Original Article

The effects of yoga-based breathing techniques and meditation on outpatients' symptoms of COVID-19 and anxiety scores

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Abstract

Context: Decreasing the outpatients' symptoms of COVID-19 is essential. For relieving symptoms, some complementary approaches are suggested.

Aims: This study aimed to evaluate the effects of yoga-based breathing techniques and meditation on outpatients' symptoms of COVID-19 and anxiety scores.

Setting and Design: This interventional study was conducted on 110 women with positive results of polymerase chain reaction (PCR) test for SARS-COV2 virus referred to PCR testing centers in Rafsanjan city, Iran, in 2021.

Materials and Methods: The participants were assigned into intervention ($n = 53$) and control ($n = 57$) groups by simple randomization according to a computer-generated assignment list. In this study, the intervention group practiced 20-min yoga-based breathing techniques and 20-min meditation daily for a 6-day period, control group did not receive any contact till 6th day. The symptoms' severity and headache, myalgia, and anxiety scores were evaluated on the 1st and 6th days via call interview by demographic and disease symptoms' checklist and the Spielberger State–Trait Anxiety Inventory.

Statistical Analysis Used: The obtained data were then reported as descriptive statistics and were analyzed using Fisher's exact test, Chi-square test, Wilcoxon signed-rank test, *t*-test, McNemar's test, Mann–Whitney U-test, and multivariate analysis of covariance.

Results: At six days after intervention, the group that practiced yoga-based breathing techniques and meditation had lower scores of headache ($P < 0.001$), myalgia ($P < 0.001$), and anxiety ($P < 0.001$) and lower severity of cough ($P < 0.001$), dyspnea ($P = 0.019$), and weakness ($P = 0.006$) than the control group.

Conclusion: It appears that yoga-based breathing techniques (pranayama) and meditation could be considered effective and easy complementary therapies in COVID-19 patients for reducing the symptom severity and anxiety level.

Keywords: COVID-19, Meditation, Women, Yoga, Breathing exercises

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INTRODUCTION

The current COVID-19 pandemic is a unique and unparalleled event that has challenged health-care systems in different countries.[1] Rapid pandemic growth and acute signs in some patients with COVID-19 have made the need for therapeutic measures more critical.[2] In addition, the current knowledge in this regard has proposed few solutions to control the growing pandemic and treat patients.[3] In search of some novel and effective therapies on the management of COVID-19, researchers have paid special attention to complementary and alternative medicine methods, including traditional Chinese medicine and traditional Indian medicine, namely Ayurveda and yoga, respectively.[4,5]

Yoga, as one of the components of the traditional Indian medicine, is currently well known worldwide. Moreover, it has been confirmed as an effective measure on creating a connection between mind and body and creating balance in the body, leading to the reduced stress, anxiety, and depression.[6-8] Yoga is also used for various aspects of health promotion, from reducing the menopausal symptoms to reducing labor pain and palliative therapies in the treatment of cancer.[9-12]

During the current COVID-19 pandemic, yoga and meditation are considered and used as an alternative and complementary approach. One rationale for the effectiveness of yoga and meditation on the management of COVID-19 is that previous studies have reported that various yoga practices, including pranayama, meditation, and mantras, can boost the body's immune system and help in preventing or reducing the severity of infectious diseases.[13,14] Regular pranayama or yoga breathing techniques' effects on improving lung function have been studied, as well.[15]

The most important studies that could potentially support the hypothesis of the positive effect of yoga and meditation on the course of COVID-19 disease are those studies that have measured the effect of mind–body therapies on the immune system. A systematic review and meta-analysis consisting of 34 studies concluded that some mind–body therapies can reduce inflammatory markers and also affect the specific viral immune responses.[16] However, the basic known mechanisms of yoga's effectiveness on reducing stress and modulating the immune system should be considered a basis for its complementary role in the COVID-19 management.[17]

Given the high risk of death in patients infected with COVID-19, this disease will undoubtedly be associated with some degrees of anxiety in patients. Several studies showed the roles of yoga and meditation in reducing anxiety in patients with various diseases.[18,19]

The existing literature on the usefulness of yoga and meditation for COVID-19 patients has not gone beyond suggestion and hypothesis.[1,5,19-23]

A study conducted in India revealed a lower prevalence of anxiety in people who practiced yoga during the COVID-19 pandemic.[24] This study aimed to evaluate the effects of yoga-based breathing techniques and meditation on outpatients' symptoms of COVID-19 and anxiety scores in patients referred to polymerase chain reaction (PCR) testing centers in Rafsanjan city, Iran.

MATERIALS AND METHODS

This was an interventional study performed on 110 clients of PCR test sampling centers in Rafsanjan, Iran, in 2021. The target population consisted of all women with positive PCR test for SARS-COV2 virus. The rationale for selecting just women in this study was the assumption that women would adhere to treatment more than men.

The sample size was determined to be 50 people in each of the two groups. This sample estimated according to $\alpha = 0.05$ and $\beta = 0.2$ and estimation of standard deviation score of headache severity in the control group: $\sigma1 = 1.17$ and in the intervention group: $\sigma2 = 0.97$ and minimum headache severity scores difference in two groups that are clinically important: $\Delta = 0.6$ and $K = 1$.

The inclusion criteria were the followings: positive PCR test, female gender, age between 20 and 50 years old, no previous medical complication, no known psychological disorder, no yoga practice in the last 6 months, no surgery in the last 3 months, access to smart phones and ability to use it, willingness to participate in this research, and declaring verbal informed consent. The exclusion criteria were the followings: hospitalization and participation in <4 yoga sessions in the intervention group. The members of the target population who met the inclusion criteria were then entered the research between February 14, 2021, and April 18, 2021.

In this time period, a colleague at the Rafsanjan University Health Department checked daily the list of all people who had PCR-positive test results. Then, she selected the all 20–50-year-old women with PCR-positive test and sent their names and phone numbers to the first researcher daily.

The first researcher immediately contacted the women. In these contacts, the inclusion criteria were reviewed and

those women who met the inclusion criteria were invited to participate in the study. The names of the women who agreed to participate in the present study, their phone numbers, and assignment in the intervention and control groups were sent to the second researcher. Because the patients were quarantined and it was not possible to see them in person, the second researcher called all samples and completed the research checklist and anxiety questionnaire via interview.

Simple randomization process accomplished at the first step of sampling and before the first contact with samples was made. The first researcher assigned samples to the intervention and control groups according to a web-based randomization table generated by Randomizer.org website. Then, she called the samples and invited them to the intervention and control groups.

From March 18 to April 6, the sampling was stopped due to the New Year's holidays in Iran and the lack of cooperation of the subjects. Due to the nature of the study, blinding was not possible in this study.

The intervention program was developed by the third researcher, who is an experienced yoga coach. She also trained the second researcher to be able to guide the samples in the intervention group to practice the intervention program. Participants in the intervention group received six audio files besides some photographs and video clips daily for a 6-day period. Accordingly, these were prepared for the 1st to 6th days of the intervention and were different in each day. This program includes 20 min of pranayama (including Nadi Shodhan, Kapalbhati, Ujjayi, and Anulom Vilom) along with 20 min of meditation per day. Of note, practicing these breaths did not require high physical strength. This program was sent to the participants through the WhatsApp social network. From the 1st to 6th days, the second researcher controlled the practice in the intervention group through contacting the samples. In these contacts, she guided them for the correct practice of breathing techniques and proper position in meditation. The samples were free to do the practices once a day whenever it was convenient for them.

The participants of the control group received no contact until the 6th day. All the participants were contacted on the 6th day and the research checklist and anxiety questionnaire were completed via call interview by the second researcher as well.

Data collection tools used in this study were demographic and disease symptom checklist and the Spielberger State–Trait Anxiety Inventory (STAI). The research checklist included demographic information of the subjects; last days of symptoms' onset; and symptoms, including myalgia, headaches, weakness, cough, fever, and dyspnea. In the presence of headache and myalgia, we asked the participants to give a score from 1 to 10 according to visual analog scale (VAS). Other symptoms were just categorized as mild, moderate, and severe based on the individual's own perception of the severity of the symptom.

In this study, the STAI was used. The validity of this questionnaire in Iran was confirmed and its reliability was also calculated as 0.889 by Cronbach's alpha.[25] This questionnaire consisted of 20 short questions, each of which has four options. Using this questionnaire, the severity of anxiety was measured by a four-point Likert scale. Moreover, the lowest anxiety score was 20, indicating no anxiety, and the maximum score was 80, indicating the highest anxiety level.[26] The questionnaire was completed at the first and sixth days of the study.

The ethics committee of Rafsanjan University of Medical Sciences approved this project with code: IR. RUMS. REC.1399.248. All the subjects voluntarily participated in this study and were informed that they could leave the study on their will.

Descriptive statistics included mean, standard deviation, and frequency used to describe the basic features of the data. Kolmogorov test was used to check the normality of the data. Quantitative variables and categorical variables were compared using the Student's *t*-test and Chi-square or Fisher's exact test, as required, across the two study groups, respectively. As well, symptom variables were compared using Wilcoxon signed-rank test (for ordinal variables) or McNemar's test (for nominal variables), before and after the intervention in either group. Mann–Whitney U-test was also used to compare the symptom variables (ordinal variables) across the two study groups before and after the intervention.

Multivariate analysis of covariance (MANCOVA) was applied to compare the clinical outcomes after performing the intervention across the two groups, while these were adjusted for corresponding pretest scores.

For all statistical analyses, the statistical software SPSS version 22 (IBM, SPSS Inc., Chicago, IL, USA) was used. All *P* values were 2-tailed, with the statistical significance level defined as $P \leq 0.05$.

RESULTS

Out of 295 patients who were called at first, 124 patients assigned to two groups of intervention and control. The

final sample of 61 in the control group and 63 in the intervention group entered to data analysis [Figure 1]. By Kolmogorov–Smirnov test, all variables had a normal distribution. There was no significant difference in terms of the age, educational level, and job between the intervention and control groups [Table 1].

The mean and standard deviation of the days of symptoms' onset in the intervention group was 4.36 ± 1.36 days (ranged from 2 to 7 days), and in the control group, it was 4.54 ± 1.54 days (ranged from 2 to 9 days). The statistical test of two independent samples showed no statistically significant difference in the mean of the days of symptoms' onset between the intervention and control groups ($P = 0.141$).

There was no statistical difference between these two groups before the intervention in terms of score of myalgia and headache and severity of cough, breathe shortness, weakness, and fever. However, after the intervention, there were significant differences between the two groups in terms of all these six symptoms [Table 2].

Table 3 shows the descriptive statistics of three numeric variables, including myalgia, headache, and anxiety according to the two study groups. Then, we use Box's M test indicated the equality of covariance matrices in these two groups ($P = 0.135$). In addition, Levene's test showed the equality of error variances across these two groups ($P > 0.05$).

In this study, we considered myalgia, headache, and anxiety together and then used MANCOVA in our analysis. All Pillai's Trace 'Wilks' Lambda' and Hotelling's Traceand Roy's Largest Root tests were statistically significant. In addition, we checked the tests of Box's test of equality of covariance matrices and Levene. All these tests showed that the assumptions for (MANCOVA) are established.

Table 1: Demographic variables in the yoga-based breathing techniques and meditation group and control group (*n*=110)

Variable	Group		*P*
	Yoga-based breathing techniques and meditation (*n*=53), *n* (%)	Control (*n*=57), *n* (%)	
Age (year), mean±SD	33.79±9.01	34.44±7.47	0.684* *t*=−0.408
Education level			
Less than high school	13 (24.5)	11 (19.3)	0.432** *F*=2.864
High school	13 (24.5)	22 (38.6)	
Masters	23 (43.4)	19 (33.3)	
Postgraduate	4 (7.5)	5 (8.8)	
Job			
Housewife	30 (56.6)	35 (61.4)	0.670†
Self-employed	9 (17.0)	11 (19.3)	χ^2=0.800
Clerk	14 (26.4)	11 (19.3)	

*Independent two-sample *t*-test, **Fisher's exact test, †Chi-square test. SD: Standard deviation

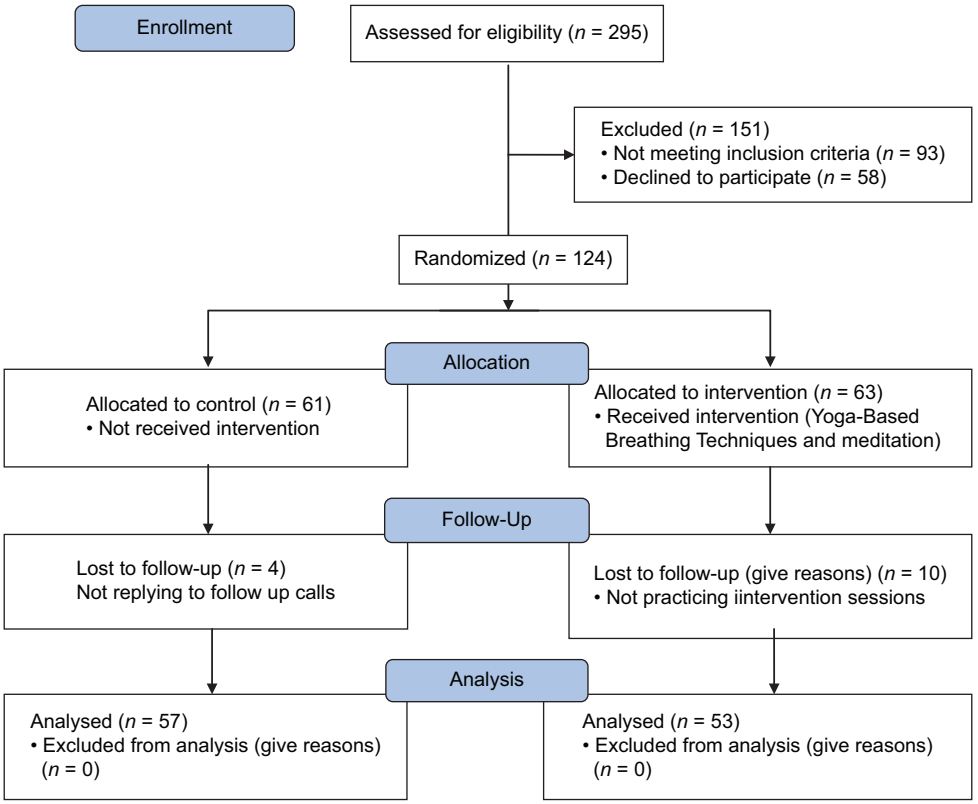

Figure 1: Enrollment of patients with COVID-19 in the study

Table 4 shows the results of MANCOVA test. According to the results of MANCOVA test, the mean scores of headache, myalgia, and anxiety were statistically different after the intervention between the two study groups. As shown in Table 3, the mean scores of these three variables decreased in the sixth day in either group; however, the decrease was more significant in the intervention group compared to the control group.

The column of partial eta squared shows that the decreasing effects of pranayama and meditation on anxiety score were more dramatic. According to power, it is clear that the sample size was efficient in this study. The second row indicated in shows that scores of these thee variables before the intervention were omitted in the MANCOVA test.

DISCUSSION

In this clinical evaluation, we studied the effects of yoga-based breathing techniques (pranayama) and meditation on outpatients' symptoms of COVID-19 and anxiety score. The results showed that, after 6 days, headache and myalgia relived in either group; however, this relief was significantly more in the intervention group compared to the control group.

Six days after the intervention, the group practiced yoga-based breathing techniques and meditation had lower scores of headache and myalgia. The results of a Cochrane review consisting of nine trials showed that in participants who practiced yoga compared to controls group reported mild to moderate alleviation in back pain. The authors graded the quality of evidence as low.[27] In a systematic review and meta-analysis, the researchers summarized the efficacy of yoga for Chronic nonspecific neck pain relief in ten trials. The researcher concluded that yoga can relieve neck pain intensity, improve pain-related function disability, increase cervical range of motion, improve quality of life, and boost mood.[28] Yoga also used for aleviating pain in women with primary dysmenorrheal.[29] It seems that in our study also, practicing yoga-based breathing techniques and meditation was effective for improving the COVID-19-related pains.

The results showed that there was lower severity of cough ($P < 0.001$), dyspnea ($P = 0.019$), and weakness ($P = 0.006$) after 6 days in the intervention group than the control group. It seems that yoga is effective for improving lung function and promoting health-related quality of life in patients with chronic obstructive pulmonary disease.[30]

Table 2: Mean severity of COVID-19 symptoms before and after the intervention in the yoga-based breathing techniques and meditation group and control group

Variable	Group					
	Yoga-based breathing techniques and meditation (*n*=53)			Control (*n*=57)		
	Before, *n* (%)	After, *n* (%)	*P*	Before, *n* (%)	After, *n* (%)	*P*
Myalgia						
No	16 (30.2)	40 (75.5)	<0.00*1	23 (40.4)	27 (47.4)	0.130*
Mild	17 (32.1)	9 (17.0)	*Z*=−4.322	21 (36.8)	21 (36.8)	*Z*=−1.513
Moderate	14 (26.4)	3 (5.7)		11 (19.3)	8 (14.0)	
Sever	6 (11.3)	1 (1.9)		2 (3.5)	1 (1.8)	
Headache						
No	18 (34.0)	39 (73.6)	<0.001*	19 (33.3)	25 (43.9)	0.197*
Mild	14 (26.4)	10 (18.9)	*Z*=−4.318	25 (43.9)	20 (35.1)	*Z*=−1.289
Moderate	11 (20.8)	3 (5.7)		7 (12.3)	9 (15.8)	
Severe	10 (18.9)	1 (1.9)		6 (10.5)	3 (5.3)	
Cough						
No	15 (28.3)	40 (75.5)	<0.001*	17 (29.8)	19 (33.3)	0.336*
Mild	23 (43.4)	9 (17.0)	*Z*=−4.555	28 (49.1)	28 (49.1)	*Z*=−0.962
Moderate	11 (20.8)	2 (3.80)		10 (17.5)	9 (15.8)	
Severe	4 (7.5)	2 (3.8)		2 (3.5)	1 (1.8)	
Dyspnea						
No	28 (52.8)	43 (81.1)	0.001*	34 (59.6)	35 (61.4)	0.385*
Mild	14 (26.4)	8 (15.1)	*Z*=−3.274	12 (21.1)	15 (26.3)	*Z*=−0.868
Moderate	11 (20.8)	2 (3.8)		10 (17.5)	7 (12.3)	
Severe	0	0		1 (1.8)	0	
Weakness						
No	18 (34.0)	32 (60.4)	<0.001*	23 (40.4)	19 (33.3)	0.717*
Mild	8 (15.1)	12 (22.6)	*Z*=−3.341	11 (19.3)	18 (31.6)	*Z*=−0.363
Moderate	13 (24.5)	5 (9.4)		16 (28.1)	16 (28.1)	
Severe	14 (26.4)	4 (7.5)		7 (12.3)	4 (7.0)	
Fever						
Yes	18 (34.0)	2 (3.8)	<0.001**	18 (31.6)	5 (8.8)	<0.001**
No	35 (66.0)	51 (96.2)		39 (68.4)	52 (91.2)	

*Wilcoxon signed ranks test, **Fisher's exact test

Yoga may enhance standard medical care and can be an appropriate approach for improving physical condition and pulmonary function in patients with diabetic lung.[31]

The results revealed that the most significant effect of this intervention was decreasing anxiety score. After 6 days of intervention, patients of the intervention group had significantly lower scores of anxiety than patients in the control group. Several studies showed the efficiency of yoga on alleviating the anxiety in different situations.[18,32-35] The effectiveness of yoga in reducing anxiety in different situations could arise a hypothesis in COVID-19 patients. Hence, in the patient with COVID-19 diagnosis, the anxiety level is high; practicing yoga-based breathing techniques (pranayama) and meditation could approve symptoms by reducing anxiety level in our study.

In this study, we had some restrictions. In this study, we just studied the women aged 20–50 years. The severity of symptoms which reported subjectively not objectively was not involved in the inclusion criteria. Regarding obtaining the telephone number of patients, we needed to get lots of licenses at first. We called so many patients for getting their consent to participate in the study and some of them behaved unfriendly. Moreover, the intervention group needed to be taught and guided, because this was the first experience of yoga for them. Some of them expressed that in some days, they could not do all 20 min of breathing exercises. Of course, they did meditation completely.

Table 3: Mean severity of symptoms before and after the intervention in the yoga-based breathing techniques and meditation group and control group

Variable	Group			
	The yoga-based breathing techniques and meditation group		Control group	
	Mean±SD	Minimum–maximum	Mean±SD	Minimum–maximum
Myalgia score				
Before	4.64±2.90	0–10	3.11±2.43	0–10
After	1.28±2.023	0–8	2.39±2.09	0–7
Headache score				
Before	3.72±2.93	0–10	3.18±2.77	0–10
After	0.98±1.60	0–7	2.28±2.44	0–10
Anxiety score				
Before	50.28±11.13	26–79	49.30±11.79	24–78
After	30.94±8.93	20–53	46.58±10.47	24–69

SD: Standard deviation

CONCLUSION

It seems that yoga-based breathing techniques (pranayama) and meditation could be considered effective and easy complementary therapies in COVID-19 patients. These techniques can be used to reduce anxiety, pain, and respiratory symptoms in COVID-19 patients. Yoga-based breathing techniques (pranayama) and meditation also reduced the severity of weakness and cough in COVID-19 patients. We suggest to study the effect of practicing asana in COVID-19 patients.

Conflicts of interest

There are no conflicts of interest.

Authors' contribution

- Z G: Designed the study, contributed to sample preparation, and provided the manuscript draft
- M H: Contributed to sample preparation and processed the experimental data
- Z M: Designed and provided the intervention materials.

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Table 4: Effect of yoga and meditation on some clinical outcomes resulted from multivariate analysis of covariance

Source	Type III sum of squares	df	Mean square	*F*	*P*	Partial eta squared	Observed power
Group							
Myalgia score	76.498	1	76.498	25.496	<0.001	0.195	0.999
Headache score	64.068	1	64.068	18.725	<0.001	0.151	0.990
Anxiety score	6598.189	1	6598.189	97.818	<0.001	0.482	1.000
Pretest							
Myalgia score	81.985	1	81.985	27.325	<0.001	0.207	0.999
Headache score	1.255	1	1.255	0.418	0.519	0.004	0.098
Anxiety score	0.771	1	0.771	0.257	0.613	0.002	0.079
Error							
Myalgia score	315.036	105	3.000				
Headache score	359.256	105	3.421				
Anxiety score	7082.654	105	67.454				
Total							
Myalgia score	870.000	110					
Headache score	814.000	110					
Anxiety score	184,695.000	110					

df: Degree of freedom

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