**IJPSR (2021), Volume 12, Issue 1** **(Review Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 29 June 2010; received in revised form, 04 December 2020; accepted, 14 December 2020; published 01 January 2021

# COMBING THROUGH TRADITIONAL TEXTS TO PREVENT COVID-19 - A SCIENTIFIC APPROACH

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**Keywords:**

Covid-19, Ayurveda, Traditional Chinese Medicine (TCM), AYUSH, Immunity boosters, Prophylaxis

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**ABSTRACT:** The coronavirus pandemic caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), is unique and unprecedented in many respects and has challenged healthcare systems worldwide. Currently, there is no specific treatment or cure in the Western medicine system. Research is underway to develop effective vaccines and medications for the disease. In this scenario, the scientific community must think about Complementary and Alternative medicinal systems available worldwide. This review will present an overview of the coronavirus, including its history of origin, spread, and epidemiology, along with a comparative view of SARS-CoV, SARS-CoV-2, and MERS. An attempt was also made to highlight the role of traditional systems of medicine in preventing the coronavirus pandemic by providing an overview of the concept of the epidemic, its pathogenesis, and prevention strategies in two of the most popular systems of traditional medicine, namely, Traditional Chinese Medicine (TCM) and Ayurveda.

**INTRODUCTION:** In recent decades, the world has seen the existence of new viruses that pose serious threats to global health. In late December 2019, several patients in Wuhan, China, began reporting symptoms that resembled pneumonia. A new virus was identified that was initially called the new 2019 coronavirus (2019-nCoV), also known as Covid-19. The World Health Organization (WHO) eventually changed the name of the virus to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and identified it as a pandemic [1].

QUICK RESPONSE CODE

**DOI:**
10.13040/IJPSR.0975-8232.12(1).8-21

**This article can be accessed online on**
www.ijpsr.com

**DOI link:** http://dx.doi.org/10.13040/IJPSR.0975-8232.12(1).8-21

Coronavirus pandemic is a rapidly changing and evolving situation. WHO constantly monitors it and updates the available information on its spread, mortality, and morbidity [2]. The pandemic has drawn the world's attention to the immune system, the body's defence force against bacteria, viruses, and other disease-causing organisms that we touch, ingest and inhale every day. Along with research on the virology of SARS-CoV-2, understanding the fundamental physiological and immunological processes underlying the clinical manifestations of COVID-19 is vital to the identification and rational design of effective therapies [3].

Traditional medicine systems [TSM] have high potential possibilities to be used both for prevention and as a complementary treatment option for COVID-19. Lack of understanding of the differences and similarities between the theoretical

doctrines of these systems is the main obstacle to their convergence, apart from the other impediments in the discovery of herbal medicines. Bringing together the rich knowledge of different traditional systems of medicine can lead to new avenues in the herbal drug discovery process.

The expertise of systems of different ethnic origins would lead to knowledge sharing and increase understanding of different systems, and this may ultimately contribute to the integration and advancement of research on herbal medicines when accompanied by collaborative work of researchers from different countries. These futuristic goals can be achieved when one gains insight into the systems, principles, and stories and works on the common strengthening aspects among the various TSMs [2, 4].

Consistent with TCM's success in managing a contagious pandemic, it is logical and essential to explore how Ayurveda can help address the COVID-19 challenge. Indeed, now is the time to incorporate AYUSH systems to transform Indian healthcare and demonstrate the potential of AYUSH systems to address the challenge and restore health [5].

**History- Origin, Spread and Epidemiology:** The first case of coronavirus was reported as cold in 1960. In 1965, Tyrrell and Bynoe cultured a virus obtained from the respiratory tract of a child with the common cold. Culture electron microscopy revealed infectious bronchitis virus-like particles from chickens. Around the same time, Hamre and Procknow recovered a tissue culture, cytopathic agent, from medical students with colds that had similar or identical morphology. The prototype of the virus was called 229E.

McIntosh and colleagues also reported the recovery of various infectious agents from human respiratory tract bronchitis, the prototype of which was called OC43, using similar techniques. At the same time, mouse hepatitis virus and pig transmissible gastroenteritis virus showed the same morphology under electron microscopy. Shortly thereafter, the name coronavirus (the prefix corona indicating the crown like the appearance of the surface projections) was chosen to indicate this new genus.

As the number of animal CoVs grew rapidly, animal CoVs and HCoVs were initially divided into three groups through sequencing and antigenicity studies:

- Group 1, containing HCoV-229E, as well as numerous animal viruses;
- Group 2, containing closely related HCoV-OC43 plus animal, bovine CoV, and mouse hepatitis viruses and
- Group 3, included only avian virus related to infectious bronchitis virus [6, 7].

Human coronaviruses (HCoV) have long been considered negligible pathogens, causing "the common cold" in healthy people. However, in the 21st century, 2 highly pathogenic HCoVs: severe acute respiratory coronavirus syndrome (SARS-CoV) and the Middle East respiratory syndrome (MERS-CoV) emerged from animal reservoirs to cause global epidemics with morbidity and alarming mortality [8].

SARS was first identified in the Guangdong Province of the People's Republic of China in November 2002 and spread from there throughout the world. Through an independent sequence, it was discovered to be remotely related to previously characterized CoV. The SARS epidemic stimulated a rapid and intense response to public health coordinated by the World Health Organization (WHO) and, by July 2003, the transmission had ceased worldwide. Despite this effort, however, 8,096 probable cases occurred in 29 countries, with 774 deaths. With the SARS-CoV identification, the HCoV field has become much more active. HCoV-NL63, an alpha-coronavirus, representing a recently identified group I coronavirus group that includes NL and the New Haven coronavirus, have been identified worldwide. These viruses were associated with diseases of the upper and lower respiratory tract.

Another HCoV-HKU1 was found in Hong Kong in an adult with respiratory disease. These two new strains of HCoV were subsequently found worldwide and appear to have similar pathogenicity to that of HCoV-229E and HCoV-OC43, with the possible exception that NL63 was found more frequently in infants with croup [7, 9].

In 2012, another highly pathogenic beta-CoV exploded the species when Middle Eastern respiratory syndrome (MERS) was recognized, and MERS-CoV was identified in the sputum of a Saudi Arabian man who died of acute pneumonia and kidney failure. A sputum sample developed a cytopathic virus that, in sequence, proved to be a CoV, classified as a Betacoronavirus and closely related to two bats CoVs, namely HKU4 and HKU5. Unlike SARS-CoV, which spread rapidly throughout the world and was contained and eliminated in relatively short order, MERS smoked, characterized by sporadic zoonotic transmission and limited chains of human diffusion. The MERS-CoV caused explosive nosocomial transmission events, in some cases linked to a single super-spreader. According to the World Health Organization (WHO), in November 2019, the MERS-CoV caused a total of 2,494 cases and 858 deaths, most of them in Saudi Arabia. The natural reservoir of MERS-CoV is assumed to be a bat; however, human transmission events have been attributed primarily to an intermediate host, the dromedary camel [7, 8].

In December 2019, for the third time in as many decades, another new HCoV pathogen, the new 2019 coronavirus (2019-nCoV), was recognized in Wuhan, China, in people exposed to seafood or wet market and caused serious illness and death [8, 10]. Initially called the 2019 novel coronavirus (2019-nCoV), it was recently renamed by the International Committee on Virus Taxonomy as "coronavirus 2 of the severe acute respiratory syndrome" (SARS-CoV-2); the disease it causes has been called coronavirus disease 2019 (COVID-19). In the coming weeks, the virus spread from Wuhan to affect various provinces in China and, after a few months, is now present in 213 countries. As of April 29, 2020, there have been 2,995,758 confirmed cases worldwide and 204, 987 deaths have been recorded. The World Health Organization (WHO) described COVID-19 as a pandemic on March 11, 2020. Numerous pharmacological studies are being conducted with some positive results. However, since there are no vaccines available, the best way to fight the virus is with preventive methods [1, 11].

**Coronavirus Taxonomy:** Coronavirus is an enveloped positive-sense RNA virus characterized by stick-like spikes protruding from its surface [12]. The name "coronavirus", coined in 1968, derives from the "crown" or morphology similar to a crown observed for these viruses under the electron microscope. In 1975, the *Coronaviridae* family was established by the International Virus Taxonomy Committee [13].

The Nidovirales order consists of three families of RNA viruses, namely *Coronaviridae, Arteriviridae*, and *Roniviridae*. The *Coronaviridae* family is made up of two subfamilies, *Coronavirinae* and *Torovirinae*, the latter containing viruses that mainly cause enteric infections of horses, cows, pigs, cats, and goats. It is not yet known to cause human infection.

Members of the *Coronavirinae* subfamily are divided into four genera:

- Alpha coronavirus includes the human viruses HCoV-229E and HCoV-NL63 along with many animal viruses.
- Beta coronavirus includes the mouse hepatitis virus (MHV) prototype, the three human viruses HCoV-OC43, SARS-HCoV, and HCoV-HKU1 and coronavirus related to SARS, the coronavirus of the Middle East respiratory syndrome (MERS), along with a variety of animal coronaviruses.
- The Gamma coronavirus contains cetacean (whale) and bird viruses,
- The Delta coronavirus contains viruses isolated from pigs and birds [14].

**Structure of Coronavirus:** Coronaviruses are large, enveloped, positive-stranded RNA viruses [15]. All coronaviruses share a common morphology and have the largest genome among all RNA viruses, generally ranging from 27 to 32 kb [14]. The genome is packaged within a helical capsid formed by the nucleocapsid protein (N) and surrounded by an envelope. Associated with the viral envelope are at least three structural proteins: the membrane protein (M) and the envelope protein (E) are involved in the assembly of the virus, while the spike protein (S) mediates the entry of the virus into host cells. Some coronaviruses also encode a hemagglutinin esterase (HE) protein associated with the envelope.

Among these structural proteins, the peak forms large protrusions from the virus surface, giving coronaviruses the appearance of having crowns (hence their name; corona in Latin means crown). In addition to mediating the entry of the virus, the peak is a critical determinant of the viral host range and tissue tropism and an important inducer of the host's immune responses [15].

It is covered at the 5' end and polyadenylated at the 3' terminal and is contagious. Due to its size, the expression of individual genes occurs through a complex process by which groups of nested mRNAs are produced, all with the same 5' sequence. The mutation rates of RNA viruses are higher than DNA viruses, suggesting a more efficient adaptation process for survival. Extensive rearrangements may occur due to heterologous recombination of RNA. **Fig. 1** summarizes the structure of the coronavirus and the function of the structural proteins [14, 16].

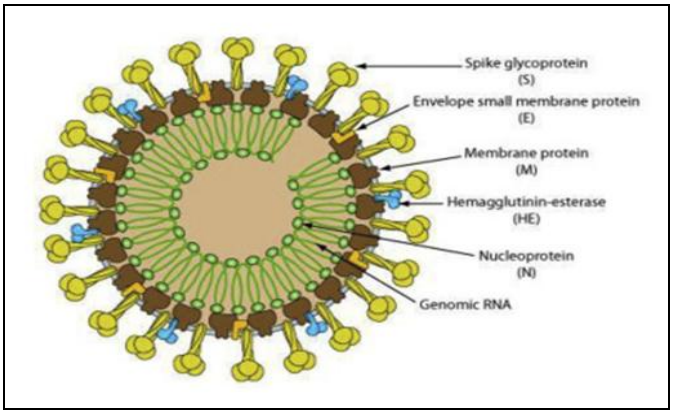


**FIG. 1: MODEL OF CORONAVIRUS VIRION STRUCTURE, SHOWING THE SUPERCOILING OF THE VIRAL NUCLEOCAPSID UNDER THE ENVELOPE [17]**

**TABLE 1: COMPARISON OF EPIDEMIOLOGICAL CHARACTERISTICS AMONG SARS-COV, SARS-COV-2, AND MERS-COV. [3, 10, 14, 15]**

| S. no. | Features | SARS-CoV-2 | SARS-CoV | MERS-CoV |
|---|---|---|---|---|
| 1 | Estimated Reproduction Number | 2.68 | 2-5 | >1 |
| 2 | Host of virus | Natural - Bats Intermediate - Pangolins Terminal - Humans | Natural - Chinese horseshoe Intermediate - Masked palm civets Terminal - Humans | Natural - Bats Intermediate - Dromedary camels Terminal - Humans |
| 3 | Transmission mode | Human-to-human through fomites, physical contact, aerosol droplets, nosocomial and zoonotic transmission | Human-to-human through aerosol droplets, opportunistic airborne, nosocomial, faecal-oral, and zoonotic transmission | Respiratory, zoonotic, nosocomial, limited human-to-human transmission and aerosol transmission |
| 4 | Incubation period | 6.4 days (range: 0-24 days) | 4.6 days | 5.2 days |
| 5 | Target cell receptors | SARS-CoV-2 bind to their target cells through angiotensin-converting enzyme 2 (ACE2), which is expressed in the lungs. | The predominant human receptor for SARS is S-glycoprotein human ACE2, found primarily in the lower respiratory tract. | The cellular receptor for MERS-CoVis CD26, a dipeptylpeptidase, is involved in regulation of cytokine responses and glucose metabolism. |
| 6 | Course of Illness | 14-21 days | 6-14 days | 7-11 days |
| 7 | Symptoms | **Mild:** An upper respiratory tract viral infection which includes dry cough, mild fever, nasal congestion, sore throat, headache, muscle pain, malaise and dyspnoea. **Moderate:** Cough, shortness of breath, and tachypnoea. **Severe:** Severe pneumonia, Acute respiratory distress syndrome (ARDS), sepsis, or septic shock, RNAaemia, cardiac injury, septic shock, or multiple organ dysfunctions. | Fever, cough, dyspnoea, and occasionally watery diarrhoea. | Severe atypical pneumonia with evident differences. Prominent gastrointestinal symptoms, acute kidney failure. In severe cases, the symptoms include severe pneumonia accompanied by acute respiratory distress syndrome (ARDS), septic shock, and multi-organ failure preceding death. |
| 8 | Epidemiology | Adverse outcomes and death are more common in the elderly and those with underlying co- | Of infected patients, 20% to 30% required mechanical ventilation, and 10% died, | MERS necessitates mechanical ventilation in 50% to 89% of patients and has a |

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| | | morbidities (50–75% of fatal cases). Much still needs to be learned about this infection. | with higher fatality rates in older patients and those with medical comorbidities. | case fatality rate of 36%. |
| 9 | Diagnosis | The US CDC has developed criteria for persons under investigation (PUI).<br>If a person is deemed a PUI, immediate prevention and infection control measures are undertaken.<br>Epidemiological factors such as travel history, close contact to an infected area within 14 days of symptom onset are used to assess the requirement of testing. The WHO recommends collecting samples from both the upper and lower respiratory tracts. These samples are then assessed for viral RNA using polymerase chain reaction (PCR). | A combination of serological and RT-PCR assays was used to detect and confirm infection.<br>RT-PCR was performed using defined primers, usually derived from the viral N sequence. | MERS-CoV RNA can be detected in blood, urine, and stool as well as in respiratory aspirates by RT-PCR. |
| 10 | Treatment | Isolation remains the most effective measure for the containment of COVID-19. No specific anti-viral medication or vaccine is currently available. Therefore, the treatment includes symptomatic care and oxygen therapy. Patients with mild infections require early supportive management. This can be achieved with the use of acetaminophen, external cooling, oxygen therapy, nutritional supplements, and anti-bacterial therapy | For the treatment of SARS, several drugs were tried clinically with no clear benefit, and since then a number of drugs including protease inhibitors used in HIV have been investigated for efficacy *in vitro.*<br>However, the genetic variability of these viruses, and poor immunity after natural infection, indicate the challenges involved. | To date, treatment has been focused on supportive therapy in the absence of any specific intervention measures. The use of antimicrobials to minimize the risk of opportunistic infection has been employed. Attempts to reverse the progression of respiratory distress and fibrosis through the use of corticosteroids have been unsuccessful. |
| 11 | Prevention | • Preventive measures must focus on optimizing infection control protocols, self-isolation, and patient isolation during the provision of clinical care.<br>• The WHO has advised against close contact with patients, farm animals, and wild animals.<br>• Patients and the general public must cover coughs and sneezes to help prevent aerosol transmission.<br>• Frequent hand washing with soap & water is also required or hand sanitizers can also be used.<br>• Immuno-compromised individuals are advised to avoid public gatherings.<br>• Emergency medicine departments must apply strict hygiene measures for the control of infections.<br>• Healthcare personnel must use personal protective equipment [PPE kits] such as N95 masks, FFP3 masks, gowns, eye protection & gloves. | Prevention has been based on careful identification and isolation of cases and contacts until ten days after symptoms had cleared, combined with investigation of particular environmental circumstances responsible for clusters of cases. This approach successfully stopped the outbreak within 4 months of the start of its global spread. | Prevention of infection involves avoiding exposure to camels, including consuming raw camel milk and inadequately cooked meat, particularly for those with diabetes, chronic lung disease, renal impairment, the immune compromised, or the elderly. Confirmed cases should be isolated to avoid nosocomial spread. |

**Current Scenario of Corona in India:** India witnesses numerous viral epidemics every year. Some of these occur regularly during the months after the rain and remain until the beginning of

winter, while others appear every two to three years. It doesn't matter how and when they appear; they always carry a bag full of misfortunes for their host and abandon them from their lives, money, and strength to severely disabled levels [20].

First reported as an outbreak in China in late December 2019, COVID-19 is now affecting 196 countries and territories around the world. India reported the first confirmed case of coronavirus infection on January 30, 2020, in the state of Kerala. The patient had a history of travel from Wuhan, China.

Thousands of suspected cases have been tested, resulting in over 42,000 confirmed coronavirus cases in India. As of June 26, 2020, the Ministry of Health and Family Welfare has confirmed a total of 490,401 cases, 285,636 recoveries (including 1 migration), and 15,301 deaths in the country. The regions with the most cases include Maharashtra, Delhi, Andhra Pradesh, Uttar Pradesh, Rajasthan, West Bengal, and Tamil Nadu [21, 22].

The Indian government has responded more rigorously than other countries in addressing the pandemic. With the rapid action of the government, emergency policies have been declared that make emergency investments in medical care, fiscal measures, investments in vaccine research and active response to the situation. The World Bank praised the rapid deployment of launched a smartphone app called AarogyaSetu to help "track contacts and contain the spread" of the COVID-19 pandemic across the nation by the Ministry of Electronics and Information Technology to combat the pandemic [23].

On April 14, 2020, Prime Minister Narendra Modi extended the national lockdown until May 3, 2020, after taking into account the recent state of the coronavirus epidemic in India. In his address, he gave "Saptapadi," 7 Mantra, or key guidelines and requested all citizens to follow these seven guidelines to contain the spread of the contagious virus in a more inclusive way. He concluded the speech with the thought "Vayam Rashtre Jagrutyaa", in the sense that ‘we will all keep our eternal nation awake’ [24].

Of these, the mantra of strengthening immunity in accordance with the AYUSH guidelines has attracted a lot of attention and highlights the importance of traditional systems in the "New India - healthy India" vision and, according to the current scenario, " Corona-free- India" .

**Role of Traditional Chinese Medicine [TCM] in Treatment of Covid-19:** TCM takes a holistic approach to treat the individual with personalized treatment based on the concept of "syndrome differentiation". The basic theories of traditional Chinese medicine were derived from the Chinese Yin-Yang and Five Elements philosophy. It involves balancing the various substances, functions, and factors that makeup and govern the body, including fluids, blood, Qi temperature, digestive and respiratory functions [25]. TCM emphasizes the importance of preventive treatment, which means if any of these balancing factors is weak, they try to strengthen it before a problem arises [26]. TCM has thousands of years of experience regulating the body and improving resistance to epidemic diseases, with unique knowledge and experience in prevention and control. For mild and common patients, early intervention can effectively prevent the disease from becoming a serious and critical illness, and in severe cases, it has gained time to save them by improving symptoms [27].

**Concept of Epidemic in TCM:** In TCM, the term "plague" is used to indicate an infectious disease. The ancient TCM book Huang Di Nei Jing (Inner Canon of Huangdi) recorded that the plague, with symptoms familiar to modern times, could be transmitted from man to man. Shang Han Za Bing Lun (Treatise on Cold Damage Diseases) written by Zhang Zhongjing, Wen Yi Lun (Theory of Plague), and Wen Re Lun (Theory of Warm) written by Wu Youke have recorded therapies and formulas used to treat the plague. TCM has provided important therapies for SARS-CoV, influenza A H1N1, influenza A H7N9, and the Ebola virus, which are significant too. As a result, TCM is becoming an important means of developing therapies for treatment of COVID-19 [28].

**Pathogenesis of COVID-19 in TCM Theory:** The ancient Chinese believed that man is an integral part of nature. According to this theory, environmental factors are critical elements in the pathogenesis of plague. Just like during the winter

of 2019, a large amount of rain fell in Wuhan, which caused a humid environment and increased the risk of virus infection. This observation implies that a Chinese herb that promotes moisture removal (a type of disease product in traditional Chinese medicine theory) can be used in the treatment of COVID-19 [28].

**TCM Treatments for COVID-19 Classical Prescription:** The National Administration of Traditional Chinese Medicine (NATCM) screened "Qing FeiPai Du Tang" (QFPDT) for the treatment of novel coronavirus pneumonia (NCP), which was mainly derived from 4 different classical prescriptions originated from Shang Han Lun and recommended nationwide *via* State Administrations also. The decoction includes Mahuang (*Ephedrae herba*), Shigao (*Gypsum fibrosum*), Banxia (*Pinelliae rhizoma*), Zhishi (*Aurantii fructus* immaturus), Shengjiang (*Zingiberis rhizome recens*), that was derived from a modification of the integration of Ma Xing Gan Shi, She Gan Ma Huang, Xiao Chai Hu, and Wu Ling San decoctions in Shang Han Za Bing Lun (Treatise on Cold Damage Diseases). This recommendation was based on previous experience with SARS and the cold and wet weather in Wuhan and in clinical trials also, the response rate was 90% among 214 cases [28, 29].

TCM has been officially included in the Chinese Guidelines on the diagnosis and treatment of COVID-19. This is exceptionally important in noting that specific TCM wards have been set-up, and designated hospitals have been established that used a variety of Chinese medicines using their own principle of syndrome differentiation in combination with treatment using Western medicine. The total number of confirmed cases treated by TCM is reported to be at least 60, 107.5.

The therapeutic practice of COVID-19 has shown that early intervention of TCM is an important way to improve the cure rate, reduce the course of the disease, delay the progression of the disease, and reduce the mortality rate.

As the prevention and control measures of COVID-19 fully reflect the ideology of "preventive treatment of diseases" as this not only works to inhibit the virus but could block infection, regulate the immune response, cut the inflammatory storm, and promote body repair. In addition to this the preventive measures also include psychology, sports, diet, drugs, *etc.* [27]

**Role of Ayurveda in Treatment of Covid-19:** Ayurveda is one of the most recognized traditional medicine systems that has survived and flourished from centuries until today. With the enormous knowledge of nature-based medicine, the relationship between the constitution and the function of the human body with nature and the elements of the universe that act in coordination and influence living beings, this system will continue to prosper in the centuries to come [4].

Ayurveda deals with all aspects of life, including the environment in which we live. It is based on the relationship between the mother-nature and the human being. Nature has a significant impact on health and the creation of disease. Every time an effort is made to disturb nature, nature tends to destroy it, leading to the breakdown of air, water, land, and climate, ultimately leading to the massive destruction of people and wealth [30].

**Concept of Epidemic in Ayurveda:** In Ayurveda, the epidemics is discussed under the term of Janapadodhwamsa (made up of "Janapada" which means community, nation, people, an empire or people belonging to a country and "Dhwamsa" which means perish or destruction), where it is said that due to an unbalanced Vayu (air), Jala (water), Desha (habitat) and Kala (seasons), certain diseases arise that kill the mass of people. These diseases can be considered airborne or waterborne infectious diseases or the diseases that occur due to soil contamination or conditions resulting from seasonal hazards.

Furthermore, under the title of Adidaivika Bala Pravritta Vyadhi (diseases resulting from causes that cannot be controlled by human intelligence), terms such as Sansargaja and Upsragaja are mentioned that indicate that there are some diseases such as contagious or certain diseases that can be transmitted directly from infected people to healthy people by respiration/airway. According to the suggestions available in Ayurveda, the management of these infectious diseases can be preventive or curative [30, 31].

**Pathogenesis of COVID-19 in Terms of Ayurveda:** During all kinds of epidemics, this is a common observation to see some people safe from the morbidities that have seriously affected others. Science tries to solve this mystery through innate immunity that prepares the body to face common pathogens that cause diseases. Ayurveda explores the problem by identifying immunity and defence through three distinct strength influencers: sahaja (natural, innate), kalaja (time and age dependent), and yuktikrita (induced, derived). The way in which a person responds when exposed to a pathology that causes phenomena depends on the net strength of the body in terms of these three different categories. Ayurveda recommends methods to improve defensive strength through epigenetic mechanisms that influence the regulation of gene function. There are numerous mechanisms based on drugs, food, behavior, and lifestyle that strongly influence genetic functions [31].

**Advisory Issued by Ayush Ministry for Prophylaxis of Covid-19:** Ayurveda, Yoga, Naturopathy, Unani, Siddha, Sowa Rigpa, Homeopathy collectively covered by the Ministry of AYUSH, represent a pluralistic and integrative scheme of health services. The 2017 National Health Policy (NHP) has strongly supported the integration of AYUSH's potential within a pluralistic system of comprehensive health care. It highlights the importance of scientific evidence for the safety and efficacy of AYUSH medications and practices [32]. Almost all the affected countries have established their own national monitoring cell to monitor the situation and manage it through their own resources. There are advisories issued from health departments about possible preventive measures of the disease.

In India, along with the advisory issued by the health authorities regarding the prevention and management of COVID-19, the AYUSH Ministry also issued an advisory regarding the use of certain indigenous medicines to improve the immunity status with particular reference to respiratory health and, therefore, can prove to be a preventive potential in the current epidemic [20]. Basically, the advisory does not claim to be treatment for COVID 19 and also does not contain any type of medication, but seeks to modify the lifestyle of people with a combination of healthy living and yoga. The guidelines are based on the measures recommended by the eminent Vaidya from across the country supported by various Ayurvedic literature and scientific publications. In the table below we have tried to find out the scientific evidence of the theories, processes and various ingredients prescribed in the advisory in terms of effect on respiratory tract, cough and immunity.

**TABLE 2: RECOMMENDED MEASURES IN AYUSH ADVISORY AND THEIR SCIENTIFIC EVIDENCES**

| S. no. | Recommended Measure | Scientific evidence for Recommendation |
|---|---|---|
| I | | **General Measures** |
| 1 | Drink warm water throughout the day. | ✓ Ushnodaka (warm water) increases the digestive power, alleviates Kapahavata and Pitta.<br>✓ It is good for throat and cleanses the urinary system.<br>✓ It is useful in Kapha, Medas, Vata, Aama,Swasa, Kasa, Trishna and softens the channels.<br>✓ Deepana property of warm water causes expansion of srotas carrying digestive juices, resulting in increased flow and proper digestion.<br>✓ Deeper penetration level leads to hydrated tissues making it easier for body to flush out toxins & impurities.[33] |
| 2 | Spices like Haldi (Turmeric), Jeera (Cumin), Dhaniya (Coriander) and Lahsun (Garlic) are recommended in cooking. | **HALDI:**<br>✓ In Ayurvedic medicine, turmeric is a well-documented treatment for various respiratory conditions (e.g., asthma, bronchial hyperactivity, and allergy), as well as for liver disorders, anorexia, rheumatism, diabetic wounds, runny nose, cough, and sinusitis.<br>✓ In Traditional Chinese Medicine, it is used to treat diseases associated with abdominal pain.<br>✓ Unani practitioners also use turmeric to expel phlegm or kapha, as well as to open blood vessels in order to improve blood circulation.<br>✓ Turmeric volatile oil is effective against disorders of the respiratory tract. The volatile oil is active in removing sputum, relieving cough, and preventing asthma. Thus, turmeric volatile oil may be an efficacious drug in the treatment of respiratory diseases.[34] |

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|---|---|---|
| | | **JEERA:**<br>✓ Cumin is rich in iron and has a considerable amount of vitamin-C & A, which are essential for better immunity and keeps infections away. Thus, it is effective in the cold.<br>✓ It also prevents cough formation in the respiratory system as it is supposed to be hot and dries up the excess mucus.<br>✓ Presence of caffeine (the stimulating agent), and abundant aromatic essential oils (the disinfectants) make cumin an ideal decongestive for those suffering from respiratory disorders such as Asthma, Bronchitis, etc.<br>✓ Antiseptic, antiviral &disinfectant properties of cumin can help fight flu by boosting the immune system.[35]<br>**DHANIYA:**<br>✓ Used externally as well as internally in various disorders such as headache, conjunctivitis, nasal drops and is useful in elevating the disorders of various organ systems (CNS, Digestive and Urinary system).<br>✓ In Respiratory system**,** it is useful in cough and dyspnoea (as kaphaghana).<br>✓ Coriander is also well known for its antioxidant, anti-diabetic, anti-mutagenic, antianxiety and antimicrobial activity along with analgesic and hormone balancing effect that promotes its use in foods due to numerous health benefits and its protective effect to preserve the food for longer period.[36,37]<br>**GARLIC:**<br>✓ Garlic is reported to possess abundant sulfur containing amino acids and other compounds that seem to initiate and stimulate increased activity in the immune system by making macrophages or killer cells more active.<br>✓ In addition to germanium, garlic has been reported to contain thiamin, selenium, sulfur, niacin & phosphorus. These also help in boosting the immune system.<br>✓ In India and Europe, it is used to treat asthma, common colds and hay fever. It is used both asfood flavouring and as a traditional medicine.<br>✓ In Africa, particularly in Nigeria, it is used to treat certain conditions such as abdominal discomfort, diarrhoea and respiratory tract infections.[38] |
| II | | **Ayurvedic Immunity Promoting Measures** |
| 1 | Take Chyavanprash 10gm (1tsf) in the morning. Diabetics should take sugar free Chyavanprash. | ✓ Chyawanprash is a potent antioxidant paste, prepared through the synergistic blending of around 50 herbs and spices. Typically, CP includes four classes of herbal drugs:<br>• The *Dashmula* class (ten roots);<br>• The *Chaturjata* class (four aromatic plants);<br>• *Ashtavarga* (threatened medicinal herbs from the Northwest Himalayas, which are not commercially available in the modern era);<br>• A general class (materials not belonging to the former classes).[39]<br>✓ *Pippali, Kantakari, Kakdashingi, bhumyaamalaki, vasaka, pushkarmool, prishniparni, arni, shalparni, til oil* and *amalaki*help in nourishing the respiratory system.<br>✓ It alleviates cough, asthama and bronchospasm of seasonal or non-seasonal origin, thereby strengthening the respiratory system. Also used in respiratory infections, common cold and tuberculosis.<br>✓ Chyawanprash strengthens immunity and facilitates healing process. The ingredients possess antioxidant, anticarcinogenic and antimutagenic activities.[40] |
| 2 | Drink herbal tea / decoction (Kadha) made from Tulsi (Basil), Dalchini (Cinnamon), Kalimirch (Black pepper), Shunthi (Dry Ginger) and Munakka (Raisin) - once or twice a day. Add jaggery (natural sugar) and / or fresh lemon juice to your taste, if needed. | **TULSI:**<br>✓ The studies reveal that tulsi has a unique combination of actions that include: Antimicrobial (including antibacterial, antiviral, antifungal, antiprotozoal, antimalarial, anthelmintic), anti-oxidant, anti-inflammatory, chemopreventive, analgesic, anti-pyretic, anti-allergic, immunomodulatory, anti-asthmatic, antitussive, etc. activities.<br>✓ Tulsi has also been shown to boost defences against infective threats by enhancing immune responses in non-stressed and stressed animals and healthy humans.[41]<br>**CINNAMON:**<br>✓ Cinnamon has been known as one of the most common spices and food flavoring additives since ancient times.<br>✓ More recently, scientific reports showed that cinnamon has potent |

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| | | neuroprotective, hepatoprotective, cardioprotective, and gastroprotective effects due to its potent antioxidant and anti-inflammatory properties.<br>✓ It possesses potent antibacterial, antifungal, antitermitic, larvicidal, nematicidal, and insecticidal properties.<br>✓ Cinnamon essential oil could also be used in aromatherapy.[42]<br>**BLACK PEPPER:**<br>✓ In Ayurvedic practices, pepper is added to tonics for treating cold and cough. It also provides relief from sinusitis and nasal congestion.<br>✓ It has an expectorant property that helps break up the mucus and phlegm depositions in the respiratory tract. Its natural irritant quality helps to expel these loosened materials through the act of sneezing or coughing, which eliminates the material from the body and helps to recover from infection or illness that caused the deposition in the first place.<br>✓ Pepper is a good treatment for respiratory conditions due to its properties as an expectorant, as well as its strong anti-inflammatory properties.[43]<br>**DRY GINGER:**<br>✓ Ginger can be used for throat infections and to relieve congestion in sinusitis. It reduces fever in colds and flu and suppresses a dry, irritating cough in laryngitis by increasing human bronchial smooth muscle cell (BSMC) migration and proliferation and reversing phthalate ester-mediated airway remodeling.<br>✓ Ginger has been found very effective against the flu virus, due to its warm and bitter property. Several sesquiterpenes, but especially beta-sesquiphellandrene, isolated from ginger hasalso been shown to have antirhinoviral activity in vitro.<br>✓ Denyer also showed that shogaol and zingerone strongly inhibited Salmonella typhi, Vibrio cholerae and Trichophytonviolaceum.<br>✓ Ginger also acts as an expectorant. Ginger juice with honey is a common home remedy for cough. Dried ginger has been found very effective against Rhinovirus.[44]<br>**MUNAKKA:**<br>✓ Munakka is known as the "Tree of Life" because of its regenerative ability.<br>✓ Munakka is effective in management of dry cough due to its cough suppressant activity. It also has a soothing property that reduces irritation in the throat. This is due to its Snigdha (oily) nature [45]<br>**JAGGERY:**<br>✓ Jaggery has anti-allergic properties that keep away from the risk of wheezing and coughing.<br>✓ It is exceptional for breathing disorders. Its anti-allergic properties detox and relax the respiratory muscles [46]<br>**LEMON:**<br>✓ Lemon is used to treat infections, and it also has antioxidant and astringent properties.<br>✓ Michelle reported that lemons are rich in vitamin C and flavonoids that work in conjunction for a serious punch against infection. This effectively aids in reducing the onset of the cold or catarrh.<br>✓ Therefore, drinking lemon juice is very good for treating common colds and flu; Lemon juice used as a gargle or oral wash also helps bring relief from sore throats, tonsillitis and can help alleviate gingivitis, as well as canker sores in a person.<br>✓ Citric acid makes up about 5-6% of the juice and tissues of lemons and limes. At this percentage, with its low pH, it breaks down the cell membrane of bacteria, similar to the effects of heating.[47] |
| 3 | Golden Milk- Half tea spoon Haldi (turmeric) powder in 150 ml hot milk - once or twice a day. | ✓ Drinking turmeric milk helps boost immunity as the compound present in turmeric, curcumin is rich in antibacterial and antifungal properties. Thus, it helps in fighting infections and boosting our immunity.<br>✓ It is also used to fight respiratory issues as well and is also a remedy for cold and cough. It helps in relieving the symptoms of asthma, bronchitis, sinus and eliminates pathogen from the respiratory system.<br>✓ Being rich in anti-microbial properties, turmeric milk helps in fighting against bacterial infections.[48] |
| III | | **Simple Ayurvedic Procedures** |

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| 1 | **Nasal application** - Apply sesame oil/coconut oil or Ghee in both the nostrils (*Pratimarsh Nasya*) in the morning and evening. | This simple procedure of *Pratimarsha Nasya* keeps the sensory faculties healthy, prevents nasal respiratory allergies, improves eye health, delays greying of hairs, prevents deafness and strengthens the denture, neck and temporomandibular joints, face muscles, relieve fatigue, and alleviate *Vata Dosha*.[49] |
| 2 | **Oil pulling therapy**- Take 1 tablespoon sesame or coconut oil in the mouth. Do not drink; swish in the mouth for 2 to 3 minutes and spit it off followed by warm water rinse. This can be done once or twice a day. | ✓ Oil pulling: It is an ancient ayurvedic therapy for maintaining oral hygiene. Ayurveda hypothesizes that the tongue is connected to various organs such as kidneys, heart, lungs, small intestine, spine, etc.<br>✓ It is believed to help in the excretion of toxic heavy metals by saliva. The process activates salivary enzymes, which absorb toxins such as chemical toxins, bacterial toxins and environmental toxins from the blood and are removed from the body through the tongue. Thus, it detoxifies and purifies the entire human body.<br>✓ It generates antioxidants which damage the cell wall of microorganisms and kill them. It is also of help to resolve symptoms of dry mouth/throat and chapped lips, sore throat, dry face, impaired vision, taste loss and anorexia.<br>✓ Coconut oil has antimicrobial activity. It also has anti-septic properties and can be safely used as emollient and moisturizer. It is better than chlorhexidine as it does not have adverse effects such as brown staining and altered taste sensation.<br>✓ Sesame oil contains sesamin, sesamolin and sesaminol and has detoxification, antioxidant, and antibiotic actions. It also prevents lipid peroxidation. Also cost of sesame oil is 5–6 times cheaper than chlorhexidine.[50] |
| IV | | **During dry cough / sore throat** |
| 1 | Steam inhalation with fresh Pudina (Mint) leaves or Ajwain (Caraway seeds) can be practiced once in a day. | **PUDINA:**<br>✓ The aromatic ayurvedic herb is a natural coolant, with a sweet and pungent aftertaste. It has the quality to pacify all the three doshas and chiefly manages the Pitta dosha.<br>✓ Regular intake of pudina leaves is highly recommended for asthmatic patients, as it acts as a good relaxant and eases chest congestion.<br>✓ The potent anti-inflammatory properties of mint leaves are well-known to alleviate congestion of the throat, bronchi and lungs and provide relief from respiratory problems like asthma and cold.<br>✓ The cooling properties of mint leaves helps to soothe irritated nose, throat and provides relief from sore throat and cough.[51]<br>**AJWAIN:**<br>✓ One of the therapeutic effects of Ajwain is its effect on the respiratory system. This plant is used as antiasthma and antidyspnea in traditional medicine. In this context, multiple studies have been carried out.<br>✓ The existence of α-pinene, an essential oil of this plant showed anticholinergic activity, antitussive effects, bronchodilatory effect, and relaxant effect on tracheal smooth muscles.<br>✓ C. copticum seeds have various important medicinal properties such as antipyretic, antitussive, and antispasmodic and cardiovasodilator, respiratory, antiparasitic, and antimicrobial effects.[52] |
| 2 | Lavang (Clove) powder mixed with natural sugar / honey can be taken 2-3 times a day in case of cough or throat irritation. | ✓ Clove oil clears the respiratory passages, acting as an expectorant for treating many upper-respiratory conditions including colds, bronchitis, sinus conditions, cough and asthma.<br>✓ Clove's antiviral and cleansing properties purify the body, augmenting our resistance to disease.<br>✓ Cloves have powerful medicinal properties. They are stimulating and have antibacterial, antiviral, antifungal natural anesthetic, and antiseptic properties.<br>✓ It also helps in reliving the inflammation of pharynx. Clove oil when mixed with honey, gives the amazing effect of recurring cough.<br>✓ Aromatherapy is the best way to use cloves as a respiratory aid. Make clove tea and breathe in the aroma from the hot tea. The aromatic clove oil, when inhaled, can help relieve certain respiratory conditions like coughs, colds, asthma, bronchitis and sinusitis.[53] |

Along with these, the ministry also recommended the daily practice of Yogasana, Pranayama, and meditation for at least 30 minutes. With pranayama, we can cleanse our pranavahasrotas, our respiratory system, and this will give us an energy boost so that we can keep the virus away. Yoga practices have several health benefits in that it:

- Improves muscle strength and flexibility of the body,
- Promotes and improves respiratory and cardiovascular function,
- Promotes treatment and recovery of addictions.
- Reduces stress, anxiety, depression and chronic pain,
- Improves sleep patterns and improve general well-being and quality of life.

Regular yoga practice promotes strength, endurance, flexibility, and facilitates the characteristics of friendship, compassion, and increased self-control, while cultivating a sense of calm and well-being. Stress has a negative impact on the immune system, and prolonged exposure increases susceptibility to illness and leads to physical and mental health problems such as anxiety and depression. Practicing yoga and meditation as a means to manage and alleviate acute and chronic stress helps people overcome other comorbidities associated with the disease and leads to a better quality of life [54, 55.]

**Recent Survey by Ayush Department:** The AYUSH Ministry recently conducted a sample survey of people who came into contact with Covid-19 patients and were quarantined with the objective to study the effectiveness of Ayurveda and homeopathy in Corona prophylaxis. At a press conference on May 4, 2020, the AYUSH ministry showed that the survey involved 6,210 people, of whom around 3,585 opted for Ayurvedic treatment and the remaining for Homeopathic one.

The treatment with Ayurvedic medicine included Amrita Peya, and ShamshamVati and Homeopathic medicine included *Arsenicum album* 30. Volunteers who chose these treatments were found negative after taking the prescribed course during the quarantine period. Of these 6,210 volunteers, only 11 tested positive for COVID after three days due to the end of their quarantine period, while the dose should ideally continue for seven days.

These volunteers were also cured after being administered with the above treatment for 7 days. This experiment was carried out in April 2020 [56].

**The way forward in search of Treatment for Covid-19 Through Ayurvedic Medicines:** The Centre has launched clinical research studies on Ayurveda interventions as an add-on to standard care to Covid-19 situation and decided to initiate "population-based studies' to analyze the impact of Ayurvedic interventions in the prevention of infection in a high-risk population. The four interventions are Ashwagandha, Yashtimadhu, Guduchi Pippali, and a polyherbal formulation. Besides, the ministry has developed the AyushSanjivani mobile app for generating data of a large population with a target of 5 million people [57].

**CONCLUSION:** The strength of traditional health care lies in maintaining health, in the preventive and promotional foundations, and not only in the care potential limited to a few hundred herbs and formulations. In emerging viral diseases where scientific knowledge is poor, vigilant observation can help prepare the plan and control future outbreaks. Additionally, early detection can help quickly implement effective measures, which are the key to reducing the risk of disastrous spread. Practice physical distancing and avoiding unnecessary exposure; this will give additional benefits.

**ACKNOWLEDGEMENT:** None

**CONFLICTS OF INTEREST:** None

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**How to cite this article:**
Agarwal P and Goyal A: Combing through traditional texts to prevent covid-19 - a scientific approach. Int J Pharm Sci & Res 2021; 12(1): 8-21. doi: 10.13040/IJPSR.0975-8232.12(1).8-21.