

VOLUME 9 (SPECIAL ISSUE 2) 2023

ISSN 2454 – 3055

**Manuscripts under Special Issue are published under the
theme “Yoga Practices and Alternative Therapies on
Human Health”**

Guest Editor: Dr. S. Mohanasundaram

Assistant Guest Editors: Mrs. K. Geetha

Mrs. M. Pennarasi

**INTERNATIONAL
JOURNAL OF
ZOOLOGICAL
INVESTIGATIONS**

***Forum for Biological and Environmental
Sciences***

Published by Saran Publications, India



International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India



ISSN: 2454-3055

Yoga and Quality of Life in Pulmonary Tuberculosis Patients During COVID-19 and Post- COVID-19: A Narrative Review

Srinivas M.¹, Patil N.J.^{2*}, Jagmohan S.V.³, Prabhakar K.⁴, Dhanashri Patil¹ and Guruprasad T.J.⁵

¹Department of Integrative Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar, KA, India

²Department of Yoga, Centre for Integrative Medicine and Research(CIMR), Manipal Academy of Higher Education, Manipal, KA, India

³Department of Pulmonology, Sri Devaraj Urs Medical College, Tamaka, Kolar, KA, India

⁴Department of General Medicine, Sri Devaraj Urs Medical College, Tamaka, Kolar, KA, India

⁵Department of TB and CD, Sri Devaraj Urs Medical College, Tamaka, Kolar, KA, India

*Corresponding Author

Received: 17th March, 2023; **Accepted:** 5th May, 2023; **Published online:** 28th August, 2023

<https://doi.org/10.33745/ijzi.2023.v09ispl2.044>

Abstract: COVID-19 is a new pandemic that causes severe respiratory and enormous mental sickness, ultimately resulting to diminished quality of life in both patients and the general population. Since Yoga is a kind of mind-body therapy, it may be used to treat mental illness and improve patients' quality of life (QOL). The purpose of this review is to assemble the data on the relationship between Yoga and QOL for people with pulmonary tuberculosis and COVID-19. After searching PubMed and Google Scholar, we found a small number of publications that met our inclusion criteria and decided to focus on them. To get these findings, we used a technique called narrative synthesis. We found 156 articles on Yoga and COVID-19 after doing an electronic search, however, after applying the field tag, that number was decreased to 39. The inclusion criteria then used this information to pick up the final group of 8 articles. In all, 26 articles were chosen from the 543 that were obtained using Boolean operators between COVID-19 and QOL. Health-Related Quality of Life may be low among people with PTB and COVID-19, according to a meta-analysis of research. Since yoga has been shown to enhance respiratory problems and mental health, it has the potential to play an important role in reducing the negative effects of the PTB and COVID-19 pandemic on patients' quality of life in terms of their health. As a result, Yoga has the potential to be an effective technique in the treatment, prevention, and rehabilitation of both COVID-19 and pulmonary tuberculosis.

Keywords: Yoga; COVID-19; Tuberculosis; Quality of Life; Pulmonary Tuberculosis; Post-COVID-19

Citation: Srinivas M., Patil N.J., Jagmohan S.V., Prabhakar K., Dhanashri Patil and Guruprasad T.J.: Yoga and quality of life in pulmonary tuberculosis patients during COVID-19 and post- COVID-19: A narrative review. Intern. J. Zool. Invest. 9(Special Issue 2): 252-260, 2023.

<https://doi.org/10.33745/ijzi.2023.v09ispl2.044>



This is an Open Access Article licensed under a Creative Commons License: Attribution 4.0 International (CC-BY). It allows unrestricted use of articles in any medium, reproduction and distribution by providing adequate credit to the author (s) and the source of publication.

Introduction

COVID-19, or the newly discovered Corona virus illness, is the world's worst viral disease. COVID-19 wreaked havoc on the global population by rapidly spreading and producing an exponential increase in the number of new cases. The World Health Organization estimates that there have been 480,170,572 confirmed cases of COVID-19, with 6,124,396 fatalities. The great stress on mental health and therefore on quality of life (QOL) (Nobari *et al.*, 2021; WHO Global tuberculosis report 2019) has been brought about by lockdown, social isolation, economic crisis, unemployment, loss of one or both parents and relatives, and financial strain on the patients.

Mycobacterium tuberculosis is the bacterium responsible for pulmonary TB and was expected to cause 1.5 million deaths globally by 2020 (Central TB Division report). It has infected one-fourth of the world's population and, of those infected, between 10 and 15 per cent will develop active TB at some point in their lives. In 2018, India was responsible for 27 Lakh new cases of tuberculosis, or 27% of the global total (India TB Report, 2020; Tuberculosis WF, 2021). Positive outcomes have been achieved with the NTEP (New National Tuberculosis Elimination Programme). The elimination of tuberculosis by 2025 is a lofty goal, and getting there will require overcoming obstacles including finding effective treatments, dealing with patients' mental health, and enhancing their ability to breathe (Aggarwal *et al.*, 2013). Patients with tuberculosis will suffer from a low QOL and extreme levels of stress, anxiety, and depression (Pachi *et al.*, 2013).

There is a synergistic relationship between the spread of COVID-19 and pulmonary tuberculosis, which makes it more difficult to isolate the two diseases (Dass *et al.*, 2022). COVID-19 is a new pandemic that causes terrible respiratory and enormous mental disease, ultimately resulting to lower quality of life in patients, whereas TB has been around for millennia and is responsible for the majority of fatalities in the globe (Cramer *et al.*, 2017). Patients with pulmonary tuberculosis who were affected by the COVID-19 pandemic report low QOL and decreased medication taking

as a result of the pandemic. Since Yoga is a kind of mind-body therapy, it may aid in the reduction of mental health problems and the enhancement of quality of life for patients. This review aims at collating available evidence on Yoga and QOL in Pulmonary Tuberculosis during COVID-19.

Materials and Methods

The PubMed and Google scholar search was carried out using the keywords "Yoga," "COVID-19", "Pulmonary Tuberculosis," "PTB," "Tuberculosis," "TB," "Quality of Life," "QOL," and their synonyms were used for electronic searching. A combination of different keywords used for searching on PubMed was searched for pertinent articles from search terms such as ["Pulmonary Tuberculosis" OR "PTB"], ["Tuberculosis" OR "TB"] ["Yoga" AND "COVID-19"], ["Yoga" AND "Pulmonary Tuberculosis"] AND ["COVID-19" AND "Quality of Life"] among them based on inclusion criterion – (i) Types of articles included were Randomized Control Trials, Clinical trials, Review articles, Systematic Reviews, and meta-analyses, (ii) Full-length free articles with robust methodology in the English language were included, (iii) Field tags used were titles and abstracts, (iv) Last 5 years' articles were picked, and (v) Reference lists of valid articles were searched for studies of similarity. The exclusion criterion is based on – (i) Articles with weak methodology and content, (ii) Case Reports and case series, (iii) Irrelevant topic of our interest. A narrative synthesis criterion was used to obtain the results.

Results and Discussion

After the electronic search, we got 156 articles related to Yoga and COVID-19, and with the field tags, it has reduced to 39 articles. Further on, the inclusion criterion was able to select full-length articles. Between Pulmonary Tuberculosis (PTB) and COVID-19, 71 articles among 8 articles were selected based on their relevance as shown in Figure 1. Using Boolean operators between Pulmonary Tuberculosis, COVID-19, and QOL able to get 543 articles; 25 research studies were picked after removing duplicates and exclusion

criteria. In the same way, between Yoga and Tuberculosis, we got only one article meeting the criterion. The many research studies were evaluated and found that PTB and COVID-19 patients may have a poor Health-Related Quality of Life.

Research Evidence in Yoga and COVID-19:

Research on the effects of yoga on the COVID-19 pandemic found that yoga (including physical postures, Bhramari Pranayama, mindfulness meditation, Sahaj yoga, and laughing therapy) had good impacts on mental health.

During the COVID-19 lockdown, volunteers took part in a randomized Control Trial that demonstrated the effectiveness of Viloma Pranayama in reducing RPE maximum during breath-holding. However, diaphragmatic breathing techniques greatly increase breath-holding duration (Visweswaraiah and Telles, 2004).

The study and practice of Sudarshana kriya include the use of certain breathing patterns and sequences. The autonomic nervous system's homeostasis is restored, and with it, stress, anxiety, depression, and stress-related disorders, are alleviated. The immune system is boosted, making the body better able to fend against many pathogens. During the COVID-19 epidemic, tele-yoga was shown to be helpful for both cancer patients and their caregivers.

In light of the possibility for future epidemics and pandemics involving novel illnesses, another study shows that yoga and meditation may help students manage with stress and maintain their health. Therefore, yoga will play an essential part in COVID-19 to improve the mental health status and general well-being of both healthy persons and those with illness.

Research in Yoga and Pulmonary Tuberculosis:

After two months, patients with PTB in the yoga and breath awareness group demonstrated a significant improvement in symptom ratings (88.1%), weight gain (10.9%), forced vital

capacity (FVC) (64.7%), and forced expiratory volume in one second (83.6%) ($P < 0.001$ in all comparisons, Paired t-test). Lower symptom ratings (paired t-test, $n=22$) were seen in the breath awareness group. It is the only research done on Yoga and PTB in the last 20 years (Dalpati *et al.*, 2022).

The co-infection of COVID-19 and pulmonary tuberculosis increases the likelihood of TB reactivation by influencing the respiratory system and generating acute illnesses through a cytokine-mediated immune response. Early identification of Tuberculosis among COVID-19 needed based on symptoms, CXR, and sputum test is crucial because of the high prevalence of active PTB among SARS-CoV-2 infected patients. For this to be a reality, the health care system must implement the required policies and infrastructure to prevent and treat co-infection. Corona virus-induced immune suppression, although complicating TB diagnosis and therapy, is a tough factor. More randomized controlled trials (RCTs) with high-quality methods and relevant material are urgently needed to address the special syndemic relationship between COVID-19 and PTB. In the highly specialized fields, only case reports indicate really exceptional cases.

Quality of Life (QOL) in Pulmonary Tuberculosis:

Due to increased psychological distress and reduced QOL in PTB patients, governmental and non-governmental organizations are now required to address psychological issues in TB therapy. Poor economic, physical, psychological, and environmental factors are only some of the reasons why persons with pulmonary TB have a far worse quality of life than the general population.

There are significant knowledge gaps concerning PTB patients' health-related quality of life (HRQOL), including in the areas of treatment adherence, mental health care integration, social support, and safety (Umesh *et al.*, 2021).

Table1: Yoga and COVID-19

S. No.	Author and Publication	Study design	Sample size	Participants	Results	Findings
1	Kulkarni <i>et al.</i> (2021)	Meta-Analysis	NA	Children, youth and adults	The results of the review indicate moderate to positive effects of yoga on the mental health parameters.	Practicing yoga (physical postures, Bhramari Pranayam, mindfulness meditation, sahad yoga and laughter therapy) can be beneficial to improve psychological health of the people during the COVID-19 pandemic.
2	Umesh <i>et al.</i> (2021)	Narrative Review	NA	Healthcare workers	The available evidences point towards the potential role of Yoga and <i>Ayurveda</i> in preventing and mitigating the infection through modulating our immune system, strengthening respiratory system, and mental health respectively.	Suggests an urgent need for conducting systematic clinical trials to investigate the add-on efficacy of <i>Yoga</i> and <i>Ayurveda</i> lifestyle interventions with current conventional treatment approaches.
3	Zope <i>et al.</i> (2021)	Narrative Review	NA	Healthy Volunteers and Patients	Sudharsana Kriya Yoga (SKY) balances the autonomic nervous system and thus can alleviate anxiety, routine stress, depression, stress-related medical disorders, and posttraumatic stress. SKY increase natural host immune system helps to tackle the microbial infections.	Article provides an overview of increases the therapeutic benefits that SKY can offer to the population at large during COVID-19 pandemic.
4	Dalpati <i>et al.</i> (2022)	Review	NA	Students	Perspectives shared in the review will also bring awareness on how yoga and meditation could boost students' performance and assist them in maintaining physical and mental wellbeing during stressful conditions such as future epidemics and pandemics with novel infections.	Adding regular yogic practices and other self-improvement routines to students' academic curriculum and daily practices in co-curricular activities or proficiency programs could help the younger generation take up the day-to-day challenges and stressful situations like lockdowns and pandemics and succeed in their personal and professional life.
5	Shukla <i>et al.</i> (2020_	RCT	60	Healthy volunteers	Anuloma Viloma Pranayama(AVP) and Deep Breathing Exercises(DBE) decreased Rating of Perceived Exertion (RPE). Kapala Bhati Pranayama(KBE) and pursed-lip breathing(PLB) did not decrease RPE as compared to AVP and DBE. DBE increased BHT more than KBP and PLB interventions.	AVP reduces RPE maximally during breath-holding, whereas DPE increases BHT more.
6	Snyder <i>et al.</i> (2021)	RCT	14	Female caregivers of Cancer	Out of 7 dyads participating in the parent trial, 1 declined the video-conference	Although in-person interventions are favored by both the study

				Patients	sessions. Despite challenges in the areas of technology, location, and setting, instruction and personal connection, the overall acceptability was high among patients, caregivers, and instructors.	participants and the interventionists, videoconference sessions were deemed acceptable. All participants had the benefit of a previous in-person experience. In a remote setting, the assistance of caregivers seems particularly beneficial to ensure practice safety.
7	Shah <i>et al.</i> (2022)	Review and Meta-Analysis of RCT's	4023	Clinical, Pregnant and Healthy Population	Out of 174 they have selected 44 articles	Yoga, Meditation and Pranayama has very much effective in lowering IL-6, cortisol, and TNF- α levels in patients, long term practice of Yoga, spanned over 8–12 weeks will have definitive results in COVID-19 patients.

Table 2: Pulmonary Tuberculosis (PTB) and COVID-19

S. No.	Authors	Study design	Sample size	Participants	Findings
1	Aggarwal <i>et al.</i> (2021)	Systematic review and meta-analysis	236,863	COVID-19 and PTB Patients	Active pulmonary tuberculosis is relatively common among COVID-19 patients.
2	Siranart <i>et al.</i> (2023)	Cross-sectional cohort study	12,275 COVID-19 patients 26 having MTB	COVID-19 and PTB Patients	Early detection of Tuberculosis among Covid-19 required based on symptoms, CXR and sputum test.
3	Singh <i>et al.</i> (2020)	Review	157	TB&COVID-19 Confected patients	Health authorities should made necessary policies & facilities to fight & control against co-infection
4	Starshinova <i>et al.</i> (2022)	Review	--	<i>M. tuberculosis</i> Bacteria and SARS-CoV-2 Virus	Immune suppression caused by the Corona virus may result in difficulties in the diagnosis and treatment of TB.

Table 3: Pulmonary Tuberculosis (PTB) and Quality of Life

S. No.	Authors	Study design	Sample size	Participants	Findings
1	Zuo <i>et al.</i> (2022)	RCT	461	PTB Patients	Cognitive Behavioral Therapy can relieve anxiety, and depression symptoms and increase the quality of life in subjects with pulmonary tuberculosis.
2	Grass <i>et al.</i> (2022)	Pilot study	67	PTB Patients	The outcome of the study provides motivation for further consideration and implementation of a pulmonary rehabilitation programme for patients with PTB.
3	Xu <i>et al.</i> (2022)	RCT	150	PTB patients	Comprehensive nursing intervention combined with respiratory functional exercises can significantly improve the pulmonary function, self-care ability, and quality of life of patients with pulmonary

					tuberculosis, with obvious clinical efficacy.
4	Kumar <i>et al.</i> (2022)	RCT	46	PTB patients	Personalized dietary counselling was found to have a positive impact on BMI, total protein, and albumin levels in the experimental group, especially in underweight individuals. Besides, the quality of life measured using SGRQ.

Table 4: Research evidence for Quality of Life and COVID-19

S. No.	Authors	Participants	Study design	Sample size	QoL Assessment	Result	Conclusion
1	Nobari <i>et al.</i> (2021)	Children and adolescents.	Systematic review	3177	Health-Related Quality of life (HRQoL) were extracted from eligible studies.	Finally, six studies fulfilled the inclusion criteria and, therefore, were included in the systematic review.	COVID-19 has a negative impact on the HRQoL of children and/or adolescents.
2	Malik <i>et al.</i> (2022)	Post-acute COVID-19 syndrome (PCS) patients and intensive care unit (ICU) admitted cases.	Meta-Analysis	4828	Quality of life (EQ-VAS)	Meta-regression analysis showed the poor quality of life was significantly higher among post-COVID-19 patients.	Study concludes that PCS is associated with poor quality of life, persistent symptoms including fatigue, dyspnea, anosmia, sleep disturbances, and worse mental health
3	Amdal <i>et al.</i> (2021)	Active COVID-19 or Post-COVID-19 Patients	Systematic review	3342	To retrieve new publications on HRQoL issues including issues related to the long-term consequences of COVID-19.	The wide range of HRQoL issues experienced by patients with COVID-19.	The results provided the foundation for the international development of a COVID-19 specific patient-reported HRQoL questionnaire.
4	Dorri <i>et al.</i> (2021)	COVID-19 survivors.	Meta-Analysis	Varied 58-44779	A systematic search using key terms COVID-19, PTSD, depression, anxiety, HRQoL, survivors.	The pooled prevalence of PTSD, depression, and anxiety among COVID-19 survivors to pre-COVID-19 time and controls showed reduced HRQoL (RE).	Our systematic review also found evidence of reduced HQOL and limited social role in these survivors.
5	Ariyo <i>et al.</i> (2021)	Elderly intensive care unit (ICU) survivors .	Meta-Analysis	2536	Assessed quality of life (QoL) in ICU survivors before the COVID-19 pandemic.	Reduced quality of life due to physical health	Elderly survivors' QoL was significantly worse than younger ICU survivors
6	Kandula and Wake (2021)	Among Health Professionals	Review	Varies 170-10516	Assessment of the quality of life (QoL) of health professionals	QoL maintained by specific types of health professionals during critical moments of COVID-19 pandemics.	This study may assist health organization stakeholders in enhancing QoL among health professionals by required provisions.

7	Poudel <i>et al.</i> (2021)	Acute Covid, females, older ages.	Structured Review	1276	Studies used a generic HRQoL assessment tool; five studies used SF-36, five studies used EQ-5D-5L.	After reading full-text, 12 eligible studies were included in this review. Higher impact on HRQoL was reported.	The impact of Covid-19 on HRQoL of Acute and Long Covid patients is substantial.
8	Nandasena <i>et al.</i> (2022)	COVID-19 patients following discharge or recovery.	Systematic review	4408	The Databases of PubMed, Cochrane Library, and Science Direct were searched.	COVID 19 patients' QOL has been significantly impacted and associated with the low level of QOL.	The QOL of the post COVID19 patients was significantly impacted, regardless of the time discharge or recovery.
9	Kasar and Karaman (2021)	Elderly individual.	Scoping Review		Assessing QoL	Resulted in seven studies selected for full reading, including three descriptive and cross-sectional studies.	Recommendations were grouped as evaluating the current state of loneliness and isolation in elderly people QOL negatively impacted.

Quality of Life (QOL) in COVID-19:

Children and adolescents with COVID-19 have a worse HRQoL (Shah *et al.*, 2022). According to the findings, those suffering with Post COVID-19 Syndrome (PCS) have a worse quality of life and have chronic symptoms such as tiredness, dyspnea, anosmia, sleep problems, and impaired mental health. More study on PCS patients is required to identify the underlying causes of this symptom and the subsequent decline in quality of life (Dorri *et al.*, 2021).

The varied HRQoL issues experienced by COVID-19 participants were the focus of this investigation. It exemplifies the catastrophic results of the illness. It is very essential because it helps doctors spot the illness earlier and equips them with the knowledge to prevent future outbreaks. The findings provide a foundation for the global creation of a patient-reported HRQoL questionnaire tailored to people with COVID-19 (Zuo *et al.*, 2022).

Many patients who survived COVID-19 may have post-traumatic stress disorder (PTSD), despair, and anxiety beyond the first month of recovery. New data reveals that these survivors have worse HQOL and play a less social role than previously thought.

Subjective QOL outcomes should guide person-centered decision-making in senior ICU patients (Amdal *et al.*, 2021), and it is important to keep an eye on the proportionality of age as a factor of ICU resource allocation.

The quality of life (QoL) of COVID-19 patients has been shown to decline, according to many studies; researchers should take into account the most significantly impacted QoL domains and related variables..

Conclusion

Yoga may be an add-on therapy as it improves respiratory conditions and mental health; hence it may play vital role as preventative, curative and rehabilitation role in PTB and COVID-19 pandemic by improving Health-related quality of life.

There is a need for evidence-based research with more emphasis should be given to Randomized Control Trails in Yoga, Pulmonary Tuberculosis and COVID-19 as well as in Post-COVID-19. Yoga can act At the government level further adding the new policies adopting to the new pandemic era required to enhance the quality of life.

References

- Aggarwal AN, Gupta D, Janmeja AK and Jindal SK. (2013) Assessment of health-related quality of life in patients with pulmonary tuberculosis under programme conditions. *Int J Tuberc Lung Dis*. 17(7): 947–953.
- Amdal CD, Pe M, Falk RS, Piccinin C, Bottomley A, Arraras JL, Darlington AS, Hofsø K, Holzner B, Jørgensen NMH, Kulis D, Rimehaug SA, Singer S, Taylor K, Wheelwright S and Bjordal K. (2021) Health-related quality of life issues, including symptoms, in patients with active COVID-19 or post COVID-19; a systematic literature review. *Qual Life Res*. 30(12): 3367–3381.
- Ariyo K, Canestrini S, David AS, Ruck Keene A, Wolfrum S and Owen G. (2021) Quality of life in elderly ICU survivors before the COVID-19 pandemic: a systematic review and meta-analysis of cohort studies. *BMJ Open* 11(10). <https://pubmed.ncbi.nlm.nih.gov/34635510/>
- Central TB Division (2020) Indian TB Report, Ministry of Health and Family Welfare.
- Cramer H, Lauche R, Klose P, Lange S, Langhorst J and Dobos GJ. (2017) Yoga for improving health-related quality of life, mental health and cancer-related symptoms in women diagnosed with breast cancer. *Cochrane database Syst Rev* 1(1). <https://pubmed.ncbi.nlm.nih.gov/28045199/>
- Dalpati N, Jena S, Jain S and Sarangi PP. (2022) Yoga and meditation, an essential tool to alleviate stress and enhance immunity to emerging infections: A perspective on the effect of COVID-19 pandemic on students. *Brain, Behav Immun - Heal* 20: 100420.
- Dass SA, Balakrishnan V, Arifin N, Lim CSY, Nordin F and Tye GJ. (2022) The COVID-19/tuberculosis syndemic and potential antibody therapy for TB based on the lessons learnt from the pandemic. *Front Immunol*. 13: 468.
- de Grass D, Manie S and Amosun SL. (2014) Effectiveness of a home-based pulmonary rehabilitation programme in pulmonary function and health related quality of life for patients with pulmonary tuberculosis: a pilot study. *Afr Health Sci* 14(4): 866–872.
- Dorri M, Mozafari Bazargany MH, Khodaparast Z, Bahrami S, Seifi Alan M, Rahimi F, Kamipoor Z, Niksima MM, Dehghan H and Rastad H. (2021) Psychological problems and reduced health-related quality of life in the COVID-19 survivors. *J Affect Disord Rep*. 6: 100248.
- India TB Report (2020) Ministry of Health and Family Welfare. <http://www.tbcindia.nic.in/showfile.php?lid=3538>.
- Kandula UR and Wake AD. (2021) Assessment of quality of life among health professionals during COVID-19: Review. *J Multidiscip Healthc* 14: 3571–3585.
- Kulkarni MS, Kakodkar P, Nesari TM and Dubewar AP. (2021) Combating the psychological impact of COVID-19 pandemic through yoga: Recommendation from an overview. *J Ayurveda Integr Med* 13(2). <https://pubmed.ncbi.nlm.nih.gov/34172388/>
- Malik P, Patel K, Pinto C, Jaiswal R, Tirupathi R, Pillai S and Patel U. (2022) Post-acute COVID-19 syndrome (PCS) and health-related quality of life (HRQoL)-A systematic review and meta-analysis. *J Med Virol* 94(1): 253–262.
- Nandasena HMRKG, Pathirathna ML, Atapattu AMMP and Prasanga PTS. (2022) Quality of life of COVID 19 patients after discharge: Systematic review. *PLoS One* 17(2): e0263941.
- Nobari H, Fashi M, Eskandari A, Villafaina S, Murillo-Garcia Á and Pérez-Gómez J. (2021) Effect of COVID-19 on health-related quality of life in adolescents and children: A systematic review. *Int J Environ Res Public Health* 18(9): 4563.
- Pachi A, Bratis D, Moussas G and Tselebis A. (2013) Psychiatric morbidity and other factors affecting treatment adherence in pulmonary tuberculosis patients. *Tuberc Res Treat*. 2013: 1–37.
- Poudel AN, Zhu S, Cooper N, Roderick P, Alwan N, Tarrant C, Ziauddeen N and Yao GL. (2021) Impact of Covid-19 on health-related quality of life of patients: A structured review. *PLoS One* 16(10): e0259164.
- Sayin Kasar K and Karaman E. (2021) Life in lockdown: Social isolation, loneliness and quality of life in the elderly during the COVID-19 pandemic: A scoping review. *Geriatr Nurs* 42(5): 1222–1229.
- Shah K, Adhikari C, Sharma S, Saha S and Saxena D. (2022) Yoga, meditation, breathing exercises, and inflammatory biomarkers with possible implications in COVID-19: A systematic review and meta-analysis of randomized controlled trials. *Evid Based Complement Alternat Med*. 2022: 3523432.
- Sharan Kumar VG, Pajanivel R, Boratne A V and Vimal Raj R. (2022) Impact of dietary counselling on the nutritional status and quality of life among pulmonary tuberculosis patients - A randomized control trial. *Indian J Tuberc*. 69(2): 201–206.
- Shukla M, Chauhan D and Raj R. (2020) Breathing exercises and pranayamas to decrease perceived exertion during breath-holding while locked-down

- due to COVID-19 online randomized study. *Implement Ther Clin Pract*. 41: 101248.
- Singh A, Prasad R, Gupta A, Das K and Gupta N. (2020) Severe acute respiratory syndrome coronavirus-2 and pulmonary tuberculosis: convergence can be fatal. *Monaldi Arch Chest Dis*. 90(3). doi: 10.4081/monaldi.2020.1368.
- Siranart N, Sowalertrat W, Sukonpatip M, Suwanpimolkul G and Torvorapanit P. (2023) First case series and literature review of coronavirus disease 2019 (COVID-19) associated pulmonary tuberculosis in Southeast Asia: Challenges and opportunities. *J Infect Public Health* 16(1): 80-89.
- Snyder S, Silva RF, Whisenant MS and Milbury K. (2021) Videoconferenced yoga interventions for cancer patients and their caregivers during the COVID-19 pandemic: A report from a clinician's perspective. *Integr Cancer Ther*. 20: 15347354211019111.
- Starshinova AA, Kudryavtsev I, Malkova A, Zinchenko U, Karev V, Kudlay D, Glushkova A, Starshinova AY, Dominguez J, Villar-Hernández R, Dovgalyk I and Yablonskiy P. (2022) Molecular and cellular mechanisms of *M. tuberculosis* and SARS-CoV-2 infections-unexpected similarities of pathogenesis and what to expect from co-infection. *Int J Mol Sci*. 23(4): 2235.
- Tuberculosis WF, 2021. Tuberculosis. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
- Umesh C, Ramakrishna KK, Jasti N, Bhargav H and Varambally S. (2022) Role of ayurveda and yoga-based lifestyle in the COVID-19 pandemic - A narrative review. *J Ayurveda Integr Med*. 13(1): 100493.
- Visweswaraiyah NK and Telles S. (2004) Randomized trial of yoga as a complementary therapy for pulmonary tuberculosis. *Respirology* 9(1): 96-101.
- WHO Coronavirus (COVID-19) Dashboard WHO Coronavirus (COVID-19) Dashboard With Vaccination Data [Internet]. Available from: <https://covid19.who.int/>
- WHO (2020) Global tuberculosis report 2019. World Health Organization. World Health Organization.
- Zope SA, Zope RA, Biri GA and Zope CS. (2021) Sudarshan kriya yoga: A breath of hope during COVID-19 pandemic. *Int J Yoga* 14(1): 18.
- Zuo X, Dong Z, Zhang P, Zhang P, Zhu X, Qiao C, Yang Y and Lou P. (2022) Cognitive-behavioral therapy on psychological stress and quality of life in subjects with pulmonary tuberculosis: a community-based cluster randomized controlled trial. *BMC Public Health* 22(1): 2160.