



## A REVIEW ON AYURVEDIC APPROACH ON PATHOGENESIS OF CLINICAL FEATURES OF COVID -19

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Article Received on 28/06/2021

Article Revised on 18/07/2021

Article Accepted on 08/08/2021

### ABSTRACT

Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) is the virus that causes novel coronavirus disease (COVID-19). The world health organization declared COVID-19 as a global health emergency and a global pandemic in 2020. The symptoms and signs of the disease vary from asymptomatic to severe stages and eventually in some cases death is caused by pneumonia or multi organ failure due to cytokine storm. Ayurveda as one of the oldest systems of medicine has given more priority to *jvara nidāna* and *cikitsā*. The symptoms and signs of COVID 19 are more relevant to the *jvara rōga* and sometimes can be correlated with *sannipāta jvara*, all three *doṣās* are in vitiated and driven by obstructed *vāta* functions. Within this context, this study aims to review Ayurvedic approach on pathogenesis of clinical features of COVID - 19 and build up a proper correlation between Ayurvedic principles and COVID - 19 based on authentic Ayurveda texts. The data was gathered from Ayurveda authentic text where a special priority is given to *jvara nidāna* and *cikitsā*. Results revealed that the authentic text describe *jvara rōga* in a broad aspect and diverse manner. Ayurveda emphasizes the importance of avoiding, neutralizing, reducing and eliminating *āma* produced by autoimmune reactions that eventually cause the cytokine storm in the critical stage of COVID-19. All the outcomes of review show that Ayurveda is capable of providing viable and effective solutions for managing COVID-19 in both preventive and curative aspects at early stages to avoid developing critical symptoms or complications.

**KEYWORDS:** SARS-CoV-2, COVID-19, *jvara*, *āma*, immunity.

### INTRODUCTION

Novel coronavirus disease (COVID -19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with a zoonotic origin. It emerged in December 2019 from Wuhan, China, and the world community was severely affected by this disease. The world health organization (WHO) declared it as a global health emergency on the 30<sup>th</sup> January 2020, and then a global pandemic on the 11<sup>th</sup> March 2020.<sup>[1]</sup> According to the data of the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University confirmed cases reported more than 178 million and 3.85 million deaths as of June 19th, 2021.<sup>[2]</sup> WHO stated that possible modes of transmission for this virus are including contact, droplet, airborne, fomite, fecal-oral, blood borne, mother to child, and animal to human.<sup>[3]</sup> Infection may cause asymptomatic, mild disease to severe disease and death. According to current medical findings COVID -19 can be classified into five stages based on the manifestation of its symptoms as Asymptomatic, Mild, Moderate, Severe, and Critical.<sup>[4]</sup> The mild COVID -19 is marked by flu-like symptoms

such as raised temperature, continuous dry cough, and loss of sense of smell or taste and most of the cases are recovered naturally without any deliberate treatment. Moderate COVID -19 symptoms occur due to inflammation lower down in the bronchioles of the lungs and cough is marked with breathlessness, increased heart that may last about 7-14 days. In severe COVID -19 infection, inflammation due to viral attack occurs in alveoli and severe symptoms breathlessness, low oxygen saturation level that may lead to the critical stage. Eventually COVID pneumonia produces Acute Respiratory Distress Syndrome (ARDS) that is caused by the collapsed alveoli. In the critical stage mainly cytokine storm was identified as the responsible cause for ARDS that can kill the patient by sepsis and multi-organ failure.

Ayurveda is an ancient science of medicine originated in India 5000 years ago and has three main authentic texts that are named as *Bṛhatrayī* viz; Caraka Samhita, Susruta Samhita, and Astanga Hrdaya Samhita. Among these three Caraka Samhita is the leading book in the tradition

of clinical medicine (*kāya cikitsā*) that describes many basic disease and treatments in eightfold divisions of Ayurveda. It also explains clearly about the *janapadōdhvaṃsa* (*janapada* + *udhvaṃsa*) *vyādhi* which literally means that “destroying human habitats” to which category these types of wide-spread epidemics or pandemics belong.<sup>[5]</sup> According to Ayurvedic principles there are three basic biological forces called *tridoṣa* that produce the diseases in their imbalance due to internal or external causes. Ayurveda explains that every individual has a unique biophysical identity called *prakṛti* that makes the different levels of resistance and responses to the diseases. Therefore disease manifestation can be seen in different forms and intensity in individuals as their natural immunity varies. But in the context of *janapadōdhvaṃsa vyādhi* there are common factors such as air, water, location, and seasons and vitiation of which leads to the simultaneous manifestation of diseases having the same set of symptoms leading to the destruction of human habitats.<sup>[6]</sup>

*Carakācāryā* explains the line of treatments for these epidemic diseases according to which the person who follows recommended routine and administers medicaments properly is able to survive without dying from the epidemics.<sup>[7]</sup> If the person doesn't have any bad outcomes of previous birth involvement (*karma sāmānya*), and those who are not destined to die during the epidemics (*namṛtyu sāmānya*), are recommended to follow *pañcakarma* procedures as the best treatment. Also rejuvenation therapy for the maintenance of physical health and enhancement of immunity are recommended. Especially it is instructed to prepare medicines from raw materials collected prior to the onset of epidemics. *Susruta Samhita* explains the contagious diseases as *aupasargika rōga* of which modes of transmission are described as physical contact, inhale contaminated air, eating with others on the same plate, sharing bed and chair, sharing clothes, garlands, and paste. Examples of such diseases given as, skin diseases, fever, consumption, conjunctivitis, and other infectious diseases that are transmitted from man to man.<sup>[8]</sup>

*Vyādhiḥṣamatva* (immunity) is another key factor that plays a vital role in contagious diseases spread in this type of epidemic and pandemics. *vyādhi* means, disease and *ṣamatva* denotes resistance and the term means the capacity of the body to resist the diseases and *Cakrapāṇiāchārya* defines the immunity as two ways according to their action as *vyādhi bala virōdhikatva* (capacity of the body to fight against the manifested diseases) and *vyādhi utpādaka pratibandhakatva* (capacity of the body to resist the pathogenic process of forming diseases). This concept describes the capacity of bodily resistant to prevent diseases and process of quick recovery from disease. *Vyādhishmatva* mostly depends on *bala* (strength) of the body (*śarīra bala*) and *bala* classified as *sahaja* (constitutional), *kālaja* (temporal) and

*yuktikṛta* (acquired) which can be updated with the diet, environment, lifestyle and medicine.<sup>[9]</sup> In this context *ojas* is also considered as a vital factor responsible for the *vyādhiḥṣamatva* in Ayurveda and it is the supreme essence of all *sapta dhātus* (seventh tissues) and mainly described in two forms as *para ojas* and *apara ojas* or *rasa ojas*. Basically *para ojas* is available in eight drops that is situated in *hrdaya*, responsible for vital force. The site of *apara ojas* is present in vessels attached to the heart (*daśa dhamani*) and directly connected with *śarīra bala* of the person that controls the immunity.<sup>[10, 11]</sup> It again explains the impact of diet and metabolic process on the immunity.

## AIM AND OBJECTIVE OF THE STUDY

This study aims to develop a conceptual correlation between ancient wisdom and modern scientific findings for explaining the clinical features of SARS – CoV-2 viral infection based on Ayurvedic principles mentioned in classical texts. Therefore objective of the study is to describe and interpret pathogenesis and clinical manifestations of COVID-19 in terms of Ayurvedic pathological knowledge and classical theories.

## METHODOLOGY

In this study data was gathered from Ayurveda authentic text, including *Brhatrayī* (*Caraka Samhita*, *Susruta Samhita*, and *Astanga Hrdaya Samhita*) for few weeks. Special priority is given to *jvara nidāna* and *cikitsā* as primary sources. Also commentaries written for the classical texts and other scholarly interpretations are included as secondary sources for this study. Obtained results were analyzed according to their fundamental principles, special consideration factors, and classification of *jvara*, Ayurveda pathology and treatments. For further analysis some research papers were referred to highlight the current scholarly approach on conceptual and theoretical perspective of Ayurveda on COVID-19. The data was interpreted by describe with using tables, figures, flow charts and descriptions in this review paper. Within this paper Most of the times the authentic Ayurvedic technical terms in Sanskrit are used with possible English translations which might not be able to give the exact meaning without any further interpretation.

## RESULTS

The main symptoms of COVID-19 are identified as fever along with or without *kāsa* (cough) and *śvāsa* (respiratory distress). In Ayurveda fever is known as *jvara* and described according to unique Ayurveda terminology that includes a wider classification and extensive explanation according to various factors, causes and pathogenesis. In *Brhatrayī* a significant discourse is dedicated for causes and treatments of *jvara*. All three main texts reflected with more or less similarity in spiritual, mental and physical aspects of the disease when considering its origin and the importance.

According to mythological origin of *jvara* lord *śiva* has created mythical goblin called, *vīrabhadra* from the wrathful fire, and said it to you will become *jvara* in this world and afflict people in the beginning of birth and the time of death as well as also on those who resort to erratic regiments<sup>[12]</sup> or by the anger of the *Maheśwara* highlighting the influence of spirit and emotions in the manifestation of the disease. Fever is known by different terms in various animals and all living beings are born with fever and die with it because all the living beings get afflicted by *tamas* or darkness at both events which is named as *mahā mōha*, living beings do not recollect any event of their previous birth, fever itself takes away the life of the living beings in the end of the life. Therefore *jvara* is considered as the most important ailment out of all diseases from birth to death as it appears before all diseases, has given the name *rōga pati* (lord of the diseases) named as the king of all diseases (superior among all diseases)<sup>[13,14,15]</sup> and to highlight the importance among other diseases as a primary symptom commonly associated with most of diseases. Therefore *jvara* is given the first priority in the all textbooks of clinical medicine in Ayurveda and classified into various groups according to the causes and characteristics in a view of emotional and spiritual aspects of it. In addition to that environmental factors also contemplated where the common manifestation of *bhūtābhiṅgaja jvara* (caused by evil spirits or germs). It should always be *tridōśaja* (*vāta*, *pitta*, *kapha*) and can be resulted with *janapadōdhvamsa* also. The name *māraka* is given for the type of epidemic that spreads very in many habitats and kills more people during *janapadōdhvamsa* as there were many occasions happened in the human history. *Adharma* (activities contributing to destruction of sustaining principles of life or nature) is the foremost cause of such pandemics that is the ultimate result of destruction of ecosystem balance by disturbing the harmony of nature. It is explicit that most of zoonotic infections like COVID-19 are resulted due to devastation of human-nature symbiotic relationship with imprudent exploitation of resources and identified the importance of non- cognitive component in pandemics. According to the fundamentals of Ayurveda all diseases arise due to the impairment of the digestive fire called *Agni* and it was mentioned by another legend explained that fever is directly connected with deranged digestive fire (erratic digestion and metabolism) as the causative that leads to infectious diseases like COVID-19.

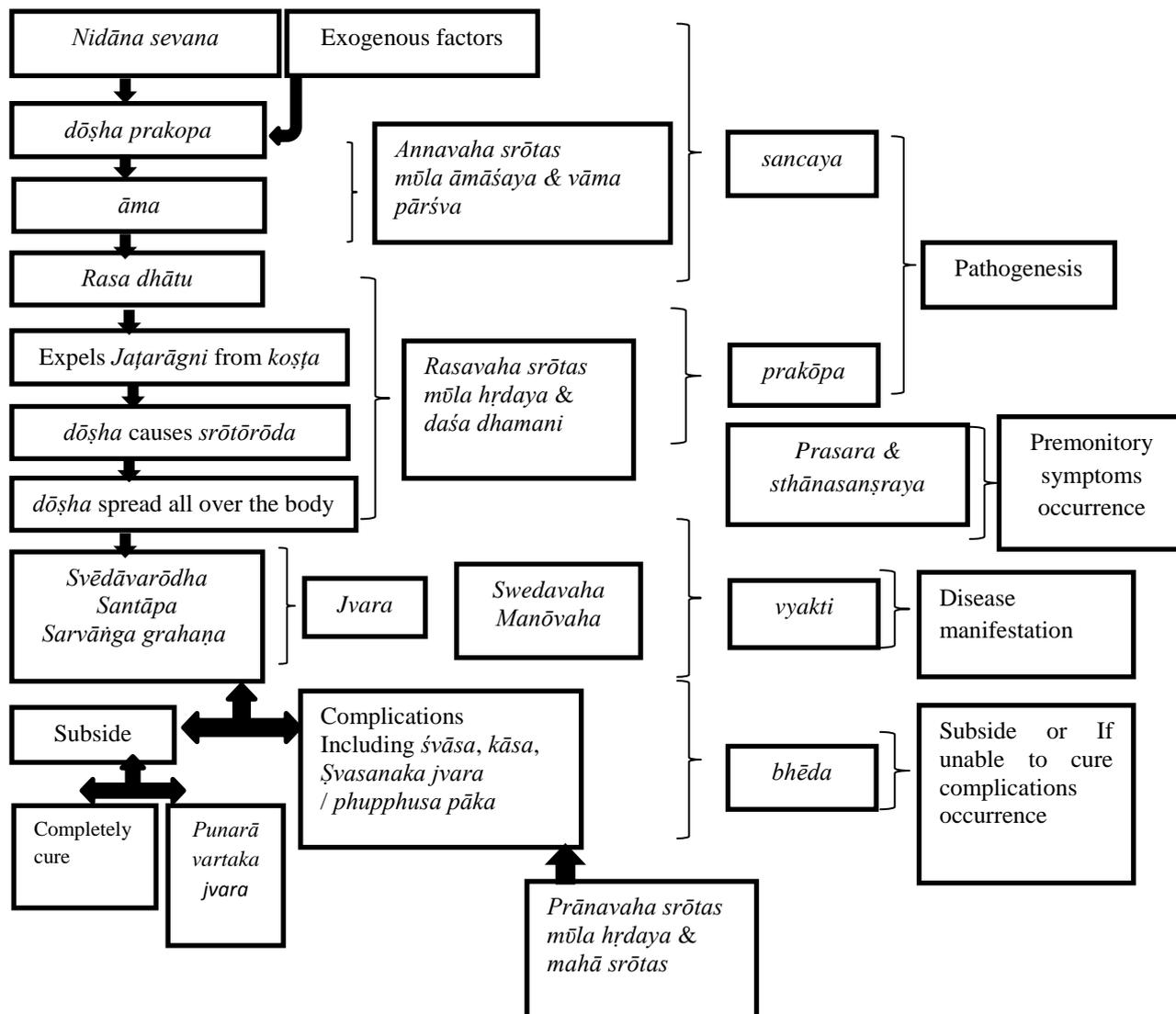
Apart from the three aspects: spiritual, mental and physical, moreover Caraka samhita mentions eighteen types of special consideration factors in *jvara* as, *prakṛti*, (nature of the disease), *pravṛtti* (origin of the disease), *prabhāva* (the manifestations of the disease), *kāraṇa* (causative factors), *pūrva rōpa* (premonitory signs and symptoms), *adhiṣṭāna* (place of manifestation), *bala kāla* (its power and the time of its manifestation), *ātma lakṣhana* (signs and symptoms which are invariably associated with this disease), *vidhi bhēda* (details of

classification), *prtak bhinna ākṛti* (signs and symptoms of each variety of this disease), *āma liṅga lakṣhana* (signs and symptoms of primary stage of disease), *liṅga lakṣhana* of *jīrna jvara* (signs and symptoms of chronic fever), *auśadha* (drugs for the treatment of the disease), *kriyā krama* (line of treatment), *vimuñcataḥ* (signs and symptoms that are manifested when the fever is getting cured), or *prasāntasya* (when it is being alleviated from both separately), *yāvatkālan rakṣayaḥ* (should avoid certain regimens and the reasons for that, *punarāvarthaka Jvara* (the reason for the re-attack of the fever after it has subsided), *punarāvṛttam kriyā prasāmyanti* (the therapies which should be administered in order to alleviate this re-attack of fever).<sup>[16]</sup>

In view of *Brhatrayī* following *samprāpti* (pathogenesis) can occur and be manifested with the various involvement of *dōśha* known as *śaṭkriyā kāla* including *sancaya* (accumulation of *dōśhas* at own site), *prakōpa* (vitiation at own site), *prasara* (spread out through body channels), *sthāna sanśraya* (localization at different sites), *vyakti* (manifestation) and *bhēda* (termination or culmination). According to Ayurveda the stage of *sancaya*, *dōśa* are accumulated in their own sites and in *prakōpa* stage *dōśa* become its maximum vitiated level. In the stage of *prasara dōśa* spread from their own site to other place through *srōtas*. These agitated *dōśa* logged in to different places and may cause obstruction of *srōtas* is called *sthānasansraya*. When comparing with the modern aspect of pathogenesis of disease premonitory signs and symptoms can correlate with *Prasara* and *sthānasansraya* stages, occurrence of signs and symptoms takes place in *vyakti* stage. Identification of each stage is essential for proper management of diseases and if treated properly in above stages disease may be subsided and completely cured. Otherwise complications may occur and this stage known as *bhēda*.

According to the holistic principle of Ayurveda mind related signs and symptoms also can be identified in *jvara* because *hrdaya* is considered as the seat of *manas*. Originated thought were circulated inside body through the *Manōvaha srōtas* and it has direct relationship among *Rasavaha srōtas*, *Annavaha srōtas* and *Prānavaha srōtas*. Details obtained related to *samprāpti* summarized in the below flowchart.

Flowchart 1: Stepwise *samprāpti* (pathogenesis) of *nija* (endogenous) and *āgantuja jvara* (caused by external factors), involvement of *srōtas* and *śaṭkriyā kāla*.



According to the authentic texts of Caraka, and Susruta manifestation of fever can be physical and mental as of COVID -19 having psychosomatic symptoms.

Table 1: General manifestation of *jvara* according to authentic text.

S.N	Caraka Samhita <sup>[17]</sup>	Susruta Samhita <sup>[18]</sup>
1	<i>Sarīra mana santāpa</i> (increased temperature with mental fatigue)	<i>Svēdāvarōdha</i> (loss of perspiration)
2	<i>Aruci</i> (anorexia)	<i>Santāpa</i> (increased temperature with mental fatigue)
3	<i>Triṣṇā</i> (morbid thirst)	<i>Sarvāṅga grahaṇa</i> (vague pain all over the body)
4	<i>Aṅgamarda</i> (malaise)	
5	<i>Hṛd- vyathā</i> (pain in cardiac region)	

Considering the new findings early stage of COVID -19 is associated with mild fever, continuous dry cough, loss of sense of smell or taste. All three texts mention the loss of taste can occur at the beginning of the fever and are clearly explained in *pūrvavāpa* (prodromal features) of *jvara*.<sup>[19,20,21]</sup> Carakāchārya mentions normal function of *vāta* coordinates all the sense faculties and helps in the enjoyment of their objects<sup>[22]</sup> and specific *pūrvavāpa* can

occur according to morbid and vitiated *dōṣa* involvement. Therefore vitiated *vāta* logging in the sense organs (*srōtādī gata vāta*) can cause disturbances in sense perceptions.<sup>[23]</sup> Also under the description of *dhamani* in Susruta Samhita mentions *dhamani* running upwards (*ūrhdva gāmīdhamani*) that sustain the body by carrying sensation of sound, touch, sight, taste and smell. It is also responsible for the respiration<sup>[24]</sup> and it connects

the five sense organs with their five objects. The disturbed function of *ūrdhva gāmīdhamani* may cause the above mentioned errors of sensory functions. It is found recently that Anosmia and hypogeusia caused by SARS-CoV-2 is a good diagnostic indicator of COVID-19 that occur as the very first symptom due to olfactory and gustatory dysfunction produced by a neurological involvement.

According to the classification of *jvara*, it is mainly classified under two categories as *nija jvara* and *āgantuja jvara* where fevers due to viral infection is fallen into the *abhiśaṅgaja* type of *āgantuja jvara*.<sup>[25]</sup> In *āgantuja jvara* firstly, it is caused by exogenous

etiological factors that afterwards aggravate three *dōṣās* and lead to produce the signs and symptoms similar to *nija* types of *jvara*.<sup>[26]</sup> Considering the mild to critical symptoms of COVID – 19 it may differ from person to person according to their situational *tridōṣa* involvement and *prakṛti*. It is clearly expressed in the classification of *nija jvara* where there are eight types including, *vātaja*, *pittaja*, *kaphaja*, *vātapittaja*, *vātakaphaja*, *pittakaphaja* and *sannipātaja* (*tridōṣaja*). This *tridōṣaja* or *sannipātaja jvara* is again classified into thirteen subtypes based on their predominance *tridoṣa* involvement.<sup>[27]</sup> According to the Ayurveda authentic text, symptoms and signs of COVID-19 can be correlated with *sannipātaja jvara* as given in Table 1.

**Table 2: Signs and Symptoms of thirteen subtypes of *sannipātaja jvara*.**

S.N	<i>dōṣa</i> involvement	Signs and Symptoms
1	<i>vāta</i> and <i>pitta</i> predominant over the vitiation of <i>kapha</i>	Giddiness, thirst, burning sensation, heaviness, excessive headache
2	<i>vāta</i> and <i>kapha</i> predominant over the vitiation of <i>pitta</i>	Coldness, bronchitis, anorexia, drowsiness, thirst, burning sensation, pain
3	<i>pitta</i> and <i>kapha</i> predominant over the vitiation of <i>vāta</i>	Emesis, coldness, frequent burning sensation, thirst, unconsciousness and pain in the bones
4	<i>vāta</i> predominant over the vitiation of remaining two <i>dōṣas</i>	Pain in the joints, bones and head, delirium, heaviness, giddiness, thirst and dryness of the throat and mouth
5	<i>pitta</i> predominant over the vitiation of remaining two <i>dōṣas</i>	Blood in stool and urine, burning sensation, sweating, thirst, loss of strength and fainting
6	<i>kapha</i> predominant over the vitiation of remaining two <i>dōṣas</i>	Laziness, anorexia, nausea, burning sensation, vomiting, arati (dislike for doing any work), giddiness, drowsiness and bronchitis
7	<i>vāta</i> less vitiated, <i>pitta</i> moderately and <i>kapha</i> excessive vitiated	Coryza, vomiting, laziness, drowsiness, anorexia and loss of power of digestion
8	<i>vāta</i> less vitiated, <i>kapha</i> moderately and <i>pitta</i> excessive vitiated	Yellowness in urine and eyes, burning sensation, thirst, giddiness and anorexia
9	<i>pitta</i> less vitiated, <i>kapha</i> moderately and <i>vāta</i> excessive vitiated	Headache, trembling, asthma, delirium, vomiting and anorexia
10	<i>pitta</i> less vitiated, <i>vāta</i> moderately and <i>kapha</i> excessive vitiated	Coldness, heaviness, drowsiness, delirium and excessive pain in bones as well as head
11	<i>kapha</i> less vitiated, <i>pitta</i> moderately and <i>vāta</i> excessive vitiated	Asthma, bronchitis, coryza, dryness of the mouth and excessive pain in chest
12	<i>kapha</i> less vitiated, <i>vāta</i> moderately and <i>pitta</i> excessive vitiated	Diarrhea, loss in the power of digestion, thirst, burning sensation, anorexia and giddiness
13	<i>sannipātaja jvara</i> (three <i>dōṣas</i> simultaneously vitiated)	Severity of the above signs and symptoms including, drowsiness, unconsciousness, delirium, bronchitis, asthma, anorexia, giddiness, <i>kuḷjana</i> from throat, absence of speech, inflammation of the channels etc.

Then the SARS-CoV-2 most commonly enters through the respiratory tract and affects the gas exchange of lungs by reducing the function and capacity of alveoli by damaging pneumocytes. In Ayurveda, *prānavaha srōtas* (passage that enter external air in to the body), *hṛdaya* (organ which control the passage of prana) and *mahāsrōtas* (gastrointestinal tract) are the anatomical sites of origin of the channels that carry *prānavāyu* (vital breath) and associated with respiratory functions. Vitiation of *prānavaha srōtas* known as *prānavaha srōtoduṣṭi* and too long or too restricted, aggravated, shallow, or frequent respirations associated with sound and pain are the symptoms produced by such

dysfunction.<sup>[28]</sup> In this stage, predominant *dōṣas* in the *prānavaha srōtas* can be identified as *kapha* with both *vāta* and *pitta* (as *anugāmī dōṣha*) that support the vital function of respiratory system. Especially *prānavāyu* and *avalambaka kapha* (two types of special *vata* and *kapha dosha*) are located in respiratory system and associated tissues as the driving biological forces of functions of alveoli for maintaining the gas exchange at optimum level through the blood-air barrier of respiratory membrane. According to all classics, *prānavāyu* is responsible for respiration and *suśrutāchārya* mentions that vitiated *prānavāyu* cause diseases like *hikkā*, (hiccough) *śvāsa*.<sup>[29]</sup> According to

Astanga hrdaya samhita, *avalambaka kapha* lubricates the heart and lungs<sup>[30]</sup> which has a similar function with surfactant of produced by pneumocyte type II. The moderate symptoms of COVID-19 infection are having similar characteristics that can be correlated with the vitiated *prānavāyu* that leads to dysfunctions in airways.

In severe and critical cases of COVID -19, virus damage to alveoli and severe symptoms such as breathlessness and COVID pneumonia occur that eventually resulted with ARDS and multi organ failure. In the alveoli *avalambaka kapha* plays a vital role and due to its vitiation, alveoli become inflamed and cause lack of oxygen that leads to destruction of tissues and sepsis. The morbid state of *avalambaka kapha* deranged from the proper functions leads to the collapsing alveoli that results the suppressing gas exchange through the respiratory membrane. Coexisting state of dysfunction *avalambaka kapha*, deviation of *vyāna vāta* and obstructions of *prāna vāta (āvarana)* can be correlated with cytokine storm. In this context *āvarana* means concealment of free-flowing nature of *vāta* function (*avarōdh gati nirōdh*) and its moving stream is obstructed as a counteraction of biological flow of micro-channels.

According to the modern point of view cytokine storm occur due to abnormal immune reactions<sup>[31]</sup> and in Ayurveda it is known as *srōtoduṣṭi* due to *āma* (un-metabolized waste) produced by autoimmune reaction occurred with immune system malfunction. Therefore in view of the *jvara cikitsā* of Ayurveda mainly focuses on the *āma pācana* which is recommended in the early stage of all types of *jvara*.<sup>[32]</sup> In severe COVID-19, pneumonia is caused by collapsed airways in lungs due to excessive

fluid leaking to alveoli and patients experience breathlessness that should be supported by ventilators. By Ayurvedic treatments the symptoms of early stage can be managed very successfully without complications and it will have a synergetic effect on immune system to prevent the cytokine storm. If the *āma* is eliminated or reversed at the early stages the contributing factors of cytokine storm can be strategically avoided according to the theoretical explanation of *āma pācana* in *jvara*. This process is identified as the *dōṣa dūṣya sammūrchana* or the amalgamation of vitiated *dōṣas* with weak and susceptible tissues and *samprāpti ghaṭaka* or elements of pathogenesis to restore the health.

The fever pattern of COVID-19 patients mostly (72%-98.6%) shows persisting fever pattern prevails up to the second week of illness while the rest has a saddleback pattern of fever.<sup>[33]</sup> The patients with saddleback fever are well-manageable and can be monitored within a non-medical set up and patient with continuous fever for seven days are recommended to be medically monitored. Ayurveda authentic texts mention the term *viśama jvara* that explains the various fever patterns including *samtata*, *satataka*, *anyeduṣka*, *ṛṭrīyaka* and *cāturthaka*.<sup>[34]</sup> It has a broad explanation about fever occurrence and *saptadhātu* involvement in each *jvara*. *Ṣvasanaka jvara / phupphusa pāka* can be correlated with pneumonia which has a fever pattern of the *samtata jvara* in Ayurveda. It is also observed that the characteristics of *samtata jvara* it is highly relevant with continuous fever or persisting fever pattern of acute stage of COVID – 19. If the unless of proper treatments according to Ayurveda suddenly *saptadhātu* may involve.

**Table 3: Fever types according to its pattern of occurrence (*viśama jvara*).**

S.N	Type of <i>jvara</i>	Recurrent gaps of fever	<i>dhātu</i> involvement
1	<i>samtata jvara</i>	Get cured or killed the patient on 12 <sup>th</sup> 10 <sup>th</sup> or 7 <sup>th</sup> day.	<i>rasa dhātu</i>
2	<i>satataka jvara</i>	In day and night (twice a day)	<i>rakta dhātu</i>
3	<i>anyeduṣka jvara</i>	Once a day	<i>medo dhātu</i>
4	<i>ṛṭrīyaka jvara</i>	Occurs on every third day	<i>asthi dhātu</i> and <i>majjā dhātu</i>
5	<i>cāturthaka jvara</i>	Occurs on every fourth day	<i>asthi dhātu</i> and <i>majjā dhātu</i>

The *saptadhātu* involvement of *jvara* is known as *dhātugata jvara* and according to *suśrutāchārya* the symptoms of the fevers caused by *vāta*, *pitta* and *kapha*,

*dvidōṣa*, and *tridōṣa* involvement in *dhātus* are described. Symptoms of *dhātugata jvara* are given in Table No. 4.

**Table 4: Characteristics of fever located in various *dhātus* (*dhātugata jvara lakṣana*).**

S.N	<i>Dhātu</i> involvement	Symptoms and signs
1	Fever located in <i>rasa dhātu</i>	Heaviness, nausea, lassitude, vomiting, anorexia, malaise
2	Fever located in <i>rakta dhātu</i>	Hemoptysis, burning sensation, perspiration, vomiting, giddiness, delirium, boils and thirst
3	Fever located in <i>māmsa dhātu</i>	Cramps in calf, thirst, elimination of urine and feces, internal heat, burning sensation, throwing of limbs and malaise
4	Fever located in <i>medo dhātu</i>	Excessive perspiration, thirst, fainting, delirium, vomiting, foul odour, anorexia, malaise and intolerance
5	Fever located in <i>asthi dhātu</i>	Tearing pain in bones, contraction, dyspnea, purgation, vomiting and throwing of limbs

6	Fever located in <i>majjā dhātu</i>	Feeling of darkness, hiccough, cough, chill, vomiting, internal heat, severe dyspnea and cutting pain in vital part (heart)
7	Fever located in <i>śukra dhātu</i>	Rigidity of penis and excessive discharge of semen leading to death

*Cakrapāṇītikā*, a commentary written to Caraka samhita, mentions that the later ayurveda text books describe ten types of *jvara upadrava* (complications of fever) such as *kāsa*, *mūrchā*, *aruci*, *chardi*, *trṣṇā*, *atīśāra*, *viḍvibandha*, *hikkā*, *śvāsa* and *aṅga bhēda*. In comparison with COVID -19 these types of complications can be considered as severe symptoms that are responsible for the critical stage. This virus affects mainly the upper respiratory tract and if the condition persists without management the large airways fails to work properly due to the alveoli collapse.

*Carakāchārya* mentions the reoccurrence of *jvara* and it known as, *punarāvarthaka* (*punar+āvarthaka*)*jvara*.<sup>[35]</sup> If the *dōṣas* not eliminate properly during fever treatment and the patient intake of unwholesome of foods, behaviors cause it reappear. These patients suffering long time, weakness and loss of vitality may be associated with them. In some patients suffering with this pandemic fever show this type of reoccurrence.

According to the WHO it is an explicit fact that all leading scientific journals publish plenty of research papers with many findings related to COVID-19 around the world where scientists are trying to find a better solution but still not successfully completed. Supplying of medical oxygen for severely ill patients and those who are at risk of ARDS is considered as the most viable, effective and advanced respiratory support for saving life in ICUs. There is no any officially recommended treatment including antibiotics as prevention or cure for COVID -19<sup>[36]</sup> while traditional medical systems claim to have successful formulas to manage COVID-19 at various level. Therefore after considering all above factors, Ayurveda can be accepted as a good choice of solution that gives priority to eliminate *āma* and counteract the production of *āma* inside the body. The holistic nature of Ayurveda treatment regimen that involves in lifestyle, diet and environment is a very effective, practical and applicable for keeping the immune system updated to fight with virus and improving functions of organs to face the failures during infection and after. Ayurveda has a wider variety of herbal medications used for preventive and curative measures without side effects. The therapeutic interventions consist of *daivavyapāśraya* (treatment based on believing divine power and divine remedies), *yuktivyapāśraya* (treatment based on medicines including *auśadha* (medicines), *āhāra* (diet regiments), *viharāṇa* (behavioral regiments) and *satvāvajaya* (treatment based on controlling mind power) aiming all three aspects of the diseases including spiritual, mental and physical. This is more or less host-directed approach of treating the patient by enhancing the immune capacity of the

system rather than not by attacking virus with a pathogen-directed approach.

Within this pandemic situation, there are many Ayurveda research papers related to COVID-19 available in Google Scholar, Pub Med, and Cochrane library among which, most of the papers address the preventive aspect of Ayurveda. AYUSH research portal has published 162 papers out of 121 are fundamental researches that support the conceptual and theoretical understanding of COVID-19 in Ayurvedic perspective (<https://ayushportal.nic.in/Covid.aspx>). The connection between obesity and less resistant against COVID-19 revealed by researchers explains the role of *āma* in aggravating COVID-19 symptoms easily. According to a new study done in the United States a COVID-19 vaccine may remain ineffective in obese people due to low immune response<sup>[37]</sup> and it is an evident to prove that the vaccine-induced antibodies do not sustain in systems with morbid *doṣa* conditions. Some Ayurvedic scholars highlight the importance of immune enhancing procedures in the prevention of COVID-19 infection especially in persons who suffer from metabolic disorders such as diabetes, obesity. Most of the articles give priority to *vyādhiḥṣamatva* or *śarīra bala*<sup>[38]</sup> which has three levels viz., *pravara*, *madhyama* and *avara* as depending on *kāla* (seasons), *vaya* (age of the person), *dōṣha* (dominant of *dōṣha*), *kāla* of the day (diurnal variation). In some papers COVID – 19 is correlated with *vātakapha* dominant *sannipātaja jvara* of *āgantuja* origin with *pittānubandha* (associate with pitta)<sup>[39]</sup> on which on Ayurveda interventions should be based for better management of the COVID – 19. The most critical challenge is to avoid annual vaccinations as the vaccine-induced antibodies are not long-lasting where the research-oriented integration of Ayurvedic inputs are suggested for better way of alleviating this burden.<sup>[40]</sup>

## CONCLUSION

Ayurveda medical system has a broad description of *dōṣha*, *dhātu*, *mala* and *agni* as basic principles of health and disease manifestation. Homeostasis of these four with healthy mind, soul, and body make a healthy person who is having an optimum level of natural immunity. All viruses and other external causes that are responsible for *sankrāmika jvara* and ultimately produce the vitiation and derangement of *dōṣas*. Morbid state of *dōṣa* associated with *āma* causes many malfunctions and dysfunctions in immune system that may weaken the capability fighting against exogenous pathogens like SARS-CoV-2. The basic theory of the Ayurveda treatments for diseases is identified as the way of eliminating morbid states by *dōṣa dūṣya sammūrchana* or the amalgamation of vitiated *dōṣas* with weak and susceptible tissues and *samprāpti ghaṭaka* or elements of

pathogenesis to restore the health. Therefore traditional lifestyle and dietary habits based on Ayurveda can build up a good immune response to the disease while homemade immune-enhancing formulas can also support to develop natural immunity. This kind of natural immunity or *kṣamatva* is long-lasting and not disease-specific but need to maintain with good conducts that make a holistic positive health state in all aspects. Considering all these factors it is concluded that the Ayurveda can effectively manage COVID -19 patients in the early stages and can prevent further the development of severe symptoms that lead to critical stages. The treatment regime is based on host-directed approach that focuses in treating the patient by enhancing the immune capacity of the system but not confined to a pathogen-directed approach.

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