

Integrating Ayurveda and Yoga for Immunity Enhancement in The Context of Covid-19: A Review

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Abstract:

The COVID-19 pandemic has placed immense strain on global healthcare systems, highlighting the need for innovative approaches to combat the virus and bolster host immunity. While conventional medical strategies primarily target the pathogen, there is growing recognition of the importance of enhancing overall host immunity to mitigate transmission and disease severity. Traditional Indian therapies, such as Ayurveda and Yoga, offer promising avenues for achieving this goal. This review synthesizes existing evidence on the potential roles of Ayurveda and Yoga in addressing COVID-19. Drawing from recent studies on immunity, respiratory health, and mental well-being, it explores the prophylactic and adjunctive management potential of these traditional practices in the current pandemic context. Ayurveda, with its holistic approach to wellness and personalized interventions, provides insights into natural remedies and lifestyle modifications that may enhance immunity and resilience against COVID-19. Similarly, Yoga's therapeutic effects on physical, mental, and emotional health offer opportunities to improve respiratory function, reduce stress levels, and boost immunity.

By integrating traditional wisdom with modern healthcare paradigms, this review underscores the importance of adopting a comprehensive approach to combatting COVID-19. It highlights the potential of Ayurveda and Yoga as complementary strategies for strengthening host immunity and promoting holistic well-being in the face of the ongoing pandemic.

Keywords: Covid 19, Ayurveda, Immunity.

INTRODUCTION

The COVID-19 pandemic presents significant challenges to the global healthcare sector. With the increasing number of positive cases surpassing healthcare capacities, the need for economically viable therapeutic options is paramount. Strategies aimed at enhancing immune surveillance and resilience, including reducing inflammatory markers and enhancing specific immune cell activity implicated in COVID-19 pathogenesis, are urgently required. Conti et al. advocate for reducing inflammatory responses as a key strategy to mitigate COVID-19 severity, potentially reducing the need for critical care [1]. While current healthcare strategies primarily target the pathogen or environmental factors, strengthening host immunity is crucial from a public health perspective to curb infection spread and diminish pathogen potency. While vaccines confer specific immunity, enhancing overall host immunity through non-specific means is equally imperative. Traditional Indian medical systems such as Ayurveda and Yoga offer potential avenues for bolstering host immunity and attenuating infection severity.

This review aims to synthesize existing literature on the utility of Yoga and Ayurveda in the context of COVID-19. Additionally, it explores ancillary evidence supporting the role of Yoga and Ayurveda in enhancing health across three key domains: 1) Immune system, 2) Respiratory system, and 3) Mental health, which are particularly vulnerable during COVID-19 infection.

Ayurveda perspective

According to *Ayurveda* classics, the term *Janapadodhwamsa* (epidemic diseases) has been used to describe epidemics/pandemics which manifest due to polluted *Vāyu* (air), *Bhūmi* (land), *Jala* (water), and *Kāla* (vitiated seasons). These are considered to be consequences of ‘*Prajñaparādha*’ (crime against wisdom) and ‘*Adharma*’ (Unrighteousness). *Ayurveda* classics have described the concept of *Sukshmakrimi/bhūta* (organisms invisible to the naked eye). The term *Bhūtabiṣanga* (exogenous cause) has been used to describe diseases caused by them. Fever due to *Bhūtabiṣanga* is similar to the conditions explained during the epidemics/pandemics. In the Ayurveda context of epidemic diseases, terms such as *Samsargaja* and *Upsargaja* have been used to indicate transmission from infected to the healthy through contact including exhaled air. The modes of spread in *Janapadodhwamsa* have been described as through *sparsha* (touch), *Niṣwāsa* (inhalation), *sahabhojana* (eating together), *sahāsana* (sleeping together), and *Sahagandhamālyānulepana* (use of infected articles) [4]. Interestingly, *sushruta* has also described a condition that mimics all symptoms of an influenza-like illness such as the current COVID-19 viz., *Jwara* (fever), *Swāsa* (difficulty in breathing), *Kāsa* (cough), *Siroruk* (head ache), *pratishyaya* (common cold), *Gandhaajñana* (anosmia), *Bhrama* (giddiness/postural instability), and *Vamathu* (vomiting)

Clinical symptoms reported by Huang et al. from heavily affected places of COVID-19 suggests that, 98% patients had mild to moderate fever (*Jwara*), 76% had cough (*Kāsa*), and 44% had myalgia (*angamarda*) and fatigue (*Tandrā*). Among those who developed pneumonia, 99% had fever (*Jwara*), 70% had fatigue (*Tandrā*), 59% dry cough (*Vātikakāsa*), 40% anorexia (*Aruci*), 35% had myalgia (*angamrda*), 31% had dyspnea (*Swāsa*), and 27% had sputum production (*Kaphajakāsa*). Considering all these factors, COVID-19 can be considered as a *Kapha-vātasamsargajawara* (a febrile condition with predominance of *kapha* and *vāta*) with *Pitta* association [3] in the initial stages. At advanced stages it acquires the status of overt *Sannipātajwara* (a febrile condition with predominance of all *Tridoṣaḥ* viz., *Vāta Pitta* and *Kapha*-a disease involving all *Tridoṣaḥ* in its pathophysiology) which has been described in *Ayurveda* as difficult to cure).

Yoga Perspective

Yoga therapy emphasises on modulation of host factors such as regulation and moderation of the lifestyle factors. Host immunity is downregulated due to altered lifestyle patterns such as consumption of unwholesome food, physical inactivity, improper sleep-wake cycle, increase in workload, stress, and addictions. This results in fragility of the immune resilience that results in the host succumbing to the virus. Thus, the aim of *Ayurveda* and *Yoga* therapeutics is to enhance host immunity and reduce the extent of infection and inflammation in the body by balancing body humors and lifestyle factors.

Potential role of Ayurveda and Yoga in COVID-19 infection: current evidence base

To understand the role, we have categorized our literature search into three domains which are commonly involved in COVID-19 infection:

1. Immune system,
2. Respiratory System and
3. Mental Health.

AYURVEDA

Based on the search criteria using the keywords "Ayurveda" and "COVID" in the PubMed database until December 20th, 2020, a total of 218 articles were identified. Among these, 63 articles specifically addressed the intersection of Ayurveda and COVID-19. Of the 63 articles, 45 were categorized as reviews, letters to the editor, or concept papers, while the remaining 18 articles comprised experimental studies.

The experimental studies encompassed various research designs, including:

One double-blind Randomized Controlled Trial (RCT)

One uncontrolled RCT focusing on Influenza-like illness

One prospective open-label interventional clinical trial

These studies represent a diverse range of research methodologies aimed at exploring the potential role of Ayurveda in the context of COVID-19, ranging from rigorous clinical trials to observational studies and conceptual analyses.

YOGA

Using the search terms "Yoga" or "meditation", "COVID", "coronavirus", and "SARS" in the PubMed database until December 2020, a total of 29 articles were identified, with 18 specifically addressing the intersection of Yoga and COVID-19, comprising a range of literature including nine review articles, four letters to the editor and short communications, two research protocols of randomized controlled trials focusing on online Sudarshan Kriya Yoga (SKY) for frontline hospital staff and the effect of a meditation app on anxiety and well-being, two cross-sectional observational studies, two articles on cancer care during the pandemic, and one article on modifications in tele-training and tele-assessment in alternative therapies for multiple sclerosis during the COVID-19 pandemic; among these, three articles exclusively focused on the role of Yoga in the elderly and two were related to maternal health during the pandemic, while only four articles discussed specific Yoga modules for COVID-19, including a study exploring the patterns of physical activity across genders during the pandemic which revealed a significant increase in women opting for Yoga, suggesting its popularity as a home-based activity for improving mental well-being amidst the pandemic, with authors emphasizing the philosophical relevance of Yoga principles such as Pancha-koshas and Pratipaksha bhavana in the current scenario, highlighting Yoga's potential role in reducing infection severity and inflammation, while another review examined traditional knowledge from Ayurveda and Yoga to formulate prophylactic and therapeutic measures against COVID-19, aligning with the known disease course of SARS-CoV-2, and Bushell et al. discussed the mechanisms of action of Yoga and meditation in combating the pandemic, emphasizing their anti-inflammatory actions and the need for further investigation to validate their use as adjunct therapies for COVID-19 management, underscoring the urgent need to explore the potential role of Yoga and meditation in combating the COVID-19 pandemic and enhancing overall public health resilience.

IMMUNITY AND AYURVEDA

In Ayurveda, the concept of Vyādhikṣamatva, or inherent strength against disease, is a fundamental principle that underscores the body's natural defense mechanisms. This inherent strength is believed to be influenced by various factors including genetics, epigenetics, and lifestyle choices. Among these factors, Ojus, considered the essence of the seven tissue elements in Ayurveda, is a primary contributor to sustaining Vyādhikṣamatva. Ojus is responsible for maintaining overall vitality and immunity within the body.

Ayurveda classifies immunity into three main categories: Sahaja (constitutional), Kālaja (chronobiological), and Yuktikṛta (acquired strength). Sahaja immunity is inherent and determined by an individual's constitution, while Kālaja immunity is influenced by circadian rhythms and seasonal variations. Yuktikṛta immunity, on the other hand, refers to acquired immunity that develops through lifestyle practices and external factors.

In the context of pandemic situations like the COVID-19 outbreak, maintaining optimum immunity becomes crucial for preventing and minimizing the risk of infection. Ayurvedic approaches to boosting immunity primarily revolve around Rasāyana therapy. Rasāyana refers to rejuvenation or revitalization treatments that aim to promote overall health and well-being.

Rasāyana therapy includes a combination of proper daily regimens, seasonal routines, and the consumption of medicinal herbs known to enhance tissue regeneration and immunity. Ayurvedic texts highlight specific Rasāyana formulations such as Kāmya Rasāyana, which promotes longevity and intelligence, and Ajsrika Rasāyana, which helps optimize the immune system.

Several medicinal herbs have been identified in Ayurveda for their potent immunomodulatory properties. These include *Tinospora cordifolia*, *Embelia officinale*, *Bacopa monnieri*, *Curcuma longa*, *Ocimum tenuiflorum*, *Terminalia chebula*, *W. somnifera*, and *Asparagus racemosus*, among others. Regular consumption of these herbs, either individually or as part of formulations like Chavyanprash and Bramha rasāyana, is believed to strengthen the immune system and provide effective prophylaxis against infections, including SARS-CoV-2.

Furthermore, Ayurvedic practices such as Swarna bindu prashana (SBP) have been advocated to enhance immunity, particularly in infants and children. SBP involves administering a combination of gold, honey, and medicinal herbs to boost immunity and promote overall health in young individuals.

In summary, Ayurveda offers a comprehensive approach to enhancing immunity and preventing infections like COVID-19. By understanding and harnessing the body's inherent strength through Rasāyana therapy and lifestyle modifications, individuals can optimize their immune response and promote overall well-being in the face of pandemics and other health challenges

RESPIRATORY HEALTH AND AYURVEDA

SARS-CoV-2, the virus responsible for the COVID-19 pandemic, primarily gains entry into the host through the respiratory tract, targeting specific cells such as airway and alveolar epithelial cells, vascular endothelial cells, and alveolar macrophages. These cells serve as the initial targets for viral entry and subsequent replication due to their expression of angiotensin-converting enzyme 2 (ACE2), which acts as a receptor for the virus. The observations regarding the disease course of COVID-19 indicate that the lung is the primary site of SARS-CoV-2 infection.

From an Ayurvedic perspective, the primary site of the disease is considered to be the Prāṇavaha srotas, which includes both the upper and lower respiratory tracts. Ayurveda offers several interventions aimed

at enhancing the innate immunological responses of the respiratory epithelium, thereby potentially preventing the transmission of the virus to the lungs. These interventions include various daily regimen measures such as Uṣha pāna (drinking water stored in a copper vessel), gargling, nasal installation, and the consumption of hot food and water. Medicated hot water (Saḍaṅga pānīya) is believed to aid in improving digestion and balancing the vāta and kapha doshas, which play a significant role in the manifestation of respiratory conditions such as rhinitis, cough, and breathlessness.

The AYUSH kvātha, an initiative by the Government of India, is an herbal concoction comprising holy basil, cinnamon, ginger, and black pepper, along with jaggery/raisins and lemon juice. This formulation is aimed at restoring respiratory health and is believed to pacify Kapha and Vāta doshas. The ingredients of AYUSH kvātha possess properties such as Kāśahara (cough-relieving), Svāsahara (relieving dyspnea), Dēpana (digestive), Pāchana (carminative), Jvaragna (febrifuge), and Kṛimigna (anti-microbial).

In addition to daily regimen measures and herbal formulations, Ayurveda emphasizes the importance of sodana (bio-cleansing) and Rasāyana (immune modulators) for the maintenance of respiratory health. Sodana practices, such as Ritu sodana (seasonal bio-cleansing), aim to cleanse the body of accumulated toxins and maintain overall health. Rasāyana therapies focus on enhancing the body's natural defense mechanisms and promoting longevity. Several in-vitro, animal, and human clinical studies have demonstrated the immunomodulatory effects of Rasāyana drugs such as Ashwagandha (*Withania somnifera*), Gudūci (*Tinospora cordifolia*), and Āmalaki (*Embllica officinalis*).

Ashwagandha, also known as Indian ginseng, has been shown to significantly increase immunoglobulins such as IgA, IgG, and IgM, thereby enhancing the body's immune response. Gudūci, commonly known as giloy, exerts a variety of immunomodulatory effects, including stimulation of phagocytic functions, macrophage and mitogenic activity, and antibody responses. Āmalaki rasāyana (AR), derived from the Indian gooseberry, possesses immuno-stimulant and cytoprotective activities, thereby enhancing the body's resilience against infections.

Overall, Ayurveda offers a holistic approach to respiratory health, emphasizing the importance of lifestyle modifications, dietary interventions, herbal formulations, sodana practices, and Rasāyana therapies. By incorporating these principles into daily life, individuals can strengthen their innate immunity and mitigate the risk of respiratory infections, including COVID-19. Ayurveda's emphasis on preventive healthcare and holistic well-being makes it a valuable resource in combating the current pandemic and promoting overall health and resilience in individuals and communities.

YOGA AND RESPIRATORY HEALTH

Currently, there is a lack of experimental studies demonstrating improvements in lung functions specifically in patients with COVID-19. However, researchers have aimed to draw evidence from analogous non-infectious conditions characterized by respiratory distress. One area of focus has been the practice of yogic breathing techniques, known as Prānayāma, which has shown promise in enhancing lung functions and capacity by strengthening the inspiratory and expiratory muscles.

In a controlled study, the practice of Bhastrika (Bellow's breath) Prānayāma significantly increased the maximum inspiratory and expiratory pressures compared to stretching exercises among elderly participants. Moreover, a randomized, double-blind, placebo-controlled, crossover trial revealed improvements in mean forced expiratory volume in 1 second (FEV1), peak expiratory flow rate, symptom scores, and inhaler use in patients with mild asthma following the practice of slow deep yogic

breathing. This breathing technique was performed for 15 minutes, twice a day, over a two-week period. Similar positive outcomes have been observed in trials involving patients with moderate to severe asthma and Chronic Obstructive Pulmonary airway obstruction among patients with bronchial asthma. Notably, studies have reported improvements in the transfer factor of Lung for Carbon Monoxide (TLCO) diffusion capacity among patients with mild and moderate COPD who participated in Yoga sessions compared to those receiving conventional therapy alone. In addition to asthma and COPD, yoga breathing techniques have shown potential in enhancing blood oxygen saturation levels. For instance, a study assessing blood oxygen saturation before, during, and after two Yoga breathing techniques—high-frequency Yoga breathing (Kapālabhāti) and breath awareness—observed a significant increase in oxygen saturation following high-frequency Yoga breathing for 33 minutes.

Furthermore, the practice of Humming breath (BhrāmariPrāṇayāma) has been associated with improvements in sinus ventilation and a notable 15-fold increase in nasal nitric oxide (NO) levels, which are integral to host defense functions.

These findings collectively suggest the potential of yogic breathing techniques in enhancing respiratory functions and capacity, although more research is needed to explore their specific application and efficacy in the context of COVID-19 and related respiratory conditions.

MENTAL HEALTH AND AYURVEDA

During the current COVID-19 pandemic, mental health issues have become increasingly prevalent among both the general public and healthcare professionals. A study by Rajkumar et al. found that 28% of screened subjects reported symptoms of stress, anxiety, and depression, highlighting the psychological impact of the pandemic on individuals. Moreover, a meta-analysis of 300 studies concluded that chronic stressors can significantly reduce both cell-mediated and humoral immunity, which underscores the intricate relationship between mental well-being and immune function.

Conversely, reducing stress hormones, psychological stress, anxiety, and depression has been associated with improved functioning of the immune system, indicating the importance of addressing mental health concerns during the pandemic. In Ayurveda, the concept of Swāsthya (health) encompasses mental well-being, which includes aspects such as Prasanna (healthy), Ātma (soul), Manaḥ (mind), and Indriyāḥ (senses). Caraka, one of the ancient Ayurvedic scholars, advocated Āchara rasāyana—a code of behavioral conduct—for achieving perfect mental, physical, social, and spiritual health. This includes adherence to moral, ethical, and benevolent conduct, such as truthfulness, nonviolence, cleanliness, and a yogic lifestyle.

Studies have shown that individuals who strongly adhere to Āchara rasāyana exhibit better academic performance, enjoy good physical and mental health, and have a favorable reputation among their peers. Additionally, Ayurvedic texts recommend the intake of Medhya rasāyana—psychotropic Ayurvedic pharmacological interventions—to maintain mental health. These include herbs such as Mandūkapaṇṇi (*Centella asiatica*), Yaṣṭimadhu (*Glycyrrhiza glabra*), Gudūci (*Tinospora cordifolia*), and Sankhapuṣpi (*Clitoria ternatea*), which are known for their cognitive enhancement properties and ability to act as brain tonics or rejuvenators.

Medhya rasāyana promote various mental faculties such as intellect (Dhi), power of self-control (Dhṛti), and memory (Smṛiti), while balancing the Manodoṣas—humors that control the mind—namely Rajas (speed) and Tamas (indolence), thereby regulating and promoting healthy mental functions. Studies have demonstrated that consumption of Ashwagandha (*Withania somnifera*), Mandūkapaṇṇi, and Sankhapuṣpi

can lead to improvements in general well-being, sleep quality, mental alertness, and reduction in anger outbursts. Meta-analyses on *Centella asiatica* have shown improvements in alertness, while studies on *Sankhapushpi* have highlighted its memory-enhancing, anxiolytic, and antidepressant properties. Overall, psychotropic Ayurvedic pharmacological interventions hold promise in managing stress, anxiety, and depression, offering potential benefits for individuals navigating the challenges of the COVID-19 pandemic.

MENTAL HEALTH AND YOGA

Mental health is intricately linked with the regulation of proper immune responses and homeostasis. However, the COVID-19 pandemic has significantly exacerbated mental health challenges across all segments of society, leading to increased incidences of anxiety, depression, and stress-related disorders. Particularly, vulnerable populations such as healthcare workers are at heightened risk of developing Post-Traumatic Stress Disorder (PTSD) due to the demanding and stressful nature of their work amidst the pandemic.

Yoga has emerged as a valuable tool in addressing mental health concerns during the current crisis. Inclusion of Yoga as a home-based activity to improve mental well-being underscores its potential effectiveness in alleviating psychological distress. Previous research has demonstrated the efficacy of Yoga in promoting mental health in the aftermath of natural disasters, highlighting its relevance in times of crisis.

Several studies have reported positive outcomes associated with Yoga practice during the COVID-19 pandemic. A cross-sectional study found that practitioners of Sudarshan Kriya Yoga (SKY) reported lower levels of anxiety and negative mental health effects compared to non-practitioners. Additionally, a pre-post single-group study evaluating the impact of a tele-yoga intervention during the national lockdown period revealed significant reductions in perceived stress and improvements in overall well-being among participants.

A wealth of evidence supports the beneficial effects of Yoga in inducing mental tranquility and equilibrium. Yoga practices have been shown to regulate the hypothalamo-pituitary-adrenal (HPA) axis and balance autonomic nervous system functions. By increasing Gamma-Amino Butyric Acid (GABA) levels and reducing cortisol and catecholamine levels, Yoga contributes to the alleviation of stress, anxiety, and depression.

Furthermore, systematic reviews and meta-analyses have underscored the effectiveness of Yoga interventions in managing various mental health conditions. Studies investigating major depressive disorder and anxiety disorders have reported positive effects of Yoga beyond placebo, with outcomes comparable to conventional interventions. Similarly, systematic reviews focusing on stress in both healthy individuals and healthcare workers have indicated the positive impact of Yoga in reducing stress levels.

Overall, the accumulating body of research highlights the valuable role of Yoga in promoting mental well-being and resilience, particularly during times of heightened stress and uncertainty such as the COVID-19 pandemic. Continued exploration and integration of Yoga-based interventions into mental health care strategies hold promise for mitigating the psychological impact of crises and fostering greater emotional and psychological resilience in individuals and communities.

DISCUSSION

As outlined above, the existing literature on Yoga and Ayurveda provides a comprehensive theoretical framework that can serve as the basis for experimental studies aimed at examining their effects on COVID-19 infection. Specifically, these studies could focus on enhancing immunity, reducing respiratory distress, and improving mental health among individuals affected by the virus.

Recommendations and potential benefits of Yoga and Ayurveda in the context of COVID-19 have been extrapolated from their observed effects on similar conditions such as acute upper respiratory infections and obstructive lung disorders. While some case studies and small pilot experimental studies have been published, there remains a notable gap in the literature regarding robust experimental studies with validated intervention protocols conducted on human subjects.

It is imperative that future research endeavors in this area adhere to scientific rigor to ascertain the efficacy of Yoga and Ayurveda interventions in mitigating the impact of COVID-19. This necessitates the implementation of well-designed experimental studies with rigorous methodology, including appropriate controls and outcome measures. Such studies will be essential in providing empirical evidence regarding the effectiveness of Yoga and Ayurveda in combating COVID-19 and informing evidence-based clinical practice and public health policies.

CONCLUSION

While conclusive evidence regarding the role of Yoga and Ayurveda in managing COVID-19 remains elusive, existing ancillary evidence suggests their potential in preventing and mitigating the infection. Through modulation of the immune system, strengthening of the respiratory system, and addressing mental health concerns, Yoga and Ayurveda may offer valuable adjunctive approaches to conventional treatment methods.

Given these promising indications, there is an urgent need for systematic clinical trials to explore the efficacy of Yoga and Ayurveda lifestyle interventions in conjunction with standard treatment protocols for COVID-19. By conducting rigorous trials with well-defined methodologies, researchers can elucidate the specific effects of Yoga and Ayurveda on various aspects of the disease, including symptom severity, immune response, and overall patient outcomes.

Furthermore, systematic trials will enable healthcare practitioners to better understand the optimal integration of Yoga and Ayurveda practices into existing treatment regimens for COVID-19. This approach holds the potential to enhance the holistic management of the disease and improve patient outcomes, while also contributing to the growing body of scientific knowledge surrounding alternative and complementary healthcare modalities.

In summary, while the evidence base for the role of Yoga and Ayurveda in COVID-19 management is still evolving, the current findings underscore the importance of further investigation through systematic clinical trials. By rigorously evaluating the efficacy and safety of these interventions, we can better harness their potential benefits in combating the global pandemic.

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