Open-label Multicentric Study

Abstract

Purpose: Untreated stress, anxiety, and depression during the perinatal period can lead to adverse maternal and infant outcomes. Yoga, the practice of body–mind–spirit techniques has been shown to reduce stress, anxiety, and depression. **Aims:** The aim of the study was to examine the feasibility and limited efficacy of the 4-week practice of pregnancy tele-yoga module (PTYM) delivered and monitored through an online platform. **Methodology:** A multicentric, open-label, exploratory study was conducted in the antenatal clinics (ANCs) of three tertiary care hospitals in India. Pregnant women between 13 and 32 weeks of gestation were invited to participate. PTYM was taught by the trained research staff. A YouTube link demonstrating the PTYM developed by the researchers was shared with consenting participants. Using the Yoga Performance Assessment (YPA), research staff monitored the online performance of the PTYM. Pre- and postintervention, women were assessed using the Depression, Anxiety, and Stress Scale-21 (DASS-21). **Results:** Preintervention, among 162 consented pregnant women, anxiety (62.34%) was the most common mental health condition, followed by stress (55.55%) and depression (45.67%). YPA at the end of week 1, week 2, week 3, and week 4 was 19.45, 21.35, 24.15, and 28.45, respectively. Postintervention anxiety, stress, and depression persisted in 19.78%, 11.44%, and 10.41% of women. Pregnant women with stress (DASS-21 ≥ 15 ; $n = 90$), anxiety (DASS-21 ≥ 8 ; $n = 101$), and depressive (DASS-21 ≥ 10 ; $n = 74$) symptoms after undergoing 4 weeks of PTYM reported significant reduction in the scores. **Conclusion:** The current study demonstrated the feasibility and limited efficacy of PTYM in ANCs of a tertiary care hospital in India.

Keywords: Anxiety, depression, pregnancy, stress, tele-yoga, yoga

Introduction

Women are most vulnerable to common mental disorders (CMDs) such as stress, anxiety, and depression during the perinatal period.^[1] The prevalence of CMDs among pregnant women recruited from the community sample in India has ranged from 16% to 37%.^[2] One in six women experience three or more stressful life situations during pregnancy resulting in feelings of discrimination, less antenatal care visits, and poor obstetric outcome.^[3] There is a gradual increase in the self-report of anxiety symptoms during pregnancy with 18.2% (95% confidence interval [CI] 13.6–22.8) in the first trimester, 19.1% (95% CI 15.9–22.4) in the second trimester, and 24.6% (95% CI 21.2–28.0) in the third trimester. The overall prevalence of any anxiety disorder

during pregnancy is 15.2%.^[4] Maternal exposure to anxiety during pregnancy has been associated with adverse pregnancy outcomes such as low birthweight (LBW) and preterm birth (PTB).^[5,6] Antenatal stress and anxiety are the strongest predictors of postpartum depression.^[7] A systematic review has shown that the prevalence of depressive symptoms is higher during the antenatal period, 28.5%, and the general population mean prevalence of self-report of depressive symptoms is around 24.5% (standard deviation [SD] = 8.1; $d = 0.6$).^[8] Untreated depression during pregnancy can increase the chances of PTB, stillbirth, LBW, increased maternal complications, and operative deliveries.^[9]

Natural and man-made disasters are known to affect the mental health of perinatal women.

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More recently, systematic reviews on mental health outcome among pregnant women exposure to COVID-19, MERS, and SARS pandemics have been associated with a higher prevalence of anxiety (32.8%), stress (29.44%), depression (24.9%), and sleep disorders (24.38%).^[10]

Yoga, the practice of body–mind–spirit techniques combining *dhyana* (meditative practices and relaxation), *pranayama* (breathing techniques), and *asanas* (postures) has been shown to reduce stress, anxiety, and depressive symptoms.^[11,12] Systematic reviews and meta-analyses have shown that yoga practice has beneficial effects on stress, anxiety, and depression associated with pregnancy; however, there is a lack of information on how yoga interventions were delivered, frequency, intensity, duration, type of yoga intervention, and how it was monitored.^[13,14]

A pilot randomized controlled trial on the feasibility and acceptability of pregnancy yoga modules in rural settings in India has identified barriers such as lack of transport and lack of time,^[15] and yoga delivered through online platforms can overcome such barriers.

It has been found that during the COVID-19 pandemic with restrictions on people gathering in one place, tele-yoga and yoga delivered through online platforms have been found to be safe, feasible, and useful in reducing stress and improving the wellbeing of the participants.^[16] With this background, multicentric, open-label, exploratory study was planned to assess the feasibility and limited efficacy of the 4-week practice of pregnancy tele-yoga module (PTYM) for managing stress, anxiety, and depression in women from three different states in India.

Methodology

This multicentric, single-arm, open-label exploratory study was conducted in three centers in India: (1) Lady Hardinge Medical College Hospital, New Delhi, (2) MGM Medical College and Hospital, Navi Mumbai, Maharashtra, and (3) Ramaiah Medical College and Hospitals, Bengaluru, Karnataka. Pregnant women visiting the antenatal clinic (ANC) in their 2nd trimester or early 3rd trimester (13 weeks to 32 weeks) were invited to participate. The obstetrician in the ANC examined the consenting pregnant women for any obstetric contraindications to given yogic practices such as comorbid serious cardiorespiratory disorders, or other high-risk pregnancies. Other exclusion criteria were – a history of two or more spontaneous abortions/miscarriages or those with a history of practicing yoga regularly for at least 1 time a week for the past 4 weeks.

Consenting pregnant women were assessed for stress, anxiety, and depression symptoms using the Depression, Anxiety, and Stress Scale-21 (DASS-21). The trained yoga research staff taught the pregnancy yoga module (either in group or one-to-one) in a quiet room made available at each study site. Pregnant women were also provided

with a YouTube link demonstrating the PTYM developed by the researchers (<https://youtu.be/d0SoY5RwdcI?t=10>). The yoga research staff contacted the consenting pregnant women through a video call to supervise the practice of the online pregnancy yoga module. The yoga research staff also assessed the performance of the pregnancy yoga module using Yoga Performance Assessment (YPA).^[17] The duration of supervision was 4 weeks, and at the end of 4 weeks, their stress, anxiety, and depression were reassessed using the DASS-21.

Sample size calculation

The sample size was calculated based on a previously published literature^[18] which assessed the effect of a 4-week yoga intervention in women on their stress, anxiety, and depression scores assessed using the DASS-21, which is the primary outcome variable in the current study. It was observed that in the study,^[18] the effect size was 0.26 for depression, 0.35 for anxiety, and 0.48 for stress. Thus, considering the minimum required effect size of 0.26, we calculated the sample size using the G*Power software. Considering an alpha value of 0.05 and expecting power of 0.8, we arrived at a final sample size of 52/center. Since there are three centers involved in the study, the final sample size as per our calculation was 156. The study^[18] used for sample size calculation did not report any dropouts. However, considering the 5% dropout rate, the final sample size calculated was 164 for this trial.

Intervention: Pregnancy tele-yoga module for stress, anxiety, and depression

The pregnancy yoga module developed by Satyapriya *et al.* was used in this study.^[19] The module was modified for its use through the tele-mode [Table 1] based on the tele-yoga guidelines advised by the Central Council for Research in Yoga and Naturopathy, Ministry of AYUSH, Government of India.^[20] Each subject underwent at least one direct supervised yoga session and assessed on yoga performance using the YPA scale by a trained therapist. A video of the module was recorded and uploaded on YouTube (<https://youtu.be/d0SoY5RwdcI?t=10>). The same was shared with the subjects. Subjects were encouraged to practice yoga at least 5 days a week for the next 4 weeks using the video and were checked for correctness of the yoga practice once a week through a video call by the trained therapist. YPA assessment was repeated at the end of 4 weeks of intervention. Pregnant women who are able to complete 75% of the PTYM sessions were considered completers.

Data analysis

Data were analyzed using IBM SPSS Statistics (Version 27).^[21] Descriptive statistics (means and SDs or proportions) were used to present trial feasibility outcomes and demographic and socioeconomic characteristics of trial participants at the baseline. Data were found nonnormally

distributed, and hence, the Wilcoxon signed-rank test was used to compare baseline data with the post-4-week intervention data.

Results

During the study, 162 pregnant women (New Delhi = 82, Bengaluru = 50, and Mumbai = 30) consented to the PTYM. The mean age of pregnant women was 26.27 years (SD 4). The mean gestational age was 23.42 weeks (SD 4.16).

Demographic and clinical profile of the pregnant women

A small sample of pregnant women had diabetes (5, 3.1%), hypertension (2, 1.23%), and epilepsy (1, 0.62%) in the current pregnancy, and around 19 (11.73%) had thyroid-related issues, mainly hypothyroidism. Past medical comorbidities were seen in 15 (9.26%) pregnant women. Only 1 (0.62%) woman had past psychiatric condition, mixed anxiety depression. The demographic and clinical profile of the pregnant women is shown in Table 2.

Stress, anxiety, and depression symptoms

Preintervention

Anxiety was the most common mental health condition ($n = 101$, 62.34%), followed by stress ($n = 90$,

55.55%) and depression ($n = 74$, 45.67%). Among pregnant women having anxiety symptoms, majority were having a moderate degree of severity. Among stress symptoms, the severity varied as follows: mild ($n = 51$, 31.48%) was the most common, followed by moderate ($n = 33$, 20.37%) and severe ($n = 6$, 3.70%). Among depression symptoms, mild ($n = 47$, 29.01%) was the most common, followed by moderate ($n = 25$, 15.43%) and severe ($n = 2$, 1.23%) forms.

Postintervention

Anxiety symptoms persisted in 19 (19.78%), stress in 11 (11.44%), and depression in 10 (10.41%) of women. Majority of stress ($n = 9$, 9.36%), anxiety ($n = 10$, 10.42%), and depressive symptoms ($n = 8$, 8.33%) were mild in nature. Postintervention, none of the pregnant women reported severe symptoms. Preintervention and postintervention stress, anxiety, and depression scores among pregnant women are shown in Tables 3 and 4.

Yoga performance assessment among pregnant women

The performance of the PTYM by the pregnant women was rated using the YPA tool.^[17] The yoga performance scores were available for 142 women at the end of week

Table 1: Components of pregnancy tele-yoga module

	2 nd trimester	3 rd trimester
Lectures on yogic lifestyle	10 min	10 min
Breathing exercises	10 min	5 min
<i>Hasta ayama svasanam</i> (hands-in and hands-out breathing)	Yes	Yes
<i>Hasta vistara svasanam</i> (hands stretch breathing)	Yes	Yes
<i>Gulpha vistara svasanam</i> (ankle stretch breathing)	Yes	Yes
<i>Vyaghra svasanam</i> (tiger breathing)	Yes	No
<i>Setu bandha svasanam</i> (bridge posture breathing)	Yes	No
Asanas	15 min	10 min
<i>Tadasana</i> (tree pose)	Yes	Yes
<i>Ardhakati-chakrasana</i> (lateral arc pose)	Yes	Yes
<i>Trikonasana</i>		
Triangle pose	Yes	Yes
Ankle posture	Yes	Yes
<i>Vakrasana</i> (spine twist pose)	Yes	No
<i>Siddhasana</i> (sage pose)	No	Yes
<i>Baddha Konasana</i> (bound angle pose)	No	Yes
<i>Upavista Konasana</i> (sitting with legs apart)	No	Yes
Squatting (garland pose)	No	Yes
<i>Viparita karani</i> (half-shoulder stand)	Yes	No
<i>Ardha-pavanamuktasana</i> (folded-leg lumbar stretch)	Yes	Yes
Pranayama	5 min	10 min
Sectional breathing	Yes	Yes
<i>Sheetali</i>	Yes	Yes
<i>Bhramari</i>	Yes	Yes
Meditation	5 min	10 min
<i>Nadanusandhana</i>	Yes	Yes
Om meditation	Yes	Yes
Deep relaxation technique	10 min	15 min

Table 2: Demographic and clinical profile of pregnant women

Variables	n (%)
Education	
No formal education	7 (4.32)
Primary school	4 (2.47)
Middle school	21 (12.96)
High school	39 (24.07)
Intermediate	21 (12.96)
Graduate	70 (43.21)
Occupation	
Homemaker	140 (86.42)
Unskilled worker	2 (1.23)
Skilled worker	9 (5.55)
Semi-professional	3 (1.85)
Professional	8 (4.94)
Religion	
Hindu	143 (88.27)
Muslim	16 (9.88)
Sikh	2 (1.23)
Christian	1 (0.62)
Current pregnancy	
Diabetes (yes)	5 (3.1)
Hypertension (yes)	2 (1.23)
Thyroid-related issues (yes)	19 (11.73)
Epilepsy (yes)	1 (0.62)
Past history	
General medical condition	
Yes	15 (9.26)
No	147 (90.74)
Psychiatric condition	
Yes	1 (0.62)
No	161 (99.38)

1, 140 at the end of week 2, 138 at the end of week 3, and 136 at the end of week 4. Data revealed that the yoga performance showed a sustained increase over 4 weeks. The mean score of yoga performance at the end of week 1, week 2, week 3, and week 4 was 19.45 (SD 6.30), 21.35 (SD 6.00), 24.15 (SD 6.50), and 28.45 (SD 7.95), respectively, indicating significantly better performance at the end of week 4 (paired *t*-test, $P < 0.05$).

Effect of 4 weeks of pregnancy tele-yoga module on stress, anxiety, and depression

Stress

Pregnant women with stress symptoms (DASS-21 ≥ 15 ; $n = 90$) (mean \pm SD = 19.31 \pm 3.75) after undergoing 4 weeks of PTYM reported a significant reduction in the stress scores (mean \pm SD = 9.27 \pm 5.18) ($t = 3$, $P < 0.001$, effect size, Cohen's $d = 0.48$).

Anxiety

Pregnant women with anxiety symptoms (DASS-21 ≥ 8 ; $n = 101$) (mean \pm SD = 12.37 \pm 5.19) after undergoing

4 weeks of PTYM reported a significant reduction in the anxiety scores (mean \pm SD = 5.02 \pm 3.56) ($t = 3$, $P < 0.001$, effect size = 0.48).

Depression

Pregnant women with depressive symptoms (DASS-21 ≥ 10 ; $n = 74$) (mean \pm SD = 12.89 \pm 3.13) after undergoing 4 weeks of PTYM reported a significant reduction in the depressive symptoms (mean \pm SD = 5.42 \pm 3.25) ($t = 3$, $P < 0.001$, effect size = 0.50).

Discussion

The current study was planned predominantly with the objective of assessing whether tele-adaptation of a yoga module for pregnancy is feasible and acceptable in tertiary care obstetric clinical setups in three different states in India (one from North India, one from middle part of India, and one from South India) and whether the adapted tele-yoga module demonstrates limited efficacy in a single-arm exploratory trial.

We observed that with slight modifications of the pregnancy yoga module developed by Satyapriya *et al.*^[19] could be adapted for its use through the tele-mode and it was feasible to incorporate this module in clinical settings of tertiary care hospitals. The study demonstrated that out of 162 pregnant women who were recruited into the study, all 162 could undergo the first supervised yoga session at the clinical setup. PYTM video was shared with all 162 subjects. The retention of these subjects with yoga practices as per the online weekly video assessment by the yoga therapist was as follows: (1) at the end of the 1st week was 87.65%; $n = 142$; (2) at the end of the 2nd week was 86.41%; $n = 140$; (3) at the end of 3rd week was 85.18%; $n = 138$; and (4) at the end of 4th week was 83.95%; $n = 136$. To monitor the yoga practice, we also performed YPAs on a weekly basis, and sustained improvements in yoga performance scores week by week (from 19.45 \pm 6.30 at the end of week 1 to 28.45 \pm 7.95 at the end of week 4) suggesting actual adherence to the yoga practice using the video. We found that 16% of pregnant women dropped from the study at the end of 4 weeks of yoga intervention; in other words, the retention rate for pregnancy tele-yoga intervention was 86%. Retention of subjects with yoga practice declined from 87.65% at the end of the first visit to 83.95% at the end of the 4th week. This extent of retention to tele-yoga intervention at 4 weeks in pregnant urban women is better than what we observed in the general urban population during the COVID-19 pandemic where the dropout rate was almost 43%.^[16] The retention rate in other yoga-based intervention studies for the mental health and well-being of pregnant women ranged from 65% to 92%.^[22]

The reason for higher retention in the current study may be due to the strategies used by the yoga therapist to mitigate difficulties faced by the pregnant women, such as (1) in each yoga session, the therapist-to-pregnant women ratio

Table 3: Pre- and postpregnancy tele-yoga module intervention stress, anxiety, and depression scores

DASS-21	Grade	Preintervention (n=162), n (%)	Postintervention (n=96), n (%)
Stress	Normal (0–14)	72 (44.44)	85 (88.54)
	Mild (15–18)	51 (31.48)	9 (9.36)
	Moderate (19–25)	33 (20.37)	2 (2.08)
	Severe (≥ 26)	6 (3.70)	0
Anxiety	Normal (0–7)	61 (37.65)	77 (80.21)
	Mild (8–9)	33 (20.37)	10 (10.42)
	Moderate (10–14)	58 (35.80)	9 (9.36)
	Severe (≥ 15)	10 (6.17)	0
Depression	Normal (0–9)	88 (54.32)	86 (89.58)
	Mild (10–13)	47 (29.01)	8 (8.33)
	Moderate (14–20)	25 (15.43)	2 (2.08)
	Severe (≥ 21)	2 (1.23)	0

DASS-21: Depression, Anxiety, and Stress Scale-21

Table 4: Comparison of stress, anxiety, and depression scores among pregnant women (Depression, Anxiety, and Stress Scale-21 stress score ≥ 15 , anxiety score ≥ 8 , and depression score ≥ 10) before and after 4 weeks of pregnancy tele-yoga module

	Preintervention, mean \pm SD (n)	Postintervention, mean \pm SD (n)	Z score	P ^a	Effect size
Stress (DASS-21 ≥ 15)	19.31 \pm 3.75 (n=90)	9.27 \pm 5.18	-5.52	<0.001*	0.48
Anxiety (DASS-21 ≥ 8)	11.52 \pm 4.18 (n=101)	5.02 \pm 3.56	-5.93	<0.001*	0.48
Depression (DASS-21 ≥ 10)	12.89 \pm 3.13 (74)	5.42 \pm 3.25	-5.32	<0.001*	0.50

*P<0.01, ^aWilcoxon's signed-rank test. SD: Standard deviation, DASS-21: Depression, Anxiety, and Stress Scale-21

was maintained at 1:6 so that individual attention could be given to each subject, (2) YPA tool was applied by the therapist on regular intervals to assess how well pregnant women were able to learn the PTYM, (3) re-sharing the YouTube link with the participants so that they may watch the yoga program again as and when required, and (4) individual interactions and practice corrections were done based on the observation of the yoga practices by the therapists. Moreover, it has been observed that females adhere to yoga intervention better than males,^[23] and this population especially was more adherent probably because of the perceived benefits of yoga in improving the health of mother and child and promoting "normal delivery."^[24]

Shidhaye *et al.* also reported a retention rate of almost 94% in pregnant rural women with in-person yoga. They conducted a 3-day orientation session for subjects where five yoga sessions were planned in 3 days. They reported that three supervised yoga sessions were sufficient for subjects to learn the given yoga module and continue practicing on their own in the rural setup (with the help of a booklet of yoga practice without a video),^[15] whereas in our study, we observed that one supervised session, either one-on-one or in a group setting, was sufficient to orient the subjects to the yoga module and then to continue the same using the video.

The second objective of this study was to assess the limited efficacy of a 4-week tele-yoga intervention through a single-arm trial on psychological parameters of stress, anxiety, and depression. We observed that there was a

significant improvement in all the above parameters with effect sizes ranging between 0.4 and 0.5. Previously, the Perceived Stress Scale has been used as an outcome measure in pregnant women by five randomized controlled trials; four from India^[15,19,25,26] and one from Japan.^[27] In all these studies, perceived stress significantly reduced in the yoga group between the baseline and the follow-up compared to the control group, except in the study by Shidhaye *et al.*, in 2023, where there was no significant difference between the group, probably due to low sample size.^[15] The findings of the current study are in line with the previous trial.

The probable mechanisms through which yoga practice would have reduced anxiety, stress, and depression would be (1) the downregulation of the hypothalamic–pituitary–adrenal axis and thereby reduction in adrenocorticotrophic hormone and cortisol levels, (2) the bottom-up enhancement of the vagal tone, and (3) top-down strengthening of the GABAergic tone.^[28] Yoga practices have also been shown to generate a relaxation response and bring a switch from a sympathetic arousal state to a state of parasympathetic dominance. Certain yoga practices have also been shown to enhance brain-derived neurotrophic factor (BDNF) levels,^[29] oxytocin levels,^[30] cause limbic deactivation,^[31] and prefrontal activation.^[32] Apart from this, enhancement of biorhythm regulations and improvement in the quality of sleep by enhancing slow wave sleep^[33] is another way through which the effects of yoga would have been mediated.

PTYM intervention has its own advantages and disadvantages. The major advantages were: (1) overcoming

the barrier of distance: travelling during pregnancy is very difficult and is a major hindrance in delivering scalable yoga intervention, this was overcome using the technology, (2) overcoming time constraints: to join the yoga session in online mode, it just requires a “click” in the mobile or computer, this definitely saved the time. PTYM intervention provided flexibility for selecting feasible time slots also as per the commitments of the participant to family and work, and (3) PTYM was recorded and uploaded on YouTube, thus providing the choice and flexibility of watching the module. PTYM intervention also has certain limitations. In this study, the major limitations observed by us were: (1) network issues: loss of connectivity is still a major problem in scaling up of tele-yoga intervention, (2) safety: through tele-mode, it is still difficult to prevent a fall (we did not observe any fall in this study) or correct a subtle mistake in yoga practice as therapist cannot observe the facial expressions of the participants as clearly as in a live one-on-one session, and (3) limited interactions: tele-mode does not provide that quality of “connectedness” among the participants or between the therapist and participant as it would happen if the sessions were in-person and done together in the same space.

The major limitation of the current study is the lack of a control group. Since it is a preliminary exploratory study for planning a bigger multicentric controlled trial in the future, we did not use a control arm. The second major limitation is that we did not explore the possible mechanisms by assessing biological objective variables. However, the current study provided valuable insights regarding feasibility and sample size calculations for future studies.

Conclusion

The current exploratory multicentric study demonstrated that it is feasible and safe to incorporate yoga and tele-yoga (using shared video) into the clinical obstetric practice in major tertiary care health-care hospitals in India. The study demonstrated the potential useful effects of yoga in reducing stress, anxiety, and depression in pregnant women during the 2nd and early 3rd trimesters of pregnancy.

Ethical statement

Ethical approval was obtained from

1. National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, Karnataka. Approval No. NIMHANS/HECAIM/3rd/MEETING/2020-21 dated: 21/04/2021.
2. Ramaiah Medical College and Hospitals, Bengaluru, Karnataka. Approval No. MSRMC/EC/AP-02/04-2021 dated: 21/04/2021.
3. Lady Hardinge Medical College, New Delhi. Approval No. LHMC/IEC/2021/03/43a dated: 08/06/2021.

4. MGM Medical College and Hospitals, Navi Mumbai, Maharashtra. Approval No. MGMIHS/RES./02/2021-22/32. dated: 12/07/2021.

The study was registered in Clinical Trials Registry - India (CTRI) with registration no. CTRI/2021/09/036732.

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Conflicts of interest

There are no conflicts of interest.

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