

An Update On The Use Of Herbal Medicine And Dietary Therapy For COVID-19 Prevention

Ponnulakshmi Rajagopal¹, Vidhya Rekha Umapathy², Jaideep Mahendra³, Selvaraj J^{4*}

¹Central Research Laboratory, Meenakshi Academy of Higher Education and Research, Chennai-600095, India

²Reader, Department of Public Health Dentistry, Sree Balaji Dental College and Hospital, Pallikaranai, Chennai-600 100, India

³Department of Periodontology, Meenakshi Ammal Dental College and Hospital, Chennai -600095, India

⁴Department of Biochemistry, Saveetha Dental College & Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India

Abstract: A novel coronavirus disease (COVID-19), which is spread from human to human, has quickly developed into the pandemic that is causing the current global health crisis. COVID-19 is caused by the extreme acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is thought to be zoonotic in nature. This review summarizes the research on the effects of herbs and foods on corona viruses in order to promote the use of dietary therapy and herbal medicine as COVID-19 preventive therapies. The number of current studies demonstrates unequivocally that foods and herbs have the potential to be antiviral against SARS-CoV-2 and also can help prevent COVID-19. Foods and herbs would be used as nutritional or alternative therapy to avoid infection and improve immunity, as antiviral agents for masks, as disinfectants to avoid aerosol transmission, or as surface sanitizing agents. These theories, however, must be tested experimentally in SARS-CoV-2 and COVID-19 patients.

Keywords: COVID-19, SARS-CoV-2, Siddha herbal medicines, Dietary therapy

INTRODUCTION

COVID-19, also known as SARS-CoV-2, a novel coronavirus disease, began causing a global epidemic of acute respiratory disease in December 2019. COVID-19's rapid spread was declared a pandemic by the World Health Organization on March 11, 2020¹. Corona viruses were classified as members of the Coronaviridae family in 1960, where they were classified as "positive sense single-stranded ribonucleic acid (RNA) viruses." 1 Corona is derived from Latin and means "Crown" or "Halo," which is a rare "appearance under two-dimensional transmission electron microscopy" which may appear to be covered in club-shaped spike peplomers. 2. Within the Coronaviridae subfamily, corona viruses are transmissible to humans. Corona viruses are derived "from the bat species (*Rousettus leschenaultii*)." MERS-CoV, SARS-CoV, and SARS-CoV-2 are the other coronavirus strains. SARS-CoV-2 is responsible for COVID-19 which was distinguished "in Wuhan, China in December 2019" and announced a pandemic by the WHO in March 2020. COVID19 clinical presentations range from mild cold-like symptoms to life-threatening respiratory failure. COVID-19 is found in two forms, S and L, according to the researchers. COVID-19 S strains are less virulent and adoptable to the human receptor than L strains, and their gene mutations account for the difference in filling (i.e., L form is mutated). 11. It is caused by a rapidly spreading virus that replicates itself by inserting its genome into the genes of other organisms. As a result of its reliance on other species for growth, it makes eradicating the disease-causing agent more difficult and it" is becoming a hot topic of study among drug producers, researchers, and scientists²

Infection Mechanism

The COVID-19 virus spreads from human to human simply by close contact with an infected individual. Individuals who exhibit symptoms such as sneezing or coughing can transmit the virus via respiratory droplets or aerosols, which enter primarily through the lungs through inhalation. Additionally, individuals with a weakened immune system or other co morbidities such as diabetes, chronic kidney disease, or cancer are more susceptible to infection^{3,4}. The SARS-CoV-2 pathogen primarily targets the human respiratory system through angiotensin-converting enzyme 2 (ACE2) and angiotensin receptors, both of which are highly susceptible to COVID-19. Although the data indicated that the most common cause of death was extreme atypical pneumonia, it was later discovered that other internal infections or co morbidities may facilitate the spread of this lethal virus^{5,6}

Herbal medicine for COVID-19

Historically, herbal medicine played a significant role in the prevention of infectious diseases. Clinical evidence from a variety of studies on herbal medicine's efficacy in treating SARS coronavirus (SARS-CoV) infection has demonstrated substantial findings, confirming the notion that herbal medicine is useful in the treatment and prevention of infectious diseases⁷. According to a Cochrane systematic review, herbal medicine used in conjunction with conventional medicine can improve symptoms and quality of life in SARS-CoV patients⁸. Herbal medication is considered one of the potential methods in the treatment of COVID-19 based on prior experience.

Siddha is a unique medical system that originated in Tamil Nadu and is based on the Tamil language. The term "Siddha" literally translates as "known reality."⁹ Siddha medicines are said to relieve the disease's root cause by balancing vatham, pitham, and kapam. Numerous Siddha formulations are available, including kudineer, mattirai, chooranam, parpam, chendurum, karuppu, and mezhugu. The aim of this review is to examine the many herbal and herb mineral formulations that have been used to prevent or treat COVID-19.

Fundamental Ideas and infectious diseases in Siddha System

All substances in the universe, according to the Siddha system, are composed of five fundamental primal elements: earth, water, fire, air, and space; while the human body is considered to be an amalgamation of three humors and seven physical components. Changes in environmental variables such as climate, water, habitat, and season are attributed to disease emergence (24). These environmental, epidemiological, seasonal, and water-borne diseases can be related and handled using principles from Siddha Pathology¹⁰. Agasthyar Pallu describes Siddha drugs that are widely used to treat infectious and communicable diseases¹¹. The Siddha system of medicine is based on the principles and relationships of the body's humors: vali/vata (wind), azhal/pitta (bile), and aiya/kapha (phlegm), where the specific pathological condition could be identified by examining the nati (pulse) to ascertain the humor responsible. According to Siddha philosophy, pulsation and its movement take on various forms, such as that of a swan or peacock in cases of deranged vata humor; that of a hen or ant in cases of pitta imbalance; and that of a fly or vulture in cases of vitiated kapha¹¹. A skilled Siddha physician is able to discern and recognize the humoral status of body parts on the right or left side via pulse movements¹², thus determining the type and cause of disease. Epidemics/pandemics are referred to in Siddha as 'Uzhi Noi' or 'Kothari Noi'. They are generally known as "Kollai Noikal" and most frequently occur during the "Ayana Santhi" months (end of the month of Uthara Ayanam & Thatchana Ayanam) that fall on Aadi (middle of July to August) and Margazhi (middle of December to January) in the Tamil Calendar. It is assumed that during those days, human immunity will be low; according to the Trithodam or Mukkutram theory (which is based on the three humors vata, pitta, and kapha), the incidence of diseases will increase due to the derangement of Mukkutram. Usually, Thottru Noigal (communicable diseases) is infected with Aiya kutram (respiratory-related illness) and becomes afflicted as a result of its Sthiram gunam (stability factor). According to Guru Naadi, Thottru Noigal is usually induced by Kirumi (Pathogens or Microbes). The symptoms are caused by Noiyan vanmai (an individual's immunity); if it is well, the individual would be unaffected. As a result, Siddha formulations or practices are developed to neutralize Aiya kutram¹³ and preserve the immunomodulatory function during this time span. According to the Siddha medicine system, COVID-19 is a Thottru Noi (communicable disease) caused by a breakdown in the body's immune system's battling an invading Kirumi (virus or pathogen), which directly results in Aiya noigal (respiratory-related illness) as a result of changes in food, behavior, and environment. Additionally, COVID-19 symptoms such as a moderate fever, sore throat, malaise, headache, shortness of breath, pneumonia, and respiratory failure are comparable to those of Kaphasuram. Additionally, as defined by Tirumantiram by Saint Tirumular, individuals with a weakened immune system or immunity are susceptible to epidemics¹¹. In Siddha, all forms of pyrexia, including vector-borne diseases such as malaria and dengue fever, are grouped into 64 categories and collectively referred to as Suram. Within them, Siddha compares dengue to Pitta Suram, as the symptoms such as haematuria, anorexia, vomiting, nausea, myalgia, dysentery, and fever with chills are similar to those mentioned in Sura Vadagam, which also explains the treatment. Dengue fever symptoms are also described in literature such as Siddha maruthuvam. Whereas Agastiyar sura nool 300 states that the 'Pitta suram' can result in bleeding similar to haemorrhages (kuruthi azhal) associated with dengue fever, and the symptoms mentioned above correlate to the WHO's description of dengue fever¹⁴. Similarly, Siddha compares COVID-19 to Kapha suram, as Kapha suram/Slethma suram symptoms include fever, cough, throat pain, anosmia, dysgeusia, shortness of breath, and exhaustion, all of which are associated with mild stage SARS-CoV-2. At the extreme stage, the symptoms correspond to the Sanni stage of Kapha or Kabavatha suram¹⁵. The Siddha research delves into various formulations for the management of Kapha suram, Kabavatha suram, and Sanni noi. As a result, it is clear that even without recognizing microbes and other harmful substances, Siddha herbalists and researchers would understand and apprehension the cause, source, and mode of infection, thereby controlling infectious epidemics. Thus, the above-mentioned hypotheses and findings support the efficacy of Siddha medicine as a major treatment for contemporary health problems.

Siddha's drug choice against COVID-19

From December 2019 to the present, the coronavirus that causes extreme acute respiratory syndrome has made a historic transition. COVID 19 has been a significant burden on the public health and economic stability of communities worldwide in the current era. The world is scrambling to find a cure for COVID-19, and health experts have indicated that boosting the body's immune system can help to mitigate the disease's effects and speed recovery. However, in Siddha, diseases are treated by the use of complex courses of medicine referred to as regimens. The protocol used to treat COVID 19 during the initial days of infection includes Kabasura Kudineer, Adathodai Manapagu, Thontha sura kudineer, Vajra kandi chenduram, Visha sura kudineer, and Nilavembu kudineer. The Siddha drugs chosen for COVID-19 control are based on their pharmacological action as described in peer-reviewed articles and book references that may aid healthcare workers and scientists in patient care. Table 1 summarizes the herbal formulations and their known pharmacological operation.

Table 1: A few Siddha medicines are used to treat COVID-19.

S. no	Siddha drugs	Pharmacological activity	Ref
1	Adathodai manapagu	Antipyretic activity, antiinflammatory activity, antioxidant activity, antiviral activity, and hepatoprotective activity	25
2	Kabasura kudineer	Antipyretic activity, expectorant, antispasmodic, anti-asthmatic activity, antiviral activity, immunomodulatory activity, hepatoprotective activity, and antioxidant activity	21
3	Thontha sura kudineer	Antiviral activity, antiinflammatory activity, anti-asthmatic activity, hepatoprotective activity, and immunomodulatory activity	24
4	Vajra kandi chenduram	Antipyretic activity, antiinflammatory activity, antioxidant activity, and immunomodulatory agent	26

5	Visha sura kudineer	Antiviral activity, antipyretic activity, anti-asthmatic activity, anti-inflammatory activity, antioxidant activity, hepatoprotective activity, and immunostimulant activity	26
6	Nilavembu kudineer	Anti-inflammatory activity, antipyretic activity, hepatoprotective activity, immunostimulant property, antiviral activity, antioxidant activity, neuroprotective activity, and immunomodulatory activity	27

Adathodai Manapagu

This preparation is made from the juice of *Adhatoda vasica* (AV) leaves. *Adhatoda vasica* is a member of the family Acanthaceae. The plants contain "quinazoline alkaloids (vasicine, 7-hydroxyvasicine, vasicinone, 3-deoxyvasicine, vasicol, vasicoline, vasicolinone, triterpenes, and anisotine)," betaine, hormones, carbohydrate, and alkanes. Triterpenes (a-amirine) and flavonoids (apigenin, astragalol, kaempferol, quercetin, and vitexin) have already been discovered in the flowers³⁰. *Justicia adhatoda* crude extract inhibits hemagglutination (HA) of influenza viruses. The assay demonstrates antiviral activity in the noncytotoxic range in two distinct layouts of simultaneous and posttreatment. At a concentration of 10 mg/mL, a methanolic extract of AV demonstrated a 100% rebate "in HA in the simultaneous and posttreatment. Simultaneous assays of the aqueous extract of *J. adhatoda* at 10 and 5 mg/mL concentrations reveal a reduction in HA to 33% and 16.67%, respectively. These findings indicate that aqueous and methanolic extracts of *J. adhatoda* possess significant antiviral activity, are capable of inhibiting viral attachment and/or replication, and could be used to prevent viral infection. In the Dock assay, the compound vasicine demonstrates exceptional antiviral activity¹⁶

Kabasura kudineer

The kabasura kudineer is a siddha formulation that translates as [kabam – cold; suram – fever; kudineer – concoction]. Kabasura kudineer is a coarse powder of drugs that is used to make decoctions. This spice, widely known as the Bile of the Earth or King of Bitters, is indigenous to India and Sri Lanka¹⁷. It contains fifteen herbal ingredients, including *Zingiber officinale*, *piper longum*, *Syzygium aromaticum*, *Tragia involucrata*, *Anacyclus pyrethrum*, *Adhatoda Vasica*, *Coleus amboinicus*, *Tinospora cordifolia*, *Clerodendron serratum*, *Andrographis paniculata*, *Suda Acura*, and *Cyperus rotundus*.¹⁸ *Zingiber officinale* aids digestion and is useful in the treatment of asthma, *piper longum* can be used to manage digestive problems, asthma, and cough, and *Syzygium aromaticum* has the ability to destroy bacteria and promote liver health. *Tragia involucrata* has already been shown to be beneficial in the treatment of bronchitis and pain. *Anacyclus pyrethrum* is beneficial in the treatment of mouth ulcers, sore throats, and coughs. *Hygrophila auriculata*¹⁹ is used to treat blood disorders. Additionally, *Terminalia chebula* is used to treat coughs, asthma, anoxia, and vomiting. *Adhatoda Vasica* is beneficial in the treatment of respiratory and bleeding conditions. *Coleus amboinicus* is a common remedy for throat infections, coughs and fevers, nasal congestion, and digestive problems¹⁹ *Saussurea Lappa* is a plant that is used to treat headaches, paralysis, asthma, coughs, fevers, and inflammation. *Tinospora cordifolia* has been used to treat diabetes, hypercholesterolemia, irritable bowel syndrome, and other cancers. *Clerodendron serratum* is used to treat jaundice and a variety of liver diseases. Since ancient times it has been used by Indians because of its therapeutic potential to manage different ailments. Kabasura kudineer has antibacterial, anticariogenic, antihelminthic, antidiabetic, antioxidant, astringent, antiviral, cytotoxic, and anti-inflammatory properties²⁰. The phytochemicals in the kabasura kudineer Siddha formulation work by attracting/binding several amino acids at distinct sites on viral proteins, a process that is consistent with the well-known antimalarial drug artemisinin²¹. This demonstrated the synergistic role of phytochemicals not only towards viral proteins and even against viral replication by modulating the immune system. *Trichosanthes cucumerina*, *T. cordifolia*, *H. auriculata*, *A. pyrethrum*, *A. paniculata*, *AV*, *S. lappa*, *C. serratum*, *S. aromaticum*, and *Z. officinale* could all suppress viral pathogenicity at different levels ranging from prevention to cure. It was discovered that formulations with functional significance against corona viral protein had a more effective inhibition activity on viral replication²¹.

Thontha Sura Kudineer

The therapeutic efficacy of Thontha sura kudineer chooranam, which contains ten herbal ingredients (*Z. officinale*, *AV*, *A. paniculata*, *T. cordifolia*, *Elettaria cardamomum*, *Solanum xanthocarpum*, *T. cucumerina*, *Tephrosia purpurea*, *Mollugo cerviana*, and *Vitis vinifera*), was determined using in silico²². The phytochemicals in thontha sura kudineer demonstrated promising activity against the viral spike glycoprotein, preventing spike proteins from binding to the host cell receptor²³.

Nilavembu Kudineer (NVK)

"Nilavembu kudineer is a polyherbal formulation that contains *A. paniculata* as the active ingredient. It is effective against all forms of fever associated with body pain. Additionally, *Vetiveria zizanioides*, *Santalum album*, *T. cucumerina*, *C. rotundus*, *Zingiber officinale*, *Piper nigrum*, and *M. cerviana* are included²⁴. Historically, these plants have been used to treat pyretic, "inflammation, arthralgia, arthritis, gastric ulcer, jaundice, and general debility conditions." Nilavembu kudineer effectively controls fever by regulating temperature, inflammation, and body pain, and it also acts to boost immunity²⁵. Many of the components in this formulation contain bioactive molecules that have been shown to be extremely effective against dengue, chikungunya, herpes simplex virus (HSV), and influenza virus²⁶.

Vajra Kandi Chenduram

It is a mineral-herb preparation that is widely used in Siddha practitioners for the treatment of a variety of acute and chronic illnesses ranging from fever to chronic inflammatory disorders and immune-mediated diseases. Purified lingam, veeram, pooram, and rasa sindhuram are used in this formulation. This substance exhibits antipyretic, anti-inflammatory, and antioxidant properties. Through its antipyretic and anti-inflammatory properties, vajra kandi chenduram may have the ability to prevent the release of COVID-19's inflammatory mediators and cytokine storm, which would be a main source of serious lung

complications. Thus, in the absence of any particular target treatment interventions, this formulation may be recommended as a secure and reliable complementary therapy. “ A novel strategy for COVID-19-induced cytokine release syndrome (CRS) is to target main molecules within the inflammatory cytokine network, such as interleukin-6 (IL-6). In people with severe COVID-19 infections, interleukin-6 inhibitors can ameliorate serious bronchial tissue damage caused by cytokine release. Numerous cases of bronchial tissue damage caused by cytokine release have been identified in patients with severe COVID-19 infections. 26 Available literatures suggest the presence of a "cytokine storm" characterized by the release of IL-6, IL-1, IL-2, and IL-8, as well as 'tumor necrosis factor' (THF) and other inflammatory mediators"²⁷.

Visha Sura Kudineer

Vishasura kudineer (VSK) is a polyherbal formulation derived from the Siddha text "Kaaviya Sura Nool." *Azadirachta indica*, *Indigofera tinctoria*, *Zingiber officinale*, *Hemidesmus indicus*, *Aristolochia bracteata*, *V. zizanioides*, *Glycyrrhiza glabra*, *E. cardamomum*, and *Santalum album* have been among the components. Each portion exhibits antiviral activity against a diverse array of viruses. “Aqueous leaf extract of *A. indica* possesses antiviral activity against vaccinia virus, chikungunya measles virus, dengue virus type 2, and herpes simplex virus type 1; it also possesses immunostimulant and anticomplement activity²⁸. *Indigofera tinctoria* inhibits HIV-1 (III B) and HIV-2 replication. “In human respiratory tract cell lines, *Zingiber officinale* exhibits antiviral activity against the human respiratory syncytial virus”. Antiviral activity of *Hemidesmus indicus* was investigated against the Ranikhet virus. “Glycyrrhizic acid, a portion of licorice root, has antiviral activity by inhibiting the growth and cytotoxicity of many DNA and RNA viruses, including vaccinia, HSV-1, Newcastle disease, and vesicular stomatitis viruses.” Additionally, it exhibits antiviral activity against flaviviruses such as dengue, Japanese encephalitis, Yellow fever, tick-borne encephalitis in mammals, influenza, and hepatitis A, B, and C viruses ²⁹. Sandalwood oil, an essential oil derived from the tree *Santalum album L.*, exhibited antiviral activity against HSV-1 and HSV-2 ³⁰.

Immunity by Foods

As per the Siddha medicine system, food is considered medicine, and its proper consumption will help the body maintain its immunity. Food is critical in this crisis because it helps to develop immunity against foreign invaders in the human body³¹. Numerous researches have shown that an individual's nutritional status often influences the proper body functions as well as their psychological health ³². It is not unusual for specific nutrients or a mixture of nutrients to play an impact on the overall health of the immune system. By controlling the development of signaling molecules and gene expression, nutrients influence an individual's immunity. As a result, immune cell function improves significantly ³³. Therefore, it is critical to consume a sufficient amount of vitamins and minerals in order to strengthen the immune system and allow it to fight any disease, including COVID-19. Carbohydrates, protein, and fat, as well as minerals and multivitamins, all play critical roles in boosting and maintaining immunity. According to a study, one of the fat-soluble vitamins D decreases viral replication rates, which can result in lung injury and pneumonia, by decreasing pro-inflammatory cytokines. Vitamin D benefits not only the musculoskeletal system, but also the respiratory system in this manner ³⁴. Apart from that, vitamins A, E, B6, and B12, as well as iron and zinc, are critical for developing a healthy immune system ³⁵. Vitamin C, on the other hand, is a well-known antioxidant that is needed to counteract the damage caused by reactive oxygen species (ROS) and thus protect the body from oxidative stress. Vitamin C (also known as ascorbic acid) contributes significantly to the maintenance of a healthy immune system by positively regulating T lymphocytes and NK (Natural Killer) cells ³⁶. It has been well established that every viral infection has a detrimental effect on the body's vitamin C levels, and the patient's vitamin C requirement is dependent on the nature of the disease. As a result, in order to preserve an individual's and communities physical and mental well-being in the face of the COVID-19 pandemic, this review article has provided critical overviews of the value of diet and nutrition. Figure 1 explains the important vitamins for immunity and the source of foods.

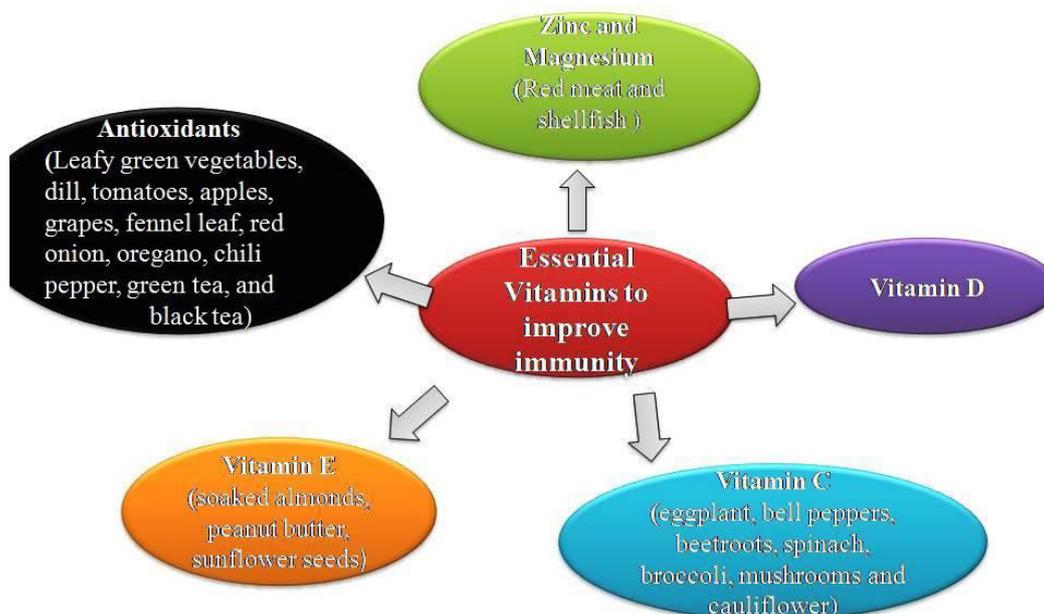


Figure 1: Therapeutic efficacy of essential oils vitamins to improve immunity**Zinc and Magnesium**

Zinc is a micronutrient that is needed for DNA synthesis and cell proliferation (Fuhrman, 2020). Additionally, it plays a role in the regulation of innate and adaptive immune responses, cell signaling, and immune cell formation³⁷. Zinc-containing foods include red meat and shellfish³⁸. Magnesium, a critical mineral for our immune system, is also a critical electrolyte that aids our bodies in strengthening their natural killer cells and lymphocytes. It is also a critical source of energy for our cells, adenosine triphosphate (ATP), which is so critical that our cells cannot survive properly without it. Magnesium aids hemoglobin in our blood, which would be responsible for carrying oxygen from our lungs to the rest of our bodies, which aids in a COVID19 infection, since the virus targets the respiratory tract³⁹. Dark chocolate, black beans, avocados, and whole grains are all high in magnesium⁴⁰.

Vitamin D Rich Foods

The general metabolism and vitamin D activities are well-known⁴¹. Vitamin D₃ is produced in the skin when UVB radiation interacts with 7dehydrocholesterol and causes a thermal reaction. Oral vitamin D or vitamin D₃ is converted to 25(OH)D in the liver and then to the hormonal metabolite 1,25(OH)₂D (calcitriol) in the kidneys or other organs as needed. Vitamin D exerts its entire effect through the entry of calcitriol into nuclear vitamin D receptors, a DNA-binding protein that frequently interacts directly with regulatory sequences surrounding particular genes and recruits active chromatin complexes that engage in transcriptional development modifications genetically and epigenetically. Calcitriol's most well-known function is to aid in the management of serum calcium concentrations, but it does so through a parathyroid hormone (PTH) feedback loop, which plays a variety of important roles in the organism. Numerous studies demonstrate how vitamin D minimizes the chances of viral diseases. Vitamin D works in a variety of ways to reduce the risk of viral infection and death. These components are classified into three groups in a report on the role of vitamin D in reducing the risk of catching a cold: adaptive immunity, physical barrier, and natural cellular immunity. Vitamin D promotes gap junctions, close junctions, and adherent junctions (e.g., via Ecadherine). Numerous studies examined how viruses compromise the junction's integrity, increasing virus infection and the growth of other microorganisms. Vitamin D enhances innate immunity in cells in part by converting 1,25dihydroxyvitamin D to antimicrobial peptides such as human cathelicidin, LL37, and defensins⁴². Cathelicidins exhibit potent antimicrobial activity against a wide range of pathogens, including Gram-negative and Gram-positive bacteria, enveloped and unencased viruses, and fungi. These host-derived compounds destroy foreign pathogens by rupturing their membranes, thus inhibiting the endotoxin's biological activity. As discussed previously, they perform a plethora of additional functions. LL37 inhibited influenza A virus replication in a mouse model. According to another laboratory study, 1,25(OH)₂D inhibited rotavirus replication in vivo and in vitro using a different approach. Vitamin D supplementation at a dose of 4,000 IU/d was found to minimize dengue virus infection in a clinical trial. Vitamin D also enhances cellular resistance by intensifying the cytokine storm produced by the innate immune system. As shown in COVID19 patients, the innate immune system produces both non- and pro-inflammatory cytokines in response to bacterial and viral infectious diseases. Vitamin D has been shown to inhibit the development of proinflammatory Th1 cytokines such as tumor necrosis factor and interferon. Vitamin D administration reduces proinflammatory cytokine production and increases antiinflammatory cytokine production by macrophages and their references. Vitamin D is a potent immunomodulator; 1,25(OH)₂D₃ activates responses induced by T helper type 1 (Th1) cells, primarily by attempting to suppress the development of inflammatory cytokines IL2 and interferon gamma (INF). Additionally, 1,25(OH)₂D₃ promotes cytokine production by T helper type 2 (Th2) cells, which contributes to the improvement of indirect inhibition of Th1 cells by supplementing it with behavior influenced by a variety of cell types. Additionally, 1,25(OH)₂D₃ promotes T regulatory cell activation, thereby inhibiting inflammatory processes. Serum 25(OH)D concentrations begin to decline with age, which may be important for COVID19, as case fatality rates (CFRs) increase with age; possible causes include inadequate time spent in the sun and decreased vitamin D output due to decreased skin 7dehydrocholesterol levels. Additionally, some prescription drugs control serum 25(OH)D concentrations by activating the pregnane X receptor. These include anticancer, antiepileptic, antiinflammatory, and antibiotic drugs, as well as antiretroviral, antihypertensive, and endocrine medications. Pharmaceutical drug use usually rises with age. Vitamin D supplementation also increases the expression of antioxidation genes (glutathione reductase and the subunit controller glutamate–cysteine ligase). Increased glutathione development eliminates the need for ascorbic acid (vitamin C), which is also antimicrobial and has been recommended for COVID19 prevention and treatment⁴³.

Vitamin C and E Rich Foods

Vitamin C is critical for boosting immunity in children, adults, and even the elderly. Vitamin C-rich fruits such as bananas, papaya, kiwi, and guava should be included in the diet. Additionally, some vegetables such as eggplant, bell peppers, beetroots, spinach, and cauliflower are considered to be high in vitamin C and beneficial to the immune system. Green vegetables such as broccoli, mushrooms, and even kale are all good sources of immunity boosters. They significantly boost the immune system of older adults. Berries can also be used in the diet alongside omega-3 fatty acid-rich foods such as beans, flax seeds, and even some nuts. Spirulina and Curcumin are excellent sources of vitamin C and minerals for the elderly. These super foods contribute significantly to the development and strengthening of immunity. Water-soluble vitamins have important advantages in the treatment of sepsis and septic shock, a potentially fatal condition caused by pathogenic organisms' inflammation. Vitamin C also benefits the body by acting as a prooxidant for immune cells, an antioxidant for lung epithelial cells, and having immunosuppressive properties⁴⁴. Oranges, kiwi, kale, and broccoli are all vitamin C-rich foods⁴⁵. Vitamin E is important for aged people's general health, especially their immunity. Vitamin E is an incredibly strong antioxidant that could really help protect against a number of diseases, bacteria, and viruses. Consume soaked almonds, peanut butter, sunflower seeds, and

even hazelnuts to satisfy the daily vitamin E need. Vitamin E primarily serves as an all-purpose, chain-breaking antioxidant, mitigating the risk of lipid peroxidation. This vitamin is often a peroxyl radical scavenger, securing the polyunsaturated fats present in plasma membranes and lipoproteins⁴⁶. Quantification of F2 isoprostan is the most effective in vivo predictor of free radical formation and oxidative lipid destruction⁴⁷. By supplementing with vitamin E, the F2 isoprostans are improved, and their emission could be reduced. Vitamin E plays a vital role in immune response maintenance, even with a slight deficiency impairing immunity, or supplementation at higher doses than suggested improving elderly people's humoral and cell-mediated immunity⁴⁸. These results have attracted attention with whether or not vitamin E supplements could mitigate immunosuppression and oxidative stress during periods of extreme stress. Numerous studies have demonstrated that 1–5 months of vitamin E supplements (200–1200 IU dl –tocopherol) improves plasma tocopherol levels but also has a negligible impact on athletic efficiency, muscle damage indices induced by contraction, and has a significant impact on exercise-induced oxidative stress. The ambiguity of these findings is due to the investigation of design problems, such as the subjects' exercise timing and structure, their health or age ranges, the volume and shape of the vitamin E supplement, and the methods for measuring oxidative stress⁴⁴. The effect of vitamin E supplementation on immune and inflammatory responses to prolonged exercise is unclear and ambiguous. Although the relationship between reactive oxygen species and immunity is not well known, substantial evidence indicates a correlation⁴⁹. Although the generation of ROS and antioxidant status has been related to immune differences in certain disease processes and the recovery process, this relationship has not been studied in human athletic effort. In a previous study, vitamin C supplementation during an ultramarathon had no impact on the oxidative stress and immune disturbances caused by physical exercise⁵⁰. Vitamin C primarily acts as an antioxidant in vivo by scavenging free radicals such as peroxyl and oxygen in the aqueous process. Even though vitamin E suppresses the spread of lipid peroxidation, we proposed that the aforementioned multivitamin has a potential to function as a protective measure against changes in immunity and lipid peroxidation caused by activity than vitamin C. The aim of this study was to determine the effect of vitamin E supplementation on oxidative stress and immune changes following the World Triathlon Championships in Kona, Hawaii. For two months prior to the race, thirty-eight randomized, double-blind triathletes obtained vitamin E (800 IU dl D — tocopherol) capsules in addition to placebo capsules. Vitamin E supplementation is concluded to relieve physical activity-induced increases in immune alterations associated with extreme discomfort, oxidative stress, and proinflammatory cytokines⁵¹.

Antioxidants

Glutathione is a potent antioxidant with in body; it neutralizes harmful free radicals, aids in tissue repair, and synthesizes chemicals and proteins used by the immune system. NAC, or N-acetylcysteine, facilitates glutathione production and is often used as a supplement. NAC was found to minimize the severity and length of symptoms in animal models of other viral infections by increasing cellular defense and repair. NAC is taken in doses ranging from 500 to 600 mg. Glutathione can be taken orally in 500 mg doses or intravenously in 400–2400 mg doses under the supervision of a physician. Quercetin is a type of bioflavonoid that occurs naturally in a wide variety of fruits and vegetables. Quercetin has been shown in animal and laboratory studies to prevent a wide variety of virus infections, including the COVID19-related coronavirus SARS CoV. Quercetin contributes to the antioxidant potential of the body and protects lung tissue. Bromelain is marketed as a single supplement when combined with vitamin C between 500 and 1000 mg daily is recommended. Leafy green vegetables, dill, tomatoes, apples, grapes, fennel leaf, red onion, oregano, chili pepper, green tea, and black tea are all significant sources

Management

Isolation is the most effective method of containing COVID-19. COVID-19 is treated in conjunction with symptomatic care and oxygen therapy. Patients with moderate infections do not receive prompt supportive care". However, in Siddha, this infection is adequately "treated through the application of a specific course of treatment referred to as a regimen." The regimen used during the initial days of infection" consists of one or more formulations, including adathodai manapagu, kabasura kudineer, thontha sura kudineer, vajra kandi chenduram, VSK, and NVK. Out of six formulations, the dynamic active biomolecules in the aforementioned formulations exert a strong antiviral impact. Since AV is available in four formulations, the treatment regimen should include adathodai manapagu. However, the effectiveness of corticosteroids, a widely used anti-inflammatory agent, in treating CRS caused by COVID-19 is debatable. There is an immediate need for innovative therapies to treat CRS caused by COVID-19. The British Pharmacological Society has responded to concerns that non-steroidal anti-inflammatory drugs (NSAIDs) can worsen symptoms associated with the novel coronavirus COVID-19. The World Health Organization said on March 18, 2020, that it is "aware of concerns about the use of ibuprofen to treat fever in people with COVID19".³⁴ Thus, at this point in time, the use of Siddha anti-inflammatory, antipyretic, and immune-modulatory agents can be of tremendous assistance in managing CRS. Vajra kandi chendooram exhibits all of these properties; hence, it can be used in place of corticosteroids. As a result, Siddha drugs will help in the prevention of stage-I corona viruses progressing to the next stage, thereby reducing morbidity and mortality in COVID-19 patients. As a result, these medications are safe to administer in prescribed doses under the supervision of a Siddha physician. Additionally, these products have been toxicologically evaluated and found to be healthy for humans. As a result, the Siddha formulation described above may be considered to be of public use during this global pandemic.

CONCLUSION

"COVID-19 is rapidly spreading across the globe. In comparison to SARS or MERS, it has resulted in a greater number of infections and deaths. Due to the infection's rapid spread, exceptional surveillance and disengagement protocols are needed to prevent further transmission. Current treatment techniques" are mostly concerned with indicative oxygen treatment. Through this study, all of the ingredients in the Siddha formulations have been scientifically evaluated for their pharmacological effects, toxicity, and safety in humans. Further preclinical studies on the Siddha formulation's antiviral activity may be essential to scientifically confirm our hypothesis, and are currently being planned. Along with siddha medicines, dietary habit also very

important to increase the immunity of individuals. Individuals with a weakened immune system are more susceptible to this global pandemic dubbed COVID-19. To aid or improve immunity, plant-based foods are critical because they promote the growth of beneficial bacteria in the body. Numerous vitamins, such as C, D, and E, are being studied for their potential to improve immunity. Vitamin C-rich fruits such as oranges, papaya, kiwi, and guava are available, while vegetables such as eggplant, bell peppers, beetroots, spinach, and cauliflower are also high in vitamin C and beneficial for immunity. A critical micronutrient is required for DNA synthesis and cell proliferation, both of which are required for the regulation of innate and adaptive immune responses. Vitamin D enhances cellular resistance in part by amplifying the cytokine storm produced by the innate immune system. Green vegetables such as broccoli, mushrooms, and even kale are a few immunity boosters that may significantly strengthen the immune system of older adults. Additionally, some herb combinations are considered to be critical in the prevention of COVID-19. Future aspects of this account include the need for additional research on physical activities or exercises and their role in immunity-related issues, thus preventing COVID-19. Additional research is necessary to understand the coronavirus's actions and the role of food in its prevention. Immune boosting food combinations should be investigated that include one and one makes eleven functions when combined. In a nutshell, green foods are critical in the fight against novel corona viruses because they boost immunity across all age groups.

CONFLICT OF INTEREST

Conflict of interest declared none.

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