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FIGHT AGAINST SEEN & UNSEEN ENEMIES OF RESPIRATORY SYSTEM THROUGH AYURVEDA W.S.R TO NOVEL COVID-19

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ABSTRACT

The outbreak of novel corona virus disease-19 (nCovid-19) provides an opportunity to resume the ancient wisdom of the Ayurveda for its prevention and management. The morbidity and mortality of novel corona virus is high at global level, which seeks attention of Govt. and private sector along with society to attain healthy living by adopting appropriate preventive measures. The previous publication reveals that most of nCOVID-19 patients were having mild to moderate fever (*Jvara*), cough (*Kasa*), myalgia (*Angamarda*), fatigue (*Tandra*), dyspnoea (*shvasa*), anorexia (*Aruchi*), sputum production (*Kaphotklesha*) etc. Considering this fact in mind, it primarily affecting respiratory system and in due course of time it involves other systems too. Initially, the nCovid-19 of modern medicine is correlated with disorders related to *Pranavaha Srotas* as mentioned in Ayurveda, which is kind of *Aupasargika, sankramaka roga*, that have pandemic in nature. Seeing the pathological aspects, it is presumed that initially *Kapha* and *Vata dosha* are actively involved in the basic matrix of diathesis of nCovid-19. Later on; it involves the other *doshas, dhatus, mala* and *srotas*. It becomes fatal in persons who have minimal immune strength i.e. *Oja, bala*. The authors searched all the relevant literatures including classical Ayurvedic texts with their commentaries available for information related to the review article. For the assessment of relevant information related to nCovid-19 and traditional medicine we have screened

published articles, reports etc from major scientific databases (namely Pubmed, Lancet, Science Direct, Springer Google Scholar). This is a review article; authors have trying to emphasize the use of traditional Ayurvedic medicine based on scientific ground for feasible management of enemies of respiratory system w.s.r. novel COVID-19.

Keywords: Ayurveda, Corona virus disease, COVID-19, *Janapadodhvamsa*, *Pranavaha srotas, Respiratory disease,* Traditional medicine

INTRODUCTION

Science is exploring ways to manage and alleviate the diseases with the help of advancements in technology but confront is still persisting because of springing up of newer diseases, and also the relapse of old ones in a modified and worsened form. Novel Corona virus disease 2019 (nCOVID-19) is an infectious disease caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) **[1]**. It was first identified in December 2019 in Wuhan, Hubei, China, and has resulted in an ongoing pandemic **[2, 3]**. In December 2019, there was an outbreak of pneumonia of unknown cause in Wuhan, Hubei province in China, with an epidemiological link to the Huanan Seafood Wholesale Market where there was also sale of live animals **[4]**.

nCOVID-19, is primarily transmitted from person-to-person through close contact (approximately 6 ft) by respiratory droplets. Symptoms of nCOVID-19 are similar to other viral upper respiratory illnesses **[5]**. The disease diathesis and clinical presentation of nCovid-19 is differing from person to person, due to their inherent immune strength. The evidences suggest that in majority of the cases its morbidity and mortality related is primarily to disorders of respiratory system, which is comparable to *Pranavaha srotasa* of Ayurveda. At present there is not proven medicine for its cure and development of vaccines are under the way in conventional system of medicine.

It is a never been experienced respiratory ailment before and with infectivity widely and speedily, it attracted the world's attention but without treatment and control manual. Ayurveda offers the precious knowledge on the use of various measures to preserve health and life. Therefore at most of the places in classics one can find that various herbs and *Rasa-Aushadhi* are suggested to get relief from the presenting illness **[6]**. Many scholars have wrote various article regarding the similarity of COVID 19 with the diseases described in Ayurveda like *Janapadodhvamsa, Aupsargika roga, Sankramaka roga, Bhootabhisangaja Jvara* and *vata-kaphaja jvara* etc. Majority of contemporary and traditional researchers and scholars are

trying to search out safe and effective remedial measures to eradicate such a kind of Global pandemic. Century's old Ayurvedic lexicons have been described numbers of purificatory and pacificator measures for the prevention and treatment of ailments related to respiratory disorders. The in-vitro- in-vivo and animal experimental studies of some common plant reveal its scientific basis, which signifies its use in clinical practice for the treatment of variety of enemies of respiratory system. Considering this fact in mind, in present review article we just have a brief review regarding correlation of ncovid 19 with Ayurveda along with it is mainly focused toward traditional medication as the disease chiefly involves respiratory system with symptoms like fever, cough, shortness of breath etc.

METHODOLOGY

The authors have searched all the relevant literature's including classical Ayurveda texts with their commentaries available for information related to the review article. Other published journal articles were also consulted for further details. For information on nCovid-19, we searched major scientific databases namely Pubmed, Lancet, Science Direct and Springer for the most recent information regarding the pandemic. Internet search on the same search engines and Google Scholar was also done to search for scientific evidence regarding Ayurvedic medicinal herbs prescribed during epidemics. The key words- corona virus disease, COVID-19, Ayurveda, *Janapadodh vamsa*, *Aupsargika Roga*, Traditional medicine, WHO, immunity, immune-modulator and *Rasayana* etc had been used to collect the relevant data. Time restriction was not made to extract the most useful information.

Epidemiology:

The epidemic of 2019 novel corona virus (now called SARS-CoV-2, causing the disease Covid-19) has expanded from Wuhan throughout China and is being exported to a growing number of countries, some of which have seen onward transmission **[7]**. COVID-19 is very similar to other respiratory viruses. The number of laboratory-confirmed cases and associated deaths are increasing regularly in various parts of the World. Seven corona viruses namely 229E, NL63, OC43, HKU1, SARS (severe acute respiratory syndrome), MERS (Middle East respiratory syndrome) and COVID-19 can naturally infect human beings. Out of these, four (229E-CoV, NL63-CoV, OC43-CoV, HKU1-CoV) are responsible for mild upper respiratory infections, while SARS-CoV, MERS-CoV, and COVID-19 are well known for their high mortality. Few mild strains of corona viruses are circulating in India but there is no evidence of SARS and MERS

outbreaks. The COVID-19 is an emerging viral infection responsible for pandemics. Fortunately, the mortality of COVID-19 is low as compared with SARS and MERS, the majority of its cases are recovered. The death toll of COVID-19 is high even after its low mortality because COVID-19 causes a pandemic while SARS-CoV and MERS-CoV cause epidemics only. COVID-19 influenced the large segments of the world population, which led to a public health emergency of international concern, putting all health organizations on high alert. COVID-19 is the first corona virus after Spanish Flu 1918–1919, who has extremely influenced the health system, economy, and psychology of India **[8]**.

In India, the first case of COVID-19 was reported on 30 January 2020. India currently has the largest number of confirmed cases in Asia and has the third highest number of confirmed cases in the world after the United States and Brazil with the number of total confirmed cases breaching the 100,000 mark on 19 May, 200,000 on 3 June, and 1,000,000 confirmed cases on 17 July 2020 **[9]**.

Contemporary Management of Novel Covid-19

In the contemporary science, the recommended drugs or treatment procedures for COVID-19 are yet to be developed. So; in the absence of any proven treatment option, many drugs are under investigation to control this disease with a potentially fatal outcome. Chloroquine is one of the widely used drugs, with in vitro evidence that it reduces viral replication **[10]**. A combination of hydroxychloroquine and azithromycin has also been found to have a significant synergistic effect in reducing viral load and early recovery **[11]**. In advance cases, the use of steroids, passive antibodies, and selective cytokine blockade is suggested **[12]** as treatment of choice. The role of NSAIDs and corticosteroids are still controversial and not advisable at present **[13]**. Antivirals such as interferon-α, lopinavir/ritonavir, ribavirin, etc. are also being used as a tentative treatment for Covid-19 **[14]**. Yet, as of now, there are no specific antiviral drugs or vaccines verified to be effective against SARS-CoV-2, hence the emphasis is being laid on preventive measures and symptomatic treatment **[15]**.

The rapidly increasing patients of COVID-19 have overwhelmed the healthcare systems across the world and many countries had come to an almost stand-still. Although most of the infected people have a mild-to-moderate clinical course, and the elderly, the immune-compromised and those with other co-morbid conditions fall into severe acute respiratory syndrome that has high mortality **[16]**. In this context, traditional systems of medicine are being explored for providing preventive,

supportive and rehabilitative care to patients. Although no direct evidence is available, some uncontrolled studies on traditional medicines suggest that they may have a direct efficacy on the virus **[17]**.

Ayurveda and COVID 19 [18]

In Ayurveda, the natural calamities like epidemics and pandemic diseases are described under *Janapadodhwamsa* (destructions of states, or kingdoms or countries) due to vitiation of *Vayu* (air), *Jala* (water), *Desha* (soil or state or continent) and *Kala* (time or climate). These factors are mainly vitiated due to *Adharma* (sinful acts) and the death of large population occurs due to invasion of *Bhutas* (Shri. Satya Narayana Sastri, 2005). Furthermore, *Bhuta* in Ayurveda also has the meaning of *Visha* (poison) and *virus* meaning in Latin meaning is poison. Here, the origin of the virus was earlier considered from animals (Bats "primary hosts, Snake - intermediate host and further Pangolins). In this context, the word '*Marak'* also specified in classics, which means destruction and occurs due to intake of contaminated water and medicines (Kaviraj Ambikadutta Shastri, 2007).

Considering all factors associated with Covid-19, the outcome of illness can be considered as interaction of three *doshas* i.e. *Sannipata* with predominance of *Kapha* and *Vata doshas*. In due course of time *Pitta dosha* also get involved and initiate the pathogenic cascade. The choice of medicine (single and poly-herbo-mineral preparations) used should be *KaphaVata hara, Tridosha hara*, *Rakta Prasadaka/ Shodhaka*, *Vishahara, Jvarahara, Ashukari, Bahukalpa Rasayana / Urjaskara* (drugs having immune-boosting properties) and potent antimicrobial activities. Herbo-mineral agents possessing above activities which can be used as prophylactic as well as curative measure is been proposed in the study.

In the classical texts of Ayurveda, various medicinal plants are reported to be useful in the treatment of allergy and upper respiratory tract disorders, but their role in mast cell-mediated allergic anaphylaxis has not yet been fully investigated.

Ayurveda views diseases such as COVID-19 as an attack on the immune system (*Ojas*) and the respiratory system (*Pranavaha Srotas*). *Srotas* are the channel in the body through which various substances pass from one place to another. There are an infinite number of *Srotas* present in the body. All the physiological and pathological processes conducted in the body are dependent on *Srotas*. A person's unique constitution and current imbalances will determine how susceptible they will be to suffering from an infection by COVID-19. This is equivalent to Western medicine viewing those with respiratory deficiencies, weakened immune systems, heart disease,

or other ailments that compromise their immune systems as being more likely to suffer severe to fatal cases of COVID-19.

Medicinal Herbs for Respiratory System Disorders

As per the previous publication of COVID-19, 98% patients were having mild to moderate fever (*jvara*,), 76% were having cough (*kasa*) and 44% were having myalgia (*Angamarda*) and fatigue (*tandra*). Among those developed pneumonia, 99% were having fever, 70% were having fatigue 59% dry cough (*vatikakasa*), 40% having anorexia (*aruchi*), 35% having myalgia (*Angamarda*), 31% having dyspnoea (*shvasa*) and 27% having sputum production **[19]**. In Ayurveda respiratory diseases occur due to involvement of *Pranavaha Srotas* where cough, breathing difficulties, troubled breathing occurs. We can observe that COVID-19 patients primarily having the symptoms of *pranavaha Srotas* (respiratory system) such as coughing, bronchitis, difficulty in breathing etc. Therefore, on the basis of classical and contemporary evidences given traditional herbs can be used to combat the disorders of respiratory system including Covid-19. Prevention before sickness is better than cure after getting diseased.

Vasa-

Adhatoda vasica commonly known as *Adosa* and *Vasaka* belong to family Acanthaceae, is found many region of India and throughout the world, with a multitude uses in traditional systems of medicine. It is an eminent herb in indigenous systems of medicine for its beneficial effects, particularly in respiratory diseases.

In a study, a compound pectic arabinogalactan isolated from *Adhatoda vasica* by aqueous extraction and precipitation with ethanol. Per-oral administration of this arabinogalactan (50 mg kg−1 body weight) inhibited the number of coughs induced by citric acid in guinea pigs and slightly decreased the values of specific airway resistance **[20]**. Another study was carried out in which the ethanol extracts of *Glycyrrhiza glabra* and *Adhatoda vasica* have very significant effects in inhibiting the cough reflex **[21**. The anti-tussive activity of *Adhatoda vasica* (AV) extract was evaluated in anaesthetized guinea pigs and rabbits and in un-anaesthetized guinea pigs **[22]**. Hitherto unknown alkaloids from *Adhatoda vasica* showed pronounced protection against allergen-induced bronchial obstruction in guinea pigs **[23]**. A study also showed bronchodilatory activity of vasicine both in vitro and in vivo **[24]**. Methanolic extract of *Adhatoda* has been reported to have anti-inflammatory activity. Srinivasrao *et al*. (2006) have worked upon the antioxidant and anti-inflammatory activity of vasicine against ovalbumin and aluminum hydroxide induced lung damage in rats.

The antioxidant and antibacterial activity of various extracts of *Adhatoda vasica* has also been investigated by Ilango *et al*. (2009) **[25, 26]**. The anti-inflammatory activity of the methanol extract, the non-alkaloid fraction, the saponins and the alkaloids was also evaluated by different researchers in their study **[27, 28]**.

The aqueous and methanolic extracts were used for antiviral activity in the non-cytotoxic range. The result suggests that extracts have strong anti-influenza virus activity that can inhibit viral attachment and/or viral replication, and may be used as viral prophylaxis **[29]** (Rahul Chavan, 2014). The extract containing the alkaloid vascinol and 20% vasicine inhibited ova-albumin-induced allergic reactions by about 37% at a concentration of 5 mg **[30]** and Vasicinone has been shown to be a potent anti-allergen in tests on mice, rats and guinea pigs **[31]**.

Bharangi:

Clerodendrom serratum has played an important role in Indian system of medicine. Scientific studies on extracts and formulations revealed anti-asthmatic, mast cell stabilization and anti-allergic effects of roots of *C. serratum* **[32]**. A study was carried out to evaluate the anti-allergic activity by Milk induced Leucocytosis in mice and Bronchial Hyper-reactivity in Guinea Pigs sensitized with egg albumin; result showed that Low Dose (LD) of *Bharangi* root and High Dose (HD) of stem shows anti-inflammatory (23%) and anti-allergic activity (21%) equivalent to Dexamethasone (21%). But the high dose of *Bharangi* root has promising anti-inflammatory (44%) and anti-allergic activity (35%). The extract of C. paniculatum leaves had shown the antioxidant activity with IC50 value of 27,73376 µg/ml and anti-inflammatory activity at dose of 50 mg/kg **[33]**. The ethanol extracts of roots of various species of *Bharangi* (*Clerodendron serratum, Premna herbaceae* and *Gardenia resinifera*) exhibited significant anti-inflammatory activity at a dose of 350 mg/kg (po), when compared to control group **[34, 35]**.

Neem [36]:

Neem (*Azadirachta indica*), a member of the Meliaceae family, is a well-known medicinal plant, especially in the Indian subcontinent. An aqueous extract preparation from the barks of neem plant *Azardirachta indica* acts as a potent entry inhibitor against HSV-1 infection into natural target cells in a study (Tiwari 2010). The neem bark extract (NBE) significantly blocked HSV-1 entry into cells at concentrations ranging from 50 to 100 µg/ml. The blocking activity of NBE was observed when the extract was pre-incubated with the virus but not with the target cells, suggesting a direct anti HSV-1

property of the Neem bark **[37]**. The antiviral assay also showed dose dependent inhibition of DENV-2 (Dengue virus) infectivity by the selected compounds without significant cell toxicity. These results suggested the potential of bioflavonoids from *Azadirachta indica* in the development of effective drug against dengue infection **[38]**. In a study it is identify that the phytochemicals of *Azadirachta indica* leaves having antiviral activity against HCV NS3 protease through molecular docking and simulation approach. Results showed that the compound 3-Deacetyl-3-cinnamoyl-azadirachtin possesses good binding properties with HCV NS3/4A protease. It can be concluded from this study that Deacetyl-3-cinnamoyl-azadirachtin may serve as a potential inhibitor against NS3/4A protease **[39]**. Ethanol extracts of Neem leaves have been shown to exhibit anti-microbial properties, and Neem components have demonstrated free radical scavenging and anti-inflammatory activities (Alzohairy, 2016). In a study 'Dewa Ayu Ratna Dewanti' (2017); analyzed modulation of aqueous extract of Neem leaves to expression of Ig E and IL-4 in gingival tissue. The Neem leaves aqueous extract showed a decrease in IgE and IL-4 expression significantly ($p<0.05$) in gingival tissue **[40]**.

Kantakari:

Kantakari (*Solanum xanthocarpum*) of the family Solanaceae is commonly used drug in Ayurveda for curing various diseases. The drug has marvelous uses as antibacterial, anti-halmentic, anti-fungal, anti-asthmatic, hypoglycemic, anti-inflammatory, and antitumor, anti-tussive, antipyretic, antispasmodic, anti-histaminic, hypotensive, cytotoxic activity **[41]**.

Solanum xanthocarpum and *Solanum trilobatum* are widely used to treat respiratory diseases in southern Indian traditional medicine. A pilot study was undertaken to investigate the clinical efficacy and safety of a single dose of the *Solanum xanthocarpum* and *Solanum trilobatum* in mild to moderate bronchial asthma. The respiratory functions (FVC, FEV1, PEFR and FEF (25-75%) were assessed by using a spirometer prior to and 2 h after oral administration of 300 mg powder of whole plant of either S. xanthocarpum or S. trilobatum. Treatment with either *S. xanthocarpum* or *S. trilobatum* significantly improved the various parameters of pulmonary function in asthmatic subjects **[42-44]**.

Pushkaramula:

The alcoholic extract of root of *Inulara cemosa* Linn, was studied for its anti-allergic effect in experimental models of type I hypersensitivity, (egg albumin induced passive cutaneous anaphylaxis (PCA) and mast cell degranulation in

albino rats). Finding indicates, the ethanolic extract of *Inula racemosa* is active in the Type-I allergic condition because of their ability to inhibit the release of mediators from mast cells and thus influence the course of the disease by preventing the harmful effects of the released mediators (Srivastava S, 1990). Another study reported that *Inula racemosa* extract at concentration 5, 10, 20 and 40 mcg/ml produced dose related inhibition of mast cell degranulation **[45]**.

Madhuyashti

The most Common medical use liquorice is for treating upper respiratory ailments including coughs, hoarseness, sore throat and bronchitis **[46-48]**. Glycyrrhizin (GRZ), a major constituent of a plant Glycyrrhiza glabra, GRZ alleviates asthmatic features in mice. A study evaluated its efficacy on asthmatic features in a mouse model of asthma. The status of airway hyper responsiveness was measured by monitoring specific airway conductance (SGaw) using a noninvasive method and the pulmonary inflammation was assessed by haematoxylin and eosin staining of lung sections **[49]**. Further, Glycrrhiza exhibits expectorant action **[50]**.

Shati:

Hedychium spicatum, commonly known as spiked ginger lily, is found in the entire Himalayan region. Rhizome contains about 4% of essential oil and its phytochemical investigations have shown the presence of a variety of terpenoids (monoterpenoids, sesquiterpenoids and diterpenoids). Traditionally, the rhizomes are used in the treatment of respiratory disorders, fevers, tranquilizer, hypotensive, antispasmodic, CNS depressant, analgesic, anti-inflammatory, antimicrobial, antioxidant, antifungal, pediculicidal and cytotoxic activities **[51]**.

Tulsi

Tulsi has many uses in Ayurveda including asthma and cough (Nadkarni‟s, 1954). It is an aromatic shrub in the basil family Lamiaceae (tribe ocimeae) that is thought to have originated in north central India and now grows native throughout the eastern world tropics. *Ocimum sanctum* L. is an erect, hairy perennial shrub popularly known as sacred basil or holy basil. A single-blind cross-over study undertaken to evaluate the bronchodilator effect of Capsules of *Ocimum sanctum* Linn (200 mg, twice daily) and it was found that *Ocimum sanctum* have a significant bronchodilator activity in mild and moderate cases of bronchial asthma **[52]**. Clinical trials conducted earlier in India, where the extract of tulsi leaves was administered for patients with viral hepatitis and encephalitis. Interestingly there was an increase in the survival and symptomatic improvement in the tulsi group when compared with controls

(Rajalakshmi, 1986). Another study proved improvement in respiratory parameters and relief from symptoms of asthma with three days of consumption of tulsi. (Sharma 1983). Another study results suggest that the crude aqueous extract of *O. sanctum* (leaf) possesses some biologically active principles that are antibacterial and immune-modulatory in nature **[53]**.

CONCLUSION

Ayurveda an alternative system of medicine; originated in India and are still broadly used among the Indian people. In addition, discovery of phyto-components of medicinal plants may be helpful for alleviate the infection (viral, bacterial etc.). It is a beautiful complement to Western world. Ayurveda main focus is to understand root causes of disease, and to treat those imbalances uniquely for each individual, whereas Western medicine primarily seeks to understand and treat symptoms. Classical public health measures, including isolation, quarantine, social distancing and community containment, along with above mentioned medicinal herbs can be used to curb the enemies of respiratory system including Covid-19. Herbal remedies are considered as the oldest forms of health care known to mankind on this earth.

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Declaration of competing interest

No conflicts of interest to declare.

Ethical approval

No ethical approval required.

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