A Perspective on Yoga as a Preventive Strategy for Coronavirus Disease 2019

Abstract

The pandemic outbreak of coronavirus disease 2019 (COVID-19) is an infection caused by severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) with the recently analyzed mortality of 5-7% (95% CI 5.5–5.9). The initial reports of disease outbreak were reported in Wuhan, Hubei Province of China, COVID-19 followed by its worldwide expansion owing to the highly contagious nature of the virus. In a meeting on January 30, 2020, as per the International Health Regulations (2005), the WHO declared the outbreak as a Public Health Emergency of International Concern as it has spread across 18 countries across the globe with four countries reporting human-to-human transmission.

Phylogenetic analysis has indicated a zoonotic origin of SARS-CoV-2, with person-to-person transmissibility. SARS-CoV-2 is a β-CoV with highly identical genome to bat CoV, pointing to bat as the natural host. CoVs belong to a large family of single-stranded RNA viruses (+) with a broad distribution across humans, other mammals, and birds and cause respiratory, enteric, hepatic, and neurologic infections. These RNA viruses derive their name due to the crown-like or coronal appearance (coronam is the Latin term for crown) given by the club-shaped glycoprotein spikes in the envelope. Importantly, the past two decades have witnessed the emergence of three highly pathogenic, novel zoonotic CoVs – SARS-CoV (SARS-CoV now named SARS-CoV-1) discovered in November 2002, Middle East respiratory syndrome (MERS)-CoV (MERS-CoV) in June 2012, and SARS-CoV-2, identified in December 2019 – and have been of global public health concerns. These periodic emergencies occur due to frequent cross-species infections and increasing interfaces between humans and other animal species. These frequent emergencies also derive from the high prevalence and wide distribution of CoVs, their large genetic diversity, and frequent recombination of their genomes.

SARS-CoV-2 causes a respiratory viral infection that represents the most prevalent and pathogenic forms of communicable infectious diseases. In severe cases, there is a plethora of evidence that supports the add-on benefits of yoga in stress management, as well as prevention and management of chronic noncommunicable diseases. There are some studies on the effect of yoga in communicable diseases as well but very few for acute conditions and almost none for the rapidly spreading infections resulting in pandemics. Based on the available scientific evidences on yoga in improving respiratory and immune functions, we have formulated very simple doable integrated yoga modules in the form of videos to be practiced for prevention of the disease by children, adults, and the elderly.

Keywords: Coronavirus disease 2019, immune function, yoga

Introduction

The current outbreak of coronavirus disease 2019 (COVID-19) is an infection caused by severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) with the recently analyzed mortality of 5-7% (95% CI 5.5–5.9). The initial reports of disease outbreak were reported in Wuhan, Hubei Province of China, COVID-19 followed by its worldwide expansion owing to the highly contagious nature of the virus. In a meeting on January 30, 2020, as per the International Health Regulations (2005), the WHO declared the outbreak as a Public Health Emergency of International Concern as it has spread across 18 countries across the globe with four countries reporting human-to-human transmission.

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The latest updates suggest that the pandemic of COVID-19 has entered a new stage with rapid spread in countries outside China indicating the need of practicing the measures for self-protection toward the prevention of transmission of the infection to others. As of March 16, 2020, a drastic escalation in the number of cases of COVID-19 was observed outside China with a number of 143 affected countries, states, or territories reporting infections to the WHO. The COVID-19 outbreak is an indication of the prevailing challenge of the recurrent surfacing of the unprecedented pathogenic infections that demand regular monitoring and preparedness. There is an urgent need of basic and clinical research efforts to aid in the understanding of the disease biology and development of robust combat measures.

Clinical Course of Coronavirus Disease 2019

SARS-CoV-2 primarily spreads by droplets, and is postulated to have higher transmissibility as compared to seasonal influenza. A major concern arises due to its likely spread via even asymptomatic or minimally symptomatic individuals who may not seek any clinical evaluation. As reported by Huang et al., patients with COVID-19 primarily present with fever, fatigue, and dry cough. Most of the patients exhibit favorable prognosis, however, older patients and those with chronic underlying conditions may present with worse outcomes. In the early stages of infection, patients could be afebrile represented with only chills and respiratory symptoms. The clinical spectrum varies from asymptomatic or mild symptomatic forms to severe forms characterized by respiratory failure that necessitates mechanical ventilation and support in an intensive care unit (ICU) or multi-organ and systemic manifestations in terms of sepsis, septic shock, and multiple organ dysfunction syndromes.

Challenges toward the Combat of Coronavirus Disease 2019

Effective prevention or treatment of COVID-19 remains a top priority toward the curtailing of this pandemic. Implementation of several infection control measures (e.g., social isolation, distancing, or quarantine of entire communities) have been posited for control and prevention of the COVID-19 outbreak. The most important and effective challenge seems to establish preventive intervening strategies before the human–pathogen interface. Vaccination is the one of the most radical countermeasures to combat an infectious disease epidemic. Although substantial progress has been made toward characterization of the causative virus for COVID-19, a time period of probably a least 1 year to 18 months has been speculated for substantial vaccine production. In the early stage of the pandemic, antiviral treatment is the most effective method. Very recently hydroxychloroquine has been reported to be apparently effective against the treatment of COVID-19-associated pneumonia in clinical studies. However, implementation of antiviral treatment and prophylaxis has several requirements, in particular an adequate stockpile of drugs along with the safety of the treatment and cost-effectiveness. Most importantly, the preventive/controlling measures should be implemented in a judicious and cost-effective manner.

Integrated Yoga for the Management of Noncommunicable Clinical Conditions

Yoga, an ancient mind–body technique, is defined as samatvam (balance/equipoise/homeostasis) at both mind and body levels to be achieved through mastery over the modifications of the mind (chitavrittinirodahah). The available evidence indicates that yoga meditation facilitates the coordination among the set of homeostatic responses involving the interaction among the nervous, endocrine, and immune systems. Hence, the recent definition of yoga states it as a comprehensive skill set of synergistic process tools that aids in bidirectional feedback and modulation of autonomic nervous system outputs through integration between central nervous system (CNS) and afferent and efferent inputs from proprioceptive processes such as the somatosensory, viscerosensory, and chemosensory. Postures (Sanskrit: asana), breath regulation (Sanskrit: pranayama), and meditation along with the conceptual corrections comprise the integrative system of yoga techniques that could promote physical as well as mental well-being. The postures or asanas are purported to have different effects. Some are stimulatory to the nervous and circulatory systems, some develop coordination and concentration, while others have a calming effect on the body. Some postures such as the corpse pose are used for elongated periods of relaxation.

Clinically, these therapeutic techniques of yoga have been reported to be beneficial against the management of acute stress as in posttraumatic stress disorder after tsunami or in chronically stressed people with depression or anxiety and in many noncommunicable diseases such as asthma and hypertension, heart disease, and diabetes. In particular, yoga has been repeatedly reported to facilitate the attainment of glycemic control and mitigate the influence of other risk factors associated with the complications in patients with diabetes as compared to control conditions. It has been proposed that the abdominal pressure created during exhalation in Kapalabhati improves the efficiency of β-cells of the pancreas. It can be further...
viewed as modulated interoception or sensory modulation evoked by the vigorous practice of Kapalabhati aids in the increased interoception of the abnormal glycemic control that is signaled through the sensory inputs of the CNS that in turn modulates the autonomic outputs to the pancreas and other organs related to disease pathophysiology.

**Insights from Clinical Evidence on Efficacy of Yoga/Meditation against Communicable Disease Settings**

There is evidence for the beneficial effects of yoga as an add-on strategy for the management of communicable diseases including influenza,[39,40] tuberculosis (TB),[41] and human immunodeficiency virus (HIV) infection,[42‑44] wherein status of immune system is an important factor that determines the progression of the disease. The results from the Meditation or Exercise for Preventing Acute Respiratory Illness Trial (MEPARI) trial indicated that training in meditation evoked a larger reduction in global acute respiratory infection (ARI) severity as compared to exercise or the wait-list control participants.[19,40] The findings of the study were found to be in concordance with prior literature on beneficial effects of moderate-intensity exercise against immune system and reduction in the incidence of ARI illness.[39]

Similarly, a prospective, randomized trial compared the efficacy of two programs (yoga and breath awareness) as an add-on to anti-TB treatment in sputum-positive cases in a sanatorium in Bangalore.[41] A total of 1009 pulmonary TB patients were screened and 73 were alternately allocated to yoga (n = 36) or breath awareness (n = 37) groups. At the end of 2 months, the yoga group showed a significantly better reduction in symptom score and an increase in weight and lung capacity with an improved level of infection control and radiographic image as compared to the nonyoga group.

Effect of 1 month of integrated yoga (IY) intervention has reported to significant improvement in the psychological states as well as in the viral loads in patients suffering from HIV-1 infection.[42] Further, yoga has also been reported to be an effective intervention for stress management and improvement in psychological health among HIV/AIDS patients.[42‑44] These findings indicate toward a potential complementary role for yoga in the management of communicable diseases.

**Yoga for the alleviation of stress induced immune deregulation and strengthening of innate immune response-Paradigm for Viral Infections**

Immunity of the host is an essential requisite to facilitate the eradication of infections. Impaired immunity characterized by lymphopenia and elevated CRP levels is an essential clinical feature of COVID-19.[19] Frequent representation of elderly individuals in the COVID-19-infected cases indicates the plausible role of immunosenescence underlying their vulnerability to the infection. The severity and outcome of the viral infection could be either an outcome of an effective cellular/innate immune response that combats SARS-CoV-2 as observed in the patients with mild clinical signs of infection or a state of immunosuppression that debilitating and sometimes overwhelms the host’s defense.[2]

Available evidence indicates that stress modulates immune competence through immunosuppression[45] (latency of herpesvirus as represented by the antibody titers), upper respiratory tract infection, and wound healing time, indicating that stress causes a significant immune response dysfunction. Both acute and chronic stressors can mediate their effects on sympathetic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis, thereby impairing antiviral immune responses and innate immunity and deregulation of different immune parameters, primarily the inflammatory pathways.[46,47] Fear, uncertainty, and stigmatization are psychological stress factors during public health emergencies such as COVID-19.[48] These factors hinder appropriate medical and mental health interventions and could serve as psychological risk factors and alter the immune function of subjects in quarantine or health-care workers. In the context of pandemics with individuals experiencing high levels of psychological stress, the modulation of HPA axis through practice of yoga could alleviate stress and could aid in the strengthening of the antiviral immune responses.

Innate immunity is needed for precise regulation to eliminate the virus, otherwise will result in immunopathology. A randomized controlled study in nonstressed young healthy students showed a significant increase in interferon-gamma (IFN-γ) levels (a central regulator of cell-mediated immunity, having antiviral, immune-regulatory functions) in the yoga group as compared to students who did not do yoga.[49] On the contrary, a study by Gopal et al.[50] on students with examination stress showed a significant reduction in the levels of IFN-γ levels after yoga as compared to the nonyoga control group. (Academic stress, the stressful condition of students taking examination, has been proposed to be considered as a more appropriate model of naturalistic stress in human beings as compared with laboratory-induced stress situations). These physiological aspects of yoga-based mechanisms indicate toward the buffering effect of the yoga that aids in restoring the imbalance characterized by either suboptimum or excessive expression of immune responses. Based on its ability to induce and precisely regulate the IFN-γ levels, yoga could boost innate immune responses during the incubation and nonsevere stages to eliminate the virus.[51] Interestingly, these preliminary observations point to the phenomenon of samatvam or shift toward homeostasis by the holistic approach of IY on the human immune system and all other physiological functions. Further, practice of yoga has been associated with increased immune surveillance.
in terms of the modulation of the frequency of blood lymphocytes.\cite{Infante} Infante et al. reported that in transcendental meditation (TM) practitioners, count of CD3+CD4–CD8+ lymphocytes ($P < 0.05$), B-lymphocytes ($P < 0.01$), and natural killer (NK) cells ($P < 0.01$) was higher as compared to the control group.\cite{Kamei} Kamei et al. reported a significant correlation between the frontal alpha wave activation and the increase in NK activity during yoga exercises.\cite{Guan} NK cells are innate lymphocytes that serve as the first line of defense against invading viruses limiting their spread and subsequent tissue damage. Further, Tooley et al. reported significantly higher plasma melatonin levels in meditators practicing TM-Sidhi.\cite{Pullen} Melatonin is known to regulate cellular as well as humoral immunity and stimulates the production of NK cells. A study on 96 women with breast cancer, who participated in a MBSR program for 8 weeks, showed restoration of their NK cell activity and IFN-γ levels as compared to continued deregulation in the non-MBSR group.\cite{Pullen} In addition, postyoga increases in IgA (an antibody isotype central to mediating mucosal immunity) in pregnant women support the protective potential of yoga against invading pathogens.\cite{Pullen} As mentioned above, the immunity scores (CD4 counts) of HIV patients have been reported to improve with yoga practice.\cite{Pullen} Overall, these studies indicate that practice of yoga might strengthen cell-mediated or mucosal immunity and could be used as a preventive measure against virus or other pathogen-mediated infections.

Yoga for alleviation of erratic immune responses

The available evidence supports the potential of yoga as a complementary intervention for populations at risk or already suffering from diseases with an inflammatory component.\cite{Infante} Several evidences indicate that yoga might influence chronic inflammatory state and might optimize impaired immune function in stress-induced conditions.\cite{Infante} The available evidence also uniformly supports that yoga practice could downregulate pro-inflammatory markers. Among its influence on pro-inflammatory markers, significant decreases in interleukin-1 (IL-1) beta, as well as indications for reductions in IL-6 and tumor necrosis factor (TNF)-alpha, have been indicated.\cite{Infante} Cytokine storm represented by increased cytokine levels (IL-6, IL-10, and TNF-α), lymphopenia (in CD4+ and CD8+ T-cells), and decreased IFN-γ expression in CD4+ T-cells is associated with severe COVID-19.\cite{Infante} These findings support the utility of yoga as a complementary intervention for populations at risk or already suffering from COVID-19. Duration of the yoga intervention could significantly influence the effects of yoga practice on inflammatory markers. Based on the findings of Pullen et al.,\cite{Pullen} in populations with a high risk of increased inflammation such as heart failure, shorter course of interventions of only 8 weeks has been suggested to be sufficient to reduce inflammatory processes. The authors have indicated that a reciprocal influence of duration of intervention required depends on the severity or deviation from normal physiology.\cite{Pullen}

**Integrated Yoga for the Management of Coronavirus Disease 2019 with Comorbidities**

Respiratory tract infections are highly prevalent in patients with diabetes as compared to those without diabetes.\cite{Infante} Extending on the same note, prevalence of diabetes has also been reported to be one of the most distinctive comorbidities in patients with COVID-19; in the study by Xiaobo Yang et al. 22% of the non-survivor critically ill COVID-19 patients were reported to have diabetes.\cite{Infante} This highly prevalent association between diabetes and COVID-19 could be attributed to the compromised immune function, reduced T-cell response, reduced neutrophil function, and disorders of humoral immunity.\cite{Infante} Further, the hyperglycemic environment in these patients could also increase the virulence of pathogens, lower the production of interleukins in response to infection, with reduced chemotaxis and phagocytic activity, and immobilization of polymorphonuclear leukocytes.\cite{Infante} As mentioned above, fear, uncertainty, and stigmatization are psychological stress factors during public health emergencies such as COVID-19.\cite{Infante} The stress-induced activation of the HPA axis could also significantly contribute to poor glycemic control (hyperglycemia),\cite{Infante} thereby exacerbating the clinical symptoms. The stress-reducing aspects of yoga through modulation of HPA axis in patients with aberrant glycemic control (diabetes and prediabetes) could aid in the attainment of glycemic control as has been frequently reported.\cite{Infante} The practice of yoga might aid in reducing the exacerbations and clearance of virus infection in COVID-19 patients with diabetes through reducing the influence of systemic hyperglycemic and inflammatory milieu.

Similarly, hypertension is also a distinct comorbidity of COVID-19 infection.\cite{Infante} A study by Guan et al. on 1099 patients with confirmed COVID-19 reported the high prevalence of comorbidities of hypertension (23.7%) and diabetes mellitus (16.2%) in 173 severe cases.\cite{Infante} Hypertension is typically treated with drug inhibitors that target the renin–angiotensin system (RAS).\cite{Infante} These drugs are mainly the angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs). These RAS inhibitors have been well established against the effective management of blood pressure (BP) as well as protection from disease-associated inflammation. However, RAS inhibitors have been postulated to affect the expression of ACE2 mRNA and the activity of ACE2 in tissues.\cite{Infante} ACE2 is a key counterregulatory enzyme of ACE that degrades angiotensin II to angiotensin-(1–7), thereby attenuating the effects on vasoconstriction, sodium retention, and fibrosis.\cite{Infante} Although there have been no definitive conclusions regarding the association of COVID-19 with RAS inhibitors, ACE2 has been proposed
to be a likely cellular receptor of COVID-19,[62] and in vitro findings have been reported that the receptor mediates the entry of COVID-19 virus into HeLa cells.[63] Further long-term use of ACEIs might suppress the adaptive immune response, which is a key defense against viral infection.[64]

Yoga and meditation, in particular slow deep breathing, have been reported to decrease sympathetic nervous system activity, and increase the baroreflex sensitivity in hypertensive patients, thereby reducing their blood pressure values.[64] Modulation of HPA axis and autonomic outputs including BP has also been reported to underlie its physiological effects of yoga.[64] However, there has been a lack of evidence on specific targeting of RAS or its effector components through yoga. Inflammatory systematic milieu in hypertensive patients with already altered autonomic regulations could exacerbate disease outcomes. Based on the anti-inflammatory potential of yoga in hyperinflammatory settings such as hypertension, we further extend that yoga could reduce the clinical unfavorable outcomes in hypertensive patients. Further, a Class II-A level of Evidence B recommendation for BP-lowering efficacy has been conferred on slow breathing.[65] Hence, yoga/slow breathing techniques could provide a safe adjunct/complementary approach for the management of hypertension in COVID-19 patients with hypertension.

**Yoga for Better Respiratory Capacity**

There is a plethora of evidence that breathing exercises have beneficial effects on the respiratory system.[66] Pranayama, a yoga-based respiratory exercise, is a simple and cost-effective intervention that could be easily integrated in daily routine and has been proven beneficial in subjects across different age groups including the elderly.[67] Yoga training has been reported to improve strength of expiratory as well as inspiratory muscles.[68] Joshi et al. reported beneficial effects of a 6-week course of pranayama on ventilatory lung functions.[69] The authors reported improved ventilatory functions with respect to lowered respiratory rate (RR) and increased forced vital capacity (FVC), forced expiratory volume at the end of 1 s (FEV1%), maximum voluntary ventilation (MVV), peak expiratory flow rate (PEFR), and prolongation of breath-holding time.[69] Repeated practice of pranayama has been shown to strengthen cardiorespiratory coupling and increases in the parasympathetic activity in healthy individuals.[64] The breathing practice called Kapalabhati is comprised of powerful strokes of exhalations accompanied with the contraction of abdominal and diaphragmatic muscles followed by passive inhalations.[70] Kapalabhati aids in appropriate training and toning of diaphragm and abdominal muscles. It also helps in removal of secretions from bronchial tree, cleansing up respiratory passages and the alveoli.[70] A combination of yogic breathing techniques improved the pulmonary functions in competitive swimmers.[71]

**Yoga Practice and Chronic and Acute Respiratory Distress**

There have been several reports of clinical trials that suggest an overall effect of yoga training toward improved pulmonary function in patients with chronic obstructive pulmonary disease (COPD),[72-77] an important cause of morbidity and mortality, and poses a major public health problem. When meta-analyzed, a significant clinical effect of yoga in COPD patients with respect to FEV1 was observed.[72] In addition, the studies reported training effects of yoga on improved exercise capacity, lung function decline, quality of life, and dyspnea in patients with COPD.[72] Several mechanistic factors have proposed to underlie the beneficial effects seen in the patients undergoing yoga such as increasing respiratory stamina, relaxing chest muscles, expanding the lungs, raising energy levels, and calming the body.[72] However, due to the lack of adequate data and insufficient clinical evidence provided by these studies, the clinical relevance of these findings needs further thorough robust experimental evaluations.[72]

**Findings of Meditation or Exercise for Preventing Acute Respiratory Illness Trial – Paradigm for viral-mediated respiratory infections**

There has been a dearth of clinical evidence on influence of yoga against acute respiratory distress. However, there have been two major relevant successive reports of MEPARI trials that tested the effect of training in mindfulness-based stress reduction (MBSR) or sustained moderate-intensity exercise on incidence, duration, severity, and impact of all-cause mortality of ARI.[59,60] MEPARI-1 reported statistically and clinically significant reductions in ARI illness for participants randomly assigned to 8 weeks of MBSR training, compared to the observational controls. The MEPARI-2 trial was designed to replicate and extend findings from the first MEPARI trial.[40] The authors reported a consistent pattern of benefits across the two trials suggestive of preventive effects ranging from 14% to 33% proportional reductions in ARI illness.[40] Very importantly, the authors presented a comparative perspective of the findings of MEPARI trials against vaccinations against influenza.[40] Flu shots or vaccines are known to reduce influenza, with published estimates of proportional reductions in symptomatic illness, medical visits, and absenteeism ranging from 13% to 70%.[79,82] The authors Vaccinations are disease specific; in other words, these are specific to virus strains, so the protection provided is also specific and restrictive. However, mindfulness and exercise trainings have more generic mechanisms, regardless of etiological agent. A recent study has reported beneficial effect of meditation on adaptation to the hypoxic high altitude conditions that requires synergistic functioning of respiratory, cardiac, and hematological
system.\textsuperscript{[83]} The authors reported increase in the partial pressure of oxygen, (PO2) a marker of bio-availability of oxygen at the cellular levels.\textsuperscript{[83]}

Pilot study on yoga module in coronavirus disease 2019
Breathing exercises using the concepts of yoga could also be adopted to help during states of acute respiratory

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Potential beneficial effects of Yoga against COVID-19 infection}
\end{figure}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Serial number} & \textbf{Category} & \textbf{Name of the yoga practice} & \\
\hline
1 & Prayer & Vinayaka Remover of all obstacles & Maha Mrityunjaya Remover of fear of death & Dhanvantari Lord of health \\
\hline
1 & Loosening Exercises (Shithilikarana Vyayama) & Forward and backward bending (1 min) & Spinal twisting (1 minute) & Forward and backward bending (1 min) \\
& & Spinal twisting (1 min) & & Spinal twisting on chair (1 min) \\
& & Mukha Dhouti (1/2 min) & & Mukha Dhouti (1/2 min) \\
& & Surya Namaskar (2 rounds - 2 min) & & \\
2 & Breathing exercises and asana & Hands in and out breathing (1 min) & Hands in and out breathing (1 min each variation) & Hands in and out breathing (1 min) \\
& & Tiger breathing (1 min) & Matsyasana/Sulabha Matsyasana (1 min) & Hands stretch breathing (1 min) \\
& & & & Chair Vakrasana (1 min) \\
3 & Kriya (cleansing techniques) and pranayama & Kapalabhati Kriya (30 strokes - 1 min) & Kapalabhati Kriya (30 strokes - 1 min) & Kapalabhati Kriya (15 strokes - 1 min) \\
& & Nadishuddhi Pranayama (2 min) & Abdominal breathing (1 min) & Nadishuddhi Pranayama (2 min) \\
& & & & Surya Anuloma Viloma Pranayama (1 min) \\
& & & & Nadishuddhi Pranayama (2 min) \\
4 & Meditation & Sun meditation (2 min) & Sun meditation (2 min) & Sun meditation (2 min) \\
& Total duration of the video with intro etc. & 18 min 24 s (practice time: 11 1/2 min) & 20 min 16 s (practice time: 11 min) & Module 1: 26 min 52 s (practice time: 12 1/2 min) \\
& & & Module 2: 16 min 23 s (practice time: 8 min) & \\
\hline
\end{tabular}
\caption{Yoga modules for management of coronavirus disease 2019 9 patients with mild symptoms}
\end{table}
Table 2: Script of the prayers and figures of the yoga practices

| Vinayaka mantra | Mahamrityunjaya mantra | Dhanvantari mantra |
|-----------------|------------------------|--------------------|
| OM HAM SAM bhagavate Nityayoga yuktaya Sacchidananda murtaye Vihayakayana namah (I offer my salutation to lord Vinayaka who is established in yoga state and is the manifestation of the universal existence, consciousness, and bliss through these syllables OM, HAM, and SAM) | Trayambakam yajamahe Sugandhim pushviradhanam Urvurakamiva Bandhnaat Mrityormuksheeyamamritaat Om shaaanti Shaaanti shanti (I offer my salutation to the three-eyed lord who is full of fragrance and gives energy and strength Drop off the fear of death just like a ripe cucumber drops from its stalk) | Om namami dhanvantarim aadi devam Suraasurairvandita paadapadmaa Loke jara rughbaya mrityunaasham Dataarameshaa vividhoushadheenaam Om shaanti Shaaanti shanti (I offer my salutation to the three-eyed lord who is full of fragrance and gives energy and strength Drop off the fear of death just like a ripe cucumber drops from its stalk) |
| **Loosening practices** Forward and backward bending | Spinal twist | Spinal twist on chair |

Surya Namaskar

Breathing practices

- Hands in and out breathing
- Hands stretch breathing
- Tiger breathing

Mukhadhouti

Matsyasana

Sulabha Matsyasana

Contd...
distress. We have previously taught an eight-stepped yoga breathing procedure consisting of very simple neck muscle relaxation movements and asanas with breathing exercises using the support of a chair during 110 episodes of acute airway obstruction in 86 bronchial asthma patients. There was a significant improvement in their PEFR by >20% within 30 min of the practice with successful relief from the episode. The patients reported reduction in panic and anxiety element, cutting the vicious cycle of aggravating bronchial obstruction. Based on the above discussed several beneficial aspects of yoga on the immune and respiratory systems against varied clinical settings including that of infectious diseases, we postulate a therapeutic potential of yoga towards COVID-19 prevention and management [Figure 1]. We have evolved age-specific sets of yoga modules [Tables 1 and 2] based on our extensive experience of over past 35 years on clinical research on yoga. The modules have been made available for public use on our website https://svyasa.edu.in. To this end, a pilot study was conducted on request providing a 4-min video of very simple practices as a voluntary clinical aid to the hospitalized COVID-19 patients in Milano, Italy, visited by 1000 people between March 17 and 20, 2020. The report by a cardiac surgeon who was also admitted in the intensive care unit of the Italy based hospital due to severe COVID-19 infection stated “We have reached scientific evidence that this simplified protocol sent by you is effective and we intend to disseminate to the overall Scientific Community”.

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Conflicts of interest
There are no conflicts of interest.

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