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Efficacy of Integrated Tele-Yoga Intervention on Physiological and Psychological Variables in Asymptomatic COVID-19 Positive Patients: A Confirmatory Randomized Control Trial

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Keywords
COVID-19 patients · Integrated yoga intervention · Breathing exercise · Physiological and psychological variables · Mindfulness

Abstract

Background: A study was conducted on asymptomatic COVID-19 positive patients admitted in a COVID-19 hospital in Indore, India, during first wave of the pandemic. The objective of the study was to assess the efficacy of an integrated tele-yoga intervention as an adjunct to conventional management on physiological, psychological, and mindfulness variables. ***Methods:*** In a confirmatory randomized control trial, 60 asymptomatic COVID-19 patients in hospital confinement were randomly allocated to experimental and control groups (n = 30). The tele-yoga intervention included breathing exercise, pranayama, and meditation delivered over 30 min for 7 days to the experimental group while the control group continued treatment as usual. Assessment of physiological variables and psychological variables was carried out before intervention and on day 7 immediately after intervention. Data were analyzed using SPSS (v.16.0). ***Results:*** Mann-Whitney U test shows that there was a statistically significant difference between groups regarding all variables ($p < 0.001$). The physiological and psychological variables which included Oxygen saturation (2.07%), Heart rate (8.21%), Respiratory rate (10.04%), Systolic blood pressure (6.14%), Diastolic blood pressure (8.38%), Visual Analog Scale for stress (62.78%), COVID-19 Peritraumatic Distress Index (68.44%), and State Mindful Attention Awareness Scale (72.72%) showed significant changes in the experimental group compared to control group. ***Conclusion:*** The results of this study suggest that integrated tele-yoga might have therapeutic benefits in improving physiological, psychological, and mindfulness variables in asymptomatic COVID-19 patients.

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This study has been registered with the Clinical Trials Registry-India (CTRI) (CTRI/2020/10/028566), registered on October 20, 2020, http://www.ctri.nic.in/.

Wirksamkeit einer integrierten Tele-Yoga-Intervention auf physiologische und psychologische Variablen bei asymptomatischen COVID-19-positiven Patienten: eine konfirmatorische, randomisierte kontrollierte Studie

Schlüsselwörter
COVID-19-Patienten · Integrierte Yoga-Intervention · Atemübungen · Physiologische und psychologische Variablen · Achtsamkeit

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Zusammenfassung

Hintergrund: Es wurde eine Studie mit asymptomatischen COVID-19-positiven Patienten durchgeführt, die während der ersten Welle der Pandemie in ein COVID-19-Krankenhaus in Indore, Indien, aufgenommen worden waren. Mit dieser Studie sollte die Wirksamkeit einer integrierten Tele-Yoga-Intervention als Ergänzung zur herkömmlichen Behandlung auf physiologische, psychologische und Achtsamkeitsvariablen bewertet werden. ***Methoden:*** In einer konfirmatorischen, randomisierten kontrollierten Studie wurden 60 hospitalisierte asymptomatische COVID-19-Patienten randomisiert einer Versuchs- bzw. einer Kontrollgruppe zugewiesen ($n = 30$). Die Tele-Yoga-Intervention, die Atemübungen, *Pranayama* und Meditation beinhaltete, erfolgte in der Versuchsgruppe über 7 Tage für jeweils 30 Minuten, wohingegen die Kontrollgruppe weiter die übliche Behandlung erhielt. Die physiologischen und psychologischen Variablen wurden vor der Intervention und an Tag 7 unmittelbar nach der Intervention beurteilt. Die Auswertung der Daten erfolgte mittels SPSS (V.16.0). ***Ergebnisse:*** Der Mann Whitney U-Test ergab einen statistisch signifikanten Unterschied zwischen den Gruppen für alle Variablen ($p <$ 0,001). In der Versuchsgruppe zeigten sich signifikante Veränderungen gegenüber der Kontrollgruppe bei den physiologischen und psychologischen Variablen, darunter Sauerstoffsättigung (2,07 %), Herzfrequenz (8,21 %), Atemfrequenz (10,04 %), systolischer Blutdruck (6,14 %), diastolischer Blutdruck (8,38 %), die visuelle Analogskala für Stress (62,78 %), der Covid-19 Peritraumatic Distress Index (68,44 %) sowie die State Mindful Attention Awareness Scale (72,72 %). ***Schlussfolgerung:*** Die Ergebnisse dieser Studie sprechen dafür, dass integriertes Tele-Yoga einen therapeutischen Nutzen zur Verbesserung der physiologischen, psychologischen und achtsamkeitsbezogenen Variablen bei asymptomatischen COVID-19-Patienten haben könnte. © 2023 S. Karger AG, Basel

Introduction

The novel coronavirus disease 2019 (COVID-19) was first identified in mid-December, 2019, in Wuhan, Hubei province, China [1], and declared as a pandemic by the WHO on December 31, 2019 [2]. This pandemic has led to a tremendous public health crisis [3]. Based on the current epidemiological investigations for the virus, the incubation period is 1–14 days. The main symptoms of this disease are fever, dry cough, and fatigue. The mode of transmission is through respiratory droplets, contact, digestive tract, and aerosols [4]. Currently, available evidence shows that almost 80% of COVID-19 infected patients will develop mild to moderate symptoms and recover without specific treatment(s). Individuals above 60 years of age or those with underlying medical conditions or immune-compromised persons with poor lifestyle have a higher risk of developing severe disease with adverse outcomes [5].

In India as per reported data, during the first wave of corona pandemic, symptomatic cases were 85.7%, and asymptomatic was 14.3% [6]. Asymptomatic cases were identified through contact tracing [7]. An asymptomatic person, laboratory confirmed for COVID-19, may either progress to become symptomatic or continue as an asymptomatic carrier [6, 7]. During the first wave of the COVID-19 pandemic in India, all the patients symptomatic and asymptomatic were hospitalized. Asymptomatic patients were admitted because they are potential carriers or transmitters of infection in the community [8]. The COVID-19 pandemic had a disastrous impact globally and has affected the society physically, psychologically, and economically. Physical health together with psychological well-being is important and the economic disruption can affect both [9]. A recent review reported that quarantine which was imposed as a part of isolation was associated with psychological distress, post-traumatic stress disorder, depression, and stress [10] leading to decreased immunity [11]. Some patients may have pre-existing anxiety, depression, or psychosis which may worsen [12]. A considerable proportion of patients reported symptoms of depression, with 21% being at high risk of major depressive disorder [13] indicating the necessity to consider the psychological and social effects of the disease.

As the COVID-19 infection spread worldwide, still there is no validated treatment protocol till now. As a preventive and treatment measure in this pandemic, complementary and alternative medicine have been tried and some studies have shown good results [14, 15]. Ministry of Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homoeopathy (AYUSH) in India recommended various complementary therapies such as ayurveda, yoga, naturopathy, and homoeopathy as a supportive and add-on treatment for this novel coronavirus disease [14]. Integrating complementary and alternative medicine interventions may be useful to reduce infection, complementing therapeutic management as an adjuvant treatment [16]. Yoga is being studied as an important intervention to prevent or reduce the severity of COVID-19 and is shown to be useful for asymptomatic cases [17].

An online yoga study conducted by Shukla et al. [18] on 60 healthy individuals during the lockdown period showed it to be useful in promoting healthy practices during the pandemic. However, there are no studies on yoga done on COVID-19-positive individuals till now. The main aim of the study was to assess the efficacy of tele-based integrated yoga intervention as an adjunct for COVID-19 asymptomatic patients. The objectives were to study its effect on the improvement on the body-mind complex.

Table 1. Details of the practice done by experimental group

Type of activity	List of practices	Total time duration
Breathing practices	Hands in and out breathing Hands stretch breathing Abdominal breathing	6 min
Pranayama	*Bhrastrika* pranayama *Nadi shodhanä*	6 min
Meditation	Sun meditation	3 min

Methodology

Trial Design

This was a confirmatory randomized control trial. We conducted a randomized control trial following the Consolidated Standard of Reporting Trials (CONSORT) 2010 guideline [19].

Participants

The study was conducted at Maharaja Tukojirao Holkar (MTH), a COVID-19 dedicated Hospital in Indore, Madhya Pradesh, India, from November 2020 to January 2021 during the first wave of COVID-19. Eligibility criteria were COVID-19-positive individuals confirmed by reverse transcription-polymerase chain reaction (RT-PCR), who were asymptomatic and admitted for quarantine under government facility. The other criteria for participant selection for the study were those aged between 18 and 80 years and both genders. Exclusion criteria for the study included those who were unwilling for participation either due to physical and mental disabilities, those with medical restrictions for physical movement, history of recent surgery, pregnancy, and those diagnosed with severe co-morbid conditions (uncontrolled diabetes, uncontrolled hypertension, cardiac diseases, COPD, etc.). The consent for participating in the study was obtained with the help of the nursing staff before the commencement of the study. The researcher was blinded to the recruitment process and was assisted by the hospital staff for the randomization method. Guidelines were issued by the first author (PJS) for the nursing staffs to ensure uniformity during assessment collection such as time, duration, and COVID-19 safety protocols.

Intervention

The integrated tele-based yoga intervention consisted of breathing practices, pranayama, and meditation techniques specially designed to improve their immunity and health (Table 1) [3]. This module was specially developed for the management of COVID-19 disease. Also, another rationale for the module selection was its inclusiveness of a wide age range covering the adult and elderly population. This tele-based yoga consisted of pre-recorded video of 15 min wherein the first author (PJS) demonstrated all the above-mentioned practices in Hindi which was the medium of instruction comfortable for all the patients.

In our study, the yoga group received the intervention for 7 days, for 30 min/day. This was divided into two sessions, viz., 15 min of morning practice under the observation of medical staff and 15 min of self-practice in the evening with the help of a television in their respective wards. The yoga intervention was taught under the observation of medical staff maintaining social distance while donning the PPE kit.

Individuals in the control group followed their normal daily routine. Patient from both the groups were undergoing treatment as usual as part of the COVID-19 treatment protocol which included conventional medications along with an ayurvedic decoction called as kadha. This was prescribed as per the guidelines from Ministry of AYUSH as part of immunity boosting. This was made from a combination of herbs, spices, and jaggery which was administered once in a day.

Outcomes

All the outcome measures were assessed at baseline and after 7 days of intervention. The physiological variables and questionnaires were administered by the nursing staff under the supervision of a physician. The primary outcome measures were oxygen saturation (SpO_2), heart rate (HR), respiratory rate (RR), and blood pressure (BP) and the secondary outcome measures were stress, COVID-19 peritraumatic distress, and mindfulness.

Assessment Methods

Physiological Variables

The physiological variables measured as part of the study included oxygen saturation (using fingertip pulse oximetery), HR, RR, and BP (by calibrated sphygmomanometer).

Psychological Variables

Stress: Visual Analog Scale (VAS) is used for the clinical assessment of self-reported stress [20]. This scale ranges between 0 and 100 wherein 0 indicating no stress and 100 designating stress "as bad as could be."

Anxiety and depression: assessment of anxiety and depression was done using the COVID-19 Peritraumatic Distress Index (CPDI) scale. This scale also was used for assessing the frequency of specific phobias, cognitive changes, avoidance, and compulsive behavior, physical symptoms, as well as loss of social functioning in COVID-19 patients in the past week, with a range from 0 to 100. Scores between 28 and 51 indicated mild to moderate distress, while scores ≥52 denoted severe distress. The Cronbach's alpha of CPDI is 0.95 ($p < 0.001$) [21].

Mindfulness

The State Mindful Attention Awareness Scale (S-MAAS) is a valid tool for assessing the receptive state of mind and awareness of observing the present moment (Cronbach's alpha = 92) [22].

Sample Size Calculation

A sample size of 46 was obtained by using the "G power" software, calculated from a similar intervention study. In a previous study, progressive muscle relaxation technique improved STAI (the Spielberger State-Trait Anxiety Scale). Mean/SD of mentioned variables in experimental group (mean ± SD, 57.15 ± 9.14) and control group (44.96 ± 12.68) along with the significance level (alpha = 0.05), power (1-beta): power = 0.95, two-tailed hypothesis, actual power 0.95, and effect size "d" = 1.10 was used for sample size calculation in the current study [11].

Randomization

All the patients ($n = 66$) were randomly assigned to either the experimental group ($n = 33$) or control group ($n = 33$) by using the simple randomized toss method. Those patients who got heads were allocated to a ward where yoga intervention was intended to be delivered and those with tails were in a separate ward where treatment as usual was given. The randomization and allocation procedure was performed by the nursing staff without any external supervision. Assessments were conducted on day 1 and at the end of day 7.

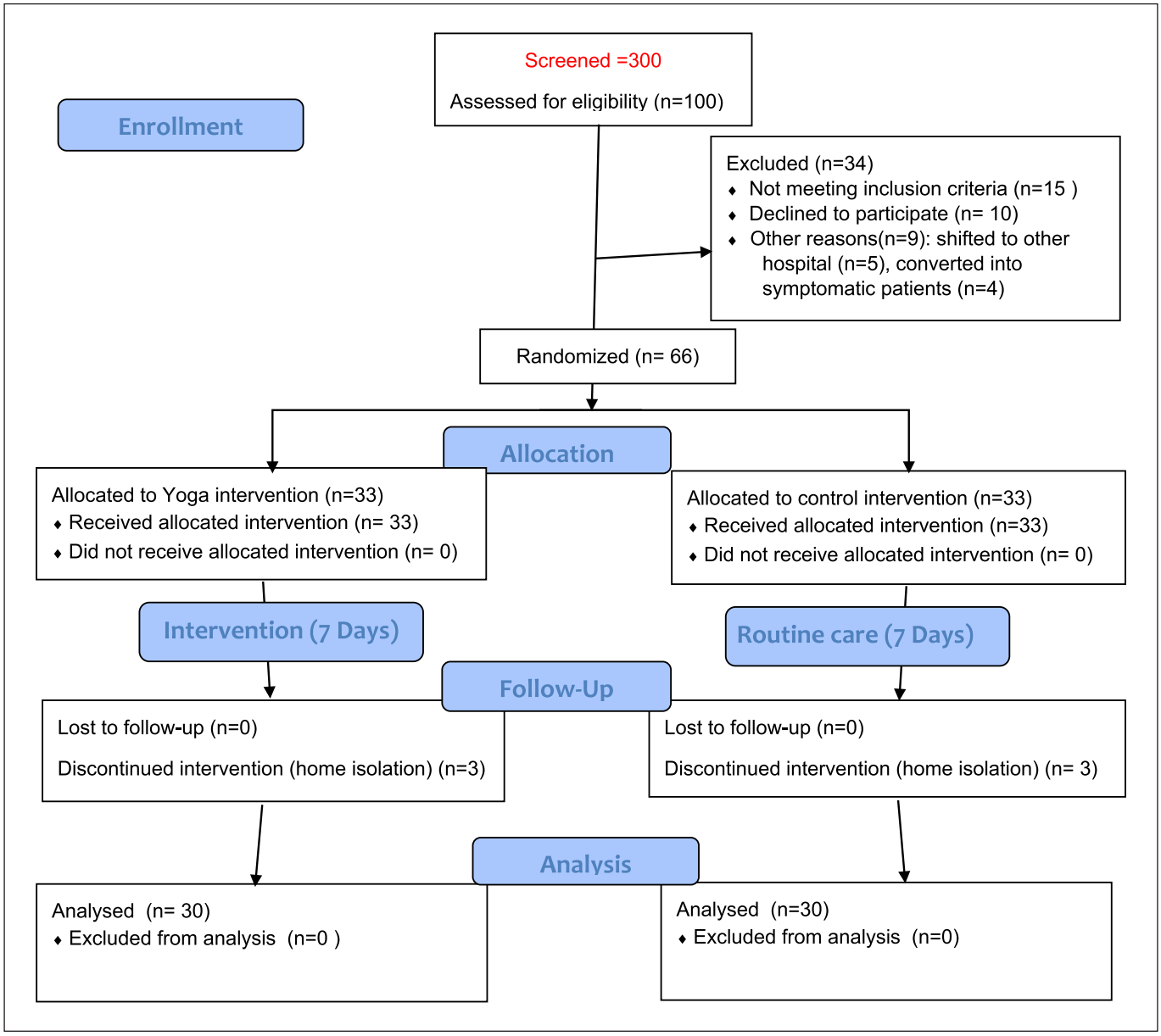


Fig. 1. CONSORT flow diagram for RCT design.

Statistical Analysis

Data collection was done in two timelines: once before the commencement of the intervention and the second data collection after the end of 1 month (post intervention). Data was analyzed using suitable software using SPSS version 16.0. Data was checked for normality using the Shapiro-Wilk test. Distribution of data was tested by performing between group comparisons. The demographic characteristics of the sample for gender, age range, population, education, occupation, and medical history were analyzed using χ^2 test. Descriptive statistics for (SpO_2, HR, RR, BP, CPDI, S-MAAS, VAS) variables were analyzed after checking the data for fulfilling the assumptions for normality. The data did not show normal distribution for all the variables ($p < 0.05$). The skewness and kurtosis values of the data were not within the normal range. Thus, a nonparametric test was employed for all the variables.

Results

Participants

Out of the 300 participants screened, 100 participants were initially selected for the study. From them, 34 participants were excluded and 66 consented and enrolled; 33 individuals were randomized equally into experimental and control group. After dropouts, 60 participants were finally maintained in the study and included for analysis (Fig. 1).

Demographic Characteristics

Demographic characteristics of 60 patients who completed the entire study were analyzed. There was no sig-

Table 2. Demographic and clinical characteristics of the experimental and control groups

Variables	Experimental group (n = 30)	Control group (n = 30)
Gender, *n* (%)		
Male	20 (66.66)	15 (50)
Female	10 (33.33)	15 (50)
Age range, *n* (%), years		
18–45	15 (50)	11 (36.66)
46–60	11 (36.66)	7 (23.33)
81–80	4 (13.33)	12 (40)
Area, *n* (%)		
Urban	24 (80)	21 (70)
Rural	6 (20)	9 (30)
Education, *n* (%)		
Uneducated	2 (2.66)	1 (3.33)
Less than graduate	7 (23.33)	8 (26.66)
Graduate	16 (53.33)	17 (56.66)
Post-graduate	5 (16.66)	4 (13.33)
Occupation, *n* (%)		
Agriculture	3 (10)	1 (3.33)
Business	8 (26.66)	8 26.66)
Employed	8 (26.66)	8 (26.66)
Home makers	6 (20)	10 (33.33)
Retired	0	2 (6.66)
Professional	5 (16.66)	1 (3.33)
Medical history, *n* (%)		
COPD	2 (6.66)	1 (3.33)
Chronic renal disease	1 (3.33)	1 (3.33)
Bronchitis	0	1 (3.33)
Hypertension	2 (6.66)	6 (20)
Diabetes	1 (3.33)	2 (6.66)
Asthma	2 (6.66)	3 (10)

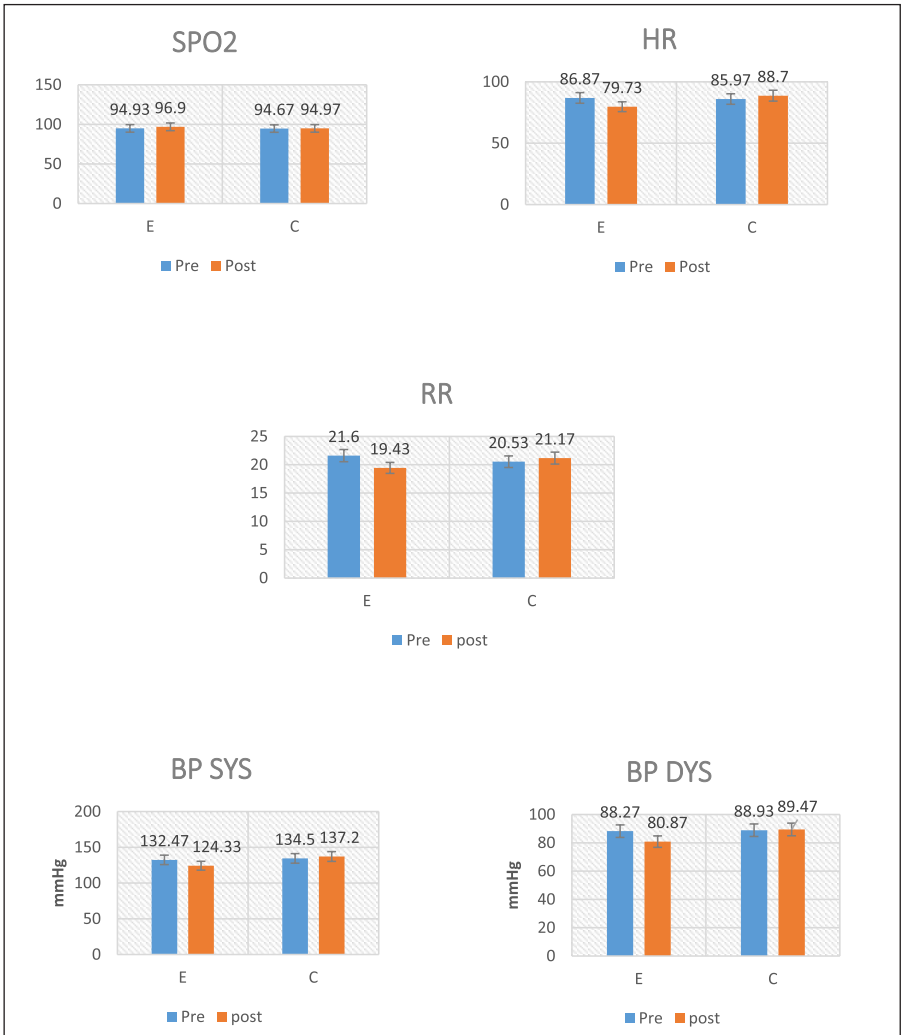
Table 3. Physiological variables before and after yoga intervention in experimental and control groups

Variable	Group	Pre (before intervention - day 1) mean±SD	Post (after intervention - day 7) mean±SD	Differences (Δ)	Sig- P actual group differences (Δ) (Mann-Whitney)	% changes
SpO_2	E	94.93±1.68	96.90±1.09*	1.97±1.38	$p < 0.001$	2.07
	C	94.67±1.82	94.97±1.67	0.30±1.66		0.31
HR	E	86.87±6.49	79.73±5.00*	−7.13±5.27	$p < 0.001$	8.21
	C	85.97±8.72	88.70±8.45	2.73±4.89		3.17
RR	E	21.60±1.92	19.43±1.38*	−2.17±1.66	$p < 0.001$	10.04
	C	20.53±1.25	21.17±1.53	0.63±1.47		3.11
BP SYS	E	132.47±7.08	124.33±6.54*	−8.13±8.17	0.003	6.14
	C	134.50±9.89	137.20±9.00	2.70±12.83		2.00
BP DYS	E	88.27±5.88	80.87±7.17*	−7.40±5.76	$p < 0.001$	8.38
	C	88.93±7.42	89.47±8.10	0.53±10.99		0.60

There is significant difference between groups with better improvement in experimental group. BP DYS, blood pressure diastolic; BP SYS, blood pressure systolic; C, control; E, experimental; HR, heart rate; RR, respiratory rate; SpO_2, oxygen saturation in the blood. *$p < 0.001$, comparing the variables between the groups using "Mann Whitney U test."

nificant difference between baseline characteristics such as gender, age, urban/rural backgrounds, education status, occupation, and medical history, which were almost the same in both the groups (shown in Table 2).

The experimental group had 66.66% male and 33.33% female patients; the control group had an equal percentage (50%) of both. The overall mean age of the patients in both groups was 49.85 ± 15.07 years. With regard to age, the yoga group comprised 50% of participants between the age range of 18–45 years. Data showed that 80% urban population were infected in the experimental group and 70% in the control group. Our data revealed that most of



Abbreviations: BP SYS: Systolic Blood Pressure; BP DYS: Distolic Blood Pressure; C: Control; E: Experimental; HR: Heart Rate; RR: Respiratory Rate; SPO2: Oxygen Saturation.

Fig. 2. Changes in values of physiological variables.

the patients were graduates with 53.33% in the experimental group and 56.66% in the control group. Occupational status data showed that 33.33% of patients infected were homemakers in the control group and 26.66% were running business in both the groups. In the experimental group, 26.66% of patients and in the control group 46.66% of patients had a significant medical history. None of the patients recruited reported of any history of malignancy, eczema, migraine, cigarette smoking, heart disease, or stroke (shown in Table 2).

Changes in the Physiological Variables

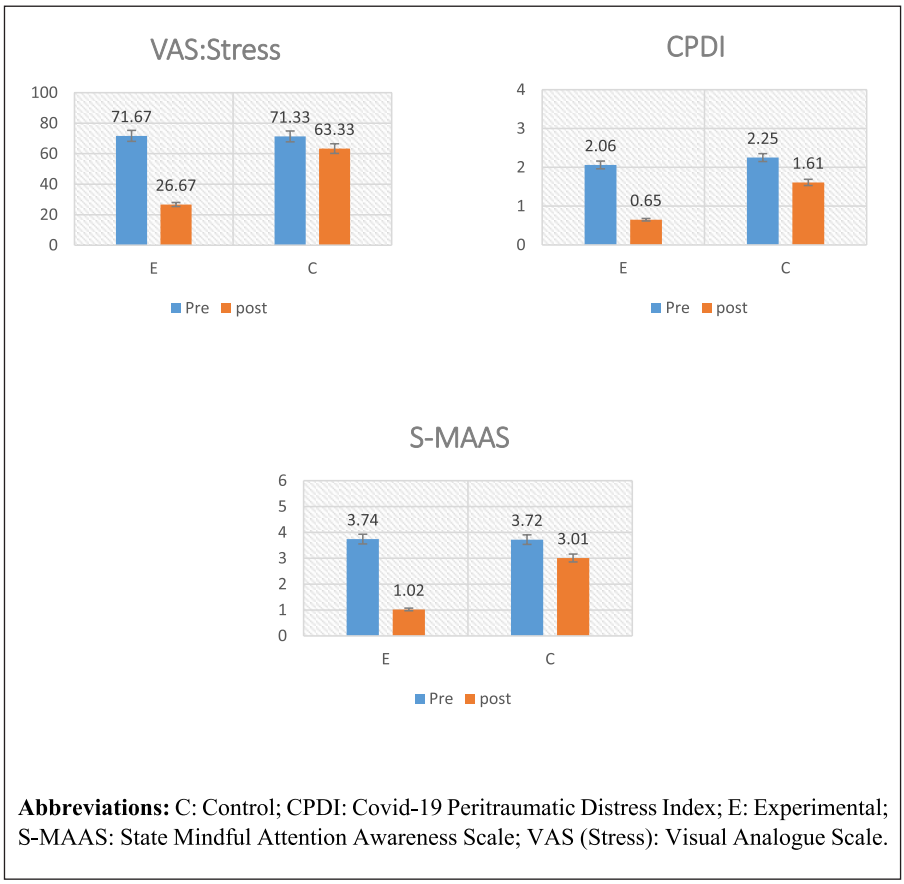
Mann-Whitney U test between groups ($p < 0.001$) shows that there were significant changes in SpO_2 (2.07%), HR (8.21%), RR (10.04%), systolic blood pressure (BP SYS) (6.14%), diastolic blood pressure (8.38%) in experimental group compared to the control group after 7 days of yoga intervention (Table 3). This has been graphically represented in Figure 2.

Changes in the Psychological Variables and Mindfulness

Mann-Whitney U test (between groups) shown in Table 4 indicated significant changes in CPDI (68.44%), S-MAAS (72.72%), VAS (62.78%) in the experimental group compared to control group after 7 days of yoga intervention ($p < 0.001$) (as represented in Fig. 3).

Changes in Distress Level (CPDI) after Intervention in Both Groups

The percentage of CPDI distress levels before intervention and changes after intervention was shown to have changes (Table 5). Initially, 24 out of 30 patients (80%) had moderate distress and 6 (20%) patients had severe



Abbreviations: C: Control; CPDI: Covid-19 Peritraumatic Distress Index; E: Experimental; S-MAAS: State Mindful Attention Awareness Scale; VAS (Stress): Visual Analogue Scale.

Fig. 3. Changes in values of psychological variables.

Table 4. Psychological variables before and after yoga intervention in experimental and control groups

Variable	Group	Pre (before intervention – day 1) mean±SD	Post (after intervention – day 7) mean±SD	Differences (Δ)	Sig-P actual group differences (Δ) (Mann Whitney)	% changes
CPDI	E	2.06±0.21	0.65±0.12*	−1.41±0.16	$p < 0.001$	68.44
	C	2.25±0.20	1.61±0.15	−0.64±0.10		28.44
S-MAAS	E	3.74±0.51	1.02±0.32*	−2.72±0.46	$p < 0.001$	72.72
	C	3.72±0.38	3.01±0.50	−0.71±0.51		19.08
VAS	E	71.67±21.02	26.67±12.13*	−45.00±17.37	$p < 0.001$	62.78
	C	71.33±18.14	63.33±18.06	−8.00±16.48		11.21

There is significant difference between groups with better improvement in experimental group. C, control; CPDI, COVID-19 Peritraumatic Distress Index; E, experimental; S-MAAS, State Mindful Attention Awareness Scale; VAS (Stress), Visual Analogue Scale. *$p < 0.001$, comparing the variables between the groups using "Mann-Whitney U test."

distress in experimental group while 10 out of 30 patients (33.33%) had moderate distress and 20 (66.66%) were having severe distress in the control group. None of the patients had normal distress levels before intervention in both groups. There were significant changes in their CPDI distress level after 7 days of yoga intervention. In the experimental group, all the patients improved and had normal distress levels whereas all the patients remained with moderate distress in the control group.

Discussion

Integrated tele-yoga intervention for 1 week has shown to improve physiological, psychological, and mindfulness variables in COVID-19 positive asymptomatic patients. In this present study, the result showed that there were statistically significant changes between groups in all variables in the experimental group as compared to control group ($p < 0.001$).

Table 5. Changes in distress level (CPDI) after intervention in both groups

S. No.	Variables CPDI	Experimental group (n = 30) % changes		Control group (n = 30) % changes	
		pre, n (%)	post, n (%)	pre, n (%)	post, n (%)
1	CPDI <28: (normal)	0	30 (100)	0	0
2	CPDI 28–5 (moderate distress)	24 (80)	0	10 (33.33)	30 (100)
3	CPDI >51 (severe distress)	6 (20)	0	20 (66.66)	0

CPDI, COVID-19 Peritraumatic Distress Index.

In our study, we included 60 asymptomatic patients whose mean age was 49.85 ± 15.07. Insights from an Indian registry-based observational study showed the mean age of asymptomatic patients was found to be 50.7 ± 18.0 during a similar period as our study [6]. Demographic characteristics in our study showed that there were 58.33% male and 41.66% female. Also, 23.33% of asymptomatic patients were more than 60 years of age. This was similar to the demographic profile of asymptomatic patients in a study by Nitin Gupta et al. [23]. In the same study, comorbidities were seen in 64.1% asymptomatic patients which included hypertension in 57.5% and diabetes in 59%. Our study also supported these findings as 36.76% of asymptomatic patients had comorbidities.

A significant change was observed in oxygen saturation and pulse rate after intervention ($p < 0.001$) between groups. This study suggests that yoga practice may improve pulmonary functions in healthy individuals and prevent complications of respiratory diseases like COVID-19. In a study by Malhotra et al. [24] on 52 healthy subjects, it was seen that the pulse rate and oxygen saturation levels had dropped after the yoga intervention probably indicating a shift toward parasympathetic dominance and anaerobic metabolism during yoga practice. Also, our experimental group exhibited significant reduction in blood pressure between and within the groups ($p < 0.001$) which is in confirmation with previous studies on healthy individuals which showed yoga group to fare better in BP management as compared to zumba and aerobics [25]. Improved digit vigilance test which was seen in our study was also in line with previous studies done on healthy volunteers along with a reduction in BP SYS. Overall findings stipulate that yoga practices may have beneficial effects in patients with COVID-19 [26].

In our study, it was found out that COVID-19 patients who were asymptomatic had stress, anxiety, depression, and fear as a result of hospitalization. A study by Goda et al. [27] shows that patients hospitalized for treatment of COVID-19 experienced various kinds of stress. Being asymptomatic, the burden of isolation was felt even more in these groups as compared to the symptomatic patients. Findings in the present study have shown a significant reduction in these psychological variables and mindfulness after 1 week of intervention in the yoga group (within and between groups) as compared to control group, indicating a potential efficacy of yoga to work even with a short duration of intervention. A study by Lemay et al. [28] on yoga on students shows a reduction in stress and anxiety levels after completing a 6-week yoga and meditation program just before their final examinations. A survey by Nagarathana et al. [29] on 23,760 healthy individuals done online indicated reduced fear, stress, and anxiety and better coping strategies in yoga group as compared to nonyoga group. A study on COVID-19 patients in Iran on a spiritual mediation technique result has shown to effectively reduces anxiety and pain in COVID-19 patients [30].

Results of our study showed significant changes in the control group also. It might be because of the fact that all of them were undergoing a combination therapy of conventional medicine and Ayurveda kadha. A study by Talwar et al. [15] has shown that novel coronavirus infections can be prevented by different holistic and conventional treatment strategies. Our study further strengthens the findings of Tillu et al. [16] which shows that Ayurveda and yoga, when added as complementary therapies to the standard care, can potentially improve the quality of well-being in patients suffering from COVID-19 infection.

Limitations

The major limitation of the current study was the small sample size. Though the sample size was calculated based on a study conducted by Liu et al. [11], including a larger sample size might have helped in strengthening the findings of the present study. The coin toss method used in randomizing the subject may not be considered ideal. Also, the exact division of the 66 subjects by the nursing staff which was done without any supervision may be questionable. The televised mode of yoga delivery that was opted as part of the intervention was another limitation of the study. Due to the physical restrictions imposed

as per government norms during that time period, face-to-face intervention was not possible. Also, the time duration to interact with patients was highly limited due to the severity of the pandemic. This prevented the researchers in conducting the intervention for longer duration as getting the medical staff to supervise the 15-min schedule was also challenging due to rising number of COVID-19 cases. These restrictions also prevented the research team from including various other assessment tools which might have added rigor to the study.

Strengths

The following are the strengths of the present research: (i) Very few studies have explored yoga in COVID-19 patients during the first wave. (ii) First-hand information (quantitative and qualitative assessments) from COVID-19 patients in context of yoga intervention. (iii) The study helped in creating awareness among the study group regarding simple yoga practices that can be performed as part of COVID-19 management. (iv) Possibility of the researcher bias was minimized to a great extent as the researchers were not involved during the intervention and data collection phases. (v) Inclusion of yoga-based intervention was greatly appreciated by the experimental group as this was the only worthwhile activity reported by them, with the potential to bring the changes in a short time duration.

Conclusion

The present study suggests that integrating a tele-based yoga therapy can improve physiological, psychological, and mindfulness variables in COVID-19 asymptomatic patients. Moreover, such yoga practices might help to reduce stress, anxiety, and depression in COVID-19 patients. These findings have implications for COVID-19 patients, suggesting that an inclusion of such therapeutic modalities in clinical care might be useful.

Recommendations

Yoga practice may be used as add-on therapy with conventional therapy for the prevention and management of COVID-19 disease. More studies in this field are required for yoga to be labeled as evidence-based practices.

Acknowledgments

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Statement of Ethics

Institutional Ethics Committee of SVYASA University, Bengaluru, India, approved the study on 15-10-2020 with reference number RES/IEC-SVYASA/180/2020/B. Written permission was obtained from the MTH Hospital, Indore, before starting the project. The patients received explanations of the purpose and contents of the study. All patients declared their voluntary participation in this study by signing an informed consent form before study commencement. Patients were informed about their freedom to withdraw from the study at any point and the patient's information was kept confidential.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Pragya Jain Shrimal, Satyapriya Maharana, and Raghuram Nagarathna were involved with the conception of the study idea. Anupama Dave had contributed toward data collection. Satyapriya Maharana and Raghuram Nagarathna were involved with data analysis. Pragya Jain Shrimal, Anupama Dave, and Satyapriya Maharana wrote the manuscript. Pragya Jain Shrimal, Raghuram Nagarathna, and Arun Thulasi did the final proof reading and corrections. All authors had read and approved the manuscript.

Data Availability Statement

Data will be provided as per request.

References

1 Tang W, Hu T, Hu B, Jin C, Wang G, Xie C, et al. Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home- quarantined Chinese university students. J Affect Disord. 2020;274:1–7.

2 Honardoost M, Janani L, Aghili R, Emami Z, Khamseh ME. The association between presence of comorbidities and COVID-19 severity: a systematic review and meta-analysis. Cerebrovasc Dis. 2021;50(2):132–40.

3 Nagarathna R, Nagendra HR, Majumdar V. A perspective on yoga as a preventive strategy for coronavirus disease 2019. Int J Yoga. 2020;13(2):89–98.

4 Liu WH, Guo SN, WANG F, HAO Y. Understanding of guidance for acupuncture and moxibustion interventions on COVID-19 (Second edition) issued by CAAM. World J Acupunct Moxibustion. 2020;30:1–4.

5 Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). StatPearls. 2020. Available:

6 Kumar G, Mukherjee A, Sharma RK, Menon GR, Sahu D, Wig N, et al. Clinical profile of hospitalized COVID-19 patients in first and second wave of the pandemic: insights from an Indian registry based observational study. Indian J Med Res. 2021;153(5&6):619–28.
7 World Health Organization. WHO. Coronavirus disease 2019 (COVID-19): situation report – 73. WHO coronavirus disease 2019 (COVID-19): situation report – 105. 2020;18.
8 Mohan A, Tiwari P, Bhatnagar S, Patel A. Maurya A, Dar L, et al. Clinico-demographic profile and hospital outcomes of COVID-19 patients admitted at a tertiary care centre in north India. Indian J Med Res. 2020;152(1 & 2):61–9.
9 Kulkarni MS, Kakodkar P, Nesari TM, Dubewar AP. Combating the psychological impact of COVID-19 pandemic through yoga: recommendation from an overview. J Ayurveda Integr Med. 2022;13(2):100433.
10 González-sanguino C, Ausín B, Castellanos MÁ, Saiz J., Lopez-Gomez A, Ugidos C, et al. Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. Brain Behav Immun. 2020; 87:172–6.
11 Liu K, Chen Y, Wu D, Lin R, Wang Z, Pan L. Effects of progressive muscle relaxation on anxiety and sleep quality in patients with COVID-19. Complement Ther Clin Pract. 2020; 39:101132.
12 Behan C. The benefits of meditation and mindfulness practices during times of crisis such as Covid-19. Ir J Psychol Med, 2020; 37(4):256–8.
13 Samrah SM, Al-Mistarehi AH, Aleshawi AJ, Khasawneh AG, Momany SM, Momany BS, et al. Depression and coping among Covid-19-infected individuals after 10 days of mandatory in-hospital quarantine, irbid, Jordan. Psychol Res Behav Manag. 2020;13:823–30.
14 Jenefer Jerrin R, Theebika S, Panneerselvam P, Venkateswaran ST, Manavalan N, Maheshkumar K. Yoga and Naturopathy intervention for reducing anxiety and depression of Covid-19 patients: a pilot study. Clin Epidemiol Glob Health. 2021;11:100800.
15 Talwar S, Sood S, Kumar J, Chauhan R, Sharma M, Tuli HS. Ayurveda and allopathic therapeutic strategies in coronavirus pandemic treatment 2020. Curr Pharmacol Rep. 2020; 6(6):354–63.
16 Tillu G, Chaturvedi S, Chopra A, Patwardhan B. Public health approach of Ayurveda and yoga for COVID-19 prophylaxis. J Altern Complement Med. 2020;26:360–4.
17 Sawant RS, Zinjurke BD, Binorkar SV. Preventive aspect of ayurveda and yoga towards newly emerging disease COVID-19. J Complement Integr Med. 2021;18(4):667–78.
18 Shukla M, Chauhan D, Raj R. Breathing exercises and pranayamas to decrease perceived exertion during breath-holding while locked-down due to COVID-19 online randomized study. Complement Ther Clin Pract. 2020;41: 101248.
19 Moher D, Hopewell S, Schulz KF, Montori V, Gøtzsche PC, Devereaux PJ, et al. CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. BMJ. 2010;340:c869.
20 Lesage FX, Berjot S. Validity of occupational stress assessment using a visual analogue scale. Occup Med. 2011;61(6):434–6.
21 Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. Gen Psychiatr. 2020;33(2):e100213–21.
22 Brown, KW, Ryan, RM. The benefits of being present: mindfulness and its role in psychological well-being. J Pers Soc Psychol. 2013; 84(4):822–48.
23 Gupta N, John A, Kokkottil MS, Varma M, Umakanth S, Saravu K. Clinical profile and outcomes of asymptomatic versus. symptomatic travellers diagnosed with COVID-19: an observational study from a coastal town in South India. Drug Discov Ther. 2021;15:1–8.
24 Malhotra V, Takare A, Bharshankar R, Mishra S, Ravi N. Effect of yoga on pulse rate and oxygen saturation: analysis of psychophysiological parameters. Cad naturol terap complem. 2021;9(17):9. d
25 Faizi N, Kazmi S. Universal health coverage: there is more to it than meets the eye. J Family Med Prim Care. 2017;6(1):169–70.
26 Telles S, Verma S, Sharma SK, Gupta RK, Balkrishna A. Alternate-nostril yoga breathing reduced blood pressure while increasing performance in a vigilance test. Med Sci Monit Basic Res. 2017;23:392–8.
27 Goda K, Kenzaka T, Yahata S, Kumabe A, Katsurada M, Nishisaki H. Concerns and anxieties of patients during hospitalization for COVID-19. Cureus. 2021;13(9):e18202.
28 Lemay V, Hoolahan J, Buchanan A. Impact of a yoga and meditation intervention on students' stress and anxiety levels. Am J Pharm Educ. 2019;83(5):7001–752.
29 Nagarathna R, Anand A, Rain M, Srivastava V, Sivapuram MS, Kulkarni R, et al. Yoga practice is beneficial for maintaining healthy lifestyle and endurance under restrictions and stress imposed by lockdown during COVID-19 pandemic. Front Psychiatry. 2021;12: 613762.
30 Parizad N, Goli R, Faraji N, Mam-Qaderi M, Mirzaee R, Gharebaghi N, et al. Effect of guided imagery on anxiety, muscle pain, and vital signs in patients with COVID-19: a randomized controlled trial. Complement Ther Clin Pract. 2021;43:101335.