Scope of yoga in Covid-19

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Introduction

- Infectious disease caused by SARS-CoV2 virus
- Approximately 80% of people infected with COVID-19 have mild to moderate disease with few symptoms
- More than 10% develop a severe disease that can lead to hypoxic respiratory failure and acute respiratory distress syndrome (ARDS)
**SERIOUS COVID-19 SYMPTOMS REQUIRING IMMEDIATE MEDICAL CARE**

- If you develop any of these symptoms, call your healthcare provider or health facility and seek medical care immediately.
- This is not an exhaustive list. These are the most common symptoms of serious illness, but you could get very sick with other symptoms – if you have any questions, call for help immediately.

**MOST COMMON SYMPTOMS**

- Fever
- Cough
- Tiredness
- Loss of taste or smell

**LESS COMMON SYMPTOMS**

- Sore throat
- Headache
- Aches and pains
- Diarrhea
- A rash on the skin or discolouration of fingers or toes
- Red or irritated eyes

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**The difference between droplet and airborne transmission**

**Droplet transmission**
Coughs and sneezes can spread droplets of saliva and mucus

**Airborne transmission**
Tiny particles, possibly produced by talking, are suspended in the air for longer and travel further

Source: WHO
Ministry of Health & Family Welfare, Government of India
CLINICAL GUIDANCE FOR MANAGEMENT OF ADULT COVID-19 PATIENTS
17th May 2021

COVID-19 patient

Mild disease
- Upper respiratory tract symptoms (and/or fever) WITHOUT shortness of breath or hypoxia

Moderate disease
- Any one of:
  1. Respiratory rate ≥ 24/min, breathlessness
  2. SpO2: 90% to ≤ 93% on room air

Severe disease
- Any one of:
  1. Respiratory rate > 30/min, breathlessness
  2. SpO2 < 90% on room air
Clinical Signs & Symptoms

- Fever, Dry Cough, Diarrhoea, Headache
- Lymphopenia, Increased prothrombin time, Increased D Dimer and LDH (mild)
- Shortness of breath, Hypoxia, Abnormal chest imaging, Transaminitis, low-normal procalcitonin
- ARDS SIRS/Shock Cardiac Failure
  Elevated inflammatory markers - CRP, LDH, IL-6, D-dimer, ferritin, troponin, NT-proBNP elevation
Yoga and Respiratory Distress

- Improved PFT, lung function in healthy, asthma and Chronic obstructive pulmonary disease (COPD)
- Slow breathing improved Heart rate variability (HRV) and lung functions and Electroencephalogram (EEG) parameters and this was associated with emotional parameters

Pulmonary Function Parameters (PFT)
- forced vital capacity (FVC),
- forced expiratory volume in first second (FEV1), ratio between FEV1 and FVC (FEV1/FVC), peak expiratory flow rate (PEFR), maximum voluntary ventilation (MVV), and forced expiratory flow 25-75 (FEF25-75)

Dinesh et al., 2018, Barassi et al., 2018, Chitnis et al., 2019, Nagarathna et al., 1985, Jayawardana et al., 2020, Gupta et al., 2014, Ramanathan et al., 2018, Zacarro et al., 2018
Cells of the Immune System
Naive T Cell

- T helper (Th 1)
  - Promote immune activation
  - Mast cells
  - Eosinophils
  - Basophils
  - Antihelmenthic

- Th2

- Th17
  - Neutrophils
  - Bacteria
  - Fungi

- Tfh
  - B cell maturation at germinal centres

- Treg
  - Suppress immune activation

Homeostasis/autoimmunity
Inflammation

Cytokines - proteins mediating autocrine, paracrine and endocrine signaling

Bamola et al., 2013
SARS-CoV-2 infection
Viral entry From Nose & Mouth
Bronchioles
Alveoli
Nucleocapsid (N)
Spike (S)
ACE2
Membrane (M)
Envelope (E)
RNA
Oxidative Stress
Inflammation
Fibrosis
Human Cell
Edema, Fibrin, Collagen, Inflammatory cells
Trachea
Bronchi
Immune Response in SARS CoV2 Infection

Angiotensin converting enzyme (ACE)
COVID-19 pathogenesis and Cytokine Storm

C-reactive protein (CRP), lactic dehydrogenase (LDH), ferritin, D-dimer, IL1-β, IL1RA, IL7, IL8, IL9, IL10, basic FGF2, IP10, MCP1, MIP1α, MIP1β, PDGFB, and VEGFA
# Yoga and Inflammation

Regular practice of yoga modulated inflammation positively

<table>
<thead>
<tr>
<th>Downregulation</th>
<th>Upregulation</th>
<th>Anti-inflammatory activity</th>
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<tbody>
<tr>
<td>- Cortisol, and IL-6 in healthy individuals</td>
<td>- TGFβ, sHLA-G and DAS28-ESR in patients with RA</td>
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<tr>
<td>- IL-1β, IL-17A, IL-6 and TNFα in people with rheumatoid arthritis (RA)</td>
<td>- IL-10 in chronic stress</td>
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<tr>
<td>- IL-6, CRP, TNFα, NFκB in patients with cancer</td>
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<tr>
<td>- Decreased IL-1β, IL-6, TNFα, hsCRP in chronic stress</td>
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*Falkenberg et al., 2018, Tolahunase et al., 2017, Gautam et al., 2019, Kiecolt Glaser et al., 2014, Shete et al., 2017, Rajbhog et al., 2015 Bushell et al. 2020*
Immunology

- Peripheral Lymphopenia - CD8, CD4 and Treg
- T cells are functionally exhausted in patients with severe COVID-19

Zhou et al., 2020, Jia et al., 2021
Yoga and Immunology

- Increased NK cells in yoga practitioners
- Higher T lymphocytes, B lymphocytes and natural killer cells in meditation practitioners
- A positive correlation was observed between the change in abundance of the activated frequency range(s) and the ratio of changes in NK activity
- Increased CD4 counts in HIV positive persons
- Improved NK cell activity

Oxidative Stress

- Can be triggered by respiratory viruses
- Status due to COVID-19 is still unclear
- Cytokine storm may result in the ROS-dependent apoptosis in endothelial cells

Chernyak et al., 2020, Winn and Harlan, 2005
SARS-CoV-2

Angiotensin Converting Enzyme 2 (ACE2)

Angiotensin-II (ATII)

Angiotensin-I receptor (ATIR)

MAPK, PKC, NFκB

NADPH oxidase (NOX)

Reactive oxidative species (ROS)

ROS production in mitochondria

Chernyak et al., 2020
Yoga and Oxidative stress

**Decreased levels of**

- 8-hydroxy-2’-deoxyguanosine (8-OHdG) and ROS in healthy individuals (12 week YMLI)
- ROS and 8-OH2dG, in patients with RA (8 weeks)
- thiobarbituric acid reactive substances (TBARS) and 8-OHdG, in people with Metabolic syndrome
- MDA and TBARS, in people with diabetes

**Increased levels of**

- Total antioxidant capacity (TAC) in healthy individuals (12 week YMLI)
- Total antioxidant capacity (TAC) in patients with RA (8 weeks)
- Increased Superoxide dismutase (SOD) in people with Metabolic syndrome
- Increased glutathione and SOD activity in people with diabetes

Tolahunase et al., 2017, Gautam et al., 2019, Yadav et al., 2018, Venugopal et al., 2021, Viswanathan et al., 2021, Pal and Gupta 2017
Neurological manifestations of COVID-19

- Fatigue, gustatory dysfunction, anorexia, olfactory dysfunction, headache, dizziness, and nausea sometimes leading up to encephalopathy and delirium
- Seizure, stroke, Guillain-Barre syndrome, encephalitis, and meningitis

Contributory factors include peripheral vasodilatation, hypercarbia, hypoxia and anaerobic metabolism with accumulation of toxic compounds

Vakili et al., 2021, Ahmad and Rathore 2020, Whittaker et al., 2020, Vakili et al., 2021
Yoga and neurology

Decreased headache duration and intensity - Tension type headache

Decreased headache intensity and frequency - Migraine

Improved quality of sleep, reduced pain, anxiety and depression in Guillain Barre Syndrome (3 weeks)

 Decreased fatigue in patients with multiple sclerosis Decreased severity of pain, fatigue and psychological status in Multiple sclerosis

Improved strength and mobility, HRQoL in Parkinson’s disorder

Reduced seizure frequency in epilepsy

Yoga Neurorehabilitation - physical and psychological challenges of living with a chronic and debilitating neurologic disorders

Anheyer et al., 2020, John et al., 2007, Sendhilkumar et al., 2013, Shohani et al., 2020, Dehkordi 2016, Moriello et al., 2013, Lenoir dit Caron et al., 2021, Panebianco et al., 2017, Legault et al., 2021
Mental Health

- 28% for PTSD, 31% for depression, 42% for anxiety, 20% for OC symptoms, and 40% for insomnia

- Patients with a positive previous psychiatric diagnosis showed increased scores on most psychopathological measures, with similar baseline inflammation
  - systemic immune-inflammation index (SII) (SII = platelets $\times$ neutrophils/lymphocytes)

- 55.7% scored in the clinical range in at least one psychopathological dimension 36.8% in two, 20.6% in three, and 10% in four (PTSD, depression, anxiety and OCD)
Yoga and Mental Health

- MDD, Anxiety, PTSD and OCD
- Useful adjunct treatment for severe mental illness
- Altered the biomarker levels in psychiatric disorders

Butterfield et al., 2017, Cramer et al., 2018, Cramer et al., 2018, Sarris et al., 2012, Sathyanarayanan et al., 2019, Bhargav et al., 2021
Long COVID Syndrome

- Diverse set of symptoms that persist after a minimum of 4 weeks from the onset of a diagnosed COVID-19 infection
- Persistent breathlessness, fatigue and cough
- Chest pain, palpitations, neurological and cognitive deficits, rashes, and gastrointestinal dysfunction

Taribagil et al., 2021
Quality of life

Cancer

Multiple Sclerosis

Asthma

Epilepsy

Decreased fatigue in cancer survivors (specifically breast cancer)

Plasma melatonin also showed an increase after three months of yogic practices

Pranayama

Panca kosa
Inflammation

Impaired function/ Apoptosis

Disease manifestation

Perturbations in Manomaya kosa

Imbalances in Pranayama kosa

Disease Manifestation in Annamaya kosa
Ancient perspective - Pranayama

- Wherever there is affliction due to disease, the **prana and breath** should be steadied to destroy the disease. (H.Y.P. 4.27)

- **Bhastrikā** removes imbalances of all three doṣas (basic humors according to ayurvedic science); vāta, pitta and kapha. (H.Y.P. 2.65)

- It also improves body fire (H.Y.P.2.65) and those who do 20 counts thrice daily, they shall never suffer from any disease and will always be healthy (G.S. 5.77).

- **Nādishuddhi** clears subtle channels in 3 months, it is useful in balancing vāta (H.Y.P. 2.7, 2.10).

- When pranayama are performed properly they eradicate all diseases but an improper practice generates all diseases (H.Y.P. 2.16)

- **Ujjayī Prāṇāyāma** should form the core, as it destroys all the diseases of the nādis, dropsy, and diseases of the dhātus (sevenfold structural components that support the body according to ayurvedic science) and increases gastric fire (H.Y.P. 2.52).
Modern perspective - Pranayama

- Alternate nostril breathing (6 weeks) and Brahmari results in parasympathetic predominance (reduction in heart rate and BP, reduction in response to cold pressor test, improvement in cognition, reduction in irritability in tinnitus, favorable EEG changes and reduction in stress levels)

- Pranayama increased the physical and mental energies and enhanced mood (30 minutes)

- Improvement in vital capacity, decreased basal heart rate and systolic blood pressure (6 weeks)

- Increased pre-frontal oxygenation in healthy subjects after Kapalabhati practice for 1 minute as compared to schizophrenia patients

Sinha et al., 2013, Kuppusamy et al., 2018, Wood 1993, Singh et al., 201, Bhargav et al., 2014
Conclusion

- Covid-19 is an infectious disease caused by SARS-CoV2 virus and having a potential to give rise to diverse set of symptoms with variable duration.
- These symptoms could range from respiratory problems to gastrointestinal, neurological and mental health
- The underlying cause has been indicated to be the robust immune responses leading to inflammation and oxidative stress
- Yoga specifically pranayama has the potential to curb the unpleasant effects of Covid-19 and decrease the severity and duration of the disease
- Further studies on yoga targeting Covid-19 could pave the way for an holistic approach to tackling the global crisis
Suggested Further Reading


Magnúsdóttir ME. The role of yoga during COVID-19: yoga and meditation as a public health support and a holistic therapeutic mechanism during the COVID-19 pandemic (Doctoral dissertation)


References


References


References


References


