



Review Article

Understanding COVID - 19 pandemic – A comprehensive Ayurvedic perspective

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ABSTRACT

Epidemics have not been new to India. Ayurveda being in the fore front of health care of those times, has recorded its valuable experiences of epidemics & termed them as *Janapadodhwamsa* or *Maraka*. It has vividly described their mechanism of Causation (*Nidana*), factors affecting severity and actions complicating illnesses their management and prevention. The present work uses the same model described in Samhitas which assert the superiority of host susceptibility (*Nija*) over External Agent/Virus (*Agantuja*) and uses the same principles in prevention; while adopting the *Jwara* model to explain and correlate with different stages of COVID – 19. It proposes management guidelines using *Ahara* (Nutritional Principles) and *Oushadha* (Medication) for different stages and subsets of patients along with their potential complications and drug interactions, utilizing the principles of host factor modification (*Dosha hara*) and potential broad spectrum Anti-viral (*Prativisha*) as envisaged by *Rasa Shastra*.

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1. Introduction

Towards the end of 2019, a novel corona virus, now designated as Severe Acute Respiratory Distress or SARS – CoV-2, was identified as the cause of a cluster of pneumonias in Wuhan, Hubei province of China and has since spread rapidly to 213 countries affecting more than 11.8 million people worldwide and caused 5.44 lakh deaths till July 2020 it was designated as a global Pandemic by WHO in March 2020. The present Pandemic of COVID-19 has brought the so-called human activity to a standstill, and has forced the entire world to seek very seriously for its cause, mechanisms of pathogenesis and its solution. Ayurveda being one of the oldest surviving Medical Tradition, has a key role to play in this crucial situation.

Epidemics have not been new to India. Ayurveda being in the fore front of health care of those times, has recorded its valuable experiences of epidemics & termed them as *Janapadodhwamsa* [1,

Vimana Sthana 3/1–4] or *Maraka* [2, *Sutra Sthana* 6/19]. It has vividly described their mechanism of Causation (*Nidana*), factors affecting severity and actions complicating illnesses, their management and prevention.

The present work uses the model of *Janapadodhwamsa* of Acharya Charaka and *Maraka* of Acharya Sushruta along with the model of *Masurika* of Acharya Madhava [3, 54/3] to explain the Pathogenesis of COVID – 19 with modern correlation. The study identifies it as *Nija Jwara* and *Oupasargika Roga*, proposes a Diagnostic Protocol based on Acharya Charaka's *Jwara* model, identifies factors affecting its severity or complicating its course, along with their modern correlation and proposes management guide lines for different stages and various subsets of patients; while describing the general contraindication of drugs, their potential interaction with concomitant modern medicines, criteria for selection etc. The study also identifies important preventive principles along with medications with aim to restore balance between man and nature.

1.1. Modern medicine perspective of COVID-19

1.1.1. Disease epidemiology

Current available evidence for COVID-19 suggests that the causative virus (SARS-CoV-2) has a zoonotic source closely related to bat-origin SARS-like corona virus but lab creation is being

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investigated. It is an enveloped RNA beta corona virus related to the Severe Acute Respiratory Syndrome (SARS) virus, and the virus has been shown to use the angiotensin-converting enzyme 2 (ACE2) receptor for cell entry. The persons infected by the novel corona virus are the main source of infection. Direct person-to-person transmission occurs through close contact mostly in closed indoor spaces, mainly through respiratory droplets that are released when the infected person coughs, sneezes, or talks. These droplets may also land on surfaces, where the virus remains viable. Infection can also occur if a person touches an infected surface and then touches his or her eyes, nose, or mouth. The median incubation period is 5.1 days (range 2–14 days). The precise interval during which an individual with COVID-19 is infectious is uncertain. As per the current evidence, the period of infectivity starts 2 days prior to onset of symptoms and lasts up to 8 days, the virus has a Basic Reproduction Number or R0 of 2–2.5 and serial interval of 4–5 days (as of may 2020) [4,5]. The extent and role played by pre-clinical/asymptomatic infections in transmission still remain under investigation. Clinical features include fever, cough, other upper respiratory symptoms, myalgia, diarrhea, loss of taste and smell, fatigue and dyspnea.

1.1.2. Patho-physiology

Most patients with COVID-19 predominantly have mild a respiratory tract infection associated with SARS-CoV-2 infection. However, in a small proportion of cases, they can progress to a more severe and systemic disease characterized by the Acute Respiratory Distress Syndrome (ARDS), sepsis and septic shock, multiorgan failure, including acute kidney injury and cardiac injury. Autopsy findings in China and European countries showed endothelial damage of pulmonary vasculature, microvascular thrombosis and hemorrhage linked to extensive alveolar and interstitial inflammation that ultimately result in COVID-19 vasculopathy, pulmonary intravascular coagulopathy, hypercoagulability, ventilation perfusion mismatch, and refractory ARDS. Hypoxemia, secondary to ARDS may also activate the coagulation cascade.

No Drug is known to be curative, although several are being studied extensively like Favipiravir, chloroquine, remdesvir, steroids like Dexamethasone and IL-6 inhibitors like tocilizumab and convalescent plasma therapy etc.

Prevention encourages diligent hand washing, practice of respiratory hygiene, avoiding of touching face, cleaning and disinfecting of objects frequently touched, ensuring adequate ventilation of indoor spaces, wearing of masks, avoiding crowds and close contact with ill individuals and Social distancing. Different vaccines are in different stages of development, with none available as of date.

2. Causation of Pandemics as per Ayurveda

Both Charaka Samhitha and Sushruta Samhitha described a fairly common Pathophysiology of Epidemics. In the context of COVID -19 the above concept is understood as follows:

Adharma [1, Vimana Sthana 3/20] Activities contributing to destruction of sustaining principles of life or nature (which include air, water, land) derived as (*Dhaarayateeti Dharmah; Na Dharmaha Adharmah*). Hence in this context Adharma is deemed as, all those activities contributing to destruction of Air, Water, Land etc.

Disturbance of air/Air Currents:Power Sector (Thermal)/Industrial pollution/Military activity related Pollution/Automobile and Aviation sector related Pollution.

Disturbance to Ecology of water bodies: Pollution of water bodies/ Sand mining from river beds/Unregulated damming etc./Contamination of Ocean beds.

Disturbance to Land Ecology: Rapid Urbanization and huge constructional activity with non-ecofriendly materials/Over exploitation and destruction of mountains, forests & ecosystems. Destruction of other life forms like Animals/Plants/Birds and displacement from their natural habitats/Usage of Non-biodegradable toxic materials like plastics pesticides etc.

Activities of this kind vitiate and disturb the balancing forces of nature and gives rise to abnormal air currents, Cyclones, Floods, non-seasonal rains, extreme weather conditions etc. Destruction of Amazon wild forests or Destruction of Australian forests due to wild fire, Extreme weathers, non-seasonal rains experienced around Europe, Australia, India etc. can be taken as Aristas (warnings).

The vitiation of air currents, seasons, seasonal irregularities and disturbance of land and water ecology simultaneously induces or leads to vitiation of doshas (Cytokines) in humans, causing mass susceptibility to the same illness, while also affecting the oshadhis (food yielding plants), thus reducing the nutritive value and leading to under nourishment. When this combines with the causative factors causing *agni mandya* (sluggish metabolism) it leads to infectious diseases like COVID-19; probably more in future if corrective actions are not taken. The predominant pulmonary involvement of covid-19 can be explained by the commonality of pranavaha srotas vitiating factors with that of vata, [1, vimana sthana 5/10] (*Kshaya*-weight loss, *vega sandharan*-constipation, *rukshata*-low fat high fibre diet intake, *vyayamat kshudhitasya-inappropriate* excessive exercise) and the increasing incidence of these in the present day life style Fig. 1.

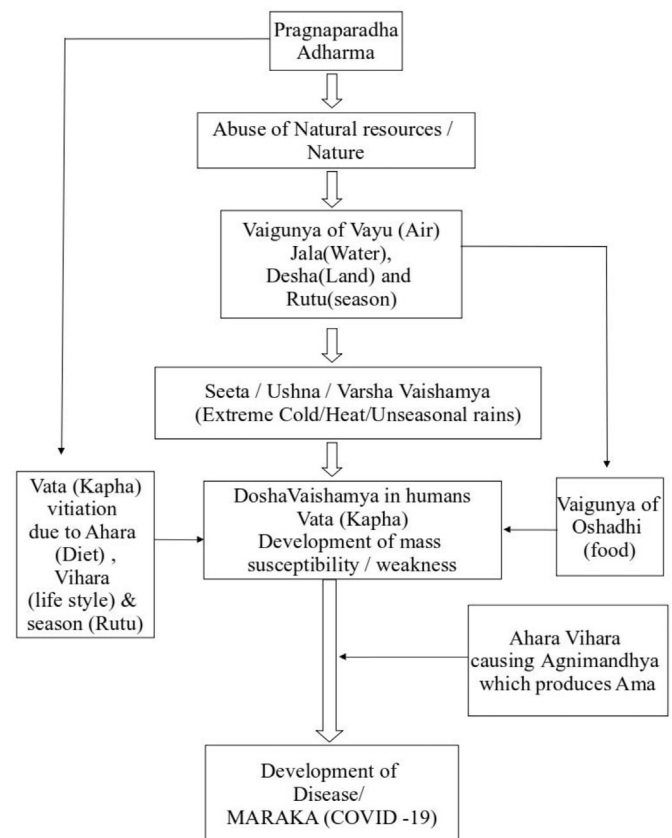


Fig. 1. Probable Pathophysiology of COVID-19 according to Ayurveda (following the model of acharya madhav in masurika) [1–3].

3. Ayurvedic perspective of COVID-19

COVID – 19 is taken as a *Janapadodhwamskara* or *Maraka*, *Oupasargika Roga* [6, Nidana sthana 5/19] (here Upa = near, Sarga = Produced due to proximity) or contagious disease; and following the model of Patho Physiology (Samprapti) explained by Acharya Madhava in *Masurika* (Smallpox), should be taken as a *nija jwara* (Endogenous Fever). *Masurika* (smallpox) model, is taken, as it shares the characters of being a pandemic, viral infection spreading through respiratory route, highly contagious etc. with COVID -19. Although many authorities have suggested COVID to be accepted as *Agantuja* (Exogenous), the authors differ from this opinion for the following reasons, discussed under two headings.

3.1. A) Why not agantuja?

Agantuja causes are explicitly described in *samhithas* with very clear causes [*hetu*], clinical symptomatology [*lakshana*], and treatment principles [*chikitsa*]. So, if a virus is accepted as *agantuja* cause, it can fit in either into a '*bhuta*' or a '*visha*' or may be a '*adrusya krimi*' but none of the above descriptions match with the clinical features of covid.

Assuming virus as *bhutha*:

- 1] Covid does not have fever that starts with psychiatric features like 8 types of *bhutonmada* or inappropriate laughing, crying or emotional excitement as described in Madhava Nidana (2/30).
- 2] The common manifestation of *Bhutaabhishangaja Jwara* should always be *Tridoshaja*, mostly in a *Vishama Jwara* pattern that is 3 types of *Trutiya* and 2 types of *Caturthaka* [7], *Chikitsa Sthana*; 3/71–74], but no one has observed that fever occurs every 48 h or 72 h in covid as described in *vishama jwara*.
- 3] As already quoted, it is well known that the main treatment of *bhutaabhishangaja* is *Daivi-vyapashraya*, and text books like *Bhaijshajya Ratnavali* have quoted procedures like *ucchatana*, *bandhana* etc. as main treatments, where as *charaka samhita* [7], *Chikitsa Sthana*: 3/291–309], quoted a completely different line of treatment like *snehana*, *swedana*, *shodhana*, followed by *shamana* with *unmada hara oushadhas*, unlike other *jwaras* where *snehana* and *shodhana* are used only in special situation.

Assuming virus as *visha*:

- 1] Although clinical features may correlate to some degree like respiratory involvement, there is no description whatsoever of a *visha*, that is communicable or *oupasargika*.
- 2] if considered as a *visha* of *jangama* origin including reptiles, bats or aquatic animals etc. again there is no description of its transmissibility from person to person nor do clinical features match to covid 19.
- 3] If it is accepted as *Visha* [8, 5/328] then *Visha hara gana* (Eladi) should be the Treatment and *Agada* will be Preventive, where as *panchakarma* and *rasayana* are described as the *paramoushadha* in *janapodhwaseyadhyaya* by *acharya charaka*.

Assuming virus as *krimi*: [3, 7/1–16]

- 1] *Acharya Charaka* or *Madhava* do not discuss *krimi* as a *agantuja* *hetu* of *jwara*
- 2] *Krimis* described correlate mostly with visible, macroscopic, ecto-parasites or helminths like nematodes and cestodes and not with invisible virus.

- 3] *Adrusya krimi* is described only in *raktaja krimi*, where its clinical features of loss of body hair, ulceration or necrosis of muscles, tendons etc are never seen in covid 19.

Hence we conclude that as far as ayurvedic perspective of respected *Acharyas* is concerned it cannot be accepted in any known *agantuja* cause, unless we propose it as a newer development.

3.2. B) Why Nija?

- 1] Although it was known that there was "some factor" that transmits Fever, Cough, Tuberculosis, Skin disease or Conjunctivitis from person to person, the *Acharyas* of *Ayurveda* [6], *Nidana sthana 5/19*] choose to focus more on the host factor (*doshas*) (*NIJA*) rather than the agent (virus, Bacteria etc.) (*AGANTUJA*) in all above cases." It is extremely important to note that in all the above diseases quoted by *acharya sushruta* and *acharya madhava* as being contagious and transmissible like *Kushta*, *jwara*, *sosha*, *netraabhishyanda* etc., there is no mention whatsoever of *agantuja* variety of *kushta*, *sosha*, *netraabhishyanda*. [*Jwara* has already been discussed above] and all these are only discussed as being *NIJA* or *DOSHIC* only.
- 2] If virus is accepted as *agantuja*, then similar logic should be applied to bacteria, fungi, protozoa etc. and all fevers diagnosed by modern medicine such as respiratory infections, pneumonia, urinary tract infection, typhoid, hepatitis, AIDS, gastroenteritis, cholera etc. all should be considered as *agantuja* and they cannot be treated as *kasa*, *shwasa*, *mutra kricha*, *kamala*, *atisara*, *vischuchika* etc. as there is no *AGANTUJA* variety in all of them and they all are *NIJA* only.
- 3] In the classical case of *Masurika* which is a viral disease, epidemic, highly contagious (sharing all these characteristics with covid 19) as per modern medicine *Acharya Madhava* has NOT FOUND any *AGANTUJA* cause and describes it only as *NIJA*.

In reality the difference lies in the fundamental difference that defines approach to fevers between modern medicine and ayurveda. Modern medicine has always looked for a cause from 'outside' basing itself on the 'GERM HYPOTHESIS', while ayurveda has always looked 'inwards' and feels it is *Doshas* or *NIJA* *hetu* that cause all these fevers.

Ayurveda believes that even if there is a virus or bacteria, until there is no vitiation of *doshas* primarily in the body, none can infect the human system in a way that it manifests as disease. This fact is accepted by modern medicine in the context of tuberculosis, that although there is an infection, disease can happen only if immunity is weakened; and in Sepsis which is deemed to happen, not due to an infection, but only when the host mounts a Dysregulated immune response.

Hence we believe that although modern medicine may feel that Covid is caused by a virus, from a classical ayurvedic perspective while it is completely acceptable; but it should be taken as secondary, and primary importance should be given to host factors or *NIJA* *doshas* or increased mass susceptibility only, in the manifestation of the disease.

This is exemplified by the fact that although same virus is causing the disease in all, some are asymptomatic, most have mild symptoms and only a few have severe disease; which we feel strongly is due to the status of *doshas* in them. Particularly the asymptomatic infections highlight the concept of viral infection in a subject with *Dosha Samya*, and underline the importance of *doshic* vitiation as the primary determinant of disease manifestation, not just an infection.

Increased mortality in patients with co morbidities also suggest the role of doshic vitiation as the primary determinant of disease severity. Although the vitiation of *Vayu*, *Jala*, *Desha*, *Kaala* (*Rutu*) and *ahara* induce the formation of specific doshas in all, leading to mass predisposition or mass susceptibility of the diseases; In the case of COVID -19 an imbalance of *Vata* & *Kapha*; The people indulging specifically in a *Vata* - *Kapha* provoking *Ahara Vihara*, at *Vataja* extreme of age (elderly), or *Vataja* & *Kapha Vikara* like hypertension, COPD, Bronchial Asthma or *Dhatu* or *Ojo Kshaya* (Immuno-compromised) are found to have a more serious disease; underlining Doshic importance.

Hence we conclude that Covid -19 from an Ayurvedic perspective should be taken as a *NiJA Jwara* and *Oupasargika Jwara*.

Correlating the clinical features described by various authorities [9] the symptoms of COVID-19 mostly correlate with *Vataja* or sometimes *Vata Kapha Jwara* usually in a *Saama avastha*. It is the *Aama* which may provoke *pitta* and *kapha* at a later stage making it a *Vatolbana Sannipata* in the more advanced stages. The severity in *Sishira rtu* (in china) & *Vasanta Rutu* (in Europe and U.S) and mild course of illness in hot weather and severe surge in rainy(in India) also point to the same. In fact the understanding of *vata* as per Ayurveda explains this seasonal variation although many studies felt that increasing relative humidity is detrimental to the virus alone [10].

Hence summarizing the causative factors or *Nidana* we can conclude the following: 1. *Viprakraustha Nidana* (Remote causative factor): *Prajnaparadha*, *Adharma*, *Dushita vayu* (air), *Jala* (water), *Desha* (land), *Kaala* (Season). 2. *Sannikrutha Nidana* (proximate causative factor): *Vata* (*Kapha*) *Prakopaka Ahara* (diet) *Vihara* (lifestyle). 3. *Vikruta sthithi* of *Vata* (*Kapha*) *Dosha* & *Ama Dosha*. 4. Manifestation of *Vataja* or *Vata Kaphaja Jwara* in *Saama avastha*.

But it should be noted here that in the later stages, after the development of the *Rasa sastra*, that the later Acharyas felt a strong resemblance in the Pathophysiology of fever, to the Pathophysiology of *Visha*, and started the use of poisonous plants or minerals (both are *sthavara visha*) as a counter (*Prativisha*) to the toxic effect of fever in humans (*Jangama Visha*) acts as Anti-bacterials/Anti-Virals. It is not a simple coincidence that modern medicine did the same by giving a fungal poison (*Sthavara Visha*) penicillin, to bacteria (*Jaangama*) in the 20th Century: heralding the era of Antibiotics.

4. Proposed ayurvedic diagnostic protocol for COVID – 19

4.1. Clinical features of COVID -19

COVID has exhibited various patterns as per various authorities. These are discussed or identified in Ayurveda as follows.

1. **Mild illness**– Rhinitis/Sore throat/Bronchitis correlates with *Vata Jwara*, *Vata Kapha Jwara* and *Kapha Jwara* (rarely). Each one of them can exist in *Sama* or *Nirama Avasatha*.
2. **Pneumonia** - correlates with the same as mild illness, but in a *Pravruddha Avastha* due to increased *Roga Bala* due to strong causative factors & decreased *Rogi Bala*. *Vata Jwara*, *Vata Kapha Jwara* and *Kapha Jwara* (rare) Each one of them can exist in *Sama* or *Nirama Avasatha*.

Mala Pravrutti or *Atisara* due to *Mala gata* or *Dhatugata* (*Mamsa* or *Asthi*) *Jwara* [7] Chikitsa Sthana; 3/78–80.]

3. **Severe Pneumonia**- (Resp. rate > 24/min SpO₂ < 90% on room air). It Corresponds to *Vatolbana Sannipata* [7], Chikitsa sthana 3/92,99,101] or *VataKapholbana Sannipata*, of *Santata pattern*

mostly in *Samavastha* due to strong or multiple causative etiologies, causing strong *Dosha* vitiation.

4. **ARDS** –(severe respiratory distress PaO₂/Fio₂<200) (Spo₂/Fio₂ < 315). It Refers to mostly *Vatolbana Sannipata* (sometimes *Vata Kapholbana Sannipata*) with *Pravruddha Swasa* or predominance of dyspnea due to *Saama Rasa*, *Rakta Dhatu* with increased *Picchila Guna* (adhesiveness) of *Ama* leading to *Srotorodha* (Obstruction) due to micro & macro vascular thrombosis.
5. **Sepsis**– (Fever, Tachypnoea, Hypotension, altered sensorium). It also refers to *Sannipata Avastha* of above *Jwara* with features *Pipaasa*, *Mukha Sosha* – hypotension, tachypnoea - *Swasa*, altered sensorium – *Pralapa*, *Tandra* representing the *Antarvega Avastha* [7], Chikitsa sthana 3/39–40] of *Jwara*.
6. **Septic Shock & MODS**: refers to *Sarva Sama Sannipata Avastha* [7], Chikitsa sthana 3/103–108]with progressive *Dhatu Paka* (*tissue necrosis*), *Srotorodha* & finally *Agni Kshaya* (*metabolic failure*). The various features described can be correlated as follows:
 - a. Altered Sensorium – *Tandra*, *Moha*, *Pralapa*.
 - b. Respiratory Distress - *Kaasa*, *Swasa*, *Kantha Kujana*.
 - c. Hypotension – *Bhrama*, *Trushna*.
 - d. Coagulopathy – *Sthivanam Rakta Pittasya* (Bleeding).
 - e. Clotting - *Kothanam syava Arunanam Mandalanam cha Darshanam*
 - f. AKI (Oliguria and Anuric)-*Chirat Mutra Darshata* – *Alpasya*.
 - g. GI dysfunction - *Gurutva Udarasya Cha*.

Any of the above features along with the manifestation of *Ama* leads to - *Saama* - *Avastha* in most fevers due to reduced *Agni* in *Amasaya* (upper GIT & Liver) the *Rasa Dhatu* is partially digested and produces an intermediate product called as *Ama*, having *Guru* (heavy), *Visra* (foul smelling), *Ati Picchila* (sticky) *Guna* leading to *Sroto rodha*. This *Ama* can be deemed to be the chief source of inflammatory cytokines or the food for the viruses and bacteria, and the source of Auto Immunity in chronic state Tables 1, 2.

5. Factors affecting severity of disease: -mild vs severe

Although the virus is the same, it ranges from Asymptomatic or mild infection, to critical disease in different subjects. This variation is due to host response. The cause for severity of the host response is explained in Ayurveda as follows[7, Chikitsa sthana 3/50–60,75]

- I. If disease is produced by **Multiple Acts of Omission or Commission or causes** (*Hetubhih bahubhirjato*). e.g.: - *Seeta*, *Ruksha Ahara* & *Upavasa* etc. Leading to a Strong *Dosha* (High causative cytokine load) which is visible by multiplicity of symptoms or involvement of multiple systems and if associated with *Mandagni* (inefficient metabolic clearance) *Jwara* is severe and it can be fatal.
- II. when there is a concordance of four factors: *Dosha* -causative cytokines; *Dushya* -functional affected tissue; *Prakruti* -constitution/metabolic type; *Kaala*–*Ritu*–season.

The resultant fever is severe and continuous and called as *Santata Jwara* and it follows a different and more aggressive course.

In context of COVID -19 i.e. *Dosha* – Mostly *Vata* (with or without *Kapha*); *Dushya* – Like *Asthi* (with or without *Mamsa*) etc; *Prakruti* – In a *Vata Pradhana* (with or without association of *Kapha*); *Ritu* – In *Sisira* (winter)/*Varsha* (rainy) *Ritu* (*Vasanta*).

(It is historical facts that all epidemics in India have been more severe in the *Varsha Ritu* i.e. June to November for E.g. Plague epidemic of 1897, Spanish flu of 1918, swine flu of 2009).

Table 1
Identification of *Vata*, *VataKapha*, *Kapha Jwara* as per ayurveda.

Features of <i>Vata Jwara</i> [1, 1/21]	Features of <i>Vata Kapha Jwara</i> [7], <i>Chikitsa sthana</i> 3/87]	Features of <i>Kapha Jwara</i> [1, 1/27]
Fever - Mild, with rigors (<i>Vepathu</i> /irregular onset - <i>Vishama Vega</i>). Dry mouth & throat - <i>Kantha Oustha Parisosham</i> Sneezing & watery nasal secretions - <i>Kshavathu</i> Head ache & Body ache – <i>Siro gatra ruk</i> . Sharp shooting pain - <i>sula</i> Insomnia – <i>Nidra Nasha</i> . Constipation with hard stools - <i>Gadha Vidkata</i> .	Mild fever with chills and rigors Excessive chills – <i>Sthaimityam</i> . Cough with productive sputum - <i>Kaasa</i> Frontal headache - <i>Siro Graha</i> Nose block & running nose – <i>Pratishaya</i> . Pain/arthritis – <i>Parvanam Bheda</i> . Generalized heaviness - <i>Gauravam</i> Excessive somnolence – <i>Nidra</i> .	Mild fever with chills - <i>Manda Jwara</i> Cough with thick and copious secretions, nose block Dyspepsia - <i>Avipakata</i> Anorexia - <i>Aruchi</i> Vomiting - <i>Chardi</i> Lassitude - <i>Aalasya</i> Heaviness – <i>Guru Gatrata</i> Excessive somnolence - <i>Tandra</i>

Table 2
[7], *Chikitsa sthana* 3/133–137].

Features of <i>Saama Avastha</i>	Features of <i>Pacchayamana Avastha</i>	Features of <i>Nirama Avastha</i>
Moderate to high fever (but with no restlessness & increased <i>guruta</i> & somnolence) (in <i>Pitta</i> – high fever & restlessness) Hyper salivation - <i>Lalapraseko</i> Nausea - <i>Hrullasa</i> Dysgeusia (coated tongue) - <i>Aasya Vairasya</i> Anorexia - <i>Arochakam</i> Dyspepsia - <i>Avipakata</i> Lassitude – <i>Aalasyam</i> . Heaviness - <i>Gurugatrata</i> Frequent urination – <i>Bahu Mutrata</i> .	Increased fever Decreased heaviness Passing motions - <i>Mala Pravrutti</i> . No restlessness	Feeling of Hunger Lightness in body Reduction in Temperature Initiation of sweating, Stool& Urine Passing of seven days – These are the features of <i>Nirama Jwara</i>

Due to the concordance of the above 4 factors the *Jwara* is very severe (high cytokine load) and Due to commonality of the *Sakhagati Vardhaka* factors it shows, an immediate *SakhaGati* (movement towards tissues). Hence it vitiates all Three *Doshas* (*Sannipata*) and also rapidly vitiates (*Yugapat*) from the very beginning, all the seven *Dhatu*s and two *Mala* (*Dwadasa Ashraya*) Produces *Stabdatha* (Stagnation) over all the *Srotas* & hence produces a continuous fever (*Santata*). If *Agni* cannot metabolize *Doshas*, then *Dhatu Paka* happens leading to a fulminant course & can be fatal in 7/10/12 days respectively for *Vata*, *Pitta* & *Kapha* Or it may relapse with 1day gap if *Dosha* are mild & *Agni* is strong.

In the context of COVID-19 this rapid *Dhatu Paka* can be seen and correlated by the following: Elevated inflammatory markers CRP, Serum Ferritin – *Ama*; Elevated D-dimer, LDH, SGOT, SGPT, Prothrombin time, – *Rasa*, *RaktaDhatuPaka*; Elevated CPK and Troponin – *Mamsa Dhatu paka*; Lymphopenia – *Mamsa/MajjaPaka*; Elevated Serum Creatinine – *MalaPaka*.

III. If fever happens in debilitated patient.

IV. The state of mind & strength of mind (*Manas*) along with the actions or lifestyle followed by the subject (*Karma*) will also determine the severity and outcome of the disease.

Ex: Anxiety, depression & *Kama* worsens the outcome by increasing the *Vata*.

6. Understanding ARDS of COVID–19

The ARDS in COVID-19 has attracted worldwide attention due to its peculiar pathophysiology of microvascular thrombosis to frank Thromboembolism. According to Ayurveda this reflects an increase in stickiness (*Picchila Guna*), mostly due to *Ama*[3, 25/1–5]. rather than *Kapha*, which along with *Vata Dosh*a leads to

Srotorodha. This also correlates with the high titers of inflammatory markers like Serum ferritin & CRP which are usually associated with *Amavastha* or (*Pitta Dosh*a). Hence necessitating the use of *Katu Rasa* (Pungent) for its *Sonitha Sanghatam Bhinatti* (Thrombolytic) action and *Amapachaka* (Metabolic activation) effect [1, *Sutra Sthana*; 26/43].

7. Actions prolonging fever by altering host factors [7, *chikitsa sthana* 3/138]

Diva swapna – day time sleep; *Snana* – prolonged bathing; *Abhyanga* – massage or applying oil; *Maidhuna* – sexual activity; *Krodha* – anger; *Vyayama* – exercise; *Ahara* – consumption of; *Guru* {curd, fatty food}; *Vidahi* {spicy foods} etc.; *Atimatra* {Excessive eating}; *Viruddha* – contradictory to state of nature of disease.

These actions prolong or intensify or complicate fever and hence are to be avoided, particularly during first 7 days of Fever.

8. Proposed management protocol for COVID-19

8.1. Investigations: (required for study validation only)

CBP, CRP, Serum Creatinine, SGPT/Serum Bilirubin,CPK.MB/Troponin –I, Serial ECG's (if concomitant use of HCQS & Azithromycin with *Visha*), Regular GRBS monitoring (especially if on HCQS with *Sudarsana churna* or *Guduchi*), PT/APTT (If patient on Heparin), Chest X-RAY, Pre and post viral treatment viral testing for NOVEL CORONA VIRUS, Serum Drug levels if needed of selected toxic drugs if on *Pippali*. LFT and RFT if concomitant use with *Remedesvir* and *Favipiravir*.

8.2. Nutrition/dietary management [7, chikitsa sthana; 3/139–145, 278–280]

All fevers in *Saamavastha* will need a Judicious *Langhana* protocol except pure *Vataja Jwara*, or patients with poor nutritional status; while taking care of hydration and hemodynamics.

8.2.1. Langhana protocol

Based on severity of *Amavastha* which can be grossly correlated with appetite. No appetite, with Nausea or vomiting – fasting till appetite appears (with or without iv fluids). Very mild appetite with no Nausea and vomiting – Ganji (rice gruel or chaavalmaand) or hot thin soups. Moderate appetite - ideally *Yavagu*; alternatively rice or wheat porridge (thin upma). If patient has normal appetite; diet will consist of soft rice with moong daal with or without rasam, or pulka with moong dal and oil free sabji. No curd, milk or raw foods or fruits or non-vegetarian foods are to be given; although nonvegetarian soups (rasa) are permitted and considered useful in *vata jwaras*. The intake of snehas processed with *deepana pachana dravyas* like ginger etc should be encouraged after completion of *amavastha* with good appetite (*agni*) and lightness in the body to pacify the *vata dosha*.

8.2.2. Fluid management

Hot water – *ushna jalapana*/Boiled and cooled water. *Paniya* – made with *panchakola* should be used for initial management in both phases. *Shadangapaniya* is given in pitta predominant patients.

8.2.3. Yavaagu preparation

50 gms (*Tiksna Dravya*) or 200 gms (*Mrudu Dravya*) is added to 3.2 L of water and boiled to 1.6 L, to this 1/6th (250 gms) of rice is added and cooked.

8.3. Medications

8.3.1. Mild illness

Vataja jwara: *Sudarsana Churna Kalpas* [11][8, 5/436] [[12], pg. 650.]; *Amritarishtam* [8, 5/1239.]; *Tribhuvana kirti ras* (less than 250 mg/day) [8, 5/1007].

The above are used with *Anupana of Sita* or *Sitopaladi* if *ruksha guna* is dominating or with *draksha* or *guda* if *vata pitta dosha* or with *ghritam* if in *Niramavastha*.

Vata Kapha Jwara: *Vyagradi Kashayam* [13]; *Tribhuvanakirti ras* (less than 375 mg/day); *Sudarshana Churna Kalpas*; *Amrutarishta*.

Kapha Vata Jwara: *Pancha Kola Kashayam*; *Mritynjaya Ras* [8, 5/510] (188–375 mg/day); *Sudarshana Churna Kalpas*; *Amritarishtam*.

Kapha jwara: *Trikatu Churnam*; *Sudarsana churna Kalpas*; *Amritarishtam*; *Ananda Bhairava Rasam* (125–375 mg/day)[8, 5/620.].

8.3.2. Mild pneumonia

Same medicines as the above but in full doses.

8.3.3. Severe pneumonia

1. *Dasamula katutrayadi Kasayam* [14, 1/25], if *Swasa* (SOB), *Kasa* (Cough) dominant or *Santata Jwara Kasayam* [7, Chikitsa Sthana; 3/200] (*kalingaka, patolapatra katurohini*) If fever is Dominant.
2. *Sudarsana Churna kalpas*.
3. *Amritarishtam/Vasakasavam* (if *Pittanubanda*).
4. *Tribhuvana kirti* (if fever dominant) (up to 500 mg/day) alternatively *Sanjeevani vati* Or *Swasa kuthar rasa* [8, 16/45–50.]

(*Swasa Pradhana Jwara*) (125–500 mg/day) Or *Samirapannaga* [[12], pg. 273]

Ras if *Kaphaja Kaasa Pradhana*(Productive cough with thick mucoid sputum) (60–120 mg/day) – any one of these medicines are to be used based on the conditions along with above.

5. *Jayamangala rasa* – (if *Rogi Bala* is low) [8, 5/1043.]

8.3.4. ARDS (Swasa Pradhana VataKapholbana sannipata)

DasamulaKatutrayadi kasayam; *Sudarsana Churna Phantam*; Any One of the following in each section based on patient's condition: *Dasamularishtam*[8, JwaraAdhikarana: 74/341 (if dry cough) or *Vasakasavam* [[12] pg.227] (if hemoptysis/purulent sputum) or *kanakasavam* [8, 16/115–119] (copious sputum); *Tribhuvana kirti* (upto 500 mg/day) alternatively *Sanjeevani vati* or *Swasakuthararas* (Anyone of the following); *Rasasindoora* [15]with *anupana of pip-pali churna* 1–3 gms or *sitopaladi churna* 3–5 gms (*Vata Pradhana*); *Samira Pannagaras* (*Vata Kapha Pradhana*)/*Mallachandrodaya* or *Mallasindoora* [[16], *Portali Rahasya* of *Hiranya Garbha Portali* vol. 2/2390–2392, pg157.] if *Kapha* dominant.

8.3.5. Sepsis

(Fever, Hypotension, Tachypnoea, Altered sensorium).

(1) *Dasamula katutrayadi kasayam*; (2) *Sudarshana Churna phantam*; (3) *Amritarishtam/Vasakasavam/Dasamoolarishtam* (any one); (4) *Tribhuvana kirti/Swasakuthara ras* (any one) (upto 500 mg/day); (5) *Samira Pannaga ras* (*Vata Kapha Pradhana*)/*Malla Chandrodaya* or *Mallasindoora* (*kapha* dominant); (6) *Poornachandrodaya Makaradwaja* (60–120 mg/day) [17]. 1,2,3,4 & 6 are to be used in severe pneumonia with sepsis. 1,2,3,4,5,6 all to be used for ARDS with Sepsis.

8.3.6. Septic shock

[Considered as *Asadhya* (incurable) in *Samhitas*, but was attempted to be treated after development of *Rasa Shastra* only], the following medicines are described for usage in the last phase (*antim avastha*) of *sannipata jwara* for *hrudaya-fuffusandimandal uttejana* (*cardiac-pulmonary and CNS stimulation*).

As definitive intestinal absorption is poor at this stage.

Hema Garba Pottali [12] [16, (with *Tamra*) *Pottali Rahasya* of *Hiranya Garbha Pottali* Vol. 2, Verse 2748] - 60–125 mg 6th hourly, sub-lingually.

Trailokya Chintamani Ras [12,18], -60 -250 mg/day, sub-lingually; *Suchikabharana Ras* [12],[8, 5/642–649] - 2–4 mg over scalp incision along with 2–4 mg orally with butter; *Swasakuthara Ras* [8] (*Nasya* – if stuporose or comatosed)

8.4. Consideration in special patient subjects

8.4.1. Jeerna jwara (Chronic fever - more than 10–12 days of fever)

Indukanta Ghritam[14 *Ghritha Prakarana*, 4th *Ghritha*]/*ShatpalaGhritam*[6, *Cikitsa Sthana*; 14/14] (If no *Ama* and *Agni* is Good) *Jaya Mangala Ras* (250–500 mg/day) OR *Suvarna Vasanta Malati* (250–500 mg/day). If required *Mrudu Virechena* or *Kshira Vasthi*[7, 3/168–171] (*Bahudosha Avastha*).

8.4.2. Special considerations

If Elderly, Emaciated, COPD or Asthma or Structural lung Disease, LVE, Immunosuppressed, Hypertension, *Diabetes Mellitus*.

Drugs of clinical stage protocol with any one or two of the following.

Abhraka Bhasma [8, 3/30]; *Naradiya Lakshmi Vilasa ras* [8, 5/1200]; *Dasamula Arishta*; *Maha lakshmi Vilasa ras* [8, 5/1200].

8.4.3. Recurrent respiratory infection/atopic Individual: In addition to the jwarahara medicine need to add one or more of the following

Bilwadi gulika [13, volume 3, Uttara Sthana; 36/84–85]; Dasan-gam gulika [13, volume 3, Uttara sthana; 37/27–28]; Shireeshaar-isham/Shireeshaadi Ghana vati; Kaphakuthar ras (125–250 mg/day).

8.4.4. Pregnant women and lactating mothers

Amrutottaram [14 Kashaya Prakaran: 6th Kashaya]/Vyaghradi Kashayam; Amrutaristha, Dashamoolaristha; Sudarshana Churna Kalpas; Suvarna Vasanta Malathi.

8.4.5. Simple Vata Kapha hara Jwara Kashayas for mild infections

Pippali Kwatham [8, 5/186,188,193 respectively]; Pancha Kola Phantha or Pancha Kola Kashaya [8, 5/186,188,193 respectively]; Dashamoolam Kashayam with Pippalichurna [8, 5/186,188,193 respectively]; Vyaghradi Kashayam (Kantakari, Sunthi, Amrita, with Pippali Churna) [13]; Amruta Kwatha with Pippali Churna [13 vol.2, chikitsa sthana 1/60–61].

8.4.6. If all three doshas are involved (Vata Kaphaja with pitta anubandha)

(ex: vatakapha jwara with APD/in Pitta prakruti/with hemoptysis/purulent sputum).

Kashayam: Amruthottaram Kashayam, Vyaghradi Kashayam & Dashmoola Kashayam; Churna: - Sudarshana Churna kalpas; Arist-ham:- Amrutaristha; Rasaoushadhi:- Jaya Mangala Ras.

8.4.7. In Pitta Pradhana Sannipataja (with bleeding)

Shadanga Paneeya leave a message [7, Chikitsa Sthana; 3/145] LajaTarpana in Ahara.

Use of Vasa Kalpas (Vasa Swarasa, Vasa Guduchyadi Kashaya, Vrisha Ghritha [14, Ghritha Prakarana, 12] or Vasa Ghritha, Vasa avalehya etc.; Chandra kala Ras [8, 34/46–54]; Mukta Pisthi; Pravala Pisthi/Pravala Bhasma; Pravala Garbha Pottali [16, Portali Rahasya of Hiranya Garbha Portali Volume 2 Verse 15]; Hemagarbha pottali (without Tamra); Suthasekhara rasa. In case of Vata with Pitta.

8.5. Proposal II

For logistic reasons can also try the following medicines in all subjects up to the stage of severe pneumonia in patients of COVID - 19.

Sudarsana Churna Kalpas; Amrutarishtam; Tribhuvana Kirti Ras/sanjeevani vati; Lakshmi vilas rasa & Jayamangala ras in high risk population only.

9. Dosing considerations

In Atyayika condition (emergency) Muhur –Muhur prayoga [13, volume1, sutra sthana; 13/39–40] (frequent dosing) is suggested:

Churnas are given in dose of 3–4 gms in multiple doses up to 12 gms/day. While Sudarsana churna may be given as a Phanta Kalpana. Kasayam dosage depends upon the method of preparation. Aristas are given up to 50 mL/day. Except Kanakasava which is given at 5–10 mL per dose twice daily. Dose of Rasa-sindoora with navasagara is 60–180 mg/day while Rasasindoora without Navasagara 125–500 mg/day and Malla sindoora – 60–120 mg/day.

10. Contraindications of drugs

1. Vatsanabha preparations are usually contraindicated in Ref. [19].
 - a. Children <12 years
 - b. Elderly > 75 years

- c. pregnant women.
- d. Emaciated/Malnourished
- e. Pitta Pradhana
- f. LV dysfunction

If it should be used in these subsets of patients, to be used with extreme caution, in the lowest possible dose, for the shortest possible time.

Important vatsanabha preparations: Sanjivani vati; Hingu-lswara ras; Tribhuvana kirti ras; Mrutyunjaya ras; Anandabhaiava ras; Trailokyachintamaniras.

2. In case of children, pregnant women & lactating mother all vishas are contraindicated, because of usna and tiksna guna and are not recommended generally.
3. All Shudda Malla yogas should be given with great precaution assessing Desha, Kala & Rogi bala, if used injudiciously in Rakta/Pitta dusti, it could be fatal [20].

11. Potential drug–herb interactions

All Vatsanabha containing preparations have a potential to interact with HCQS & Azithromycin or other QT- Prolonging drugs. As purified Visha is known to cause Bradycardia in high doses and may worsen the QT Prolongation [21]. Hence caution to be used in terms of close monitoring of ECG if concomitantly used; All Pippali containing preparations are known to augment the drugs of other modern medicines [22]. Hence care should be taken in use of potentially toxic medications; Possible interference with anti-coagulation, with potential to increase PT/APTT with all ushna, tiksna Preparations. Hence ideal to use Unfractionated Heparin rather than LMWH and monitor PT/APTT closely in case of concomitant use; Increased incidence of Hypoglycemia possible with concomitant use of Sudarshana churna, Guduchi, etc with HCQS and other Glucose lowering agents [23]; Possibility of increased hepatotoxicity/nephrotoxicity on concomitant use of Remdesvir and Favipiravir with Ugra/Ushna veerya drugs.

12. Criteria used for selection of medication [24]

Dosha Pratyanka – Specific for Dosa with Guna; Vyadhi Pratyanka - Specific for disease with avastha; MukhyaDravyaVisheshatvam - Specific characteristics of chief ingredients; Prakarana Visheshatvam – Described in the concerned chapter only; Acharyokta Vishesh Kaarmukatvam [14] –Chief indications prescribed by Original Acharyas; Vriddha Vaidya Anubhava Visheshatvam – Experience of Vaidya's in earlier Pandemics; Dravya Nishedhatvam – Contra-indication of a Drug mentioned by previous Acharyas; Potential side effect/interaction with concomitant medication; Sweeya/Pratyaksha Anubhava - personal experience; Use of medications ideally prepared before the onset of Pandemics. Example: - Arishtas, Rasa Oushadhas.

13. Prevention

As COVID-19 is presumed to involve the following key players in its pathogenesis, prevention aims at the reversal of the same.

Vata Dosha; Sannipata; Ama Utpatti; Sakha Gati; Prana vaha Sroto Dushti; Adharma- Prajnaparadha (Table 3).

13.1. Preventive medication

It is ideal to do Panchakarma or At least Kunjal and Mridu Virechana (Kosta Shuddi) before starting medicines as per one's own Prakruti, Agni Bala and overall health status. The following can be used.

Table 3**Preventive Measures:** [1, Nidana Sthana; 1/19&28] [13, vol.1, sutra sthana 8/13–14].

Don'ts: - Avoid	Do's
1. Excessively cold foods/drinks	1. Timely meals
2. Excessively cold air conditioning.	2. Mindful eating
3. High fiber diet/fat free diet	3. Light diet (eating as per appetite)
4. Fasting/weight loss regimen.	4. Balanced/Moderate diet as per season/Health.
5. Excessively Spicy(mirchi), Bitter (bitter gourd), Astringent (Bengal gram) etc.	5. water – boiled to half and cooled/Boiled with coriander seeds - If summer like weather or hot constitution
6. Inter meal snacking	6. Boiled with ginger if cold weather.
7. Excessive Tea/coffee/Nicotine/Alcohol	7. Timely sleep.
8. Heavy & excessively fatty foods.	8. Light exercises - to half of one's Capacity
9. Irregular meal timings.	9. Pranayama
10. Excessive exercise (particularly when hungry or after food or before bowel evacuation)	10. Meditation/Prayer
11. Excessive sex	11. Relaxed mind.
12. Day sleep immediately after heavy food	12. Observance of Dharma (protecting nature)
13. Constipation	
14. Late night awakening.	
15. Exposure to unseasonal weather.	
16. Excessive anxiety/depression, lust.	

Guduchi (Satwa, Vati, Churna); Agastya rasayana; ChyavanaPrasa Avalehya; Pippali Rasayana; Naradiya Lakshmi Vilasa Ras; Suvarna Vasantha Malini; Abhraka Bhasma; Haridra Khandh – For Atopic Individuals.

13.2. *Measures to restore human environment relationship [1, Vimana Sthana; 3/12–18] [2, Sutra Sthana; 6/22]*

As the root cause of Epidemics is *Adharma* – Leading to *Rudra Kopa* (Fever); Until we realize the oneness of life & learn to live in harmony with nature & creatures around us, we cannot have a complete prevention of Future Pandemics.

Hence Ayurveda advises us to practice Dharma in the form of.

1. Satya: - Being truthful in all dealings & in one's work.
2. Daya: - Compassion on all living beings including animals, plants.
3. Tapa: - Austerity.
4. Japa:- Meditation.
5. Homa& Devatarchana: - Measures to pacify the vitiated nature & its controlling energies, through the principles of Snehana of Prapanchika Vaayu through Vaidika Agni to restore the dynamics of air currents.
6. Brahmacharya: - Self-control& seeking of Spiritual happiness
7. Dedication to Spirituality
8. Prayaschitta: - Actions undertaken to undo the wrongs towards nature and Life forms, with a view to repair Man's Relationships with Nature and to help Nature in Healing Itself from the ravages of overexploitation caused by our Civilization & to rediscover living and growing in harmony with Mother Nature.

14. Discussion and way forward

The present proposal is based on classical understanding of Ayurveda and it needs to be emphasized that as of date there are no known curative medicines for this virus. Hence this approach has to be applied pragmatically, taking into consideration various aspects, like a proper evaluation of the individual patient based on Ayurvedic parameters, with due advice and inputs from the colleagues from Modern medicine, proper discussion in a integrative scenario of possible drug to drug interaction and limitations of therapy, ones own experience with usage of particular drugs, with proper preventive contact and respiratory precautions in place, and results being documented systematically particularly when dealing with sick patients and critical conditions. But we strongly feel that

Covid-19 presents a very valuable opportunity for Ayurveda to join hands with Modern Medicine and enrich itself and Science in general for betterment of Mankind.

15. Limitations of the study [1, Sutra Sthana 20/20–22]

As the number of severe COVID Positive patients directly studied by the authors is limited and very little attention has been paid to the details of clinical symptoms across different studies, need to study clinical presentation in larger subsets of patients to draw more specific conclusion. Hence may need to update the guidelines as numbers/understanding of the disease increases.

Declaration of competing interest

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