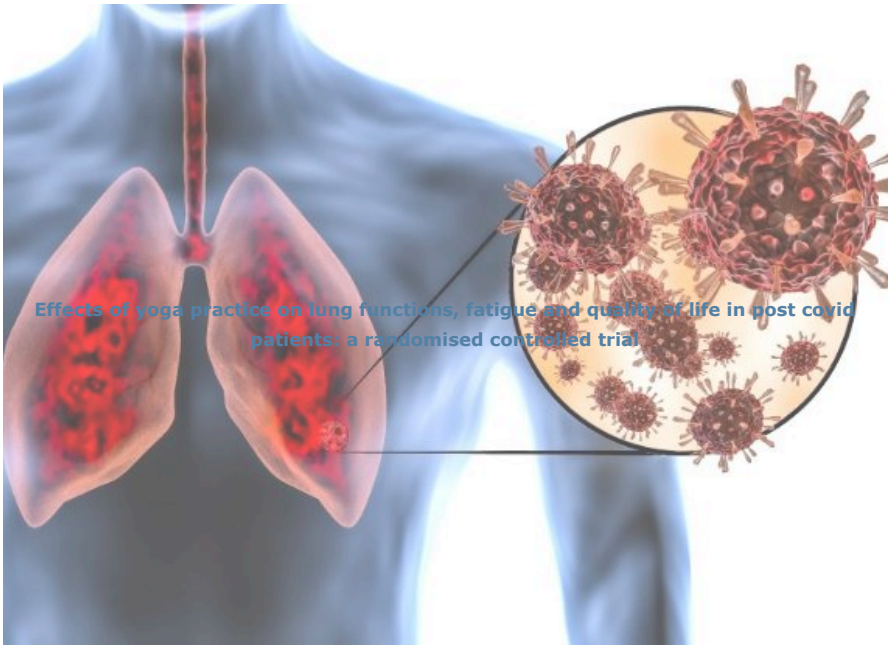
Biomedical Review
JOURNAL OF BASIC & APPLIED MEDICAL SCIENCES
SINCE 2014

Research Article
Infectious disease and Yoga
Volume 11 Number 1 Title Jan-Dec 2024

E-ISSN:2349-3275 P-ISSN:2349-5502 www.biomedicalreview.in

Effects of yoga practice on lung functions, fatigue and quality of life in post covid patients: a randomised controlled trial

Laishram T[1], Swathi PS[2*], Nagaraj SD[3]



Abstract

Background and objective: COVID-19 is a highly transmissible disease which affects multiple bodily systems and lingering for an extended duration. Following recovery, individuals often experience reduced lung function, physical fatigue, and mental health challenges like anxiety and depression. Engaging in yoga has shown promise in alleviating these issues. This study aims to examine the effect of tailored yoga interventions on lung function, fatigue and quality of life in patients experiencing post-COVID symptoms.

Methods: Thirty four participants including both genders aged between 18-40 years, were recruited and divided into two groups following recovery from COVID- 19. Baseline evaluations were performed for all participants. The intervention group participated in 30- minute yoga asana sessions daily for 15 days.

Results: Substantial alterations were noted in Peak Expiratory Flow Rate (PEFR) ($p < 0.003$), Breath Holding time (BHT) ($p < 0.001$), Modified Fatigue Impact Scale (MFIS) ($p < 0.001$), and COVID-19 Impact on Quality of Life (COV19-QoL) ($p < 0.001$) within the intervention group. Conversely, in the control group significant changes were not observed.

Conclusions and implication for translation: The findings indicate that engaging in yoga practice can lead to notable enhancements in lung function, reduction of fatigue, and overall improvement in quality of life among individuals recovering from COVID-19.

Keywords: *Post Covid, Covid, Yoga, Lung function, Fatigue, Quality of life*

[1] Tiffany Laishram, Junior Research Fellow, Division of Life Science, Swami Vivekananda Yoga Anusandhana Samsthana Svyasa, Bengaluru, Karnataka, India.

[2*] P S Swathi, BNYS, MSc, PhD Yoga, Division of Yoga and Life Sciences, Swami Vivekananda Yoga Anusandhana Samsthana Svyasa, Bengaluru, Karnataka, India.

[3] S D Nagaraj, Naturopathy and Yoga Consultant, Kshemavana Wellness Centre, Bengaluru, Karnataka, India.

Email
swathisanketh@gmail.com

Cite this Article
Laishram T, Swathi PS, Nagaraj SD. Effects of yoga practice on lung functions, fatigue and quality of life in post covid patients: a randomised controlled trial. Biomed Rev J Basic Appl Med Sci. 2024;11(1):5-9. Available From https://www.biomedicalreview.in/effects-of-yog-practice-on-lung-functions-fatigue-and-quality-of-life-in-post-covid-patients-randomised-controlled-trial

Meta History
2024-11-26 Submission Recieved
2024-12-05 1st review
2024-12-14 2nd review
2024-12-23 3rd review
2024-12-31 Accepted and Published

Declaration
15.88% Plagiarism. Authors state no conflict of interest. Non Funded. The conducted research is not related to either human or animals use. All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Evidence in Context
What Know: Post-COVID individuals often face impaired lung function, fatigue, and reduced quality of life, with yoga showing potential benefits for these issues.
What New: A 15-day yoga intervention significantly improved lung function, fatigue, and quality of life in post-COVID patients compared to controls.

To view

Introduction

COVID-19 has the highest morbidity and mortality rates globally (Dong, Du, & Gardner, 2020). Emerging scientific and clinical evidence highlights that COVID-19 can result in subacute and long-term effects affecting multiple organ systems (Gupta et al., 2020). Persistent symptoms following COVID-19 include difficulty in breathing, chest discomfort, tiredness, discomfort in joints, cognitive dysfunction and significant decline in quality of life (Carfì, Bernabei, & Landi, 2020; Huang et al., 2021; Tenforde et al., 2020). These residual effects are thought to arise from cellular damage, an intense innate immune response with inflammatory cytokine release, and increased blood clotting induced by the virus (McElvaney et al., 2020; Sungnak et al., 2020; Tang et al., 2020). This complex interaction between viral pathogenesis and host immune responses need further more research and clinically comprehensive management to address both acute and chronic aspects of the disease.

Initial epidemiological data indicated that 8.2% of COVID-19 cases experienced severe respiratory issues that lead to Acute Respiratory Distress Syndrome(ARDS) (Ñamendys-Silva, 2020). Recent findings suggest that COVID-19 predominantly affects the lungs, causing diffuse alveolar epithelial destruction, hyaline membrane formation, capillary damage, bleeding, alveolar septal fibrous proliferation, and pulmonary consolidation (Mo et al., 2020; Shi et al., 2020). Extensive damage to alveolar epithelial and endothelial cells, along with secondary fibroproliferation, hints at potential long-term consequences such as lung fibrosis and pulmonary hypertension (Venkataraman & Frieman, 2017; Frija-Masson et al., 2020). These observations emphasize the need for careful evaluation of lung injury in patients after discharge (Mo et al., 2020). Additionally, SARS and MERS, indicates that patients experience lingering impairments for months or years after post discharge (Hui et al., 2005; Ong et al., 2005).

A meta- analysis found that 32% of individuals continued to feel fatigue for more than 12 weeks after diagnosis of COVID-19 (Ceban et al., 2022). Fatigue prevalence reports suggest that between 9% and 49% of patients experience fatigue four weeks after symptom onset, with about 30% still affected between 12 and 16 weeks (Sandler et al., 2021). COVID-19 significantly impacts the quality of life, especially in acute cases, among females, older adults, patients with severe disease, and those from low-income backgrounds (Poudel et al., 2021). Yoga therapy offers a potential adjunctive treatment to mitigate COVID-19 complications. Suganthy et al. (2023) reported significant improvements in biochemical, inflammatory, and haematological markers in COVID-19 patients at tertiary care hospitals after three months of Asana-Pranayama practice. Additionally, a review study highlighted the role of yoga and meditation in alleviating stress and enhancing immunity against infections like COVID-19 (Dalpati et al., 2022). Thus, yoga appears to be a promising strategy for boosting innate immunity and mental well-being, supporting its use as an adjunctive treatment for post-COVID symptoms (Basu-Ray et al., 2022).

This study aims to examine the effect of tailored yoga interventions on lung function, fatigue, and quality of life in patients experiencing post-COVID symptoms.

Materials and Methods

This protocol has been approved by the Institutional Ethics Committee from the authorities of the SVYASA deemed-to-be University and conducted in compliance with the Declaration of Helsinki. The written informed consent was obtained from individual participants before their recruitment to the study.

Participants: Sample size required for the study was calculated based on study of differences in aerobic exercise capacity between COVID-19 patient's post-hospital discharge and comorbidity-matched controls. With an effect size of d=0.998d for aerobic exercise capacity, 15 participants per group was needed with an alpha= 5% and power=95%. To account for potential 20% loss to follow-up, 17 participants were recruited per group, totalling 34 participants (Raman et al., 2021).

Participants were recruited from SVYASA deemed-to-be University. Inclusion criteria: individuals over 18 years of age with confirmed COVID-19 diagnosed, either via reverse transcription-polymerase chain reaction (RT-PCR) on oropharyngeal-nasopharyngeal swab or Positive Rapid Antigen Test. Participants who have been hospitalised during COVID-19 infection; pregnant women; major surgery in the past 3 months; any other acute or chronic diseases like Chronic Obstructive Pulmonary Disease (COPD), Ischemic heart disease have been excluded in the study. Only participants who have mild acute infection at the time of diagnosis were recruited. Recruited participants were randomly allocated into two groups- 1. Yoga Group and 2. Control Group by using Computer-Generated Randomisation Sequence with a 1:1 allocation ratio.

Interventions: The integrated tele-based yoga intervention included breathing exercises, loosening exercises, pranayama and meditation techniques, specially designed to enhance immunity and overall health (Table 1) (Nagarathna, Nagendra, & Majumdar, 2020). This module was developed to address the needs of individuals recovering from COVID-19. The tele-based yoga program featured a 20-minute pre-recorded video. In the video, the first author (TL) demonstrated the practices in English and Hindi, while the second author (NSD) presented them in English and Kannada. Instructional language was tailored to the participants' preferences. Yoga sessions were scheduled based on participant availability, preferably between 6-8 am. The yoga group received the intervention for 15 days, with each session lasting 20 minutes. The sessions were conducted by certified Yoga and Naturopathy doctors with a Bachelor of Naturopathy and Yogic Sciences (BNYS), under medical supervision. Participants were required to attend at least 85% of the sessions (a minimum of 20 out of 24 scheduled sessions); those who did not meet this attendance requirement were withdrawn from the study. Participants in the control group were instructed to follow WHO guidelines for rehabilitation, specifically "Support for Rehabilitation: Self-Management after COVID-19" on a self-guided basis (Jimeno-Almazán et al., 2023).

Outcomes

All the outcomes were measured at baseline and after 15 days of intervention.

Primary Outcome: Measured using a PEFR machine. Instructions were given to participants to exhale maximal followed by inhale maximal for three times repeatedly. Normal peak flow rates for adult males =450-500 L/min and for adult females =320-470 L/min.

Breath Holding Time: Instructions were given to participants to exhale completely followed by a complete inhalation and then hold their breath for possible maximum duration. Procedure was repeated three times and the highest duration obtained was taken for subsequent analysis. (Mitrouska et al., 2007).

Secondary Variables

- **Modified Fatigue Impact Scale (MFIS):** This questionnaire is modified from Fatigue Impact Scale (FIS), it has 21 extracted questions from FIS. Total score ranges from 0-84, along with three subscale scores for physical (0-36), cognitive (0-40) and psychosocial (0-8) dimensions of fatigue (Larson, 2013).
- **COVID-19 Impact on Quality of Life (COV19-QoL) Scale:** The COV19-QOL scale is to assess the Quality of life after the COVID-19 pandemic. Cronbach's alpha coefficient of this scale is 0.88. This scale consists of six questions with 5-points Likert type responses 1(strongly disagree to 5 (strongly agree). The total scores ranged from 6-30 points. Higher scores indicate greater impact by COVID-19 pandemic on mental Health. (Repišti et al., 2020).
- **Data Collection and Management:** On the first day of intervention baseline data were collected before the procedures commenced. A second set of data was gathered 15 days later using a validated and reliable questionnaire. There were no dropouts, and no adverse effects from the yoga practices were reported. Data were encrypted for security, with access restricted to the principal investigator. Participants were assigned codes to ensure confidentiality, and all information was kept confidential.
- **Statistical Analysis:** Data were extracted from questionnaire manuals and organized using Microsoft Excel 2016. Statistical analysis was done in JASP statistical software version17.0. An independent sample t-test was used to compare baseline measurements with those obtained 15 days after the intervention. <0.05 was considered statistically significant.
- **Sociodemographic Characteristics:** Baseline demographic characteristics are detailed in Table 2. There were no statistically significant differences between the yoga and control groups regarding age or gender
- **Primary Outcome Measures: PEFR and BHT:** Significant improvements were observed in the yoga group after 15 days of intervention, with PEFR ($p = 0.003$) and Breath Holding Time (BHT) ($p < 0.001$) showing notable changes.

In contrast, the control group did not exhibit significant changes in PEFR ($p = 0.343$) or BHT ($p = 0.708$) after 15 days.

- **Secondary Outcome Measures: MFIS and COV19-QoL:** The yoga group demonstrated a significant reduction in fatigue as measured by the Modified Fatigue Impact Scale (MFIS) ($p < 0.001$) and an increase in quality of life (QoL) ($p < 0.001$) after 15 days of No significant changes were observed in the control group for MFIS ($p = 0.126$) or QoL ($p = 0.078$).
- A summary of the changes within and between groups is presented in Table

Discussion

The purpose of this study was to examine the effects of a yoga asana intervention on Peak Expiratory Flow Rate (PEFR), Breath Holding Time (BHT), Modified Fatigue Impact Scale (MFIS), and COVID-19 Quality of Life (COV19-QoL) in post-COVID patients. Significant improvements were observed in PEFR, BHT, MFIS, and COV19-QoL following the yoga intervention. To our knowledge, this is the first study to investigate the impact of yoga on these specific outcomes.

Consistent engagement in yoga has been shown to enhance pulmonary function (Gohel et al., 2021). Various yoga interventions have demonstrated benefits in managing different conditions. For instance, a randomized controlled trial involving 72 participants with diabetes-related lung issues revealed significant improvements in both pulmonary function and glycemic control in the yoga group compared to the control group (Balaji et al., 2019). Similarly, Jain Shrimal et al. (2023) reported positive physiological and psychological outcomes in a yoga group versus a control group, attributed to the holistic nature of yoga. Another study found increased cardiorespiratory function in MBBS students after six months of yoga training compared to a control group (Kothari et al., 2023). These findings suggest that incorporating yoga into post-COVID-19 rehabilitation may improve PEFR and overall respiratory recovery, although further research is needed to confirm and extend these results.

Yoga's impact on fatigue has been explored in various populations, including cancer patients (Armer & Lutgendorf, 2020), individuals with Parkinson's disease (Deuel & Seeberger, 2020), irritable bowel syndrome (D'Silva et al., 2023), eye fatigue (Gupta & Aparna, 2020), and chronic insomnia disorder (Turmel et al., 2022). A study involving 20 moderate COVID-19 patients showed reductions in fatigue severity, high-sensitivity C-reactive protein, depression, and anxiety, along with improved quality of life in the yoga group compared to the control group (Dua et al., 2023). Numerous studies have examined yoga's effects on various aspects of quality of life, including physical, mental, and social well-being. These studies span diverse populations with chronic illnesses such as cardiovascular disease (Sharma et al., 2021), arthritis (Gautam et al., 2020), chronic pain (Metri et al., 2023), neuropsychological disorders (Nourollahimoghadam et al., 2021), depression (Zetzl et al., 2021), and cancer survivors (Lin et al., 2023).

Our study supports these findings, confirming improvements in quality of life across multiple dimensions. This study is the first to specifically assess the effects of a targeted yoga asana intervention in post-COVID patients. The observed improvements in PEFR, BHT, quality of life, and reduced fatigue offer valuable insights and suggest potential benefits for further research and replication in other studies.

Strengths and Limitations

Strengths: This study introduces a novel approach by applying specific yoga asanas tailored for post-COVID patients, thereby addressing a gap in the literature on alternative therapies for this population. The study's objectives are clearly defined and target specific aspects of post-COVID health, enhancing the focus and relevance of its research goals. Additionally, the study had no dropouts, ensuring integrity of data collected.

Limitations: The generalizability of the findings may be limited due to potential constraints in sample size or participant characteristics, which may not fully represent the broader post-COVID population. Reliance on self-reported data for outcomes such as quality of life and fatigue introduces the possibility of bias, which could affect the accuracy of the results. The relatively short follow-up period may also restrict the study's ability to assess the long-term effects of the yoga intervention on post-COVID recovery. Despite providing valuable insights, the study highlights the need for further research with larger, multi-center trials to validate and extend the findings.

Conclusion and Implications for Translation: The positive outcomes observed in this study highlight the potential benefits of integrating yoga into rehabilitation strategies for post-COVID patients. Further research and collaborative efforts are needed to better understand the long-term effects and broader applicability of yoga in post-COVID recovery.

Author Contribution: TL was involved in writing the Draft, Review, Editing, Methodology, Project administration, and Conceptualization. PSS was involved in Conceptualization, Data analysis and Interpretation, Review and editing, and supervision, NSD was involved in review, and editing, project administration, methodology.

Conflicts of Interest: The author declare no competing interests.

Financial Disclosure: Nothing to declare.

Funding/Support: There was no funding for this study.

Ethics Approval: The institutional Ethics Committee of the SVYASA University has approved the study

Acknowledgments: NONE

Disclamier: NONE

References

1. Armer, Jessica S, and Susan K Lutgendorf. 2020. "The Impact of Yoga on Fatigue in Cancer Survivorship: A Meta-Analysis. " JNCI cancer spectrum 4(2): pkz098. *doi:10.1093/jncics/pkz098 [Crossref][PubMed][Google Scholar]*

2. Balaji, Rajasekar, Meena Ramanathan, Ananda Balayogi Bhavanani, Pajanivel Ranganadin, and Karthik Balachandran. 2019. "Effectiveness of Adjuvant Yoga Therapy in Diabetic Lung: A Randomized Control Trial. " International journal of yoga 12(2): 96–102. *doi:10.4103/ijoy.IJOY_20_18 [Crossref][PubMed][Google Scholar]*

3. Deuel, Lisa M, and Lauren C Seeberger. 2020. "Complementary Therapies in Parkinson Disease: A Review of Acupuncture, Tai Chi, Qi Gong, Yoga, and Cannabis. " Neurotherapeutics : the journal of the American Society for Experimental NeuroTherapeutics 17(4): 1434–55. *doi:10.1007/s13311-020-00900-y [Crossref][PubMed][Google Scholar]*

4. D'Silva, Adrijana, Deborah A Marshall, Jeff K Vallance, Yasmin Nasser, Vidya Rajagopalan, Jessie H Szostakiwskyj, and Maitreyi Raman. 2023. "Meditation and Yoga for Irritable Bowel Syndrome: A Randomized Clinical Trial. " The American journal of gastroenterology 118(2): 329–37. *doi:10.14309/ajg.0000000000002052 [Crossref][PubMed][Google Scholar]*

5. Dua, Ruchi, Saloni Malik, Ranjeeta Kumari, Manisha Naithani, Prasan K Panda, Amit Saroha, Balram Omar, Monika Pathania, and Sudhir Saxena. 2023. "The Role of Yoga in Hospitalized COVID-19 Patients: An Exploratory Randomized Controlled Trial. " Cureus 15(5): e39320. *doi:10.7759/cureus.39320 [Crossref][PubMed][Google Scholar]*

6. Gautam, Surabhi, Manoj Kumar, Uma Kumar, and Rima Dada. 2020. "Effect of an 8-Week Yoga-Based Lifestyle Intervention on Psycho-Neuro-Immune Axis, Disease Activity, and Perceived Quality of Life in Rheumatoid Arthritis Patients: A Randomized Controlled Trial. " Frontiers in psychology 11: 2259. *doi:10.3389/fpsyg.2020.02259 [Crossref][PubMed][Google Scholar]*

7. Gohel, Manisha Kalpesh, Ajay G Phatak, Utpala N Kharod, Bhanuprasad A Pandya, Balvantkumar L Prajapati, and Utkarsh M Shah. 2021. "Effect of Long-Term Regular Yoga on Physical Health of Yoga Practitioners. " Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine 46(3): 508–10. *doi:10.4103/ijcm.IJCM_554_20 [Crossref][PubMed][Google Scholar]*

8. Gupta, Satish Kumar, and S Aparna. 2020. "Effect of Yoga Ocular Exercises on Eye Fatigue. " International journal of yoga 13(1): 76–79. *doi:10.4103/ijoy.IJOY_26_19 [Crossref][PubMed][Google Scholar]*

9. Jain Shrimal, Pragya, Satyapriya Maharana, Anupama Dave, Nagarathna Raghuram, and Arun Thulasi. 2023. "Efficacy of Integrated Tele-Yoga Intervention on Physiological and Psychological Variables in Asymptomatic COVID-19 Positive Patients: A Confirmatory Randomized Control Trial. " Complementary medicine research 30(2): 151–60. *doi:10.1159/000528832 [Crossref][PubMed][Google Scholar]*

10. Kothari, Ruchi, Gaurav Mittal, Prashanth A, and Pradeep Bokariya. 2023. "Exploring the Effect of Yoga on Exercise Endurance As Assessed by Cardiorespiratory Efficiency Tests in Exercise Physiology Laboratory: A Pilot Study. " Cureus 15(4): e38283. *doi:10.7759/cureus.38283 [Crossref][PubMed][Google Scholar]*

11. Lin, Po-Ju, Brian J Altman, Nikesha J Gilmore, Kah Poh Loh, Richard F Dunne, Javier Bautista, Chunkit Fung, et al. 2023. "Effect of Yoga and Mediational Influence of Fatigue on Walking, Physical Activity, and Quality of Life Among Cancer Survivors. " Journal of the National Comprehensive Cancer Network : JNCCN 21(2): 153-162. *e2. doi:10.6004/jnccn.2022.7080 [Crossref][PubMed][Google Scholar]*

12. Metri, Kashinath G, Nagaratna Raghuram, Meera Narayan, Karthik Sravan, Sanjana Sekar, Hemant Bhargav, Natesh Babu, Sriloy Mohanty, and Rishab Revankar. 2023. "Impact of Workplace Yoga on Pain Measures, Mental Health, Sleep Quality, and Quality of Life in Female Teachers withChronic Musculoskeletal Pain: A Randomized Controlled Study. " Work (Reading, Mass. *) 76(2): 521–31. doi:10.3233/WOR-210269 [Crossref][PubMed][Google Scholar]*

13. Nourollahimoghadam, Elnaz, Shaghayegh Gorji, Ali Gorji, and Maryam Khaleghi Ghadiri. 2021. "Therapeutic Role of Yoga in Neuropsychological Disorders. " World journal of psychiatry 11(10): 754–73. *doi:10.5498/wjp.v11.i10.754 [Crossref][PubMed][Google Scholar]*

14. Sharma, Gautam, A Mooventhan, Gitismita Naik, and L Nivethitha. 2021. "A Review on Role of Yoga in the Management of Patients with Cardiac Arrhythmias. " International journal of yoga 14(1): 26–35. *doi:10.4103/ijoy.IJOY_7_20 [Crossref][PubMed][Google Scholar]*

15. Turmel, Denis, Sarah Carlier, Anne Violette Bruyneel, and Marie Bruyneel. 2022. "Tailored Individual Yoga Practice Improves Sleep Quality, Fatigue, Anxiety, and Depression in Chronic Insomnia Disorder. " BMC psychiatry 22(1): 267. *doi:10.1186/s12888-022-03936-w [Crossref][PubMed][Google Scholar]*

16. Zetzl, Teresa, Agnes Renner, Andre Pittig, Elisabeth Jentschke, Carmen Roch, and Birgitt van Oorschot. 2021. "Yoga Effectively Reduces Fatigue and Symptoms of Depression in Patients with Different Types of Cancer. " Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 29(6): 2973–82. *doi:10.1007/s00520-020-05794-2 [Crossref][PubMed][Google Scholar]*