

Role of the Unani System of Medicine in Countering Epidemic Diseases, Considering Coronavirus Pandemic -19

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ABSTRACT

Since December 2019 world faces a respiratory pandemic named Coronavirus disease-19 (COVID-19). COVID-19 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The term epidemic was coined by Hippocrates who is considered the father of Unani medicine which is based on four humours. In the Unani System of Medicine (USM) equivalent term for the epidemic is *Wabā'*. In classical Unani literature symptoms of *Nazla-i-Wabā'iyya* and *Humma-i-Wabā'iyya* closely resemble the symptoms of COVID-19. Major manifestations of this outbreak are cough, fever, headache, nausea, and breathlessness. This pandemic takes place due to a change in the quality of the surrounding air. We searched different databases electronically using the terms "COVID-19 or Coronavirus", "*Wabā'* or infectious disease", "Unani immunomodulators", "Herbal immunomodulators", "Anti-viral herbal drugs", Herbal fumigation and "*Nazla-i-Wabā'iyya* or *Nazla Wabā'ī*". We also gone through different classical textbooks of USM available in the NRIUMSD library. We reviewed the concept of *Wabā'*, its prevention, and management strategies available in USM. We also searched antiviral, immunomodulation, fumigation activities of Unani drugs. Unani physicians advocated general measures of physical distancing, health hygiene, isolation, quarantine, and immunomodulation. As a preventive measure, various immunomodulatory drugs like *Asgandh*, *Aam*, *Babuna*, *Gilo*, *Satawar*, and *Kalonji* and antidotes such as *Tiryāq Wabā'ī* have been described in the literature. The ingredients of *Tiryāq-i-Wabā'ī* include *Aloe barbedensis*, *Crocus sativus*, and *Commiphora myrrha*. Several fumigants like *Sandal*, *Ood*, *Kafoor*, *Loban*, and *Jhau* are

also mentioned in the management of the epidemic. For symptomatic management various antiviral, antipyretic and antitussive drugs are described well. Many evidence-based studies have already been reported for single drugs and formulations used in the USM. The *Khamira Marwareed* possesses antiviral, cardiotoxic, and immunomodulatory activity. Single drugs such as *Khaksi*, *Asgandh*, *Adusa*, *Chiriata*, and *Zanjabeel* possess antipyretic, immunomodulatory, antitussive, antibacterial, and antiviral activities respectively. The knowledge from classical Unani literature and scientific researches may be useful in the prevention and management of COVID-19 like epidemic diseases. This review article aims to find out the concept of the pandemic, prevention, and management strategies existing in the USM.

Key words: *Amrād Wabā'ī*, COVID-19, Epidemic, Humours, Kaifyat, Unani medicine, *Wabā'*.

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DOI: 10.5530/jyp.2022.14.28

INTRODUCTION

The Novel Coronavirus disease is a global pandemic (a disease occurring in a large geographical region and affecting an exceptionally high proportion of the population) and has become a serious threat to public health worldwide. COVID-19 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that was first isolated and identified in patients who were exposed in December 2019 to the seafood market in Wuhan City, Hubei Province, China.¹ The World Health Organization (WHO) initially named this coronavirus on 12th January 2020 as the 2019 novel coronavirus (2019-nCoV).² The WHO officially named the disease, coronavirus disease 2019 (COVID-19), and the International Committee on taxonomy of virus recommended that the new coronavirus be named SARS-CoV-2, both released on 11 February 2020.³⁻⁴

Generally, the transmission of this disease is through droplets or fomites but some other modes (orofaecal, airborne) are also speculated. SARS-CoV-2 is believed to cross-species to initiate primary human infections just like SARS-CoV-1⁵⁻⁶ and Middle East respiratory syndrome coronavirus (MERS-CoV); it's now spread primarily by humans to human transmission.⁴ Although the case death rate of COVID-19 (estimated at 2-3%) is less than those of SARS (approximately 10%) and

MERS (approximately 40%), the pandemic related to COVID-19 has been much more severe.⁷ As of 23rd April 2021, the spread of COVID-19 is reported in 223 countries/territories/areas across five continents.⁸ The COVID-19 epidemic represents a considerable challenge for governments, individuals, and society as a whole.

In India first laboratory-confirmed case of COVID-19 was reported on 30th January 2020 in Kerala. The patient was a student coming back from Wuhan, China.⁴ As of 23rd April 2021, globally 404.91 million confirmed cases of COVID-19, including 5.78 million deaths have been reported.⁸ India has reported 42.53 million cases and 5.07 million deaths.⁹ The SARS-CoV-2 is an enveloped, non-segmented, positive-sense Ribonucleic acid (RNA) β -coronavirus (subgenus sarbecovirus, Orthocoronavirinae subfamily).¹⁰

Coronaviruses (CoV) have four genera, including α , β , γ , and δ . Mammals are generally infected by α and β , while birds are infected by γ and δ CoVs. Six CoVs are identified as a human susceptible virus, among which α -CoVs, HCoV-229E, HCoV-NL63, and β -CoVs, HCoV-HKU1, HCoV-OC43 with low pathogenicity, cause mild respiratory symptoms almost like the common cold. Respiratory tract infections that are severe

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and fatal are caused by β -CoVs, SARS-CoV, and MERS-CoV.¹¹ It had been found that 96.2% genome sequence of SARS-CoV-2 is similar to a bat CoV-RaTG13, whereas 79.5% identity of SARS-CoV is shared by it.¹² Based on virus genome sequencing and evolutionary analysis, the natural host of virus origin is probably bats, and SARS-CoV-2 could be transmitted from bats via unknown intermediate hosts to infect humans. SARS-CoV-2 and SARS-CoV use the same receptor angiotensin-converting enzyme 2 (ACE2), to infect humans.¹² World governments are working to determine countermeasures to prevent possible catastrophic effects. Health organizations coordinate the flow of information and issue directives and guidelines for optimal risk mitigation.

Scientists around the world worked tirelessly and gathered knowledge about the transmission mechanisms, the clinical spectrum of disease, diagnostics, prevention, and treatment strategies. Many uncertainties remain concerning both the host-virus interaction and the spread of the pandemic, with specific regard to the time when it'll reach its peak. In an *in-vitro* experiment of chloroquine, it is found that it reduces viral replication.¹³ The combination of hydroxychloroquine and azithromycin shows a significant synergistic effect in reducing viral load and early recovery.³ Steroids, passive antibodies, and selective cytokine blockade were usually recommended in severe conditions of disease.¹⁴ NSAIDs and corticosteroids were not advisable, as their role is still controversial. The tentative treatment for Covid-19 is antivirals like interferon- α , lopinavir/ritonavir, remdesivir, and ribavirin.¹⁵

Research and therapeutic strategies for COVID-19 have focused on agents to attack the virus or immunize against it.¹⁶ More than one billion seven hundred twenty-nine million vaccine doses have been administered until February 14, 2022, with over seven hundred fifty-five million having received two doses and being fully immunised. To achieve a meaningful effect from vaccines, a large proportion of the population should receive both doses as soon as possible, breaking the chain of infection dissemination.

According to the Indian Council for Medical Research (ICMR) sero survey one in five people have been infected with SARS-CoV-2, but to achieve herd immunity 60-70% of people should have developed immunity against the virus.¹⁴⁸ So, with these limitations, we need to explore more supportive and preventive strategies through our traditional treasure to deal with the infection and reducing transmission within the community. During this crisis, the prophylactic and therapeutic potential of traditional medicine systems like Unani and Ayurveda isn't being considered in the global search for effective preventive and treatment measures.

In this review article different concepts and practices from Unani Medicine that might be utilized in the prophylaxis and adjuvant therapy of COVID-19 have been described. Several recommendations are based on the emerging dynamics of the causative organism SARS-CoV-2 and the pathophysiology of COVID-19. While we focus here on prophylaxis, symptomatic relief and the protection of vulnerable target organs using Unani Medicine as add-on therapy may support patients of COVID-19 by improving the quality of standard care.

METHODS

Authors performed a systematic search of the most recent published papers through databases such as AYUSH Research Portal, PubMed, Science direct, and also by Google Scholar advanced search engine using the words "COVID-19 OR Coronavirus", "Wabā' OR infectious disease", "Unani immunomodulators", "Herbal immunomodulators", "Anti-viral herbal medicines", "Herbal fumigation", and "Nazla Wabā'". Additionally, we also hand-searched medical journals in the NRIUMSD Hyderabad library including the Hippocratic Journal of Unani Medicine, Indian Journal of Unani Medicine.

The concept of epidemic diseases (*Amrād Wabā'ī*) has been reviewed from different books of Unani System of Medicine as *Kāmil al-Sanā'a al-Tibbiyya* (The complete art of medicine) of Ali ibn 'Abbās Majūsī, *Al-Qānūn fi'l Tibb* (The Canon of Medicine) by Ibn Sīnā, *Dhakhīra Khawārizm Shāhī*, (Treasure of Khawārizm Shāh) by Ismā'il Jurjānī, *Kitāb al-Taysīr* (Books of simplification in therapeutics and planning) by Ibn Zuhr, *Al Iksīr* by Kabīr al-Dīn, *Hummāyāt-i-Qānūn* by Kabīr al-Dīn, *Kitāb al-Hāwī* (The Comprehensive Book of Medicine) by Zakariyya Rāzī, *Kitāb al-Kulliyāt* (The Complete Book on Medicine) by Ibn Rushd, *Kitāb al-Mansūrī* (Book dedicated to Caliph Mansoor) by Zakariyya Rāzī, *Kitāb al-Mukhtārāt fi'l Tibb* (The Book on Choice of Medicine) by Ali ibn Hubal, *Sharh al-Asbāb wa'l 'Alāmāt* (Translated version of book *al-Asbāb wa'l 'Alāmāt* by Najīb ad-Dīn Samarqandī) by Kabīr al-Dīn, *Tibb-i-Akbar* by Akbar Arzānī, *Kitāb-al-Aghzhiya* (The book of foods) by Ibn Zuhr, *Ghinā Munā* (The book of wealth and wishes) by Al-Qamari, and *Haziq* by Hakim Ajmal Khan.

Concept of Wabā' (epidemic) in Unani System of Medicine

As the human world turned out to be increasingly unhealthier with its appearance, conditions and information also got clear to it, and it started to forestall them based on their causes. Hence, later on, such diseases were uncovered in humans, which is because of the change in the air, water, and climate. A large population was affected by this disease, resulting in what is known as an epidemic. It was important to take appropriate measures to prevent it, hence the Unani scholars used their skills and abilities to treat it. They provide us with a comprehensive selection of their preventive and management techniques through writings. From Hippocrates' time to the present, Unani Medicine has defined the idea of epidemics and the drugs that can be used to treat them. Before *Buqrāt* (Hippocrates) though there was evidence of epidemics, the credit for outlining the reasons systematically went to Hippocrates. The reason for this is that even in this advanced era, he has been referred to as the "Father of Epidemiology" due to this contribution.¹⁷ Hippocrates coined the terms epidemic and endemic. The *Corpus Hippocraticum* of Hippocrates includes seven books titled Epidemics. In Epidemics, books I and III contain lists of diseases accompanied by clinical case descriptions. Hippocrates contrasted and grouped these cases to create a sequence of related cases. Another novel, titled "Airs, Waters, and Places," discusses the relationship between diseases and the environment, with a particular emphasis on the patients' habitats and the season in which the disease occurs. Hippocrates explained hypothetical and realistic perspectives for the first time in these volumes, rather than metaphysical hypotheses.⁷⁶ The great Greco-Roman physician *Jālinūs* (Galen) postulated the Miasma theory of disease (e.g. plague, cholera) transmission and explained that miasma (a noxious form of bad air) is responsible for it. Miasma is created when putrefied matter decays and emits noxious vapours. Following transmission, it reaches the human body through the respiratory system and skin pores. Later on, the germ hypothesis was instrumental in scientific advances that bolstered ancient theories for infectious diseases, such as Galen's miasma theory.¹⁸ Numerous eminent Unani physicians had exhaustively described *Amrād-i-Wabā'iyya* (epidemic diseases). We will address a few of them chronologically (from oldest to newest) in this section:

According to *Kitāb al-Mansūrī*, the *Wabā'* (epidemic disease) is most prevalent at the end of summer, i.e., autumn, when there is a lot of rain, persistent cloudiness, and the southern winds are contaminated and still.¹⁹

Zakariyya Rāzī (Rhazes) mentioned in *Kitāb al-Hāwī*, that when one breathes in hot air, the heart first warms up, followed by the entire body. Sepsis is caused by hot temperament air, especially in the fluid-filled

body. The bodies that embrace the epidemic's consequences are those that are contaminated with harmful substances. Owing to an abundance of comfort, prolonged sexual activity, and excessive hot bathing, their wastes do not fully metabolize. There are some bodies where the effects of the epidemic and its deterioration are difficult. These are the bodies that do not contain waste and any embolism and follow the principles of exercise. Days that are wet and humid are extremely conducive to the spread of epidemic diseases. Therefore, the principle of drying should be adopted for them.²⁰

According to *Kāmil al-Sanā'a* Amrād-e-wafida is synonymous with epidemic disease. It is said that like the air we breathe shifts and transforms from its original state, its composition changes. This deterioration of the air's composition would result in epidemic disease. The transition and transformation of the composition of the air are caused by two factors. The first is the physical state of the location, i.e., the accumulation of water, rotting fruits and vegetables, dead humans, and other animals in the open. They would condense into vapours, contaminating and putrefying the air. The second is a change in regular weather patterns, such as when winter becomes hot and dry and autumn becomes hot and rainy. Such airborne exposure can cause infection in humans, manifesting as body pain, increased sweating, halitosis, bilious vomiting, diarrhoea, and changes in the urine.²¹

Abul Hasan Al-Qamari in his book *Ghinā Munā* defined *Wabā'* as contamination and change in the state of the temperament of the air. It is caused by the emergence of circumstances against the habit of weather. This type of contamination is most prevalent during the autumn season. If this type of air contamination happens during the Rabi season, it is much worse and more dangerous, as the Rabi season is the best of all seasons and the most conducive to human aeration; thus, if the wind during this season is bad, the effects would be bad as well. The effect of bad air occurs in a person whose body is more capable of accepting these substances, as *Jālinūs* (Galen) states that none of these factors will have an immediate effect in the body unless the body is capable of accepting that bad air. Hippocrates said that when the temperature fluctuates between cold and hot during the day, the possibility of autumn season disease spreading increases. This is due to the temperament's similarity to the autumn season.²²

Ibn Sīnā stated in his popular book *Al-Qānūn fi'l Tibb* that air changes occur as a result of the composition of the air changing, which means that the composition of the air becomes bad and polluted. This type of shift is referred to as *Wabā'* (epidemic). Additionally, he writes: Changes in the air occur only as a result of the presence of harmful earthly substances and as a result of traveling through contaminated areas. According to him, contamination in water occurs only when harmful substances are present in it. According to Ibn Sīnā, the source of pollution is also terrestrial, although it is not readily apparent at the moment. Several terrestrial changes that can result in epidemics include dust admixture in the air and water, underground changes, an excess of waste, carcass purification, and abandoned fields.²³

In *Kitab-al Aghzia*, it is also stated that the term *Wabā'* (epidemic) is used when a disease affects a large number of people. This occurs when individuals become entangled in the use of a shared object. As a result, such individuals will contract the same disease according to their ability. Air is the most frequently used substance on the planet, and without it, life will be inconceivable. Air reaches the body through the breath and blood vessels. If it becomes contaminated and spreads throughout, the disease will also spread throughout this region, affecting the majority. Typically, this occurs during periods of heavy rain in the extreme summer. According to Hippocrates, rain during the summer season will result in infections and even epidemics that affect the majority of citizens. He said that in this case, it is critical to improving the surrounding air

quality. Hippocrates states that sometimes, *Wabā'* (epidemic) spreads for no apparent cause. Much of this occurs, according to us, as a result of God's wrath and transcendence.²⁴

In his book *Dhakhīra Khawārizm Shāhī*, Ismā'il Jurjānī defines the *Wabā'* as contaminated or putrefied changes in the air. Celestial causes, terrestrial causes, and a mixture of both are the three primary causes of change in the air.

Celestial cause: The sun will generate hot air when it is at the tropic of cancer or Northern tropic. When the rays of two or more stars collide with those of the sun, the atmospheric conditions alter, and the air temperature rises.

Terrestrial cause: The weather is hotter in downhill areas than in uphill areas, and the region below mountains has a hotter atmosphere than the area above. If the mountain is located in the northern direction of the city, even though the city is southern, the air will be hotter; similarly, if the mountain is located on the western side of the city, the air will be hotter. If a city's north direction is closed to airflow and its south direction is open, the city's air will be hot.

If the sea is located in the city's northern direction, the air will be cold; if the sea is located in the city's southern direction, the air will be more viscous and vapor-like; and if the sea is located in the city's eastern direction, the air will be more moist or humid. As the airflow is obstructed by a mountain, contamination increases.

Combined causes: If the location of the place is close to the equator, hot air will be present.

In any of the above conditions, the air quality deteriorates (it gets hotter), resulting in contamination and putrefaction in the air. Contamination and putrefaction eventually contribute to epidemic disease transmission.²⁵

According to Ibn Zuhr, the author of *Kitāb al-Taysir*, Hippocrates identified a disease called "*Humair Saifi*" that is caused by rain during periods of extreme heat in a hot climate. Individuals who are exposed to it feel a burning sensation. Patients with this condition lose their muscles and bones as a result of decomposition. Now it is clear that contaminating unhealthy air that is hot and moist (as a result of temperament change) will result in this disease. This phenomenon happens more often when there is moisture in the air and the air is still. Due to its arid climate, winds from the west are *majmoom* (bad), while winds from the north are *mamdooh* (good).²⁶

Ibn Rushd in his famous book *Kitāb al-Kulliyāt* said that when there is a change in the composition of air, it will cause diseases according to the variation that occurred. It will cause airborne diseases (*Wabā'*) due to contamination or infiltration of harmful pathogens. Excessive rainfall in the summer season often leads to contamination of air. Occasionally, pollution in the air is caused by polluted water vapours created by decomposing bodies and decaying matter, resulting in *Wabā'i Amrād* (epidemic disease).

Wabā'i Amrād may also be caused by contaminated water and food, as seen in drought-prone areas. Airborne diseases are often lethal due to the infection's potential to damage the heart. One of the consequences of such a disease is respiratory problems. Despite low-grade fever and persistent *Su'-i-Mizāj* (impaired temperament), the root cause of the patient's pain is *Su'-i-Mizāj Mukhtalif* (abrupt change in temperament). Epidemics and pandemics do not affect everyone; only those who are more vulnerable to disease become ill. When the climate is physiologically normal, the likelihood of seasonal diseases is almost zero. Certain diseases manifest themselves according to the *Mizāj* (temperament) of the season.²⁷

According to the popular Unani book *Kitāb al-Mukhtārāt fi'l Tibb*, the epidemic is a disease that affects a large number of people at the same time. This form of *Wabā'īya Amrād* (epidemic disease) is caused by the air contamination and transition. When people breathe, their hearts

warm and the whole humour contained within this cavity becomes putrid. These putrefied Humours are now circulated throughout the body through arteries. This results in a rise in the body's temperature, and thus malignant fever develops. This is referred to as epidemic fever.²⁷

In his book *al-Asbāb wa'l 'Alāmāt*, Najib al-Din Samarqandi discussed the epidemic of influenza. Hakim Kabir al-Din describes *Nazla-i-Wabā'iyya* (epidemic influenza) in the translated edition of this book titled *Sharh al-Asbāb wa'l 'Alāmāt*. He explained that it is a form of acute coryza that sometimes causes outbreaks. The patient complains of a fever, body ache, nasal and throat pain and burning sensations, sneezing, coughing, and malaise. The disease's specific symptom is that patients become very frail very quickly. Pleurisy and pneumonia are signs of a poor prognosis.²⁹

Akbar Arzānī mentioned in his book *Tibb-i-Akbar* that when an excess of fluid accumulates in the brain, it is excreted even without being metabolized. It manifests as coryza and cough. This occurs as a result of exposure to a hot environment or the heat produced by accumulated fluid (contamination or irregular air temperament), which attempts to escape and transfer to a cooler location. Increased temperature stimulates fluids and allows them to rush toward the nose. When the brain generates heat, all fluids begin to secrete, resulting in the accumulation of waste products.³⁰

According to Notable modern age Unani physician Ajmal Khan, the cause of *Nazla-i-Wabā'iyya* is the creation of a dreadful and poisonous effect in the air that enters the body through breathing. The disease is often found in humid and downhill areas and spreads rapidly from one location to another. Children and the elderly are more susceptible to disease.³¹

According to the renowned Unani text, *Al Iksir, Wabā'* (epidemic) refers to air contamination in which the original quality of the air has deteriorated. The air in a particular location is contaminated and reaches the body through the lungs and then the heart. It contaminates the soul and the substance that surrounds it. When its effects are felt in the heart and brain, both the fluid and the soul are destroyed. As a result, this contaminated hot soul spreads across the body, causing fever. There are three forms of causes of epidemics or air contamination:

The first is a celestial origin, in which changes in the composition of stars and the influence of sun rays result in a shift in the quality of air. Occasionally, as a result of this impact, the earth's vapours linger within the earth and become polluted; these contaminated vapours then combine with the air, contaminating it.

The second is terrestrial, in this case, dead bodies of people killed in battle are not properly disposed of, lodging of water in either location for an extended period, a pile of wastes, and the disposal of leatherwork wastes in an open gutter. All of these factors contribute to air pollution.

The Third cause occurs when both celestial and earthly causes combine to contaminate the climate. This is a more serious form of the outbreak.

Ibn Sinā has written that air metabolization occurs either according to temperament (hot and cold) or according to their composition, and thus air becomes contaminated. This transformation or metabolization takes place in such a way that the water doesn't become contaminated until it is not mixed with some bad terrestrial matter. In the way, the air is contaminated when bad vapours are admixed into the air.³²

According to *Misbāh al-Hikmat*, as contamination and toxicity are released into the environment, the contaminated air enters the heart through the nostrils and skin pores. It spoils the soul of the heart, thus contaminating the humour inside. Additionally, it contaminates the brain and liver's souls and fluids. Now, these infected fluids spread across the body, causing fever. Certain individuals whose bodies have been cleansed of impurities have a natural disposition, and those who adhere to prophylactic procedures are protected from its consequences.³³

In the *Hummayāt Qānūn*, epidemic fever is characterized as a dangerous disease, which is caused by the air contamination and putrefaction and usually spreads to a large number of individuals at the same time. Often the same changes occur in the air as they do in the water. Changes in the quality of the air result in temperature changes, while changes in the composition of the air result in changes in the colour, odour, and toxicity of the air, much as water's taste and colour change. Keeping in mind that water does not contaminate in its most basic (simple) state. Other than that, it becomes polluted when impure earth materials are combined with it, thus creating a *Raddi* (bad) condition throughout.

The same is true for air, in that it does not become polluted when it is pure, but becomes contaminated when harmful vapours mix with it and produce an unhealthy environment for all. The cause of this situation is generally that the wind blows the polluted vapour from remote locations (where there are filthy streams, dead bodies that have not been properly buried or burned due to a deadly epidemic) to uncontaminated locations. As a consequence, these vapours pollute the air in a healthy environment. Occasionally, the source of pollution is not far away but is nearby, or these events occur there. We are unaware of the extent to which the planet is polluted by the causes found inside it.

The best weather preserves its natural state and temperament. If it's summer, it's hot; if it's winter, it's cold. Both of these variations are caused by one of the celestial bodies. To some extent, one party claims to be aware of these changes, but their assertion is not supported by any credible and convincing statement. The primary and remote cause of these changes is almost certain celestial forms, while the immediate cause is some ground conditions. When the active celestial and passive earthly forces evaporate and smoke, a large amount of moisture is released into the air. Now, with its insufficient heat, this force acts on-air and, as a result of the weak force, moistened air turns into bad air that has a detrimental effect on the heart when inhaled. As a result, both the temperament of the soul of the heart and the moisture inside the heart become contaminated. Then an unnatural heat travels through the body's arteries, resulting in an outbreak and spread to a creature with a specific proclivity for spreading.

Isti'dād Wabā' (predisposition to epidemics)

These are the people who are afflicted by contaminated air and whose bodies are brimming with bad humour. Since bodies devoid of bad humour are almost impervious to the effects of contaminated air. Airborne epidemics also have an impact on frail bodies. They are vulnerable to epidemics because their pores are large, they live in humid environments, and they often take hot baths. At the start of the *Kharif* season, meteor flames and stars are more visible in the sky. It notifies the public of an epidemic in the same way as a cause notifies the public of a disease. Bear in mind that if there is cloudiness and heat in the air, an outbreak is imminent. Similarly, there should not be excessive heat in the summer, the air should be more bitter and the trees should be dusty. The weather shifts often during the day; one day the air is clear and the sun is bright, but the next day the air blows, and the sun is obscured by a veil of dust, indicating that an epidemic is about to spread.³⁴

Pathogenesis

Changes in air quality, whether caused by heat or humidity, cause many problems in the body and affect almost every aspect of life. These variations in air quality are sometimes caused by the same form of metabolism and sometimes by a different type of metabolism. As a result, when this altered or contaminated air is inhaled, it contaminates the humour. Heat is added to the air, which reaches the body; organs become loose, fluid dissolves, and thirst increases. The soul perishes and strength is squandered. Digestion is detrimental because the blood inside the body, which serves as a mechanism for healthy operation, dissolves.

There is a pale coloration of the skin due to the dissolution of red humour and the predominance of bile. Contamination of the humour results in contamination of the heart. There is irregular heat output in the heart, which results in humoral excitation and, ultimately, contamination. These contaminated humours circulate into internal vessels and weak organs, causing a variety of symptoms of *Wabā'*.²³

As a result of the preceding discussion, we may infer that *Wabā'* (epidemic) is a disease that affects a large number of people at the same time. It is the contamination of air that results in a change in the original quality of the air. Changes and transformations in the quality of air occur for a variety of reasons: earthly, celestial, and even both celestial and terrestrial.

Additionally, despite their inability to observe microbes, Unani scholars have identified disease origins, reservoirs, modes of transmission, and causes. The Unani System of Medicine's theories and findings strongly mimic contemporary information (contemporary) about infections, reinforcing the notion that USM can play a critical role in combating current epidemics.

Unani System of Medicine has two fundamental theories about the cause of illness, depending on the mode of origin³⁵ i.e., imbalance in the humour inside the body and invasion of foreign bodies, which attack the humour. Infectious and epidemic diseases, according to these theories, fall into the second group. The *Wabā'* (epidemic) affects the humour, heart, and other vital organs such as the liver and stomach, as well as *Harārat Gharīziyya* or innate heat of the body.

Indicators of *Wabā'* (epidemic)

Summer rains are frequent, the sky is cloudy during the day and night, the southern and western winds blow stronger and more often, the wind is always still and remains southern, electrical storms occur at night, earth creatures emerge from their holes the creatures such as laqlaq (lizard), ababeel (martin), hudhud (woodpecker), and others birds leave their nests and sometimes their eggs and relocate to a safer place, smoke blows over the buildings despite the absence of smoke (in fact, this is contaminated air), the temperature of the air fluctuates unpredictably, dust and dirt accumulate in the air, the weather becomes humid, and the tendency for the weather to gloom increases unpredictably.^{22,28,32,34}

Symptoms of *Nazla-i-Wabā'iyya* (epidemic influenza) and *Humma-i-Wabā'iyya* (epidemic fever)^{29,31}

Fever with or without chills, Sore throat, Hoarseness in the voice, Dry cough, Nausea, Loss of taste, Headache, Vertigo, Congestion and tension in the chest, Breathing difficulty, Diarrhea and Loss of smell

As indicated above, the symptoms of *Nazla-i-Wabā'iyya* (epidemic influenza) and *Humma-i-Wabā'iyya* (epidemic fever) closely match those of the present COVID-19.

Principles of Unani System of Medicine for prevention and management of the infectious and epidemic diseases including COVID-19³⁵

- Avoid contact with an infected person and thoroughly clean the area.
- Utilize blood purifiers to normalize and purify the humours.
- Administering the appropriate medication following the symptom.
- Utilize *Fād Zahr* and *Advia Tiryāqiyya* (antidote drugs) to ward off infection and epidemics.
- Tone up the heart and guard against the innate heat being diminished or drained in some other way.

The aim of preventive measures during *Wabā'* (epidemic) is to contain the spread of infection, promote hygiene, and strengthen the immune

system. The works of eminent Unani scholars such as Rabban Tabarī, Zakariyya Rāzī, Ibn Sīnā, Ismā'il Jurjānī, and Azam Khan advocate for broad measures of physical separation, quarantine, and isolation. According to Rāzī's book *Kitāb al-Mansūrī*, one should avoid persons having contagious and epidemic diseases, humid airy climates, crowded accommodations, and damp areas.

Environmental decontamination

Disinfection of the environment and maintaining hygienic conditions are critical to protecting human health during an outbreak, as the infection spreads through this medium. Unani scholars advocated for the use of Unani herbs as Joshanda (decoction) or distillate for spraying or as an air disinfectant fumigant. While herbal fumigation is rarely used at the moment, some studies have been published on the efficacy of herbal drugs in sanitizing the environment. Resins, tannins, glycosides, alkaloids, essential oils, and flavonoids are phytochemicals having germicidal, antimicrobial, and anthelmintic properties.³⁶

Things to do during the *Amrād-i-Wabā'iyya* (epidemic diseases)^{19,20,22,29}

Incorporate vinegar into your diet; Drink boiled water; Consume light foods; Make use of citrus fruits; Maulshaeer (Barley water) is a good choice and drink few cups of tea daily.

Things to avoid doing during the *Amrād-i-Wabā'iyya* (epidemic diseases)^{19,20,22,29}

Avoid consumption of meat, fish, curd, sweet, fruit with plenty of water, oily food and alcohol; avoid sexual intercourse and hot bath.

Normalising and purifying the humour by blood purifiers

Blood purifiers have been used to treat a variety of ailments based on the *Musaffi-i-Dam* theory (removal of unwanted and waste from the blood).^{35,67} Both single drugs such as Charaita (*Swertia chirata*),^{70,71} Neem (*Azadirachta indica*),^{88,104} Mundi (*Sphaeranthus indicus*),⁶⁷ Babchi (*Psoralea corylifolia*),⁶⁷ and Shahtara (*Fumaria parviflora*).⁶⁷ Additionally, compound drugs such as Habb Musaffi Khoon,⁶⁸ Itrifal Mundi,⁶⁸ Majoon Musaffi Khas,⁶⁹ Arq Ushba,⁶⁹ and Arq Chiriata,⁶⁹ are used to purify the blood.

Use of *Fād Zahr* and *Advia Tiryāqiyya* (antidote) and cardiotoxic for protection from infection and epidemics.

Fād Zahr, *Advia Tiryāqiyya* (antidote), and cardiotoxic are used to maintain normal function and protect against disease. The Unani Scholars agreed on the heart's superiority in terms of vital (innate) heat and vital operation, which are responsible for disease prevention and normal function.^{35,70} Individual drugs⁷¹ such as Badranjboya (*Melissa officinalis* L), Zafran (*Crocus sativus*), Gaozaban (*Borago officinalis*), Abresham (*Bombyx mori*), and Sandal safaid (*Santalum album*) are all examples of such herbal remedies,⁷⁰⁻⁷¹ Additionally, compound formulations^{69,71} like *Khamira Marwareed*, *Khamira Abresham*, *Qalbeen*, *Khamira Gaozaban*, and *Khamira Sandal Sada* are used to strengthen the heart, which supplies enough energy to protect the body and vital heat from epidemic diseases (Table 1).

The rationale for using cardiotoxic, *Advia Tiryāqiyya* (antidote), and *Fād Zahr* can be understood in light of the body's defence mechanism. Only when the body is incapable of fighting or resisting the invasion will the epidemic disease deceive. Since Unani Medicine is focused on assisting the body in protecting itself against disease in general and infection in particular, the use of cardiotoxic, *Advia Tiryāqiyya*

Table 1: Fād Zahr and Advia Tiryāqiyya (antidote) and cardiotoxic for protection from infection and epidemics including COVID-19.

Formulations	Ingredients	Dose	Dosage form	Pharmacological activity	References
Tiryāq-e-Wabā'ī	Sibr (<i>Aloe vera</i>) - 2 part; Mur Makki (<i>Commiphora myrrh</i>) - 1 part; Zafran (<i>Crocus sativus</i>) - 1 part; Arq Gulab (distillate of <i>Rosa damascene</i>) - 10 part	1-2 Pills (500 mg each)	Habb (Pill)	Antioxidant, immunomodulator, antiviral, antipyretic, cardioprotective	73
Tiryāq-e-Arba	Habb ul Ghar (<i>Laurus nobilis</i> L.) - 1 part Juntiyana (<i>Gentiana kurro</i> Royle) - 1 part Mur Makki (<i>Commiphora myrrha</i> Engl.) - 1 part Zarawand Taveel (<i>Aristolochia longa</i> L.) - 1 part Honey or Sugar - Q.S	3-5 g with lukewarm water	Semi-solid (Majoon)	Dafa-e-Sumoom (antidote), Dafa- e-Tashannuj (anti-spasmodic), antiviral, analgesic, Anti- inflammatory, antioxidant activity	74
Khamira Marwareed	Marwareed (pearl) - 25 gm; Tabasheer (<i>Bambusa arundinacea</i>) - 25 gm; Sandal Safaid (<i>Santalum album</i>) - 25 gm; Amber (Ambergris) - 10 gm; Qand (Sugar) - 1.5 kg; Arq Gulab (distillate of <i>Rosa damascene</i>) - 1 lit; Arq Gaozaban (distillate of <i>Borago officinalis</i>) - 1 lit	3-5 g	Semi-solid (Majoon)	Cardiac-tonic, immunomodulator.	75
Arq Chiraita	Chiraita (<i>Swertia chirata</i> Ham.) - 1 kg; Water - 9.6 liter	125 ml	Distillate	Blood purifier, antibacterial, antioxidant	69,131

(antidote), *Fād Zahr*, and other immunomodulators appears to be right to a large extent. Several important *Advia Tiryāqiyya* (antidote) and *Fād Zahr* include,^{68,70,72} single-drug such as Jadwar (*Delphinium denudatum*), Filfil Siyah (*Piper nigrum*), Habb-ul-Ghar (*Laurus nobilis*), Afsanteen (*Artemisia absinthium*), and Mur-Makki (*Commiphora myrrha*), as well as compound preparations such as *Tiryāq-e-Arba*, *Tiryāq-e-Wabā'ī*, *Dawa-e-Jalinus*, and *Habb Taoon Qawi*.

Concept of immunomodulators in Unani system of medicine

Rabban Tabarī mentioned *Tabī'at* (medicatrix naturae) as a quasi-administrative power of the body in his treatise, *Firdaws al-Hikma*. This force administers the body with the assistance of numerous forces known as *Quwa* (power/faculty) of the body, including *Quwā Tabī'iyya* (natural faculties), *Quwā Haywāniyya* (vital power), and *Quwā Nafsāniyya* (psychic power/mental faculties). Thus, *Tabī'at* (medicatrix naturae) is primarily responsible for the general administration of the body, as well as its protection or immunity (a subset of *Tabī'at*).⁷⁷

Immunity (*Quwwat-i-Mudafa'at*) is described in the USM as the body's defines system that protects the host from invading pathogens, enabling people to monitor and enhance their resistance to improve their health. The Unani System of Medicine places a premium on improving the patient's immune system to increase the body's resistance. A review of classical Unani literature shows that great Unani physicians such as Buqrāt (Hippocrates) [460-370 BC], Jalinūs (Galen) [131-210 AD], Rāzī (Rhazes) [865-925 AD], and Ibn Sinā (Avicenna) [980-1037 AD] used a variety of immunomodulator drugs⁷⁸ (Table 2).

General management

Although there is currently no proven treatment for COVID-19. We can have symptomatic care.^{29,31}

A basic regime for *Nazla-i-Wabā'iyya* (epidemic influenza), prepare a decoction of Behidana (*Cydonia oblonga* Mill.)-3 gm, Unnab (*Ziziphus jujuba* Mill.)-5 numbers, Sapistan (*Cordia myxa* L.) -9 numbers and add 24 ml *Sharbat Banafsha* (a compound formulation), and drink lukewarm

twice daily. This is the primary Nuskha (regime); medications may be substituted or added based on the severity and type of the symptoms.

In case of the fever add Khaksi (*Sisymbrium irio* L.) -5 gm in the above decoction and consume.

In case of severe cough add Khaskhas (seeds of *Papaver somniferum* L.) 24 gm or *Sharbat Aijaz* (a compound formulation) 25 ml or *Khamira Khaskhas* (a compound formulation) 7 gm in place of *Sharbat Banafsha*.

In the case of Sore throat add *Sharbat Toot Siyah* (a compound formulation) in place of *Sharbat Banafsha*.

In the case of Sore throat, a gargle of the following drugs may also be used: Sumaq (*Rhus coriaria* L.), Rubb-e-Jauz (concentrate of *Juglans regia* L.), Rubb-e-Toot (concentrate of *Morus indica* L.), Arq Gulab (distillate of *Rosa damascena* Herrm.) may be boiled in sufficient quantity of water to make a decoction and do gargle two times a day.

In case of the headache and body ache following regime for foot bath may be used: *Banafsha* (*Viola odorata* L.) flower, Ikliul malik (*Trigonella uncata* Boiss. and Noe) pods, Babuna (*Matricaria chamomilla* L.) flower, Marjanjosh (*Origanum vulgare* L.), Khatami (*Althaea officinalis* L.) all in 25 gm quantity and bery leaves (*Ziziphus mauritiana* Lam.) 60 gm, make a decoction of all ingredients in 10 liters of water and decant and do Pāshoya (foot bath) for 10 min in lukewarm decoction.

In case of cough with chest pain Qairooti (anti-inflammatory paste) made up of the following drugs may be used externally; Aarad Karasna (Flour of *Pisum sativum* L.), 12 gm, Zafran (*Crocus sativus* L.), 1 gm, Sibr (*Aloe barbadensis* Mill.) 1 gm, grind to a fine powder and make a paste and apply on the chest in lukewarm condition

For inhalation following regime may be used; 12 gm Laooq Sapistan, 12 gm Laooq Motadil may be boiled in 150 ml water or Arq Gaozaban (distillate of *Borago officinalis*) and inhaled.

The Arq Ajeeb (Table 3) may be inhaled as such or inhaled by putting 2-5 drops in hot water. The other regime for the same purpose is as Kafoor (*Cinnamomum camphora* (L.) J.Presl), Qust (*Saussurea costus* (Falc.) Lipsch.), Kundur (*Boswellia serrata* Roxb. ex Colebr), Ood (*Paeonia emodi* Royle.), Mushk (*Moschus moschiferus* L.), Mur Makki

Table 2: Immunomodulators mentioned in Unani System of Medicine.

Sl.No.	Unani Name	Botanical name	Part used	Chemical constituent	Mechanism of action	References
1.	Aam	<i>Mangifera indica</i> L.	Fruit	Mangiferin, Quercetin, Gallic acid	An increase in humoral antibody (HA) titer and DTH enhance the production of IgG1 and IgG2b	79-80
2.	Amla	<i>Emblica officinalis</i> Gaertn.	Fruit	Phyllembin Gallic acid	Immunosuppressive effects on lymphocyte proliferation, restoration of IL-2 and IFN- γ production	81-82
3.	Asgand	<i>Withania somnifera</i> (L.) Dunal	Root	Steroidal Lactones (Withanolides), Polysaccharides, Lectins, Proteins, and Peptides	Increase total WBC count, bone marrow cellularity, circulating antibody titer, plaque-forming cells in the spleen, phagocytic activity of macrophages	83-84
4.	Aslus-soos	<i>Glycyrrhiza glabra</i> L.	Bark, Root	Glycyrrhizin, Liquirtin, Isoliquertin, chamazulene, Glucoliquirtin- apioside	Enhance immune and antioxidant enzyme activities stimulates immune cells by CD69 expression on CD4, CD8 T cells and macrophages function	85-86
5.	Baboona	<i>Matricaria chamomilla</i> L.	Flowers	Bisablol, Guiazuline, Matricine, Flavonoids including Apigenin, Luteolin	Initiation of immunostimulant properties of heavy erythrocytes, activation of immunoregulation cells of peripheral blood, and increased sensitivity of effector cells to helper signals.	87-88
6.	Balela	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Fruit	Gallic acid, Ellagic acid	Increase in phagocytic activity of macrophages and T-lymphocyte proliferation	89
7.	Bargad	<i>Ficus benghalensis</i> L.	Whole plant	Flavonoids, Phenolics, Steroids, Glycosides, Carbohydrates, and Proteins	Enhance the phagocytosis of the human neutrophils <i>in-vitro</i> , increase the antibody titer value	84,90
8.	Bartang	<i>Plantago major</i> L.	Seeds	Aucubin, Chlorogenic acid, Ferulic acid, Vanilic acid, P-coumaric acid, Luteolin, Baicalein	It expresses higher levels of MHC class II molecules and stimulatory molecules such as CD80 and CD86. It acts on human peripheral blood mononuclear cells (PBMC) through lymphocyte transformation; enhance the secretion of IFN- γ	91
9.	Sibr	<i>Aloe barbadensis</i> Mill.	Leaves	Glucmannans, Aloin, Emodin	Increases phagocytosis and stimulate the production of superoxide	92-94
10.	Filfil daraz	<i>Piper longum</i> L.	Fruits, leaves	Piperine Sesamin Asarinine	Increase the total WBC count, bone marrow cellularity, and α - esterase positive cells, enhance the total antibody production	82,95
11.	Fowah	<i>Rubia cordifolia</i> L.	Leaves	Alkaloids, Cardiac glycosides, Tannins, Flavonoids, and Phenols	Increase in total counts of WBC and RBC	84
12.	Gilo	<i>Tinospora cordifolia</i> (Willd.) Miers	Stem Root	Berberine, Tinosporic acid	Increase the total white blood cell count, bone marrow cellularity, and α -esterase positive cells, enhance the macrophage activation	96-97
13.	Gudhal	<i>Hibiscus rosa-sinensis</i> L.	Flower	Cyanidin, Quercetin, Hentriacontane, Thiamine, Riboflavin, Niacin and Ascorbic acid	The stimulatory effect on both humoral immunities as well as cell-mediated immunity by stimulating phagocytosis, increase DTH.	98
14.	Haldi	<i>Curcuma longa</i> L.	Rhizome	Curcumin Turmerol	It shows immunomodulation through inhibition of proliferation induced by PMA and anti-CD28 antibodies. It also inhibits the T lymphocytes isolated from healthy donors induced by PHA	84,88,99
15.	Halela	<i>Terminalia chebula</i> Retz.	Fruits	Gallic acid Chebulagic acid	Inhibit the killing activity of CD8+CTL Granular exocytosis	100

continued...

Table 2: Cont'd.

Sl.No.	Unani Name	Botanical name	Part used	Chemical constituent	Mechanism of action	References
16.	Kalonji	<i>Nigella sativa</i> L.	Seeds	Thymoquinone, Nigellone and d-limonene	Reduces pancreatic ductal adenocarcinoma cell (PDA) synthesis of monocyte chemoattractant protein-1 (MCP-1), TNF- α 17, IL-1 β and cyclooxygenase (COX) -2 Inhibits the polymorphonuclear leukocytes functions	84
17.	Kath	<i>Acacia catechu</i> (L.f.) Willd.	Bark	Quercetin Catechin	Significant increase in the neutrophil adhesion, carbon clearance, and reduction in cyclophosphamide-induced neutropenia	101
18.	Kutki	<i>Picrorhiza kurroa</i> Royle ex Benth.	Rhizome	Picoside-II, III. Pikuroside Minicoside Androsin	Strong inhibitory activity towards the classical pathway of complement, chemiluminescence, and T- cell proliferation	102-103
19.	Musli Safed	<i>Chlorophytum borivilianum</i> Santapau and R.R.Fern.	Root	Bibenzyl xyloside, Sapogenins, Nonacosane, Tetracosanoic, and Triacosanoic acids.	Polysaccharide fraction was able to enhance the antibody titer, while the non-polysaccharide fraction was effective in enhancing cell-mediated response by augmenting the natural killer cell activity	82,84
20.	Neem	<i>Azadirachta indica</i> A.Juss.	Flower, leaves, Seed	Margosine Nimbidin	Increase IgM and IgG production, inhibits NO synthesis, degranulation of neutrophils	88,104
21.	Kanwal	<i>Nelumbo nucifera</i> Gaertn.	Rhizome, seeds	Quercetin Nuciferin Roemerin Flavonoid	Reduce NO production, protects mast cells degranulation, Express CD40, CD80, CD86	82,105-106
22.	Papita	<i>Carica papaya</i> L.	Leaves, seeds	Caproside Sinigrin Carpaine	It enhances the phyto-hemagglutinin responsiveness of lymphocytes, inhibits the classical complement-mediated hemolytic pathway	107-108
23.	Satawar	<i>Asparagus racemosus</i> Willd.	Root	Vitamins, Saponins, Glycosides, Golyphenol, and Flavonoids	Significant increase in phagocytosis, Proliferation of lymphocytes, reduced glutathione content, and decreased lipid peroxidation.	84,109
24.	Tulsi	<i>Ocimum sanctum</i> L.	Leaves	Eugenol Carvacrol Eugenol Methyl- ether Apigenin Ursolic acid	Increased DTH to RBCs The marginal stimulatory effect on humoral immunity	82,110
25.	Zanjabeel	<i>Zingiber officinale</i> Roscoe	Rhizome	Gingerols, Paradols, 3-Hydro-shogaols, β - Phalladrene	Reduction in IL-2 and IL-10 production, inhibit lymphocyte proliferation	84,111

DTH= Delayed type hypersensitivity, IL=interleukin, IFN= interferon, WBCs= white blood cells, RBCs= red blood cells, CD-8= Cluster of differentiation-8, TNF- α = Tumour necrosis factor- α , MHC class-II=Major histo-compatibility complex molecule, PMA= Phorbol 12-myristate 13-acetate, PHA= Poly hydroxy alkanooates, CTL= Cytotoxic t- lymphocytes.

(*Commiphora myrrha* (Nees) Engl.) take all ingredients and boil in 150 ml water and inhale the vapours.

In case of diarrhea Zahar Mohra (serpentine stone) 1 gm and Tabasheer (crystal from *Bambusa arundinacea* Willd.) 1 gm in the form of fine powder may be taken with Khamira Khaskhas (a compound formulation).

To address the overall weakness any of the following compound formulations may be used:

Khamira Gaozaban Jawaharwala 5 gm, Khamira Marwareed 5 gm, Khamira Abresham Hakim Arshad wala 3 gm, Safuf Asgandh 5 gm, Majoon Falasafa 5 gm (Table 3).

DISCUSSION

COVID-19 is a pandemic caused by a novel coronavirus called SARS-CoV-2. *Waba'*, is a term used in the USM for an epidemic to refer to changes in the composition and condition of air caused by bad matter contamination. Generally, this virus attacks the lungs and causes respiratory symptoms. COVID-19 symptoms can range from mild to severe. Dry cough, fever, sore throat, and diarrhoea are the most common mild symptoms, while respiratory and multiorgan failure is the most common extreme symptoms.^{29,31} The causes, pathology, symptoms, and management of various epidemic diseases such as smallpox, plague,

Table 3: Symptomatic drugs described in the Unani System of Unani for epidemic condition.

Sl. No	Unani Drug	Botanical name	Dose	Part used	Pharmacological action	References
1	Adoosa	<i>Adhatoda vasica</i> Nees	Decoction = 5-10 ml Powder = 3 gm	Leaf	Antitussive, expectorant, antibacterial, hepatoprotective	112
2	Unnab	<i>Ziziphus jujuba</i> Mill.	5 Pieces	Fruit	Antiviral, antioxidant, immunomodulator, anti-influenza, expectorant, antitussive, antipyretic	31,75,113-114
3	Sapistan	<i>Cordia myxa</i> L.	9 pieces	Fruit	Antioxidant, immunomodulator, Hypoglycemic, antitussive, analgesic	31,115-117
4	Behidana	<i>Cydonia oblonga</i> Mill.	3-5 g	Seed	Antioxidant, immunomodulator, antiallergic, antiinfluenza, antipyretic, antitussive	118-119
5	Khaksi	<i>Sisymbrium irio</i> L.	5-7 g	Seed	Antipyretic, expectorant, analgesic, antimicrobial, antioxidant	31,120
6	Toot	<i>Morus indica</i> L.	6-10 g	Leaf, fruit	Antiallergic, antioxidant, antistress, antitussive	19,121
7	Sharbat-e-Banafsha	Banafsha (<i>Viola odorata</i> L.) flowers - 125 g; Qand (Sugar) - 1 kg	25-50 ml	Syrup	Laxative, concoctive, antitussive	122
8	Arq Ajeeb	Kafoor (<i>Cinnamomum camphora</i>) - 2 part; Satt-e-Pudina (Menthol) (<i>Mentha arvensis</i>) - 2 part; Satt-e-Ajwain (Thymol) (<i>Trachyspermum ammi</i>) - 1 part	2-5 drops	Liquid mixture	Antiallergic, analgesic, carminative, antiseptic	72

and leprosy are mentioned in ancient Unani literature. Unani physicians have listed a variety of general interventions for the prevention of epidemics. General interventions include social distancing, avoiding crowded places and close contact with an infected individual, and the use of immunomodulators, fumigants, and certain specific medications.^{19,35}

The aim of preventive measures during *Wabā'* (epidemic) is to boost immunity, prevent infection spread, promote hygiene, and promote overall health. Certain Unani drugs are defined in the literature as being useful for environmental sanitization. These medications can be applied through spray or fumigation.³⁶ Vinegar, camphor, sandalwood, and rose water are used in the form of spray.^{42,47,59,61} Rosewater contains citronellol, geraniol, kaempferol, and nerol, which have antibacterial, antimicrobial, and insecticidal properties.^{24,28,32,42} Camphor contains camphor oil, linalool, and saffrole, all of which have antimicrobial properties.^{19,22,28,30,32-34,47} Due to the presence of α - and β -santalol, β -santalene and α -trans-bergamotol, sandalwood exhibits antimicrobial and insecticidal activity.^{19,22,28,32-34,47} Owing to the presence of acetic acid, catechin, and gallic acid, the vinegar possesses antibacterial and insecticidal properties.^{19,23-24,28,32,61} These medications are extremely effective and beneficial and are still vogue.

Numerous fumigants are often addressed in the USM to sanitize the environment (Table 5). *Salix caprea* L.,^{28,32,40} *Cymbopogon jwarancusa* (Jones) Schult.,^{23,32,45} *Tamarix gallica* L.,^{23,46} *Boswellia serrata* Roxb. ex Colebr.,^{19,23,27-28,34,48} *Styrax benzoides* W. G. Craib,^{24,49} *Paeonia emodi* Royle.,^{19,24,33-34,54-55} *Zingiber officinale* Roscoe,^{27,66} has been recommended. Numerous scientific studies have identified the antimicrobial, insecticidal, insect repellent, and antifungal properties of these plants. These activities are a result of the presence of

chemical constituents such as Naringenin, Taxifolin, Citral, β -Pinene, Linalool, Geraniol, α -terpeniol, Catechin, Gallic acid, Vanillic acid, Monoterpenes, Diterpenes, Sesqui-terpenes, Benzaldehyde, benzoic acid, benzyl benzoate, cinnamic acid, vanillin, Emodinol, Paeonin A, Paeoninol, Gingerol, Geraniol, and Eugenol.^{40,45-46,48,54-55,66}

Unani medications, both single and compound formulations, are beneficial in the treatment of COVID-19. *Withania somnifera* (L.) Dunal,⁸⁴ *Terminalia bellirica* (Gaertn.) Roxb.,⁸⁹ *Aloe vera* (L.) Burm. f.,⁹²⁻⁹³ *Piper longum* L.,⁹⁵ *Tinospora cordifolia* (Willd.) Miers,⁹⁶⁻⁹⁷ *Curcuma longa* L.,^{84,99} *Nigella sativa* L.,⁸⁴ *Ocimum sanctum* L.,¹¹⁰ *Zingiber officinale* Roscoe,^{84,111} and *Emblica officinalis* Gaertn.,¹²³⁻¹²⁵ *Swertia chirata* Buch.-Ham. Ex Wall.,¹³¹⁻¹³² *Allium sativum* L.,¹³⁶ *Solanum nigrum* L.,¹³⁹⁻¹⁴⁰ *Hyssopus officinalis* L.,¹⁴⁴ have immunomodulatory activity and antiviral activity respectively (Tables 4, 5). These effects are due to the presence of {(steroidal Lactones withanolides, polysaccharides, lectins, proteins, and peptides), (gallic acid and ellagic acid), (glucomannans, aloin and emodin), (piperine, sesamin and asarinine), (berberine and tinosporic acid), (curcumin and turmerol), (thymoquinone, nigellone and d-limonene), (eugenol, carvacrol, eugenol methyl- ether, apigenin and ursolic acid), (gingerols, paradols, 3-hydroshogaols and β -Phalladrene)} and (penta galloyl glucose-PGG, phyllaemblicin-B), (swertiamerin, amarogentin, swerchirin), (diallyl trisulfide, allicin, ajoene), (solasodine, solasonin, gallic acid, caffeic acid) and (quercetin, apigenin, acacetin) respectively.

According to one study, *Withania somnifera* aqueous extract exhibited immunomodulatory activity by increasing total WBC count, circulating antibody titer, plaque-forming cells in the spleen, and macrophage phagocytic activity⁸⁴ (Figure 1). In another study, *Aloe vera* (L.)

Table 4: Antiviral drugs listed in the Unani System of Medicine.

Sl. No	Unani name	Botanical name	Part used	Chemical constituent	Mechanism of action	References
1	Aam	<i>Mangifera indica</i> L.	Fruit, Leaves	Mangiferin, isomangiferin	Inhibit virus replication, decrease in TNF- α production	80
2	Amla	<i>Emblica officinalis</i> Gaertn.	Fruit	Penta galloyl glucose (PGG), Phyllaemblicin- B	Inhibition of viral reverse transcription and replication; reduce the accumulation of Nucleo-protein at the late stage of the replication cycle	123-125
3	Anar	<i>Punica granatum</i> L.	Juice Seed Peel	Ellagic acid, Caffeic acid, Punicalagin	Punicalagin block replication of the virus Ribonucleic acid (RNA), inhibit agglutination of chicken RBC's by the virus and had virucidal effects	126
4	Aslussoos	<i>Glycyrrhiza glabra</i> L.	Root	Glycyrrhizic acid, Glycyrrhizin, Liquiritigenin	Glycyrrhizin interferes with H5N1 replication via reduced activation of nuclear factor-kappa- light chain enhancer of activated B cells(NF-kB), c-Jun N-terminal kinase (JNK), and redox-sensitive signaling events	127
5	Asgand	<i>Withania somnifera</i> (L.) Dunal	Root	Withaferin A, Withanolide A, Withanone	Reduce the interaction between ACE2 and RBD (receptor binding motif)	128-129
6	Babool	<i>Acacia arabica</i> (Lam.) Willd.	Leaves and bark	Catechin, Gallic acid, Ellagic acid, Quercetin	Inhibit the functions of the viral protein	130
7	Chiriata	<i>Swertia chirata</i> Buch.-Ham. ex Wall.	Stems leaves	Swertiamerin, Amarogentin, Swerchirin	Inhibit viral plaque formation	131-132
8	Sibr	<i>Aloe barbadensis</i> Mill.	Leaf extract	Aloe-emodin, Emodin, Chrysophanol	Prevent virus adsorption, inhibit replication of the virus	94
9	Haldi	<i>Curcuma longa</i> L.	Rhizome	Curcumin	Block host-virus interaction (viral spike protein-ACE inhibitor)	133
10	Kunjad	<i>Sesamum indicum</i> L.	Seed oil	Sesamin, Sesamol, Sesamol	Molecular binding at ARG118, ILE222, ARG224, TYR406; Enhance the IL-2 by downregulating the JNK, p38, ERK1/2MAPK signaling pathways	134
11	Kundur	<i>Boswellia serrata</i> Roxb. ex Colebr.	Gum Resin	Essential oil	Oil treatment of the virus inhibits viral NP, but not mRNA expression	135
12	Kutki	<i>Picrorhiza kurrooa</i> Royle	Rhizome, Stem	Picroside I, Picroside II, Picrorrhizin, Veronicoside	Inhibit replication and infection of healthy cells	123
13	Seer	<i>Allium sativum</i> L.	Bulb	Diallyl trisulfide Allicin Ajoene	Alter transcription and translation of viral genome, inhibit RNA polymerase	136
14	Litchi	<i>Litchi chinensis</i> Sonn.	Fruit	Oligonol, Stigmasterol, Citric acid, Linoleic acid, Friedelin	Oligonol inhibits nuclear export of viral ribonucleoproteins (RNP) by blocking ERK phosphorylation	137
15	Madar	<i>Calotropis gigantea</i> (L.) Dryand.	Leaves stem bark	A new lignan glycoside, (β)-pinoselinol4-O[60-Ovanilloyl]-b-D-glucopyranoside	Inhibit NF-kB pathway and viral ribonuclear proteins nuclear export.	138
16	Makoh	<i>Solanum nigrum</i> L.	Seed	Solasodine, Solasonin, Gallic acid, Caffeic acid	Inhibit replication of viral deoxyribonucleic acid (DNA) and RNA	139-140
17	Sahejna	<i>Moringa oleifera</i> Lam.	Leaves	Ellagic acid, Aurantiamide acetate	Inhibit viral replication	141
18	Zaitoon	<i>Olea europaea</i> L.	Leaves	Oleuropein, Cornoside	Stimulation of phagocytosis, inhibit cell to cell transmission of the virus, Stop viral replication	65,142
19	Zanjabeel	<i>Zingiber officinale</i> Roscoe	Rhizome	6- Gingerol	Increases binding affinity and interaction with targets of virus viz. viral proteases, RNA binding protein	143
20	Zufa	<i>Hyssopus officinalis</i> L.	leaves	Quercetin, Apigenin, Acacetin	Inhibition of virus replication	144

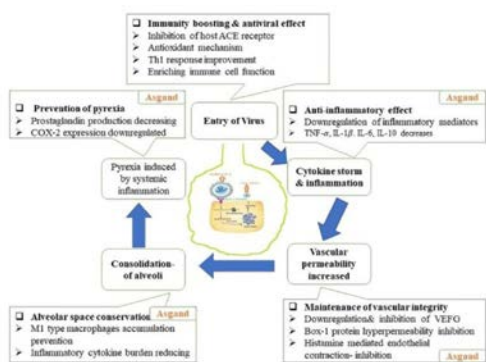
Table 5: Fumigants described in Unani System of Medicine.

Sl.No	Unani name	Botanical name	Part used	Method of use	Active principle	Action	References
1.	Aabnus	<i>Diospyros ebenum</i> J. Koenig ex Retz. (Ebenaceae)	Wood Leaf	Fumigation	Terpenoids, Ursanes, Polyphenols	Antibacterial Insecticidal	19,37-38
2.	Abhal	<i>Juniperus communis</i> L. (Cupressaceae)	Berry	Fumigation	α -cadinol, α -pinene, β -myrcene, α -humulene, epi- α - bisabolol, GermacreneD, Spathulenol and Germacrene- B	Antimicrobial Antifungal	39
3.	Bedemushk	<i>Salix caprea</i> L. (Salicaceae)	Stem wood, knot	Fumigation	Naringenin, Catechin, Taxifolin, Prunin	Antimicrobial Antifungal	40
4.	Banafsha	<i>Viola odorata</i> L. (Violaceae)	Whole	Fumigation	Violine, Ionine	Antimicrobial	41
5.	Gule Surkh	<i>Rosa damascena</i> Herrm. (Rosaceae)	Distillate of petals	Spray-on clothes, curtains	Citrenello, Geraniol, Nerol Kaempferol	Antibacterial Antimicrobial Insecticidal	42
6.	Hilteet	<i>Ferula assa-foetida</i> L. (Apiaceae)	Gum-resin	Fumigation	Conferol, Feselol, Ferulenol	Antibacterial Antifungal Antiviral	43-44
7.	Izkhar	<i>Cymbopogon jwarancusa</i> (Jones) Schult. (Poaceae)	Leaves, stems, Inflorescence	Fumigation	Citral, β - Pinene, Linalool, Geraniol, and α - terpeniol	Antimicrobial, Insect-repellent, Insecticidal	45
8.	Jhau	<i>Tamarix dioica</i> Roxb. ex Roth (Tamaricaceae)	Leaves Flowers	Fumigation	Catechin, Gallic acid, Vanillic acid	Antimicrobial	46
9.	Kafoor	<i>Cinnamomum camphora</i> (L.) J. Presl. (Lauraceae)	Crystal, oil	Fumigation	Camphor, Linalool, Safrole	Antimicrobial	47
10.	Kundur	<i>Boswellia serrata</i> Roxb. Ex Colebr. (Bursaceae)	Oleo-resin gum	Fumigation	Mono-terpenes, Diterpenes, Sesqui-terpenes	Antifungal Antimicrobial	48
11.	Loban	<i>Styrax benzoides</i> W. G. Craib (Styracaceae)	Resin	Fumigation	Benzaldehyde, benzoic acid, benzyl benzoate cinnamic acid, and vanillin	Bactericidal Fungicidal	49
12.	Mastagi	<i>Pistacia lentiscus</i> L. (Anacardiaceae)	Gum-resin	Fumigation	α -pinene, β -pinene, Myrcene, α -Copeane	Antimicrobial Antifungal	50-51
13.	Mur Makki	<i>Commiphora myrrha</i> (Nees) Engl. (Bursaceae)	Oleo-gum resin	Fumigation	Cuminic aldehyde, Eugenol, Pinene, Limonene, Diterpenes, and Sesquiterpenes	Antibacterial Antifungal Antiviral Antiseptic	52
14.	Nilofar	<i>Nymphaea alba</i> L. (Nymphaeaceae)	Flower Seed Root	Fumigation	Catechin, Tannic acid, Apigenin, Gallic acid,	Antimicrobial Antiviral	53
15.	Ood	<i>Paeonia emodi</i> Royle (Paeoniaceae)	Wood	Fumigation	Emodinol, Oleanolic acid, Paeonin A, Paeoninol	Antibacterial Antifungal Insecticidal	54-55
16.	Qaranfal	<i>Syzygium caryophyllatum</i> (L.) Alston (Myrtaceae)	Dried buds	Fumigation	β -Caryo-phyllene, Carvacrol, Eugenol	Antimicrobial, Fungicidal, Insect-repellent	56
17.	Qust	<i>Saussurea costus</i> (Falc.) Lipsch. (Compositae)	Root	Fumigation	Costunolide, Saussurealdehyde, α -Amyrin	Antimicrobial Antiparasitic	57
18.	Saad Kofi	<i>Cyperus rotundus</i> L. (Cyperaceae)	Root	Fumigation	α -Cyperone, α -Rotunol, Cyperol, Selinene	Antibacterial Larvicidal Ovicidal	58

continued...

Table 5: Cont'd.

Sl.No	Unani name	Botanical name	Part used	Method of use	Active principle	Action	References
19	Sandal safaid	<i>Santalum album</i> L. (Santalaceae)	Heartwood	Fumigation	α -and β -santalol, β -santalene, α -trans-Bergamotol	Antimicrobial Insecticidal	59
20	Sandroos	<i>Hymenaea verrucosa</i> Gaertn. (Leguminosae)	Resin	Fumigation	Hydroxy-13-epimanool, α -cubebene, α -copaene, Copacamphene, Caryophyllene	Antibacterial Antiviral	60
21	Sirka	Acetic acid (vinegar)	Whole	Spray	Acetic acid, Catechin, Gallic acid	Antibacterial Insecticidal	61
22	Waj Turki	<i>Acorus calamus</i> L. (Acoraceae)	Rhizome	Fumigation	α -asarone, β -asarone, sesquiterpenoids	Antibacterial, Antifungal, Insecticidal, Insect- repellent	62-63
23	Zafran	<i>Crocus sativus</i> L. (Iridaceae)	Stamen	Fumigation	Safranal, Picrocrocin	Antibacterial Antiviral	64
24	Zaitoon	<i>Olea europaea</i> L. (Oleaceae)	Leaf, Gummy exudate from the root	Fumigation	Calciumelenolate, Oleuropein	Antimicrobial Antiviral	65
25	Zanjabeel	<i>Zingiber officinale</i> Roscoe. (Zingiberaceae)	Rhizome	Fumigation	Citral, Gingerol Geraniol, Eugenol, Zingerone	Antimicrobial, Insecticidal, Insect- repellent	27,66



ACE- Angiotensin-converting enzyme, COX- 2= cyclooxygenase -2, TNF- α = Tumour necrosis factor- α , IL- interleukin, VEGF- vascular endothelial growth factor.

Figure 1: Mechanisms of action of Asgard (*Withania somnifera*) in prevention and management of COVID-19.¹⁶

ACE- Angiotensin-converting enzyme, COX- 2= cyclooxygenase -2, TNF- α = Tumour necrosis factor- α , IL- interleukin, VEGF- vascular endothelial growth factor.

demonstrated immunomodulatory activity by increasing phagocytosis and stimulating superoxide production.⁹²⁻⁹⁴ Bishayi B, et al., 2002 recorded a substantial increase in total white blood cell count, bone marrow cellularity, and α -esterase positive cells, as well as an increase in macrophage activation, indicating that *Tinospora cordifolia* stems methanolic extract has immunomodulatory activity. Curcumin derived from *Curcuma longa* rhizome demonstrated antiviral activity by inhibiting host-virus interaction (viral spike protein-ACE inhibitor).¹³³ Likewise, the active constituents of *Hyssopus officinalis* L. leaves inhibit viral replication.¹⁴⁴

Numerous evidence-based formulations for the prevention and management of COVID-19 exist in the classical Unani literature. These formulations contain ingredients that exhibit immunomodulatory, antiviral, antioxidant, antiallergic, antitussive, and antipyretic properties. *Tiryāq Wabā'ī*, a pharmacopeial formulation contains *Aloe barbadensis*, *Commiphora Myrrha*, and *Crocus sativus* (Table 1). According to the scientific study, the ingredients in this formulation possess antiviral, immunomodulatory, antioxidant, antimicrobial, and antipyretic properties.⁷³ *Tiryāq Af'āee* contains the same active ingredients as *Tiryāq Wabā'ī*, which is the drug of choice in this epidemic disease situation.^{19,28}

Joshanda Nazla (decoction), is another important formulation that contains seven ingredients i.e., Unnab (seeds of *Ziziphus jujuba* Mill.), Sapistan (berries of *Cordia myxa* L.), Behidana (seeds of *Cydonia oblonga* Mill.), Tukhm-e-Khubbazi (seeds of *Malva sylvestris* L.), Gul-e-Banafsha (flowers of *Viola odorata* L.), Tukhm-e-Khatami (seeds of *Althaea officinalis* L.), and Aslus-soos (roots of *Glycyrrhiza glabra* L.). Antiviral, immunomodulatory, anti-allergic, antimicrobial, antitussive, bronchodilator, analgesic, and anti-inflammatory properties of these ingredients have been demonstrated in experimental studies.^{23,114}

Apart from these formulations, *Sharbat-e-Banafsha*,¹⁴⁵ *Sharbat Khaksi*,¹⁴⁶ and *Khamira Marwareed*¹⁴⁸ are also recommended according to clinical manifestations. An aqueous extract of *Sisymbrium irio* L., a major component of *Sharbat Khaksi*, demonstrated antipyretic activity against yeast-induced pyrexia in a preclinical study on rats.¹⁴⁶ *Khamira Marwareed* demonstrated significant immunomodulatory activity in mice by increasing haemoglobin, WBCs, and IgG levels.¹⁴⁷

CONCLUSION

The ancient Unani physicians used the word epidemic in the same way as we do today. Justifiably, the physicians of USM do not distinguish between epidemic and pandemic, and the common word *Wabā'* is used to refer to infections (diseases) that affect a wide geographical area. This paper aims to educate readers about the USM's concept of

epidemic diseases and how the speculations based largely on observation and clinical experiences adequately depict preventive and protective measures for infectious and epidemic diseases such as COVID-19. The present state of COVID-19 necessitates close monitoring to unearth additional nuggets of knowledge from this antiquated medical system. Without a conclusive cure for COVID-19 at the moment, the onus is being placed on conventional medicine to provide adequate safety.

Almost all of the prophylactic and therapeutic steps used by Unani physicians over the last two and a half millennia are still in vogue and have been investigated in light of various scientific studies. Additionally, the analytical analysis recommends that Unani Medicine can prevent and manage infectious and epidemic diseases, including those caused by COVID-19. Finally, it is suggested that more proactive studies on Unani medicines' role in health promotion and disease prevention will generate more reliable evidence for their role in health promotion and disease prevention.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to the Director-General, CCRUM, New Delhi, for providing all facilities.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

AYUSH: Ayurveda, Yoga, Unani, Siddha and Homeopathy; **CD-8:** Cluster of differentiation-8; **COVID-19:** Coronavirus disease-19; **CTL:** Cytotoxic t-lymphocytes; **DTH:** Delayed type hypersensitivity; **IFN:** Interferon; **IL:** Interleukin; **MERS-CoV:** Middle East respiratory syndrome coronavirus; **MHC class-II:** Major histocompatibility complex molecule; **nCoV:** Novel Coronavirus; **NRIUMSD:** National Research Institute of Unani Medicine for Skin Disorders; **PHA:** Polyhydroxyalkanoates; **PMA:** Phorbol 12-myristate 13-acetate; **RBCs:** Red blood cells; **SARS-CoV-2:** Severe acute respiratory syndrome coronavirus 2; **TNF- α :** Tumour necrosis factor- α ; **USM:** Unani system of Medicine; **WBCs:** White blood cells.

REFERENCES

- Zhai P, Ding Y, Wu X, Long J, Zhong Y, Li Y. The epidemiology, diagnosis and treatment of COVID-19. *Int J Antimicrob Agents.* 2020;55(5):105955. doi: 10.1016/j.ijantimicag.2020.105955.
- Sun P, Lu X, Xu C, Sun W, Pan B. Understanding of COVID-19 based on current evidence. *J Med Virol.* 2020;92(6):548-51. doi: 10.1002/jmv.25722, PMID 32096567.
- Gautret P, Lagier JC, Parola P, Hoang VT, Meddeb L, Mailhe M, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: Results of an open-label non-randomized clinical trial. *Int J Antimicrob Agents.* 2020;56(1):105949. doi: 10.1016/j.ijantimicag.2020.105949.
- Nikhat S, Fazil M. Overview of Covid-19; Its prevention and management in the light of Unani medicine. *Sci Total Environ.* 2020;728:138859. doi: 10.1016/j.scitotenv.2020.138859.
- Drosten C, Günther S, Preiser W, Van der Werf S, Brodt HR, Becker S, et al. Identification of a novel coronavirus in patients with severe acute respiratory syndrome. *N Engl J Med.* 2003;348(20):1967-76. doi: 10.1056/NEJMoa030747, PMID 12690091.
- Ksiazek TG, Erdman D, Goldsmith CS, Zaki SR, Peret T, Emery S, et al. SARS Working Group. A novel coronavirus associated with severe acute respiratory syndrome. *N Engl J Med.* 2003;348(20):1953-66. doi: 10.1056/NEJMoa030781, PMID 12690092.
- Zaki AM, Van Boheemen S, Bestebroer TM, Osterhaus AD, Fouchier RA. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. *N Engl J Med.* 2012;367(19):1814-20. doi: 10.1056/NEJMoa1211721, PMID 23075143.
- World Health Organization. WHO coronavirus (COVID-19) dashboard; 2022 [cited Feb 14, 2022]. Available from: <https://covid19.who.int/>.
- World Health Organization. The current COVID-19 situation [April. Accessed on.

- Vol. 24; 2021]. Available from: <https://www.who.int/countries/ind/> [cited 23/3/2022].
- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. China Novel Coronavirus Investigating and Research Team. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med.* 2020;382(8):727-33. doi: 10.1056/NEJMoa2001017, PMID 31978945.
- Yin Y, Wunderink RGYin Y, Wunderink RG. MERS, SARS. MERS, SARS and other coronaviruses as causes of pneumonia. *Respirology.* 2018;23(2):130-7. doi: 10.1111/resp.13196, PMID 29052924.
- Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature.* 2020;579(7798):270-3. doi: 10.1038/s41586-020-2012-7, PMID 32015507.
- Deponti GN, Da Silva Naue W, Hervé BB, Piekala DM, Glaeser SS, De Fraga Gomes Martins LD, et al. Perme Intensive Care Unit Mobility Score: Analysis of mobility improvement in critical care patients admitted to a university hospital in Brazil. *J Crit Care.* 2017;42:399. doi: 10.1016/j.jccr.2017.09.091.
- Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ. HLH Across Speciality Collaboration, UK. COVID-19: Consider cytokine storm syndromes and immunosuppression. *Lancet.* 2020;395(10229):1033-4. doi: 10.1016/S0140-6736(20)30628-0, PMID 32192578.
- Russell B, Moss C, Rigg A, Van Hemelrijck M. COVID-19 and treatment with NSAIDs and corticosteroids: Should we be limiting their use in the clinical setting? *Ecancermedicinescience.* 2020;14:1023. doi: 10.3332/ecancer.2020.1023, PMID 32256706.
- Tillu G, Chaturvedi S, Chopra A, Patwardhan B. Public health approach of Ayurveda and yoga for COVID-19 prophylaxis. *J Altern Complement Med.* 2020;26(5):360-4. doi: 10.1089/acm.2020.0129, PMID 32310670.
- Martin PM, Martin-Granel E. 2,500-year evolution of the term epidemic. *Emerg Infect Dis.* 2006;12(6):976-80. doi: 10.3201/eid1206.051263, PMID 16707055.
- Parvez A, Ahmed Z, Anwar N, Ahmed K. Razi's unique approach to Amraz-e-Wabaiya (Infectious Diseases): An overview. *Int J Herb Med.* 2016;4(6):176-8.
- Kitab al-Mansoori RaziZ. New Delhi, India: CCRUM. 1st ed. Ministry of Health and Family Welfare, Government of India; 1991.
- Kitab al-Hawi RaziZ. Vol-XV. New Delhi, India: CCRUM. Ministry of Health and Family Welfare, Government of India; 2008.
- Majoosi AIA. Kamil-al- Sana (Urdu translation by G.H. Kantoori. Vol 1st and 2nd. New Delhi, India: Idara Kitab-us-Shifa; 2010.
- Qamari AMH, Mina G. Urdu Translation. New Delhi, India: CCRUM. Ministry of Health and Family Welfare, Government of India; 2008.
- Ibn Sina. Al-Qanoon fil Tib (Urdu translation by G.H. Kantoori. Vol 1st-5th. New Delhi, India: Idara Kitab-us-Shifa; 2010.
- Zuhr AMB, al-Aghzia K (Urdu translation). New Delhi, India: CCRUM. 1st ed. Ministry of Health and Family Welfare, Government of India; 2009.
- Jurjani AHI. Zakhira Khwarzam Shahi. Urdu Translation by Khan HH. Part V. New Delhi, India: Idara Kitab-us-Shifa; 2010.
- Zuhr I. Kitab Al-Taisir fi' Al-Midawa wo Al-Tadbeer (Urdu Translation). New Delhi, India: CCRUM. Ministry of Health and Family Welfare, Government of India; 1986.
- Kitab al-Kulliyat RI (Urdu translation). New Delhi, India: CCRUM. 2nd ed. Ministry of Health and Family Welfare, Government of India; 1987.
- Baghdadi IH. Kitab al-Mukhtarar fil-Tib. 1st ed. Part IV. New Delhi, India: CCRUM. Ministry of Health and Family Welfare, Govt. of India; 2004.
- al-Din K, Sharah Asbab H (translated version of Al-Asbab wa Alamat by N. Samarqandi). Part 1 to Part-4. New Delhi, India: Aijaz Publishing House; 2010.
- Arzani A, Akbar T. Delhi, India: Hamdard kutub Khana; YNM.
- Haziq KA. 1st ed. Delhi, India: Beeswin Sadi Publication; 1987.
- al-Din K, Al-Akseer H (Urdu translation).Vol-11. New Delhi, India: Aijaz Publication; 2003.
- Firozuddin H. Misbal al- Hikmat. Lahore, Pakistan: Sheikh Basheer and Sons; 2000.
- al-Din K, Hummiyat Qanoon H. 4th ed. Vol. 1. Delhi, India: Daftarul Masih; 1959.
- Khan AJ. A survey of the concepts and measures developed by the Greco-Arab physicians related with the prevention and treatment of the infections and epidemic diseases. *Indian J Hist Sci.* 1981;16(2):139-44. PMID 11611786.
- Bhatwalkar SB, Shukla P, Srivastava RK, Mondal R, Anupam R. Validation of environmental disinfection efficiency of traditional Ayurvedic fumigation practices. *J Ayurveda Integr Med.* 2019;10(3):203-6. doi: 10.1016/j.jaim.2019.05.002, PMID 31427141.
- Rauf A, Uddin G, Patel S, Khan A, Halim SA, Bawazeer S, et al. Diospyros, an under-utilized, multi-purpose plant genus: A review. *Biomed Pharmacother.* 2017;91:714-30. doi: 10.1016/j.biopha.2017.05.012, PMID 28499243.
- Baravalia Y, Kaneria M, Vaghasiya Y, Parekh J, Chanda S. Antioxidant and antibacterial activity of *Diospyros ebenum* Roxb. leaf extracts. *Turk J Biol.* 2009;33(2):159-64.
- Bais S, Gill NS, Rana N, Shandil S. A phytopharmacological review on a medicinal plant: *Juniperus communis*. *Int Sch Res Notices.* 2014;2014:634723. doi: 10.1155/2014/634723, PMID 27419205.
- Ahmed A, Shah WA, Akbar S, Younis M, Kumar D. A short chemical review

- on *Salix caprae* commonly Known as Goat willow. *Int J Res Phytochem Pharmacol.* 2011;1(1):17-20.
41. Singh A, Dhariwal S, Navneet. Traditional uses, Antimicrobial potential, Pharmacological properties and Phytochemistry of *Viola odorata*: A Mini Review. *J Phytopharmacol.* 2018;7(1):103-5. doi: 10.31254/phyto.2018.7120.
 42. Boskabady MH, Shafei MN, Saberi Z, Amini S. Pharmacological effects of *Rosa damascena*. *Iran J Basic Med Sci.* 2011;14(4):295-307. PMID 23493250.
 43. Mohammadhosseini M, Venditti A, Sarker SD, Nahar L, Akbarzadeh A. The genus *Ferula*: Ethnobotany, phytochemistry and bioactivities – A review. *Ind Crops Prod.* 2019;129:350-94. doi: 10.1016/j.indcrop.2018.12.012.
 44. Upadhyay PK. Pharmacological activities and therapeutic uses of resins obtained from *Ferula asafoetida* L: a review. *Int J Green Pharm.* 2017;11(02):S241-7.
 45. Prasad C, Singh D, Shukla O, Singh UB. *Cymbopogon jwarancusa*-An important medicinal plant: a review. *J Pharm Innov.* 2014;3(6):13-9.
 46. Ksouri R, Falleh H, Megdiche W, Trabelsi N, Mhamdi B, et al. Antioxidant and antimicrobial activities of the edible medicinal halophyte *Tamarix gallica* L. and related polyphenolic constituents. *Food Chem Toxicol.* 2009;47(8):2083-91. doi: 10.1016/j.fct.2009.05.040, PMID 19500639.
 47. Singh R, Jawaid T. *Cinnamomum camphora* (Kapur): Review. *Pharmacogn J.* 2012;4(28):1-5. doi: 10.5530/pj.2012.28.1.
 48. Pilkhwal N, Dhaneshwar S. An update on pharmacological profile of *Boswellia serrata*. *Asian J Pharm Clin Res.* 2019;12(5):49-56.
 49. Atia Sharif HN, Rehman R, Mushtaq A, Rashid UA. Review on the bioactive potential of benzoin resin. *Int J Chem Biol Sci.* 2016;10(1):106-10.
 50. Lingbeck JM, O'Bryan CA, Martin EM, Adams JP, Crandall PG. Sweetgum: An ancient source of beneficial compounds with modern benefits. *Pharmacogn Rev.* 2015;9(17):1-11. doi: 10.4103/0973-7847.156307, PMID 26009686.
 51. Pachi VK, Mikropoulou EV, Gkiouvetidis P, Sifakas K, Argyropoulou A, Angelis A, et al. Traditional uses, phytochemistry and pharmacology of Chios mastic gum (*Pistacia lentiscus* var. Chia, Anacardiaceae): A review. *J Ethnopharmacol.* 2020;254. doi: 10.1016/j.jep.2019.112485, PMID 112485.
 52. Shameem I. Phytochemical and therapeutic potentials of Murr Makki (*Commiphora myrrha*): A review. *Indian J Appl Res.* 2018;8(9):102-4.
 53. Abirami A, Nagarani G, Saipriya V, Ashwathi R, Siddhuraju P. Influence of thermal treatments on polyphenolic contents and antioxidant properties of underutilized edible flowers of *Nelumbo nucifera* and *Nymphaea alba*. *Int J Health Sci Res.* 2017;7(10):210-23.
 54. Joshi P, Prakash P, Purohit VK, Bahuguna V. *Paeonia emodi*: A review of Multipurpose Wild Edible Medicinal Plant of Western Himalaya. *Int J Adv Res.* 2017;5(12):480-6. doi: 10.21474/IJAR01/5982.
 55. Zargar BA, Masoodi MH, Khan BA, Akbar S. *Paeonia emodi* Royle: Ethnomedicinal uses, phytochemistry and pharmacology. *Phytochem Lett.* 2013;6(2):261-6. doi: 10.1016/j.phytol.2013.03.003.
 56. Chaieb K, Hajlaoui H, Zmantar T, Kahla-Nakbi AB, Rouabhia M, Mahdouani K, et al. The chemical composition and biological activity of clove essential oil, *Eugenia caryophyllata* (*Syzygium aromaticum* L. Myrtaceae): A short review. *Phytother Res.* 2007;21(6):501-6. doi: 10.1002/ptr.2124, PMID 17380552.
 57. Pandey MM, Rastogi S, Rawat AK. *Saussurea costus*: Botanical, chemical and pharmacological review of an ayurvedic medicinal plant. *J Ethnopharmacol.* 2007;110(3):379-90. doi: 10.1016/j.jep.2006.12.033, PMID 17306480.
 58. Sivapalan SR. Medicinal uses and pharmacological activities of *Cyperus rotundus* Linn-A Review. *Int J Scient Res Publ.* 2013;3(5):1-8.
 59. Kumar R, Anjum N, Tripathi YC. Phytochemistry and pharmacology of *Santalum album* L.: A review. *World J Pharm Res.* 2015;4(10):1842-76.
 60. Da Silva Oliveira FG, De Souza Araújo C, Rolim LA, Barbosa-Filho JM, Da Silva Almeida JRG. The genus *Hymenaea* (Fabaceae): A chemical and pharmacological review. *Stud Nat Prod Chem.* 2018;58:339-88. doi: 10.1016/B978-0-444-64056-7.00012-X.
 61. Budak NH, Aykin E, Seydim AC, Greene AK, Guzel-Seydim ZB. Functional properties of vinegar. *J Food Sci.* 2014;79(5):R757-64. doi: 10.1111/1750-3841.12434, PMID 24811350.
 62. Yadav D, Srivastava S, Tripathi YB. *Acorus calamus* A Review. *IJSRBS.* 2019;6(4):62-7. doi: 10.26438/ijsrbs/v6i4.6267.
 63. Yende S, Harle U, Rajgure D, Tuse T, Vyawahare N. Pharmacological profile of *Acorus calamus*: An overview. *Pharmacogn Rev.* 2008;2(4):22-6.
 64. Okmen G, Kardas S, Bayrak D, Arslan A, Cakar H. The antibacterial activities of *Crocus sativus* against mastitis pathogens and its antioxidant activities. *World J PharmSci.* 2016 Jan 6;5(3):146-56.
 65. Khan Y, Panchal S, Vyas N, Butani A, Kumar V. *Olea europaea*: A phyto-pharmacological review. *Pharmacogn Rev.* 2007;1(1):114-8.
 66. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): A review of recent research. *Food Chem Toxicol.* 2008;46(2):409-20. doi: 10.1016/j.fct.2007.09.085, PMID 17950516.
 67. Mastan A, Abid M, Anjum A, Khan NA, Shamsi Y. Blood purifier: Unique concept of treatment in Unani system of medicine for various disorders. *Int J Biol Sci.* 2015;6(2):105-10.
 68. Anonymous. National formulary of Unani Medicine. Part III. 1sted. New Delhi, India: Department of AYUSH, MoHFW, Govt. of India; 2006.
 69. Anonymous. National formulary of Unani Medicine. 1st ed. Part V. New Delhi, India: Department of AYUSH, MoHFW, Govt. of India; 2008.
 70. Khan AB, Tariq M, Afaq SH, Asif M. Poisons and antidotes in Unani system of medicine. *Indian J Hist Sci.* 1981;16(1):57-63. PMID 11611781.
 71. Naseer M, Anwar M, Siddiqui MY. Cardioprotective Drugs with especial reference to Kitab Al-Adwiyah Al-Qalbiyah: A review. *World J PharmSci.* 2016;5(9):2453-62.
 72. Anonymous. The Unani pharmacopoeia of India. Part-II. 1.1st ed. New Delhi, India: Department of AYUSH, MoHFW, Govt. of India; 2009.
 73. Kalam MA, Haseeb A, Mushtaq MS, Hussain Z. Taryaq-i-Waba'i: A review on Potent Compound Formulation of Unani Medicine with special reference to epidemic/pandemic diseases. *J Drug Delivery Ther.* 2020;10(4):234-7. doi: 10.22270/jddt.v10i4.4223.
 74. Khan AA, Bashir F, Tiryq-e-Arba AJ. A classical Unani Formulation to boost immunity. *J Drug Deliv Ther.* 2020 Aug 15;10(4-s):259-63.
 75. Ansari AP, Ahmed NZ, Ahmed KK, Khan AA. An Insight on Wabai Amrad (Epidemic Diseases) and COVID-19 Like Conditions – Unani Perspective. *Int J Curr Res Rev.* 2020;12(17):109-19. doi: 10.31782/IJCRR.2020.12177.
 76. Martin PMV, Martin-Granel. *Engl Hist Rev: 2,500-year Evolution of the Term Epidemic.* *Emerg Infect Dis.* 2006;12(6):976-80.
 77. Kulliyat-e-Asri Al. Delhi, India: New Public Press; 1983.
 78. Rachh P, Dhaliya F, Rachh M, Lakhani K, Kanani A, Limbani D. Immunomodulatory medicinal plants: A review. *Ph Tech. Med.* 2014;3(1):435-40.
 79. Garcia D, Leiro J, Delgado R, Sanmartin ML, Ubeira FM. *Mangifera indica* L. extract (Vimang) and mangiferin modulate mouse humoral immune responses. *Phytother Res.* 2003;17(10):1182-7. doi: 10.1002/ptr.1338, PMID 14669253.
 80. Ediriweera MK, Tennekoon KH, Samarakoon SR. A review on ethnopharmacological applications, pharmacological activities, and bioactive compounds of *Mangifera indica* (Mango). *Evid Based Complement Alternat Med.* 2017;2017:6949835:Article ID 6949835. doi: 10.1155/2017/6949835, PMID 29456572.
 81. Sairam KC, Rao ChV, Babu MD, Kumar KV, Agrawal VK, K Goel RK. Anticancerogenic effect of methanolic extract of *Embolia officinalis*: An experimental study. *J Ethnopharmacol.* 2002;82(1):1-9. doi: 10.1016/S0378-8741(02)00041-7, PMID 12169398.
 82. Khare CP. *Indian medicinal plants.* 1st ed. Berlin: Springer publication; 2007.
 83. Ghosal S, Lal J, Srivastava R, Bhattacharya SK, Upadhyay SN, Jaiswal AK, et al. Immunomodulatory and CNS effects of sitoindosides IX and X, two new glycowithanolides from *Withania somnifera* Phytother Res. 1989;3(5):201-6. doi: 10.1002/ptr.2650030510.
 84. Majeedi SF, Roqaiya M, Jahan D, Khan AA. Immunomodulatory herbs of Unani medicine: A review. *Int J Herb Med.* 2015;3(4):19-21.
 85. Pandit S, Ponnusankar S, Bandyopadhyay A, Ota S, Mukherjee PK. Exploring the possible metabolism mediated interaction of *Glycyrrhiza glabra* extract with CYP3A4 and CYP2D6. *Phytother Res.* 2011;25(10):1429-34. doi: 10.1002/ptr.3426, PMID 21351298.
 86. Hong YK, Wu HT, Ma T, Liu WJ, He XJ. Effects of *Glycyrrhiza glabra* polysaccharides on immune and antioxidant activities in high-fat mice. *Int J Biol Macromol.* 2009;45(1):61-4. doi: 10.1016/j.ijbiomac.2009.04.001, PMID 19447260.
 87. Mukherjee PK, Nema NK, Bhadra S, Mukherjee D, Braga FC, Matsabisa MG. Immunomodulatory leads from medicinal plants. *Indian J Trad Know.* 2014;13(2):235-56.
 88. Nadkarni KM. *Indian materia medica.* 3rd ed. Vol. 1. Mumbai, India: Popular Press Prakashan; 1976.
 89. Kumar N, Khurana SM. Phytochemistry and medicinal potential of the *Terminalia bellirica* Roxb. (Bahera). *Indian J Nat Prod Resour.* 2018;9(2):97-107.
 90. Gabhe SY, Tatke PA, Khan TA. Evaluation of the immunomodulatory activity of the methanol extract of *Ficus benghalensis* roots in rats. *Indian J Pharmacol.* 2006;38(4):271. doi: 10.4103/0253-7613.27024.
 91. Chiang LC, Ng LT, Chiang W, Chang MY, Lin CC. Immunomodulatory activities of flavonoids, monoterpenoids, triterpenoids, iridoid glycosides and phenolic compounds of *Plantago* species. *Planta Med.* 2003;69(7):600-4. doi: 10.1055/s-2003-41113, PMID 12898413.
 92. Duansak D, Somboonwong J, Patumraj S. Effects of Aloe vera on leukocyte adhesion and TNF- α and IL-6 levels in burn wounded rats. *Clin Hemorheol Microcirc.* 2003;29(3-4):239-46. PMID 14724347.
 93. Zhang XF, Wang HM, Song YL, Nie LH, Wang LF, Liu B, et al. Isolation, structure elucidation, antioxidative and immunomodulatory properties of two novel dihydrocoumarins from Aloe vera. *Bioorg Med Chem Lett.* 2006;16(4):949-53. doi: 10.1016/j.bmcl.2005.10.096, PMID 16297615.
 94. Radha MH, Laxmipriya NP. Evaluation of biological properties and clinical effectiveness of Aloe vera: A systematic review. *J Tradit Complement Med.* 2015;5(1):21-6. doi: 10.1016/j.jtcm.2014.10.006, PMID 26151005.
 95. Sunila ES, Kuttan G. Immunomodulatory and antitumor activity of *Piper longum* Linn. and piperine. *J Ethnopharmacol.* 2004;90(2-3):339-46. doi: 10.1016/j.jep.2003.10.016, PMID 15013199.
 96. Bishayi B, Roychowdhury S, Ghosh S, Sengupta M. Hepatoprotective and

- immunomodulatory properties of *Tinospora cordifolia* in CCl₄ intoxicated mature albino rats. *J Toxicol Sci.* 2002;27(3):139-46. doi: 10.2131/jts.27.139, PMID 12238138.
97. Kumar D, Arya V, Kaur R, Bhat ZA, Gupta VK, Kumar V. A review of immunomodulators in the Indian traditional health care system. *J Microbiol Immunol Infect.* 2012;45(3):165-84. doi: 10.1016/j.jmii.2011.09.030, PMID 22154993.
 98. Gaur K, Kori ML, Nema RK. Comparative screening of immunomodulatory activity of hydro-alcoholic extract of *Hibiscus rosa sinensis* Linn. and ethanolic extract of *Cleome gynandra* Linn. *Glob J Pharmacol.* 2009;2009(3 (2)):85-9.
 99. Ranjan D, Johnston TD, Wu G, Elliott L, Bondada S, Nagabhushan M. Curcumin blocks cyclosporine A-resistant CD28 costimulatory pathway of human T-cell proliferation. *J Surg Res.* 1998;77(2):174-8. doi: 10.1006/jrsr.1998.5374, PMID 9733605.
 100. Upadhyay A, Agrahari P, Singh DK. A review on the pharmacological aspects of *Terminalia chebula*. *Int J Pharmacol.* 2014;10(6):289-98. doi: 10.3923/ijp.2014.289.298.
 101. Ismail S, Asad M. Immunomodulatory activity of *Acacia catechu*. *Indian J Physiol Pharmacol.* 2009 Jan 1;53(1):25-33. PMID 19810573.
 102. Smit HF. *Picrorhiza scrophulariiflora*, from traditional use to immunomodulatory activity. Available from: dspace.library.uu.nl Utrecht [doctoral dissertation]. Netherlands: University of Utrecht; 2000.
 103. Sah JN, Varshney VK. Chemical constituents of *Picrorhiza* genus. *Am J Essent Oil Res Nat Prod.* 2013;1(2):22-37.
 104. Upadhyay SN, Dhawan S, Garg S, Talwar GP. Immunomodulatory effects of neem (*Azadirachta indica*) oil. *Int J Immunopharmacol.* 1992;14(7):1187-93. doi: 10.1016/0192-0561(92)90054-o, PMID 1452404.
 105. Mukherjee D, Khatua TN, Venkatesh P, Saha BP, Mukherjee PK. Immunomodulatory potential of rhizome and seed extracts of *Nelumbo nucifera* Gaertn. *J Ethnopharmacol.* 2010;128(2):490-4. doi: 10.1016/j.jep.2010.01.015, PMID 20079418.
 106. Mukherjee D, Biswas A, Bhadra S, Pichairajan V, Biswas T, Saha BP, et al. Exploring the potential of *Nelumbo nucifera* rhizome on membrane stabilization, mast cell protection, nitric oxide synthesis, and expression of costimulatory molecules. *Immunopharmacol Immunotoxicol.* 2010;32(3):466-72. doi: 10.3109/08923970903514830, PMID 20095810.
 107. Otsuki N, Dang NH, Kumagai E, Kondo A, Iwata S, Morimoto C. Aqueous extract of *Carica papaya* leaves exhibits anti-tumor activity and immunomodulatory effects. *J Ethnopharmacol.* 2010;127(3):760-7. doi: 10.1016/j.jep.2009.11.024, PMID 19961915.
 108. Roshan A, Verma NK, Gupta A. A brief study on *Carica papaya*-a review. *Int J Curr Pharm Res.* 2014;2(4):541-50.
 109. Muruganadan S, Garg H, Lal J, Chandra S, Kumar D. Studies on the immunostimulant and antihepatotoxic activities of *Asparagus racemosus* root extract. *J Arom Pi Sci.* 2000;22:49-52.
 110. Vaghasiya J, Datani M, Nandkumar K, Malaviya S, Jivani N. Comparative evaluation of alcoholic and aqueous extracts of *Ocimum sanctum* for immunomodulatory activity. *Int J Pharm Biol Res.* 2010;1(1):25.e9.
 111. Singh R, Singh K. *Zingiber officinale*: A spice with multiple roles. *Res J Life Sci Bioinform Pharm Chem Sci.* 2019;5(2):113-25.
 112. Sayeed A, Madhukar G, Maksud A, Mhaver S, Athar MT, Ansari SH. A phyto-pharmacological overview on *Azharatoda zeylanica* Medic. syn. A. vasica (Linn.) Nees. *Nat Prod Radiance.* 2009;8(5):549-54.
 113. Anonymous. Guidelines for Unani Practitioners in the wake of COVID-19 pandemic. New Delhi, India: CCRUM. Department of AYUSH, MoHFW, Government of India; 2020.
 114. Hong EH, Song JH, Kang KB, Sung SH, Ko HJ, Yang H. Anti-Influenza Activity of betulinic acid from *Zizyphus jujuba* on Influenza A/PR/8 Virus. *Biomol Ther (Seoul).* 2015;23(4):345-9. doi: 10.4062/biomolther.2015.019, PMID 26157551.
 115. Alam MA, Quamri MA, Sofi G, Ayman U, Ansari S, Ahad M. Understanding COVID-19 in the light of epidemic disease described in Unani medicine. *Drug Metab Pers Ther.* 2020;35(4):1-12. doi: 10.1515/dmtdi-2020-0136.
 116. Afzal M, Obuekwe C, Khan AR, Barakat H. Antioxidant Activity of *Cordia myxa* L. and Its Hepatoprotective Potential. *Elec J env. Agric Food Chem.* 2007;6(8):2236-42.
 117. Salimimoghadam S, Ashrafi A, Kianidehkordi F, Najafzadehvarzi H. Hypoglycemic, antitussive and analgesic effects of nanoparticles of *Cordia myxa* fruits extract. *Int J Pharm Investig.* 2019;9(4):205-9. doi: 10.5530/ijpi.2019.4.38.
 118. Hamazu Y, Yasui H, Inno T, Kume C, Omanyuda M. Phenolic profile, antioxidant property, and anti-influenza viral activity of Chinese quince (*Pseudocarya sinensis* Schneid.), quince (*Cydonia oblonga* Mill.), and apple (*Malus domestica* Mill.) fruits. *J Agric Food Chem.* 2005;53(4):928-34. doi: 10.1021/jf0494635, PMID 15713000.
 119. Shinomiya F, Hamazu Y, Kawahara T. Anti-allergic effect of a hot-water extract of quince (*Cydonia oblonga*). *Biosci Biotechnol Biochem.* 2009;73(8):1773-8. doi: 10.1271/bbb.90130, PMID 19661701.
 120. Hailu T, Gupta RK, Rani A. *Sisymbrium irio* L.: An Herb used in the Unani system of medicine for broad-spectrum therapeutical applications. *Indian J Trad Know.* 2019;18(1):140-3.
 121. Kumar S, Singh B. Medicinal and traditional uses of Shahtoot (*Morus indica* Linn.): A review. *Int J Unani Integer Med.* 2020;4(2):40-7.
 122. Talat H, Latafat H, Naseer M, Aziz Y. Clinical evaluation of the efficacy of Unani formulation Sharbat Banafsha in the management of chronic sinusitis. *IJRAR.* Jan 2019;6(1):830-43.
 123. Devi BP, Manoharan K. Antiviral medicinal plants-an ethnobotanical approach. *J Phytol.* 2009;1(6):417-21.
 124. Liu G, Xiong S, Xiang YF, Guo CW, Ge F, Yang CR, et al. Antiviral activity and possible mechanisms of action of pentagalloylglucose (PGG) against influenza A virus. *Arch Virol.* 2011;156(8):1359-69. doi: 10.1007/s00705-011-0989-9, PMID 21479599.
 125. Estari M, Venkanna L, Sriprya D, Lalitha R. Human immunodeficiency virus (HIV-1) reverse transcriptase inhibitory activity of *Phyllanthus emblica* plant extract. *Biol Med.* 2012 Oct 1;4(4):178.
 126. Haidari M, Ali M, Ward Casscells III SW, Madjid M. Pomegranate (*Punica granatum*) purified polyphenol extract inhibits influenza virus and has a synergistic effect with oseltamivir. *Phytomedicine.* 2009;16(12):1127-36. doi: 10.1016/j.phymed.2009.06.002, PMID 19586764.
 127. Michaelis M, Geiler J, Naczek P, Sithisarn P, Leutz A, Doerr HW, et al. Glycyrrhizin exerts antioxidative effects in H5N1 influenza A virus-infected cells and inhibits virus replication and pro-inflammatory gene expression. *PLOS ONE.* 2011;6(5):e19705. doi: 10.1371/journal.pone.0019705, PMID 21611183.
 128. Balkrishna A, POKHREL S, Singh J, Varshney A. Withanone from *Withania somnifera* may inhibit novel coronavirus (COVID-19) entry by disrupting interactions between viral S-protein receptor binding domain and host ACE2 receptor. *Res Square.* 2020. doi: 10.21203/rs.3.rs-17806/v1.
 129. Cai Z, Zhang G, Tang B, Liu Y, Fu X, Zhang X. Promising anti-influenza properties of active constituent of *Withania somnifera* ayurvedic herb in targeting neuraminidase of H1N1 influenza: Computational study. *Cell Biochem Biophys.* 2015;72(3):727-39. doi: 10.1007/s12013-015-0524-9, PMID 25627548.
 130. Nutan, Modi M, Dezzutti CS, Kulshreshtha S, Rawat AK, Srivastava SK, et al. Extracts from *Acacia catechu* suppress HIV-1 replication by inhibiting the activities of the viral protease and Tat. *Virology.* 2013;10:309. doi: 10.1186/1743-422X-10-309, PMID 25228267.
 131. Kumar V, Van Staden J. A Review of *Swertia chirayita* (Gentianaceae) as a Traditional Medicinal Plant. *Front Pharmacol.* 2015;6:308. doi: 10.3389/fphar.2015.00308, PMID 26793105.
 132. Verma H, Patil PR, Kolhapure RM, Gopalkrishna V. Antiviral activity of the Indian medicinal plant extract *Swertia chirata* against herpes simplex viruses: A study by *in-vitro* and molecular approach. *Indian J Med Microbiol.* 2008;26(4):322-6. doi: 10.1016/S0255-0857(21)01807-7, PMID 18974483.
 133. Manoharan Y, Haridas V, Vasanthakumar KC, Muthu S, Thavoorullah FF, Shetty P. Curcumin: A wonder Drug as a preventive measure for COVID19 management. *Indian J Clin Biochem.* 2020;35(3):373-5. doi: 10.1007/s12291-020-00902-9, PMID 32641876.
 134. Fanhchaksai K, Kodchakorn K, Pothacharoen P, Kongtawelert P. Effect of sesamin against cytokine production from influenza type A H1N1-induced peripheral blood mononuclear cells: Computational and experimental studies. *In vitro Cell Dev Biol Anim.* 2016 Jan 1;52(1):107-19. doi: 10.1007/s11626-015-9950-7, PMID 26424131.
 135. Wu S, Patel KB, Booth LJ, Metcalf JP, Lin HK, Wu W. Protective essential oil attenuates influenza virus infection: An *in vitro* study in MDCK cells. *BMC Complement Altern Med.* 2010;10(1):69. doi: 10.1186/1472-6882-10-69, PMID 21078173.
 136. Al-snafi AE. Iraqi medicinal plants with antiviral effect-A review. *IOSR J Pharm.* 2019;9(7):57-75.
 137. Gangehei L, Ali M, Zhang W, Chen Z, Wakame K, Haidari M. Oligonol a low molecular weight polyphenol of lychee fruit extract inhibits proliferation of influenza virus by blocking reactive oxygen species-dependent ERK phosphorylation. *Phytomedicine.* 2010;17(13):1047-56. doi: 10.1016/j.phymed.2010.03.016, PMID 20554190.
 138. Parhira S, Yang ZF, Zhu GY, Chen QL, Zhou BX, Wang YT, et al. *In vitro* anti-influenza virus activities of a new lignan glycoside from the latex of *Calotropis gigantea*. *PLOS ONE.* 2014;9(8):e104544. doi: 10.1371/journal.pone.0104544, PMID 25102000.
 139. Javed T, Ashfaq UA, Riaz S, Rehman S, Riazuddin S. *In-vitro* antiviral activity of *Solanum nigrum* against hepatitis C virus. *Virology.* 2011;8(1):26. doi: 10.1186/1743-422X-8-26, PMID 21247464.
 140. Saleem TM, Chetty C, Ramkanth S, Alagusundaram M, Gnanaprakash K, Rajan VT, et al. *Solanum nigrum* Linn.-A review. *Pharmacogn Rev.* 2009;3(6):342.
 141. Biswas D, Nandy S, Mukherjee A, Pandey DK, Dey A. *Moringa oleifera* Lam. and derived phytochemicals as promising antiviral agents: A review. *S Afr J Bot.* 2020;129:272-82. doi: 10.1016/j.sajb.2019.07.049.
 142. Lee-Huang S, Zhang L, Huang PL, Chang YT, Huang PL. Anti-HIV activity of olive leaf extract (OLE) and modulation of host cell gene expression by HIV-1 infection and OLE treatment. *Biochem Biophys Res Commun.* 2003;307(4):1029-37. doi: 10.1016/s0006-291x(03)01292-0, PMID 12878215.
 143. Rathinavel T, Palanisamy M, Palanisamy S, Subramanian A, Thangaswamy S.

- Phytochemical 6-Gingerol – A promising Drug of choice for COVID-19. IJASE. 2020;06(4):1482-9. doi: 10.29294/IJASE.6.4.2020.1482-1489.
144. Mukhtar M, Arshad M, Ahmad M, Pomerantz RJ, Wigdahl B, Parveen Z. Antiviral potentials of medicinal plants. *Virus Res.* 2008;131(2):111-20. doi: 10.1016/j.virusres.2007.09.008, PMID 17981353.
145. Anonymous. National formulary of Unani Medicine. Part I. 1st ed. New Delhi, India: Department of AYUSH, MoHFW, Govt. of India; 2006.
146. Malik FA. Experimental study for antipyretic study of Khaksi (*Sisymbrium irio*L.) [MD Unani thesis], Karnataka, Bangalore; 2007 Bangalore, India: Rajiv Gandhi University of Health Sciences.
147. Khan F, Ali S, Ganie BA, Rubab I. Immunopotentiating effect of Khamira Marwarid, an herbo-mineral preparation. *Methods Find Exp Clin Pharmacol.* 2009;31(8):513-22. doi: 10.1358/mf.2009.31.8.1419719, PMID 19967100.
148. ICMR sero survey: One in five Indians exposed to Covid-19; 2021. BBC NEWS. Available from: <https://www.bbc.com/news/world-asia-india-55945382> [cited 23/3/2022]. In:.

Article History: Received: 08-01-2022; Revised: 14-02-2022; Accepted: 05-03-2022.

Cite this article: Alam Md A, Zakir M, Minhajuddin A, Viqar U, Ahmad T, Lahari K. Role of The Unani System of Medicine in Countering Epidemic Diseases, Considering Coronavirus Pandemic -19. *J Young Pharm.* 2022;14(2):140-55.