Review Article

Understanding COVID - 19 pandemic – A comprehensive Ayurvedic perspective

Uma Shankar Prasad Adluri a,*, 1, Akash Chandra Tripathi b

a Modern Medicine & Ayurveda, S.I.V.A.S Health & Research Institute, Sunshine Hospitals, Secunderabad, Telangana, India
b Chandra Prakash Ayurved Sansthan, Varanasi/Gorakhpur, India

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A B S T R A C T

Epidemics have not been new to India. Ayurveda being in the forefront 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 Samhitás which assert the superiority of host susceptibility (Nija) over External Agent/Virus (Agantu) 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 Shastru.

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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 forefront of health care of those times, has recorded its valuable experiences of epidemics & termed them as Janapadodhwamsa [1, 2], 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 Sushrutha along with the model of Masurika of Acharya Madhava [3, 5, 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
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 2–3.5 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 milder 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, multigorgan 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, remedesvir, steroids like Dexamethasone and IL-6 inhibitors like tocilizumab and convalesce 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 Sushrutha 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 weather, 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.

![Probable Pathophysiology of COVID-19 according to Ayurveda](image-url)
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 nijā 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 [lakshanam], 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 bhuta:

1] Covid does not have fever that starts with psychiatric features like 8 types of bhutonnada or inappropriate laughing, crying or emotional excitement as described in Madhava Nidana (2/30).
2] The common manifestation of Bhutaabhisangajā Jwara should always be Tridoshajā, mostly in a Vishama jwara pattern that is 3 types of Trutiya jā and 2 types of Caiturthakā [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 bhutaabhishangajā Jwara is Daivi-vyapashraya, and text books like Bhaijishajya Ratnavali have quoted procedures like uccatana, 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 and no 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 paramourshadha in janapodhwameeyadhaya 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] Kritis described correlate mostly with visible, macroscopic, ecto-parasites or helminths like nematodes and cestodes and not with invisible virus.

3] Adrisya 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.) (AGANTIJA) in all above cases.” It is extremely important to note that in all the above diseases quoted by acharya sushrutha and acharya madhava as being contagious and transmissible like Kushtha, jwara, sosa, netraabhisyandta etc., there is no mention whatsoever of agantuja variety of kushtha, sosa, netraabhisyandta. 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 AGANTIJA 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 AGANTIJA 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 Doshas Samyog, 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 (Ritu) and ahara induce the formation of specific doshas in all, leading to mass predisposition or mass susceptibility of the diseases; in the Vikruta sthithi indulging specifically in a Vata - Kaptha provoking Ahara Viharata, at Vataja extreme of age (elderly), or Vataja & Kaptha 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 Kaptha 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 Rtu (in Europe and U.S) and mild course of illness in hot weather and severe surge in rain(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. Viprakrutha Nidana (Remote causative factor): Prapajnaparadha, Adharma, Dushita vayu (air), Jala (water), Desha (land), Kaala (Season). 2. Sannikrutha Nidana (proximate causative factor): Vata (Kaptha) Prakopaka Ahara (diet) Vihara (life-style). 3. Vikruta stithi of Vata (Kapha) Dosa & Ama Dosa. 4. Manifestation of Vataja or Vata Kaptha 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 shavara 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 (Shhavara 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 exists in Sama or Nirmama 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 exists in Sama or Nirmama 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 Samanavastha due to strong or multiple causative etiologies, causing strong Dosh viation.

4. ARDS- (severe respiratory distress PaO2/Fio2<200) (SpO2/Fio2 < 315). It Refers to mostly Vatolbana Sannipata (sometimes Vata Kaptholbana 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. Septic Shock & MODS: refers to Sarva Sannipata Avastha [7], Chikitsa sthana 3/103–108[with progressive Dhatu Paka (tissue necrosis), Srotorodhakmatching Agnii Kshaya (metabolic failure). The various features described can be correlated as follows:

   a. Altered Sensorium – Tandra, Moha, Pralapa.
   b. Respiratory Distress – Kausa, Swasa, Kantha Kujana.
   c. Hypotension – Bhrama, Trushna.
   d. Coagulopathy – Shvivanam Rakta Pittasya (Bleeding).
   e. Clotting – Kothanam svaya Arunanam Mandalanal cha Darshanan
   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 Srotro 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 (Hetubhirah bahuhrirajato). e.g.: - Seeta, Ruksha Ahara & Upavasa etc. Leading to a Strong Doshha (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: Doshha -causative cytokines; Dushya -functional affected tissue; Prakrti -constitution/metabolic type; Kaala –Ritu –eseason.

The resultant fever is severe and continuous and called as Santta Jwara and it follows a different and more aggressive course. In context of COVID -19 i.e. Doshha – Mostly Vata (with or without Kapha); Dushya – Like Ashi (with or without Mamsa) etc Prakrti – In a Vata Pradhan (with or without association of Kapha); Kaala – 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 Vata Jwara[1, 1/21] | Features of Vata Kapha Jwara[7], Chikitsa sthana 3/87 | Features of Kapha Jwara[1, 1/27] |
|---------------------------------|-------------------------------------------------------|--------------------------------|
| Fever - Mild, with rigors (Vepathu/irregular onset - Vishana Vega). | Mild fever with chills and rigors | Mild fever with chills - Manda Jwara |
| Dry mouth & throat - Kantha Ousha Parisosham | Excessive chills - Sthaimityam. | Cough with thick and copious secretions, nose block |
| Sneezing & watery nasal secretions - Kihavathu | Cough with productive sputum - Kaasa | Dyspepsia - Avipakata |
| Head ache & Body ache - Siro gatra ruk. | Frontal headache - Siro Graha | Anorexia - Aruchi |
| Sharp shooting pain -sula | Nose block & running nose — Pratishaya. | Vomiting - Chardi |
| Insomnia — Nidra Nasha. | Pain/arthalgia – Purvanam Bhdha. | Lassitude - Aulasya |
| Constipation with hard stools - Gadha Vidkata. | Generalized heaviness - Gauravam | Heaviness — Guru Gatara |
|                              | Excessive somnolence — Nidra. | Excessive somnolence - Tanda |

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

| Features of Saama Avastha | Features of Pacchyamana Avastha | Features of Nirama Avastha |
|---------------------------|---------------------------------|---------------------------|
| Moderate to high fever (but with no restlessness & increased guruta & somnolence) (in Pitta – high fever & restlessness) | Increased fever | Feeling of Hunger |
| Hyper salivation - Lalapraseko | Decreased heaviness | Lightness in body |
| Nausea - Hrullasa | Passing motions – Mala Pravrutti. | Reduction in Temperature |
| Dysgeusia (coated tongue) - Aasya Vairasya | No restlessness | Initiation of sweating, Stool & Urine |
| Anorexia - Arochkam | | Passing of seven days |
| Dyspepsia - Avipakata | | These are the features of Nirama Jwara |
| Lassitude – Aulasym. | | |
| Heavyness - Gurugaratua | | |
| Frequent urination–Baha Mutrata. | | |

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 Dhatus 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, Pro-thrombin 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 Vatu Dosha 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 Dosha), 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 churum 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 Judicial *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 chavalamma) or hot thin soups. Moderate appetite – ideally *Yavagru*; 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 *vata dosha*.

8.2.2. **Fluid management**

Hot water – *usha 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. **Yavaagru preparation**

50 gms (*Tiksna Dravya*) or 200 gms (*Mrdudu 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]; *Triibhuvana kirti ras* (less than 250 mg/day) [8, 5/1007].

The above are used with *Anupana of Sita* or *Sitopaladi* if *raksha guna* is dominating or with *draksha* or *guda* if *vata pitta dosha* or with *ghrtam* if in *Niravastha*.

*Vata Kapha Jwara*: *Yavagri Kashayam* [13]; *Triibhuvanakirti ras* (less than 375 mg/day; *Sudarshana Churna Kalpas*; *Amritarishtam*).

*Kapha Kapha Jwara*: *Pancha Kola Kashayam*; *Mrittinyaya 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 kutraturayadi Kasayam* [14, 1/25], if *Swasa* (SOB), *Kasa* (Cough) dominant or *Santata Jwara Kasayam* [7, Chikitsa Sthana; 3/200] (*Kulingaka, patolapatra katurohini*) if fever is Dominant.

2. *Sudarsana Churna kalpas*.

3. *Amritarishtam/Vasakasavam* (if *Pittanubanda*).

4. *Triibhuvana kirti* (if fever dominant) (up to 500 mg/day) alternatively *Sanjeevani vati* Or *Swasa kuthar rasam* [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 *Ragi Bala* is low) [8, 5/1043].

8.3.4. ARDS (*Swasa Pradhana VataKapholbana sannipata*)

*DasamulaKaturaturayadi 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); *Triibhuvana kirti* (upto 500 mg/day) alternatively Sanjeevani vati or *Swasakuthararas* (Anyone of the following): *Kasasindooraa* [15] with *anupana of pip-pali churna* 1–3 gms or *sitopaladi churna* 3–5 gms (*Vata Pradhana*); *Samira Pannagaras* (*Vata Kapha Pradhana*)/Mallachandrodoya or *Mallasisindooraa* [16], *Portalai Rahasyaa of Hiranya Garbha*.

8.3.5. **Sepsis**

(Fever, Hypotension, *Tachypnoea*, Altered sensorium).

(1) *Dasamula kututrayadi kasayam*; (2) *Sudarshana Churna phantam*; (3) *Amritarishtam/Vasakasavam/Dasamoolarishtam* (any one); (4) *Triibhuvana kirti/Swasakuthara ras* (any one) (upto 500 mg/day); (5) *Samira Pannaga ras* (*Vata Kapha Pradhana*/ *Malla Chandrodoya* or *Mallasisindooraa* (kapha dominant); (6) *Poomnachandrodoya* *Makradwaja* (*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 Seipsis.

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-fuffusa-nadimandal uttejana* (cardiac-pulmonary and CNS stimulation).

As definitive intestinal absorption is poor at this stage.

*Hema Garba Pottali* [12] (16, with *Tamra* *Pottalli Rahasyaa of Hiranya Garbha*.

8.4. **Consideration in special patient subjects**

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

*Indukanta Ghritam*[14] Ghrita Prakaran, 4*th Ghrita*: *[ShatpalaGhritam*6, Cikitsa Sthana; 14/14] (if no *Ama* and *Agni* is Good) *Jaya Mangala Ras* (250–500 mg/day) OR *Swarna Vasanta Malatt* (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*, LVF, *Immunosuppressed*, *Hypertension*, Diabetes Meliitus.

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

*Ahhraka 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 jwara hara medicine need to add one or more of the following
Bilwadi gilika[13, volume 3, Uttar Sthana; 36/84–85]; Dasangam gilika[13, volume 3, Uttar sthana; 37/27–28]; Shireeshaar- ishtam/Shireeshaadi Ghana vati; Kaphakuthar ras (125–250 mg/ day).

8.4.4. Pregnant women and lactating mothers
Amrutas [14 Kashaya Prakaran: 6th Kashaya]/Vyaghradi Kashayam; Amrutaristha, Dashamoolaristha; Sudarshana Churna Kalpas; Sudarsana Churna kalpas; Suvarna Vastasa Malathi.

8.4.5. Simple Vata Kapha hara Jwara Kashayas for mild infections Pippali Churna [8, 5/186,188,193 respectively]; Dashamoolam Kashayam with Pippali churna [8, 5/186,188,193 respectively]; Vaghradi Kashayam(Kantakari, Sunthi, Anrati, with PippaliChurna) [13]; Amruta Kwatha with Pippali Churna [13 vol.2, chikitsa sthana 1/60–61].

8.4.6. If all three doshas are involved (Vata Kapha with pitta anubandha)
(ex: vatakapha jwara with APD/ in Pitta prakrut/ with hemoptysis/purulent sputum).
Kashayam: Amruthottaram Kashayam, Vyaghradi Kashayam & Dashmoolam Kashayam with Pippali churna [8, 5/186,188,193 respectively]; Vaghradi Kashayam(Kantakari, Sunthi, Anrati, with PippaliChurna) [13]; Amruta Kwatha with Pippali Churna [13 vol.2, chikitsa sthana 1/60–61].

8.4.7. In Pitta Pradhana (with bleeding)
Shadanga Paneeya leave a message [7, Chikitsa Sthana; 3/145] LajaTarpana in Ahara.
Use of Vasa Kalpas [Vasa Swarasa, Vasa Guduchyadi Kashayya, Vrisha Ghritha [14, Ghrit Prakaran, 12] or Vasa Ghritha, Vasa avalehya etc.; Chandra kalas Ras [8, 34/46–54]; Mukta Pithi; Pravala Pithi/Pravala laBhasma; 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 also try the following medicines in all subjects up to the stage of severe pneumonia in patients of COVID - 19.

Sudarsana Churna Kalpas; Amrutaristhant; Tribhuvana Kirti Ras/sanjeevani vati; Lakshmi vilas rasa & Jayamangala rasa 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. Arista 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 navasadara is 60–180 mg/day while Ratasindoora without Navasadara is 125–500 mg/day and Malha sindoora – 60–120 mg/day.

10. Contraindications of drugs
1. Vatsanabh 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; Hinguleswara ras; Tribhuvana kirti ras; Mrutyunjaya ras; Anandabhaiva 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 Shuddha Malia 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 Vatsanabh 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 Remedesvir and Favipiravir with Ugra/Ushna veerya drugs.

12. Criteria used for selection of medication [24]

Dosha Pratyaniya – Specific for Dosa with Guna; Vyadhi Pra- tyaniya - Specific for disease with avastha; MukhyaDravyaVises- shatvam - Specific characteristics of chief ingredients; Prakarana Viseshatvam – Described in the concerned chapter only; Acharyokta Visesha Kaarmukatvam [14] –Chief indications prescribed by Original Acharyas; Vruddha Vaidya Anubhava Viseshatvam – 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/Pra- tyaksha Anubhava - personal experience; Use of medications ideally prepared before the onset of Pandemics. Example: - Arishtas, Rasa Oushadhhas.

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 Desha; Sannipata; Ama Upatti; Sakha Gati; Prana vaha Sroto Dushiti; Adharma- Prajnaparadha (Table 3).

13.1. Preventive medication
It is ideal to do Panchakarma or At least Kunjal and Mridu Virechana (Kosta Shuddhi) 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, 6; 20/20–22] [3, vol. I, 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)    | 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. Panayama                                                        |
| 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. Observence 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 Vlasa 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. Hom& 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. Prayashchitta: - 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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