

POST-COVID SYNDROME PATHOPHYSIOLOGY: THROUGH VISION OF  
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## INTRODUCTION

There is enormous potential and opportunity for Ayurveda to treat and prevent long-term COVID-19. Ayurvedic treatment is helpful in mild to moderate cases of COVID-19 with long-term symptoms that remain, according to clinical trials conducted on the disease's care within the last year, particularly when used in addition to other treatments. This suggests that side effects may be minimized and long-term residual symptoms may not occur if Ayurvedic treatment is combined with contemporary medicine during the acute period. Further implementation of *Ahara Vidhi* (proper dietary regimen), *Dinacharya* (day regimen), and *Sadvritta* (code of conduct) may also play a vital role in the prevention of post-COVID syndrome. The prevalence of post covid 19 syndrome in adults is variable and ranges from 5-80%.

## KNOWLEDGE GAP

Covid and post covid are the most prevalent ailments across the globe. Although Standardized case definition is still developed in the broadest sense, post-COVID conditions can be considered a lack of return to a usual state of health following acute covid 19 illness. Post covid conditions might also include those that occur after the symptoms of acute illness have resolved. Scientific knowledge is still limited about this effect, including what causes them and how often they occur.

Many research articles are available on post-covid symptoms and so on. However, no study is available that correlates the ayurvedic and modern points of view of the post-covid.

## Need for Study

After pandemic of covid most of people experience symptoms of post covid symptoms, like *Balhani*, *Hritistambho*, *Nidranash*, *Vishtambho*, *Gourav*. Some people develop multisystem inflammatory syndrome and autoimmune condition after covid 19. Cardiovascular, pulmonary, renal, dermatologic, neurologic, and psychiatric. Almost 10% of children aged 2-11 years and 13% aged 12-16 years reported one or more lingering symptoms 5 weeks after covid 19.

To avoid all this, we have to know the exact pathophysiology of post covid and break that pathophysiology by different preventive and management cures and treatments.

## The Epidemic

*Janpadodhwansa* is the Ayurvedic terms for epidemics. Epidemics or outbreak is a sudden spread of the disease within a short time to a large number of people in a given population.

*Janpadodhwansis* one among the unique concept described in the Ayurveda There are four factors that has been described which are common and essential for every living being i.e. *Vayu*(air), *Jala*(water), *Desha*(land) and *kaal*(season). Interestingly there is mention of an epidemic fever with respiratory system presentation caused by entry of pathogenic agent through the nasal passages. Covid19 is include in *air(vayu)*.

## Symptoms of Post Covid Syndrom

Symptoms persisting for more than three weeks after diagnosis of Covid 19 characterize the post covid syndrome. Post covid syndrome was described for the first time in spring 2020 in the context of survey of prolonged covid 19 symptoms. Symptoms of post covid syndrome correlate with *Dhatupak*.

## Progression of Disease/Covid 19

|                     |                                |
|---------------------|--------------------------------|
| Acute covid 19      | (After 4 weeks)                |
|                     | 1. Viral Specific variations   |
|                     | 2. Oxidative Stage             |
|                     | 3. Immunological Abnormalities |
| Post covid syndrome | 4. Inflammatory Damage         |



Most common post-covid symptom

1. Fatigue(*Balhani*).
2. Chest pain(*Hritistambho*).
3. Myalgia with Arthralgia.
4. Sleep and mental Disorder(*Nidranash*).
5. Anorexia(*Aruchi*).
6. Loss of appetite.
7. Disturbed bowel habit (*Vishtambho*).
8. Lithargy(*Gourav*).
9. Cough (dry/wet).
10. Headache.

### Pathophysiology

Long-term tissue damage In a three-month follow-up study of COVID-19 survivors, pulmonary radiological abnormalities and functional impairments were detected in 71% and 25% of participants, respectively, despite that only less than 10% had severe pneumonia.

The following are major potential pathophysiological mechanisms for post-COVID-19 syndrome: (a) virus-specific pathophysiological variations, (b) oxidative stress, (c) immunologic abnormalities, and (d) inflammatory damage.

#### A) Virus-Specific Pathophysiological

The pathogen responsible for COVID-19, SARS-CoV-2, causes cellular damage by inflammatory cytokines, maladaptation of the ACE2 pathway, procoagulation, and other immune abnormalities. Viral toxicity probably contributes to sequela seen in post-COVID19 syndrome.

#### B) Oxidative Stress

Numerous individuals diagnosed with post-COVID-19 syndrome experienced respiratory distress during the acute phase of their illness. Viral pneumonia brought on by SARS-CoV-2 frequently results in lung tissue destruction. Infections with viruses, particularly those caused by coronaviruses, cause the lungs' immune system to become overactive in an attempt to stop viral multiplication. If SARS-CoV-2 causes severe pneumonia by infecting Type ii pneumocytes, the numerous mitochondria synthesizing acetyl CoA needed for pulmonary surfactants are damaged. Also, Oxidative stress is caused when the mitochondria's capacity to generate antioxidants is diminished.

#### C) Immunologic Abnormalities

There is an immunological response from the host when SARSCOV-2 reaches the respiratory system. Initially, the virus's S-protein spike binds to various human cells' ACE2 receptors. Next, the host is shielded from the virus invasion by innate immunity.

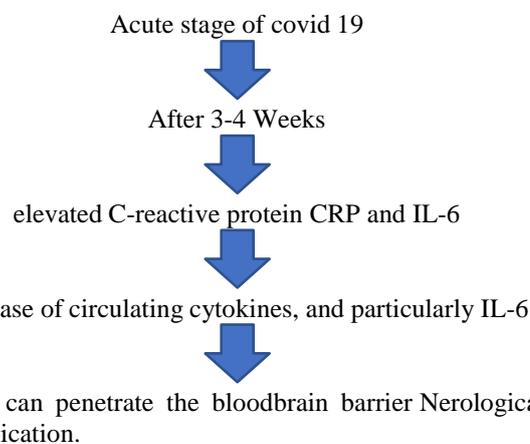
#### D) Inflammatory Damage

Systemic inflammatory response syndrome is the term for the severe inflammatory response that occurs with an illness like COVID-19. In this syndrome, the body activates a long-lasting, counterbalancing, compensatory anti-inflammatory response syndrome to help dampen

the pro-inflammatory state and return to immunologic homeostasis to prevent multiple-organ dysfunction.

The viral particle is round or oval in shape and has a diameter of 60–100 nm. The incubation period on average has been reported as 5-6 days, though it can extend up to 14 days.

A significant part of the pathophysiology of the majority of post-COVID symptoms is prolonged inflammation.



which can penetrate the bloodbrain barrier Nerological Complication.

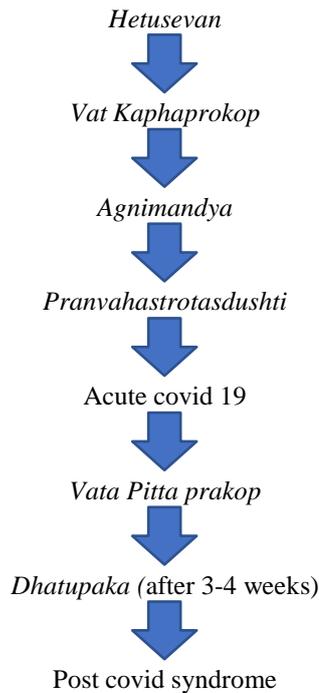
### Samprapti

The Roga Marg for Post covid syndrome is *Abhyantar*. *NidanaPanchaka* is one of the unique principles of Ayurveda and main tool for understanding pathogenesis and establishing diagnosis of the disease. The respiratory system is predominantly involved in the pathophysiology of COVID-19, which is *Sannipata Jwara* (fever). Abnormal immune responses in COVID-19 are result of abnormalities of *Tridosha*, *Rakta* (blood) and *Ojas* (Vital nectar). The initial phase is *Vata-Kapha* dominant whereas later stage of aggravated immune response is of *Vata-Pitta* dominance. Alveolar damage, coagulopathies indicate *Rakta dhatu* vitiation. Utilizing this comprehensive comprehension of COVID-19, we suggest innovative approaches for treatment and prevention. Measures for 'Conservation of *Agni-bala*', of *Rakta-Pitta-Prana* homeostasis and 'Protection of *Tri-Marma* i.e. vital organs'. Examination of patient through *Rugna Parikshan*, *Roga parikshan* and *shatkriyakal* will make the path for proper diagnosis of disease.

### Dhatupaka

*Dhatupaka* is a condition in which tissues are severely destructed either a temporary or permanent. This leads to manifestation of many disease and loss of immunity and strength. This happens because vitiated doshas attack tissue and cause their destruction. This is because tissues are subjected to a process of digestion. This digestion or destruction of tissues or *dhatu* called *dhatupaka*.

*Dhatupaka* is unfavourable condition while *Doshapaka* is favourable.



#### MANAGEMENT

1. Administration of *Rasayan*.
2. *Nimittika rasayan* principle of ayurvedic focuses on *Apunarbhava chikitsa*.
3. *Punarnava mandur, Pravalpanchmruta rasa, shamshamani vati, Chavyanprash Avalehya*.
4. *Kushmand Rasayan, Vardhaman Pippali Rasayan*.
5. The Ministry of Health and Family Welfare, Director General of Health Services has also issued post covid management protocol which includes Immunity promoting AYUSH medicine like *Ayush Kwath, Guduchi churna, Ashwagandha churna, Amalaki churna, Yastimadhu churna*.
6. Warm milk with *Haridra churna* and Gargle with turmeric and salt under the direction of registered Ayurvedic Physician.
7. The procedure such as *Abhyang, Swedan, Mrudu virechan, Sneha, Kashay Basti, Shirodhara, and Nasya*.
8. Regular *Yoga, Asan, Pranayam*.

#### Do's

1. Nutritious eating routine.
2. Drink an adequate amount of warm water.
3. Take immunity-promoting Ayurveda supplements.
4. Daily practice of *yogasana*.
5. Daily morning or evening walk at a comfortable place.
6. Sufficient sleep and rest.
7. Play a few memory games.
8. Increase the intake of turmeric, cumin, coriander, and garlic.

#### Don'ts

1. Avoid fast food, fried food, frozen pizza.

2. Don't compromise on sleep.
3. Avoid smoking, alcohol, and other addictive substance.
4. Limit your intake of soft drinks or sodas and other drinks that are high in sugar.

#### DISCUSSION

Symptoms of post covid are correlated with symptoms of *Dhatupak*. Evidence on why persistent symptoms occur is still limited, and available studies are heterogeneous. Apart from long-term organ damage, many hints suggest that specific mechanisms following acute illness could be involved in long COVID symptoms.

#### CONCLUSION

This is an overview of published information on post-COVID syndrome, focusing on its pathogenesis. The evolving data indicate a multi-factorial pathogenesis, namely inflammation, nervous system dysfunction, endothelial damage, and thromboembolism as the main pathogenetic mechanisms. It is expected that as the long-term complications of cations of COVID-19 unfold, more evidence will be available to guide therapeutic management. Further research is needed in order to elucidate the incidence, clinical spectrum, pathogenesis, and prognosis of this new clinical entity. In the interim, standardization of definitions and a consensus on classification criteria are needed.