



Indian Journal of Traditional Knowledge
Vol. 19 (Suppl), December 2020, pp S 95-S 102



Emergence of Severe Acute Respiratory Syndrome (SARS) COVID-19 and approach of AYUSH systems of medicine towards its prevention and management

A Mastan^{*a,+}, A Tripathi^b, S K Rai^c, V Pai^d, L Venkatachalam^e

^aDepartment of Unani, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

^bDepartment of Homoeopathy, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

^cDepartment of Ayurveda, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

^dDepartment of Yoga & Naturopathy, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

^eDepartment of Siddha, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

E-mail: ⁺dradnanmastan@aiimsraipur.edu.in

Received 13 August 2020; revised 18 September 2020

SARS-CoV-2/novel coronavirus is a fresh virus strain that was first detected in the city of Wuhan located at Hubei province of China in December, 2019. Within a couple of months the virus has spread rapidly to different geographical regions through human transmission leading to serious disease burden worldwide. Although research is under progress to develop effective vaccine and drugs for the disease, a unified approach between conventional and traditional medicine system may prove to be beneficial in early prevention and management of the disease. Joint efforts are being put up at global scientific community level to enhance the research on advancement of meticulous diagnostics, antiviral measures and finally leading to development of an effective vaccine against the novel coronavirus. Some basic and safe measures from AYUSH systems of medicine have also been advocated for prophylaxis and treatment of COVID-19 which can be used independently or with integrated approach. The rationale of this review paper is to provide the details regarding disease spectrum, modes of transmission, social & economic consequences, and role of AYUSH systems of medicine in prevention and management of COVID-19. Based on the signs and symptoms of COVID-19, list of herbs and drugs of AYUSH systems of medicine were also searched and are being reported here.

Keywords: AYUSH systems of medicine, Coronavirus, COVID-19, SARS-CoV-2, Unani Medicine

IPC Code: Int. Cl.²⁰: : A61K 9/00, A61P 37/02, A61K 45/06

There has always been threat of tackling emerging infections because of arrival of new viral infections or reoccurrence of viral infections, may be due to increasing population, poverty, malnutrition, environmental and global changes, misuse of antibiotics or prolonged usage of immunosuppressant agents, or surge in drug resistant microbes. An emerging infection is an infection that has either recently occurred in a general population or had existed before, but its incidence is on the rise on a faster pace. The recent outbreak of coronavirus infection has startled medical field.

The novel corona virus (SARS-CoV-2) which caused the Coronavirus disease 2019 (COVID-19) pandemic was first found in Wuhan, China on December 31, 2019^(ref. 1). WHO stressed on the dire need to make global endeavors for diagnosing and better comprehending COVID-19 and to diminish the danger

of further worldwide spread by pronouncing the pandemic as Public Health Emergency of International Concern (PHEIC).

In this review, the emergence, disease spectrum, modes of transmission, current status, and social impact of the SARS-CoV-2 infection on world map has been discussed. A plausible way to its prophylaxis and management through AYUSH systems of medicine has also been presented. This paper may be useful in better management of the current pandemic and its further escalation.

Coronavirus disease 2019 (COVID-19)

Causative agent & its origin

There are 39 species of coronaviruses, coming under the family coronaviridae, suborder cornidovirineae and order nidovirales². Most of the species are enzootic and only a small number of species can infect humans³. Currently, seven human CoVs (HCoVs)

*Corresponding author

have been identified. Human coronaviruses are mainly linked with a range of mild to moderate upper respiratory tract disorders including common cold.

Exact origin of the virus is still a mystery, to medical investigators around the world. However, it is believed that SARS-CoV-2 was introduced to humans by an intermediary animal species and then the human-to-human transmission was recorded. The WHO, on February 11, 2020, officially announced the viral disease as COVID-19^(refs 4,5). The coronavirus Study Group of the International Committee on Taxonomy of Viruses termed the new microbe as SARS-CoV-2^(ref. 6). The SARS-CoV-1 was detected in 2002. During its course of transmission from 2002 to 2003, a total of 774 deaths were recorded out of the 8000+ infective cases spreading across 37 countries⁷.

Disease spectrum

The COVID-19 manifests gradually over an incubation period of around 14 days. During this time the virus multiplies in the upper and lower respiratory tract, forming lesions⁸. Researchers in China mentioned the average incubation period of 5.2 days⁹. The common symptoms of infection include high fever, dry cough, sneezing, fatigue, muscle pain, sore throat, diarrhea, anosmia, respiratory problems, etc. and some severe cases may have pneumonia, serious respiratory syndrome, kidney failure and even death^{10,11}. Having these symptoms does not necessarily mean COVID-19, as similar symptoms can also be present in other viral infections. The chances of infection with COVID-19 are higher if there is shortness of breath, dry cough, and a person exposed to COVID-19 patient or traveled in a COVID-19 affected region. Elderly people, children, and the infected persons having health issues like pulmonary disorders, cardiac disorders, diabetes, and malignancies are at greater risk of catching the infection. However, some patients depending on their health status and age recuperate soon while others may take more time. Survival to death duration post infection is 6 to 41 days with coronavirus. Age, health and co-morbid conditions of the patients play a major role in recovery¹². The pathological findings of coronavirus include higher values of chemokines, cytokines, and leukocytes, and high plasma pro-inflammatory cytokines and C-reactive protein levels¹³.

Transmission dynamics

In the beginning cases of SARS-CoV-2 were linked to the Huanan seafood market of Wuhan, China and it was affirmed that the infection could

have been spread through zoonotic or environmental exposures⁹. Further studies of the confirmed cases and detection of the root of the infection caused by SARS-CoV-2 suggested human-to-human transmission leading to global pandemic⁹. The Coronavirus spreads either by direct contact or through the minute droplets released while coughing and sneezing. Usually, the virus enters the body through the nasal, oral route or through eyes¹⁴. It has been reported that a person can be infected at a distance of about 6 ft (1.8 m) radius. The virus can be active from 2 h to few days in the minute droplets released while coughing and sneezing, which can be on the surface or ground. Virus can be contacted by touching an object or surface which already has the virus.

Current scenario

On 24th April 2020, as per WHO data it was reported that, the first case of this novel disease was detected in December 2019 and as of 9th September 2020 a total of 27,417,497 cases are reported to be infected by this virus globally which resulted in 894,241 deaths¹⁵. In India, a total of 4,370,128 cases have been reported till now with death of 73,890 individuals¹⁵. COVID-19 has shown its harsh effects among the America, Asia, Europe continents. Initially China and Italy were the hot spots but currently majority of cases and deaths are in USA, Brazil and India (Fig. 1).

Impact of coronavirus

The big negative impact of COVID-19 is due to the social distancing, which leads to anxiety and stress¹⁶. Anxiety and stress can disrupt and weaken the immune system and thereby an individual can easily catch COVID-19 infection^{17,18}. Living a fast life with socializing has been diminished by lockdowns and social distancing. The unsocial public behavior is also observed to hoard essential food items and medical consumables during this pandemic. Black marketing of various medical consumables was also noticed due to their excess demand¹³. There were also reports of attack on healthcare workers, because of which Government of India had to pass a special bill for the protection of healthcare workers¹⁹. The next greatest misfortune is the financial loss which is around 2.7 trillion USD¹³. COVID-19 has shown its brutal impacts on economy of each country. It has been predicted that COVID-19 may create serious problems like unemployment and destitution²⁰. The position of financial backwardness will be more

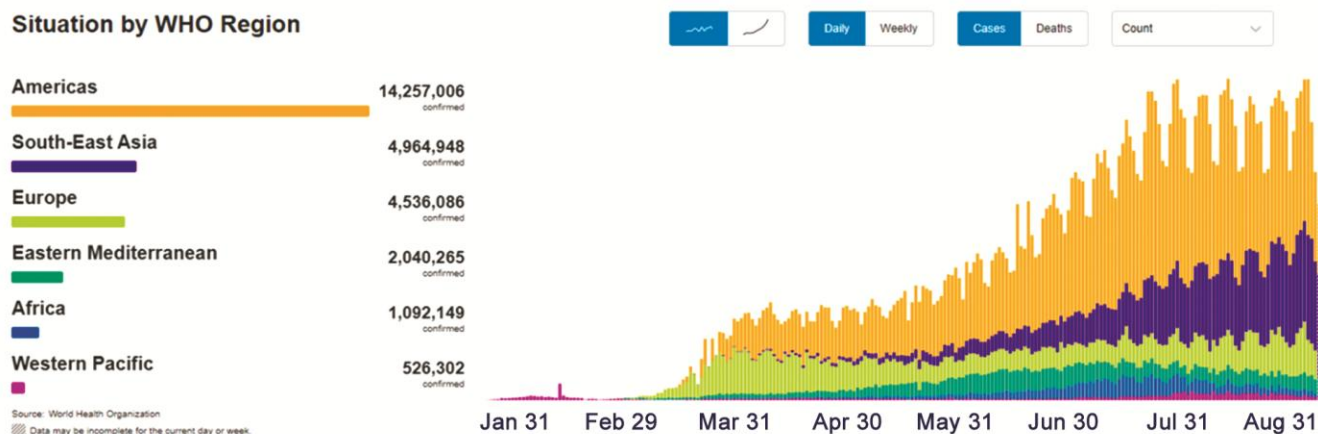


Fig. 1 — Situation by WHO region as on 09th September, 2020

drastic on Asian and African countries than European countries²⁰.

Environmental impact of this pandemic can be considered as a slight positive aspect of COVID-19. The restrictions on public movement and industries led to a significant improvement in air and water quality, leading to improvement in overall air quality index. Rivers and sea beaches were not polluted by human activities due to the nationwide lockdown²⁰. There was significant reduction in emission of greenhouse gases in comparison to time after the World War II^{20,21}. It has been reported that, in India the air quality was improved during first lockdown period of 21 days²¹. Because of quarantines and lockdowns, NO₂ emission was reduced by 22.8 µg/m³ and 12.9 µg/m³ in Wuhan and China, respectively [20]. PM 2.5 also fell by 1.4 µg/m³ in Wuhan and decreased by 18.9 µg/m³ in other 367 cities of China²⁰. In India compared to previous year around 43, 31, 10, and 18% decrease in PM_{2.5}, PM₁₀, CO, and NO₂, respectively, was observed this year during lockdown period²¹. 44, 33, 29, 15 and 32% reduction in air quality index in north, south, east, central and western India respectively was noticed²¹. The noticeable reduction in the air, water, noise pollution and greenhouse gases are the good signs.

The other positive side of COVID-19 is that all countries have learnt the importance of quality healthcare services and are trying their best to upgrade the same. Many nations have established better health infrastructure specially to cater the COVID-19 patients. Many companies adapted a new work culture called work from home during this pandemic which has curtailed traffic on the roads.

Role of AYUSH systems of medicine to combat against COVID-19

Management of epidemics is not new to traditional Indian health systems. *Janapadodhwamsa vyadhi & Waba* are well- defined terms used for epidemics in the classical Ayurvedic & Unani texts respectively. AYUSH systems of medicine which includes Ayurveda, Siddha, Unani, Yoga, Naturopathy and Homeopathy (AYUSH) becoming popular in general public. Drugs used in these systems are majorly from plants, minerals and animal origin. It is estimated that approximately 25,000 plant-based formulations are being used by traditional practitioners in India²².

Management with Unani medicine

Unani system of medicine is developed upon Hippocratic concepts of *Mizaj* (temperament) and *Akhlal* (humors)²³. There is description of epidemic influenza in a book namely *Al-asbab wa-Alamat* (the book of causes and symptoms) written by Najeebuddin Samarqandi (d.1222 CE). This treatise has been translated in Urdu and published by the name *Sharah Asbab* in which this disease is delineated with the term *Nazla-e-Wabaiya* (epidemic influenza)²⁴. Generally, the *Unani* medicines (plant-based medicines) are considered to be safe without any side effects. Many plants are well known for their anti-viral activities²⁵⁻²⁷. Few of these medicinal plants are *Allium cepa* L., *Allium sativum* L., *Cinnamomum verum* J.Presl, *Curcuma longa* L., *Daucus maritimus* L., *Glycyrrhiza glabra* L., *Piper nigrum* L., *Ocimum sanctum* L., *Ocimum tenuiflorum* L., *Zingiber officinale* Roscoe etc. A decoction (*joshanda*) of these medicinal plants may be used for flu and common cold virus infections. Anti-viral properties have already been reported of the plants²⁸⁻

⁴⁰. Certain drugs have been prescribed by *Unani* physicians that may be used in protecting the health during epidemics. Summary of these medicines is given in Table 1^(ref 41-55).

Management with Ayurveda

Ayurveda is a very esteemed and primeval traditional system of medicine that has been practiced since antiquity in India. It offers both preventive and therapeutic treatment for number of ailments. Mild to moderate symptoms of the patient infected with COVID-19 can be managed with *Ayurveda*^{56,57}. Some scientifically validated practices which can be adopted are as follows^{16,18}:

- Consumption of luke-warm water is advocated which is known to have body cleansing effects.
- Consume diet which substantially contains *Lehsun, Haldi* and *Zeera* for promotion of health.
- *Ayurvedic* immune-boosters (*chyawanprash*) may be used which rejuvenates the body.
- Turmeric dissolved in milk is commonly used especially for its anti-inflammatory effects and considered as healthy drink.

- Consume sesame or coconut oil or ghee which has coolant properties and help in healing.
- Use of powder of *Laung (Syzygium aromaticum)* (L.) Merr. & L.M. Perry in combination with brown sugar or honey is prevalent in throat infection.
- Inhalation of *Kapoor (Cinnamomum camphora)* (L.) J. Presl. directly or local application in the form of balm or ointment, also has positive effect in respiratory disease.

Management with Homoeopathy

Arsenic when given in ultra diluted form, as used in *Homoeopathy*, has been found beneficial for several diseases including viral infections. Arsenic trioxide is highly diluted to obtain *Arsenicum Album-30* which has been widely used in epidemics for flu like symptoms as a prophylactic medicine. For COVID-19, the dose recommended is one dose of *Arsenicum Album 30* daily on empty stomach for 3 consecutive days to be repeated after one month in the same manner if the infection still remains in the population. It is also pertinent to mention that in a

Table 1 — Health protective drugs used in *Unani* medicine

S. No.	Botanical name	<i>Unani</i> name	Part used	Method of use in <i>Unani</i> medicine	Mode of action/rationale for use	References
1.	Acetic acid (vinegar)	<i>Sirka</i>	Whole	Spray	Anitmicrobial, antioxidant, antiobesity	41,42
2.	<i>Alhagi pseudalhagi</i> (M. Bieb.) Desv. ex B. Keller & Shap.	<i>Turanjbeen</i>	Resinous exudates from fruit and stem	Oral	Anitmicrobial, antioxidant, hepatoprotective, anti-pyretic	43,44
3.	<i>Cassia fistula</i> L.	<i>Amaltas</i>	Pulp	Oral	Immunomodulatory, antioxidant, hepatoprotective, anti-pyretic	44,45
4.	<i>Crocus sativus</i> L.	<i>Zafran</i>	Stamen	Oral	Immunoregulatory, anti-inflammatory	44,46
5.	<i>Juglans regia</i> L.	<i>Jauz</i>	Jam made of fruits	Oral	Neuroprotective, cardioprotective	42,47
6.	<i>Morus nigra</i> L.	<i>Toot</i>	Jam made of fruits	Gargle	Anitmicrobial, anti-inflammatory	42,48
7.	<i>Punica granatum</i> L.	<i>Anar</i>	Fruit juice	Oral	Anitmicrobial, antioxidant, antifungal, anti-viral	44,49
8.	<i>Rheum australe</i> D.	<i>Revand Chini</i>	Rhizome	Oral	Anitmicrobial, antioxidant, anti-inflammatory	44,50
9.	<i>Rhus coriaria</i> L.	<i>Sumaq</i>	Fruit	Gargle	Antibacterial against oral bacteria	42,51
10.	<i>Rosa damascena</i> Herrm.	<i>Arq-e-Gulab</i>	Distillate of petals	Gargle	Antioxidant; contains alcohols	42,52
11.	<i>Tamarindus indica</i> L.	<i>Imli</i>	Pulp	Oral	Analgesic, anti-inflammatory	44,53
12.	<i>Terminalia chebula</i> Retz.	<i>Halela</i>	Fruit	Oral	Antibacterial	44,54
13.	<i>Viola odorata</i> L.	<i>Banafsha</i>	Flowers	Oral	Anitmicrobial, antifungal	44,55

study of *Arsenicum album*, it was found to be effective in swine flu patients with symptoms like fever, runny nose, headache, sore throat⁵⁸. Other medicines that are being prescribed in the management of COVID-19 are *Atropa belladonna*, *Bignonia sempervirens*, *Bryonia alba*, *Eupatorium perfoliatum* and *Rhus toxicodendron*⁵⁹.

Management with Yoga and Naturopathy

Yoga and Naturopathy are the drugless systems of medicine based on preventive and adjuvant care which can be integrated with other proposed interventions, and thereby helping the body towards achieving health and well-being. *Yoga and Naturopathy* are guided by ancient Indian science of health and wellbeing with scientific developments that upholds the body's natural ability to heal itself, improves disease prevention, and enhances ones capability to achieve optimal health. Studies have shown that mental stress is linked with increased upper respiratory tract infections⁶⁰ and wound-healing time⁶¹ which shows that stress causes significant immune response dysfunction. There are evidences which points at the role of *Yoga* in establishing homeostasis in association with the nervous, endocrine, and immune systems⁶². Therefore, it can be said that lifestyle modification based on *Yoga and Naturopathy* interventions, integrated with standard care can help in promoting physical as

well as mental well-being during this COVID-19 scenario^{63,64}.

Management with Siddha

Siddha system of medicine has existed from the time immemorial. In *Siddha* system main concept is “*Unava Marunthu, Marunthae Unavu*” which means food is medicine, medicine is food. In *Siddha* system of medicine infectious disease are called “*Thotrunkoikal, kollainoikal, ottunkoikal*”⁶⁵. *Kabasura kudineer* is a poly-herbal formulation consists of fifteen drugs prescribed for the preventive and symptomatic treatment of COVID -19 patients⁶⁶. The preparations like *thalisathi chooranam* and *adathodai manapagu* are also used as prophylactic drug against COVID-19⁶⁶. Immune boosters like *nelikai legiyum, senthil sarkari, amukuura choorna mathirai, brahamanantha bairavam* may also be used⁶⁶.

Recommended AYUSH medicines for prevention and symptomatic management of COVID-19

Government of India through AYUSH Ministry issued an advisory. The advisory advocates prophylactic and symptomatic management of COVID-19 and outline some AYUSH medicines. These medicines are mentioned in Table 2 but they should be used after proper consultation with AYUSH practitioner.

Table 2 — AYUSH medicines for prevention and management of COVID-19^(ref. 5)

Drug	Form	System	Administration	Reported activities
Preventive and prophylactic management for COVID-19				
<i>Tinospora cordifolia</i> (Thunb.) Miers or Samsamani Vati	Aqueous	<i>Ayurveda</i>	Twice a day for 15 days with luke warm water	Chronic fever, immunomodulatory, anti-inflammatory, anti-Virus, antipyretic etc.
<i>Andrographis paniculata</i> (Burm.f.) Nees	Aqueous	<i>Siddha</i>	60 ml decoction, twice a day for 14 days	Fever and cold
<i>Cydonia oblonga</i> Mill. (Behidana) <i>Zizyphus jujube</i> Mill. (Unnab) <i>Cordia myxa</i> L. (Sapistan)	Aqueous	<i>Unani</i>	Boil <i>Cydonia oblonga</i> Mill. (3 part), <i>Zizyphus jujube</i> Mill. (5 parts), and <i>Cordia myxa</i> L. (9 parts) in 250 ml water and reduce to half. Use decoction twice a day for 14 days	Antioxidant, immunomodulatory, anti-allergic, smooth muscle relaxant, anti-influenza activity
<i>Arsenicum album</i> 30	Globules	<i>Homoeopathy</i>	Daily once in a day on empty stomach for 3 days (Should be repeated after 1 month till the infection persist)	Effective in epidemics, immune-modulator

(Contd.)

Table 2 — AYUSH medicines for prevention and management of COVID-19^{ref 5}

Drug	Form	System	Administration	Reported activities
Symptomatic management for COVID-19				
AYUSH -64	<i>Ayurveda</i>		Two tablets twice day	Respiratory infections
<i>Agastya Haritaki</i>			5g twice day	Immunomodulatory and upper respiratory infections
<i>Anu taila</i>			2 drops in each nostril daily morning	Respiratory infections
<i>Adathodai Manapagu</i>	<i>Siddha</i>		10 ml twice a day	Fever and cold
<i>Vishasura kudineer</i>			60 ml decoction, twice a day	Fever and cough
<i>Kaba sura kudineer</i>			60 ml decoction, twice a day	Fever, cough, sore throat, shortness of breath
<i>Bryonia alba</i> L.	<i>Homoeopathy</i>		As prescribed by physician	Reduce lung inflammation
<i>Rhus toxicodendron</i>				Viral infections
<i>Atropa belladonna</i> L.				Asthma and chronic lung diseases
<i>Bignonia sempervirens</i> L.				Asthma
<i>Eupatorium perfoliatum</i> L.				Respiratory symptoms

Conclusion

Human civilization has been very harshly affected by COVID-19. As of now no confirmed cure exist for this disease. Due to unavailability of vaccine against COVID-19, disease is currently managed symptomatically with varied anti-viral drugs. Therefore, it demands to take actions for awareness raising campaign, harmony, and joint efforts among various medical systems and healthcare institutions. Therefore, to counter the pandemic, an integrated process is needed wherein AYUSH systems of medicine can contribute extensively. The AYUSH inputs advocates strengthening general immunity so that a larger proportion of the number of exposed are able to remain asymptomatic or experience only mild disease, and fewer proportions move to become severe cases. Research to evaluate and establish role of potent herbs as prophylactic agent against viral infections can also be planned.

It is also suggested and appealed that general public should strictly observe norms and guidelines

of prevention, social distancing and quarantine, issued by Government from time to time. A mechanism should also be developed for educating younger generation to withstand against any such catastrophe in future. Briefly, collective efforts are required globally to fight against such diseases in future.

Conflict of Interest

Authors declare they have no conflict of interest

Authors' Contribution Statement

AM: Conception, design, literature review, drafting, Unani content, other important intellectual content, technical inputs, correspondence, revision, approval; AT: Drafting of Homoeopathy content, revision, approval; SKR: Drafting of Ayurvedic content, revision, approval; VP: Drafting of Yoga and Naturopathy content, technical inputs, revision, approval; VLK: Drafting of Siddha content, revision, approval

References

- 1 World Health Organization. Coronavirus. <https://www.who.int/healthtopics/Coronavirus>. [Last Accessed 14 July 2020].
- 2 Gorbalenya A E, Severe acute respiratory syndrome-related Coronavirus—the species and its viruses, a statement of the Coronavirus study group, *BioRxiv*, (2020) 02.07.937862. <https://doi.org/10.1101/2020.02.07.937862>.
- 3 Schoeman D & Fielding B C, Coronavirus envelope protein: current knowledge, *Virology*, 16 (1) (2019) 69.
- 4 Jiang S, Shi Z, Shu Y, *et al.*, A distinct name is needed for the new Coronavirus, *Lancet*, 395 (10228) (2020) 949.
- 5 Guarner J, Three emerging Coronaviruses in two decades the story of SARS, MERS, and now COVID-19, *Am J Clin Path*, 153 (2020) 420-21.
- 6 Gorbalenya A E, Baker S C, Baric R S, *et al.*, The species severe acute respiratory syndrome-related Coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2, *Nat Microbiol*, 5 (2020) 536-44.
- 7 Peiris J, Guan Y & Yuen K, Severe acute respiratory syndrome, *Nat Med*, 10 (2004) S88-S97.
- 8 Chan J F-W, Yip C C-Y, To K K-W, *et al.*, Improved molecular diagnosis of COVID-19 by the novel, highly sensitive and specific COVID-19-RdRp/Hel real-time reverse transcription-polymerase chain reaction assay validated in vitro and with clinical specimens, *J Clin Microbiol*, 58 (5) (2020) e00310-20.
- 9 Li Q, Guan X, Wu P, *et al.*, Early transmission dynamics in Wuhan, China, of novel Coronavirus-infected pneumonia, *N Engl J Med*, 382 (2020) 1199-1207.
- 10 Huang C, Wang Y, Li X, *et al.*, Clinical features of patients infected with 2019 novel Coronavirus in Wuhan, China, *Lancet*, 395 (10223) (2020) 497-506.
- 11 Hui D S, Azhar E I, Madani T A, *et al.*, The continuing 2019-nCoV epidemic threat of novel Coronaviruses to global health - the latest 2019 novel Coronavirus outbreak in Wuhan, China, *Int J Infect Dis*, 91 (2020) 264-66.
- 12 Wan Y, Shang J, Graham R, *et al.*, Receptor recognition by novel Coronavirus from Wuhan: an analysis based on decade-long structural studies of SARS, *J Virol*, 94 (7) (2020) e00127-20.
- 13 Ali I & Alharbi O M L, COVID-19: Disease, management, treatment, and social impact, *Sci Total Environ*, 728 (2020) 138861.
- 14 Transmission of Novel Coronavirus (2019-nCoV) | CDC. www.cdc.gov. 28 June 2020. Retrieved 29 June 2020.
- 15 WHO Coronavirus Disease (COVID-19) Dashboard, Available at <https://covid19.who.int/> 09 September, 2020 retrieved on 09 September 2020.
- 16 Rajkumar R P, COVID-19 and mental health: a review of the existing literature, *Asian J Psychiatr*, 52 (2020) 102066.
- 17 Pedersen A, Zachariae R & Bovbjerg D B, Influence of psychological stress on upper respiratory infection-A meta-analysis of prospective studies, *Psychosom Med*, 72 (2010) 823-32.
- 18 Rajkumar R P, Ayurveda and COVID-19: Where psychoneuroimmunology and the meaning response meet, *Brain Behav Immun*, 87 (2020) 8-9.
- 19 India Today: Updates: Available at <https://www.indiatoday.in/india/story/central-govt-ordinance-to-protect-medical-staff-covid19-Coronavirus-1669784-2020-04-22> (Last accessed on 10 July 2020).
- 20 Monserrate M A Z, Ruano M A & Alcalde L S, Indirect effects of COVID-19 on the environment, *Sci Total Environ*, 728 (2020) 138813.
- 21 Sharma S, Zhang M, Anshika M, *et al.*, Effect of restricted emissions during COVID-19 on air quality in India, *Sci Total Environ*, 728 (2020) 138878.
- 22 Joshi V K, Joshi A & Dhiman K S, The Ayurvedic Pharmacopoeia of India, development and perspectives, *J Ethnopharmacol*, 197 (2017) 32-38.
- 23 Husain A, Sofi G, Dang R *et al.*, Unani system of medicine - introduction and challenges, *Med J Islamic World Acad Sci*, 18 (1) (2010) 27-30.
- 24 Samarqandi N, *Sharah Asbab*, (Aijaz Publishing House, New Delhi), 2010.
- 25 Li S Y, Chen C, Zhang H Q, *et al.*, Identification of natural compounds with antiviral activities against SARS-associated Coronavirus, *Antivir Res*, 67 (2005) 18-23.
- 26 Lin L T, Hsu W C & Lin C C, Antiviral natural products and herbal medicines, *J Tradit Complement Med*, 4 (2014) 24-35.
- 27 Kim H Y, Eo E Y, Park H, *et al.*, Medicinal herbal extracts of Sophorae radix, *Acanthopanax cortex*, *Sanguisorbae radix* and *Torilis fructus* inhibit Coronavirus replication in vitro, *Antiviral Ther*, 15 (2010) 697-709.
- 28 Bano N, Ahmed A, Tanveer M, *et al.*, Pharmacological evaluation of *Ocimum sanctum*. *J Bioequiv Availab*, 9 (2017) 387-92.
- 29 Chang J S, Wang K C, Yeh C F, *et al.*, Fresh ginger (*Zingiber officinale*) has anti-viral activity against human respiratory syncytial virus in human respiratory tract cell lines, *J Ethnopharmacol*, 145 (2013) 146-51.
- 30 Bayan L, Koulivand P H & Ali G, Garlic: A review of potential therapeutic effects, *Avicenna J Phytomed*, 4 (2014) 1-14.
- 31 Fatima M, Zaidi N U, Amraiz D *et al.*, In vitro antiviral activity of *Cinnamomum cassia* and its nanoparticles against H7N3 influenza A virus, *J Microbiol Biotechnol*, 26 (2016) 151-159.
- 32 Ghoke S S, Sood R, Kumar N, *et al.*, Evaluation of antiviral activity of *Ocimum sanctum* and *Acacia arabica* leaves extracts against H9N2 virus using embryonated chicken egg model, *BMC Complement Altern Med*, 18 (2018) 174.
- 33 Hashemipour M A, Tavakolineghad Z, Arabzadeh S A M, *et al.*, Antiviral activities of honey, royal jelly, and acyclovir against HSV-1, *Wounds*, 26 (2014) 47-54.
- 34 Jiang Z Y, Liu W F, Zhang X M, *et al.*, Anti-HBV active constituents from *Piper longum*, *Bioorg Med Chem Lett*, 23 (2013) 2123-27.
- 35 Konowalchuk J & Speirs J I, Antiviral effect of commercial juices and beverages, *Appl Environ Microbiol*, 35 (1978) 1219-20.
- 36 Lee J B, Miyake S, Umetsu R H K, *et al.*, Anti-influenza A virus effects of fructan from Welsh onion (*Allium fistulosum* L.), *Food Chem*, 134 (2012) 2164-68.
- 37 Miladi S, Abid N, Debarnot C, *et al.*, In vitro antiviral activities of extracts derived from *Daucus maritimus* seeds, *Nat Prod Res*, 26 (2012) 1027-32.
- 38 Omer M O, AlMalki W H, Shahid I, *et al.*, Comparative study to evaluate the anti-viral efficacy of *Glycyrrhiza glabra* extract and ribavirin against the Newcastle disease virus, *Pharm Res*, 6 (2014) 6-11.

- 39 Praditya D, Kirchoff L, Brüning J, *et al.*, Anti-infective properties of the golden spice curcumin, *Front Microbiol*, 10 (2019) 912.
- 40 Weber N D, Andersen D O, North J A, *et al.*, In vitro virucidal effects of *Allium sativum* (garlic) extract and compounds, *Planta Med*, 58 (1992) 417-23.
- 41 Ho C W, Lazim A M, Fazry S, *et al.*, Varieties, production, composition and health benefits of vinegars: a review, *Food Chem*, 221 (2017) 1621-30.
- 42 Razi Z, *Kitab ul-Munsoori*, Central Council for Research in Unani Medicine, New Delhi), 1991, p. 48-87.
- 43 Imani G, Mehrpoya M, Khalilian A, *et al.*, Effects of cinnamon extract on complications of treatment and eradication of *Helicobacter pylori* in infected people, *J Herbmed Pharmacol*, 9 (1) (2020) x-x.
- 44 Rushd I, *Kitabul Kulliyat*, 2nd ed, (Central Council for Research in Unani Medicine, New Delhi), 1987.
- 45 Rahmani A H, *Cassia fistula* Linn: potential candidate in the health management, *Pharm Res*, 7 (2015) 217-24.
- 46 Zeinali M, Zirak M R, Rezaee S A, *et al.*, Immunoregulatory and anti-inflammatory properties of *Crocus sativus* (Saffron) and its main active constituents: A Review, *Iran J Basic Med Sci*, 22 (2019) 334-44.
- 47 Hayes D, Angove M J, Tucci J, *et al.*, Walnuts (*Juglans regia*) chemical composition and research in human health, *Crit Rev Food Sci Nutr*, 56 (2016), 1231-41.
- 48 Lim S H & Choi C I, Pharmacological properties of *Morus nigra* L. (Black Mulberry) as a promising nutraceutical resource, *Nutrients*, 11 (2) (2019) 437.
- 49 Bassiri-Jahromi S, *Punica granatum* (pomegranate) activity in health promotion and cancer prevention, *Oncol Rev*, 12 (2018) 1-7.
- 50 Pandith S A, Dar R A, Lattoo S K, *et al.*, *Rheum australe*, an endangered high-valued medicinal herb of NorthWestern Himalayas: A review of its botany, ethnomedical uses, phytochemistry and pharmacology, *Phytochem Rev*, 17 (2018) 573-609.
- 51 Vahid-Dastjerdi E, Sarmast Z, Abdolazimi Z, Mahboubi A, Amdjadi P, *et al.*, Effect of *Rhus coriaria* L. water extract on five common oral bacteria and bacterial bio-film formation on orthodontic wire, *Iran J Microbiol*, 6 (2014) 269-75.
- 52 Sharafati C F, Saholi M & Sharafati C R, Chemical composition, antioxidant and antibacterial activity of *Bunium persicum*, *Eucalyptus globulus*, and rose water on multidrug-resistant listeria species, *J Evid Based Integr Med*, 23 (2018) 2515690X17751314.
- 53 Komakech R, Kim Y-G, Matsabisa G M, *et al.*, Anti-inflammatory and analgesic potential of *Tamarindus indica* Linn. (Fabaceae): A Narrative Review, *Integr Med Res*, 8 (2019) 181-86.
- 54 Saxena S, Lakshminarayan N, Gudli S, *et al.*, Anti bacterial efficacy of *Terminalia chebula*, *Terminalia bellirica*, *Embilica officinalis* and Triphala on salivary *Streptococcus mutans* count-A linear randomized cross over trial, *J Clin Diag Res*, 11 (2017) ZC47-ZC51.
- 55 Parsley N C, Kirkpatrick C L, Crittenden C M, *et al.*, Pep SAVI-MS reveals anticancer and antifungal cycloviolacins in *Viola odorata*, *Phytochem*, 152 (2018) 61-70.
- 56 Panda A K, Dixit A K, Rout S, *et al.*, Ayurveda Practitioners Consensus to Develop Strategies for Prevention and Treatment of Corona Virus Disease (COVID-19), *J Ayur Integr Med Sci*, 5 (2020) 98-106.
- 57 Maria John K M, Enkhtaivan G, Ayyanar M, *et al.*, Screening of ethnic medicinal plants of South India against influenza (H1N1) and their antioxidant activity, *Saudi J Biol Sci*, 22 (2) (2015) 191-97.
- 58 Mathie RT, Baitson ES, Frye J, *et al.*, Homeopathic treatment of patients with influenza-like illness during the 2009 A/H1N1 influenza pandemic in India, *Homeopath*, 102 (3) (2013) 187-92.
- 59 Anonymous, AYUSH Ministry- Corona Advisory – D.O. No. S. 16030/18/2019 – NAM; dated: 06th March, 2020. Available at <https://www.mohfw.gov.in/pdf/advisoryMORD.pdf> (Last accessed in July 2020).
- 60 Cohen S, Psychological stress, immunity and upper respiratory infections, *Curr Dir Psychol Sci*, 5 (1996) 86-90.
- 61 Kiecolt-Glaser J K, Marucha P T, Malarkey W B, *et al.*, Slowing of wound healing by psychological stress, *Lancet*, 60 (1995) 362-65.
- 62 Gard T, Noggle J J, Park C L, *et al.*, Potential self-regulatory mechanisms of yoga for psychological health, *Front Hum Neurosci*, 8 (2014) 770.
- 63 Fleming S A & Gutknecht N C, Naturopathy and the Primary Care Practice, *Prim Care*, 37 (1) (2010) 119-36.
- 64 Nagarathna R, Nagendra H R & Majumdar V, A perspective on Yoga as a preventive strategy for Coronavirus Disease 2019, *Int J Yoga*, 13 (2) (2020) 89-98.
- 65 Durairajan, *NoiillaNeri*, (Indian Medicine & Homoeopathy Department, Chennai), 1993.
- 66 Kuppusamy K N & Utthamarayan K S, *Siddha vaidyathirattu*, 1st ed, (Indian Medicine & Homoeopathy Department, Chennai), 1998.