

## Nutraceuticals for the COVID-19 Prevention and Treatment

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### Abstract

**Background:** The novel severe acute respiratory syndrome-related coronavirus 2 (SARS-CoV-2) was spreading rapidly in 2020, and researchers and medical professionals were working around the clock to develop effective host-directed treatments and prevent it from causing the coronavirus illness 2019 (COVID-19) pandemic.

**Methods:** This was done in an effort to prevent the novel severe acute respiratory syndrome-related coronavirus 2 from causing COVID-19. In 1989, Dr. Stephen combined the terms nutrition and pharmaceutical to create the phrase "nutraceutical," which was described as a dietary component or nutrient that, in addition to its nutritional value, also has health benefits, such as those that promote health and fight disease.

**Results:** The nutraceuticals are helpful for both preventing and treating COVID-19; therefore, they serve a dual purpose. COVID-19 is caused by the same virus that causes SARS-CoV-2, which is a severe acute respiratory syndrome. The signs and symptoms of COVID can vary, but they frequently include fever, coughing, headaches, exhaustion, problems breathing, and a loss of taste and smell.

**Conclusions:** Nutraceuticals like minerals, antioxidants, dietary fibres, and various vitamins are used to treat and prevent the symptoms of the Corona virus.

**Keywords:** COVID-19, Nutraceuticals, Mineral, Prebiotic, Probiotics.

### Introduction

SARS-CoV-2, a novel coronavirus linked to severe acute respiratory syndrome, should be contained before it spreads and causes COVID-19 in 2019. Researchers and doctors scrambled for host-directed drugs in 2020 [1]. This fast endeavor found promising in-hospital

pharmacological treatments including dexamethasone and remdesivir. While the market for nutraceuticals and nutritional supplements has grown just 5% annually (or \$345 million in 2019), sales in the six weeks preceding April 5<sup>th</sup> of next year climbed by 44% [2]. Most societies use public health actions to

decrease SARS-CoV-2 transmission, even while the virus spreads. However, many people at this time sought further defences by taking nutraceuticals and nutritional supplements they thought would help. Despite the absence of evidence that dietary supplements and vitamins treat COVID-19, sales soared at the outset of the pandemic [3]. In the six weeks through May 17<sup>th</sup>, 2020, U.S. sales grew 16% from the same period in 2019. China, France, New Zealand, India, and the UK have similar sales patterns. Due to dietary supplements and nutraceuticals' "immune-boosting" promises, customers believed they might protect them from infection or reduce its symptoms, which increased sales [4].

The public is interested in food additives, thus scientists are still studying their preventative and therapeutic benefits. Nutraceuticals and dietary supplements are related non-pharmaceuticals. Nutraceuticals are supplements having health benefits beyond nutrition. Nutraceuticals, unlike dietary supplements, should prevent and treat disease and improve diet [5]. Nutraceuticals and nutritional supplements are not regulated like pharmaceuticals. Even though the FDA is not solely responsible for nutraceuticals, the FDAMA and DSHEA regulate them as dietary supplements. In response to rise demand for supplements and nutraceuticals, the FDA created the Office of Dietary Supplement Programmes (ODSP). Novel goods or nutraceuticals must now submit dietary ingredient notifications to the ODSP for approval. These rules require producers to ensure safety before production or marketing, raising concerns that they will not adequately protect consumers. Manufacturing and selling nutraceuticals and food supplements doesn't require FDA registration. After the FDA verifies the information, an Academy of Sciences statement can support health or

nutritional content claims for labelling or other government agencies. According to the statistics, the public's perceptions of dietary supplements and nutraceuticals often differ from their claims [6, 7].

Globally, same concerns remain despite regulatory variances. Directive 2002/46/EC requires the EU to secure supplements across Europe. However, nutraceuticals are not mentioned. Nutraceuticals can be categorised as medications, supplements, or foods under European Council Directive 2004/27/EC or Directive 2002/46/EC. The European Community passed Regulation (EC) No. 1924/2006 on Nutrition and Health Claims to consolidate multiple regulatory regimes and ensure product safety and efficacy [8]. However, nutraceutical-specific regulation is lacking. Health claims on product labels should be approved by the European Food Safety Authority. Because clinical evidence are needed to support health claims for new products, EFSA does not distinguish between nutraceuticals and food supplements [9]. Although they may hinder corporate innovation, these principles seem to safeguard consumers better than FDA rules. Comparing standards globally is difficult because China and India already have legal systems for indigenous medicines and phytomedicines that are rarely used in Western culture. Scientists and regulators are discussing how to create a widespread regulatory framework to demonstrate the efficacy of safety and health claims for nutraceuticals, which do not follow the same clinical trial approval standards as pharmaceuticals [10]. Since many persons and businesses have made exaggerated claims about how supplements and nutraceuticals help cure COVID-19, the epidemic has highlighted these regulatory disparities. The FDA has issued multiple letters warning businesses against advertising

or selling products that promise to treat or prevent COVID-19 or SARS-CoV-2 [11]. The letters were in reaction to ads for pricey nutritional supplements that claim to prevent COVID-19. Oleandrin was recommended as a "cure" by former US president's associates despite its toxicity. Such examples have received public attention due to their potential for disaster. Despite the lack of study into these chemicals, nutraceuticals and dietary supplements that promise COVID-19 protection have been marketed [12].

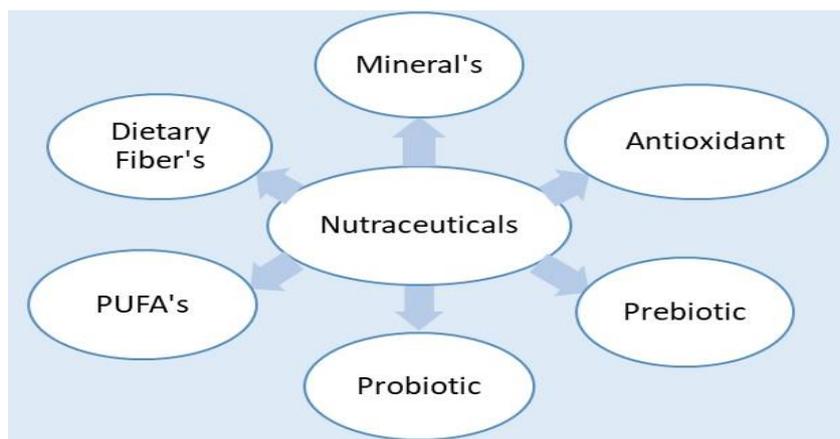
Some dietary supplements and nutraceuticals offer therapeutic and preventative promise despite safety, effectiveness, and regulatory issues. These may prevent ARDS, reduce immunopathology, block viruses, and reduce inflammation. A long number of potential treatments for COVID-19 viral infections and host immune system strengthening is available in the literature. They compete with n-3 PUFA, vitamins, minerals, and extracts. To prevent or treat RNA virus infections, phycocyanobilin, N-acetylcysteine, glucosamine, selenium, or phase 2 inductive nutraceuticals like ferulic acid, lipoic acid, or sulforaphane can increase mitochondrial antiviral-signaling (MAVS) protein signalling and activate Toll-like receptor 7 [13]. Phase 2 inductive chemicals used to make nutraceuticals activate Nrf2, a protein. Nrf2 regulates antioxidants. Gamma-glutamylcysteine synthetase is a Nrf2-stimulated antioxidant. These nutrients and nutraceuticals have showed promise in animal and human COVID-19 trials, but their therapeutic potential is unknown. This chapter focuses on the most thoroughly studied dietary supplements and nutraceuticals for prevention and treatment. Vitamins C and D, zinc, n-3 PUFA, and probiotics are examples. Nutraceuticals for COVID 19 prevention

and treatment are the focus of this review [14].

#### *Importance of nutraceuticals*

As a result of the pandemic, there has been a rise in demand for and sales of "immune-boosting" nutraceuticals and dietary supplements. To evaluate the efficacy of different nutritional supplements and nutraceuticals for avoiding COVID-19 [15], it is necessary to identify these special nutrients and nutraceuticals' medicinal potential. In this review, focus has been placed on the most promising dietary supplements and nutraceuticals being studied for preventative and therapeutic benefits. Vitamins C and D, Zinc, omega-3 fatty acids, and probiotics are all examples. Novel coronaviruses include COVID disease 2019, or SARS-CoV-2 and the illness it causes [16]. This review assesses the possible preventative and therapeutic advantages of various dietary supplements and nutraceuticals based on the available data. Vitamins C and D, as well as zinc, are commonly thought to be able to treat or prevent respiratory infections [17]. Authorities may only lightly regulate some supplements, but that doesn't mean customers should not be wary of false claims and misleading advertising. Determine if COVID-19 and SARS-CoV-2 infections can be treated and prevented using dietary supplements and nutraceuticals. However, a great deal more research is necessary. This review sheds light on the nutritional supplements and nutraceuticals that are connected to biological functions important for COVID-19 prevention or recovery [18].

### Classification of Nutraceuticals



**Figure 1** Classification of nutraceuticals (Self-prepared using Microsoft powerpoint 2010)

#### Mineral supplements

E.g., calcium, magnesium, manganese, boron, copper, zinc, phosphorous, etc. [Figure 1](#) represents the classification of nutraceuticals.

#### Zinc

The body's second-most common trace metal after iron is the transition metal zinc (Zn). It has been acknowledged that it is vital for a variety of cellular processes, including the preservation of immunological function, which is crucial for antiviral actions. Furthermore, zinc has anti-inflammatory and membrane-stabilizing effects [19]. Zinc can be found in a variety of foods, mostly those with an animal origin (such as fish, meat, and egg yolk), as well as those with a vegetable origin (such as oats and wheat germ), nuts, seeds, legumes, pumpkin, and sesame. Due to a reduction in lymphocyte B cell growth in the bone marrow, Zn deficiency can result in lymphopenia. Zn has a role in COVID-19 disease because it inhibits the action of the coronavirus RNA polymerase. The improvement in the effectiveness of other medications, such as hydroxychloroquine, is affected by zinc supplementation [20].

Further research revealed that the combination of zinc and low-dose

hydroxychloroquine resulted in significantly fewer hospitalisations when 141 COVID-19 patients were studied retrospectively. Clinically symptomatic improvements were also seen in a case series involving four COVID-19 patients receiving large doses of zinc [21].

Zn supplementation may lessen symptoms of COVID-19, including lower respiratory tract infections. The quantity of zinc needed to have a therapeutic effect has not yet been determined with certainty. The variation in Zn bioavailability and absorption, as well as the existence of a pre-existing zinc shortage, should be taken into account. The capacity to deliver treatment of zinc deficiency during the acute phase with high doses of intravenous zinc associated with COVID-19 was demonstrated in RCT research, together with the practicality and security of intravenous Zn therapy. With larger RCTs, this area needs additional research [22].

#### Antioxidants

They can be found in fish, vegetables, and fruits. They are utilised to stop free radical scavengers and reactive oxygen species.

Like vitamin E, C, A, and beta-carotene. [Table 1](#) represents the sources of antioxidants [23].

**Table 1:** Sources of antioxidants

Food	Reducing acids present
Spinach, turnip and rhubarb, cocoa bean and chocolate	Oxalic acid
Legumes, maize, whole grain	Phytic acid
Cabbage, beans, tea	Tannins

*Vitamins*

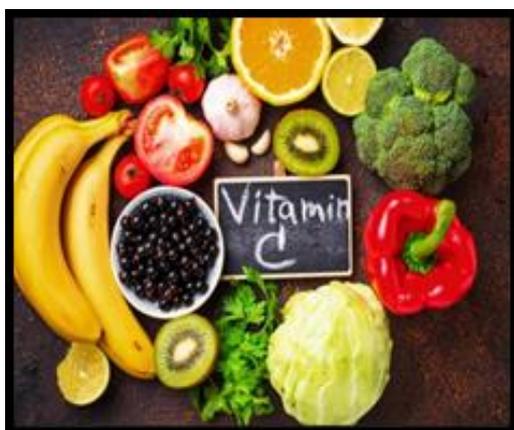
Micronutrients called vitamins are important for several physiological functions and signalling pathways, as well as the proper structure and function of proteins. The word "micronutrients" refers to the fact that very tiny, often microgram-sized nutrients are needed on a daily basis. The needs for these micronutrients can, however, be greatly augmented in severe disease. It has been shown that they are helpful for COVID-19 patients, and subsequent studies have looked into how they work [24].

A powerful molecule with many applications is ascorbic acid, which is another name for vitamin C. In addition to have anti-inflammatory, antiviral, anticancer, and antithrombotic characteristics, it has been shown to have a considerable impact on immunological

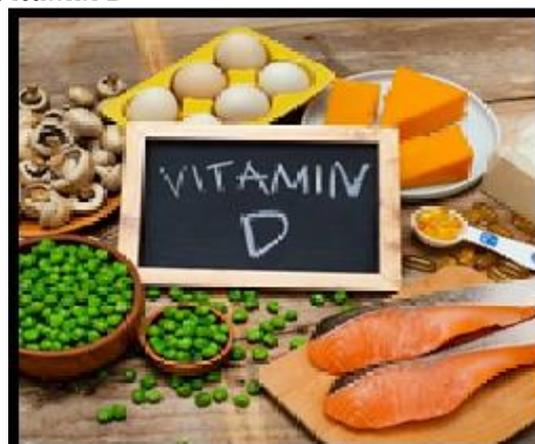
performance. The plant kingdom (including chard, broccoli, spinach, cauliflower, sweet potatoes, peppers, and other vegetables) is where it is primarily found. Numerous fruits, especially kiwis, oranges, strawberries, apples, and cherries, are also high in vitamin C. The levels are typically 80-120 mg per 100 g of fresh weight in the Hayward green cultivar. Vitamin C is helpful for individuals with CARDS and other respiratory disorders when taken at pharmaceutical dosages. Figure 2 depicts sources of vitamin C [25].

Recent clinical research and meta-analyses have demonstrated the role of vitamin D in the prevention, development, and severity of COVID-19 infection. COVID-19 appears to be made worse by vitamin D insufficiency. Since COVID-19 instances where *Vitamin D*

*Vitamin C*



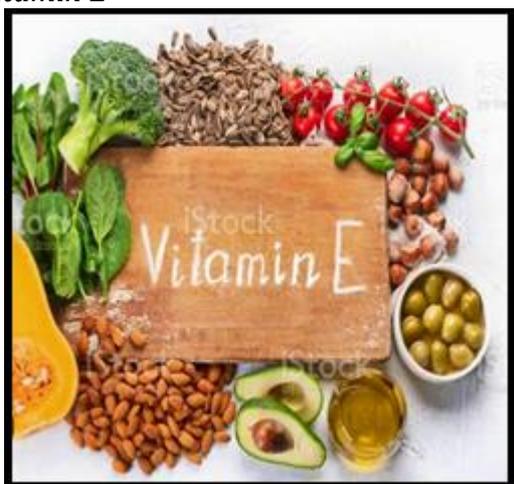
**Figure 2:** Sources of vitamin C (Modified using paint)



**Figure 3:** Sources of vitamin D (Modified using paint)

hypovitaminosis D was also detected were more likely to have severe COVID-19, the degree of hypovitaminosis D was correlated with the COVID-19 prognosis. Furthermore, there was an association between COVID-19 and hypovitaminosis D. Vitamin D is a steroid hormone in addition to being a fat-soluble vitamin, is crucial for controlling the immune system and maintaining the equilibrium of blood calcium. Two types of vitamin D, ergocalciferol and cholecalciferol, are available as supplements. The two main sources of vitamin D are the UVB-irradiated skin undergoes photochemical and thermal changes in the precursor to cholesterol (7-dehydrocholesterol). Some foods, such as fatty fish and egg yolks, contain trace levels of vitamin D. Sunlight is still the best way to get your vitamin D. [Figure 3](#) shows Sources of vitamin D [26].

By enhancing immunological and antioxidant activity throughout the infection phase, patients with COVID-19 have benefited from vitamin E supplementation, which has been used to treat nutritional deficits and obesity and maintain optimal nutritional status. It is impossible for the body to produce vitamin E. Only plants are capable of producing it by photosynthetic *Vitamin E*



**Figure 4:** Sources of vitamin E (Modified using paint)

means; therefore, only trace amounts must be received from outside sources. Sunflower and olive oils, almonds, avocados, soybeans, wheat, and green leafy vegetables are all its rich sources [27].

Vitamin E can change how the body responds to inflammation in many organs, including the lungs. It does this by making T cells multiply and change, reducing the production of pro-inflammatory cytokines, and in other ways. By lowering the production of nitrogen oxide, Vitamin E improves the immune response in both animal and human models by downregulating prostaglandin E2 and inhibiting cyclooxygenase-2, initiating T-lymphocyte signalling, and modifying the Th1/Th2 balance. Functioning as an immunoregulator via control of protein kinase C. [Figure 4](#) demonstrates sources of vitamin E [28].

#### *Poly Unsaturated Fatty Acids (PUFA)*

These comprise important fatty acids and are fatty acids with more than one double bond. For instance, fish oil, safflower oil, corn oil, and soybean oil.

#### *n-3 PUFA*

A recent meta-analysis of 10 RCTs looked at the positive effects of n-3 PUFAs on patients with ARDS, but the influence on secondary outcomes could not be determined due to the low quality of the evidence. The findings showed no effect on mortality rates. Another meta-analysis of 24 randomised controlled trials (RCTs) found some evidence for an effect on mortality when n-3 fatty acids were administered via enteral nutrition in patients with sepsis, including ARDS-induced sepsis, but the quality of evidence was again insufficient to draw firm conclusions. This means that while there is theoretical support for the effect of n-3 PUFAs on COVID-19's immune

system, there is not yet enough evidence from existing RCTs to identify whether supplementation is useful in a clinical setting relevant to COVID-19. The potential role of n-3 PUFAs as precursor molecules for the biosynthesis of endogenous specialised proresolving mediators (SPM), like protectins and resolvins, which actively fight infection and inflammation, has also piqued interest in these compounds as antiviral agents, including COVID-19 defence. Several types of lung infections, especially those caused by RNA viruses, have responded well to SPM treatment [29].

Prebiotics are substances found in food that hasten the growth or activity of good bacteria and fungi. Prebiotics can change the makeup of organisms in the gut microbiome in the gastrointestinal system, which is the most typical habitat taken into account. They are living microorganisms that enhance the health and function of the large intestine when consumed with or without food e.g., *Bifidobacterium*, *Lactobacillus*, *Saccharomyces cerevisiae*, etc. Figure 5 illustrates sources of prebiotics and probiotics [30].

### Prebiotic



**Figure 5:** Sources of prebiotics and probiotics (Modified using paint)

### Probiotic

These are non-digestible substances that provide beneficial effects and protection for the prebiotics from gastric acid and digestive enzymes. They also promote the growth of probiotic bacteria. E.g., oligo fructose, inulin, galacto-oligosaccharides, lactulose

COVID-19 is caused by the SARS-associated coronavirus 2 (SARS-CoV-2), also referred to as the coronavirus illness. The virus belongs to the Coronaviridae family (subfamily Coronavirinae) and is an encapsulated, single-stranded, positive-sense RNA virus. Wuhan City, Hubei Province, China, was where it was discovered on December 12<sup>th</sup>, 2019. It rapidly spread to neighbouring countries after that, endangering the health of everyone. A global deployment is now necessary because the pandemic epidemic has reached frightening proportions and crippled national healthcare systems. On March 11<sup>th</sup>, 2020, the World Health Organisation (WHO) classified it as a pandemic due to its dangerously quick spread and a large proportion of illness and fatalities. The WHO reported that as of August 5<sup>th</sup>, 2022, COVID-19 had been confirmed in 579,092,623 people, leading to 6,407,556 deaths. As of August 2, 2022, a total of 12,308,330,588 doses of vaccination had been distributed [31]. The multi-organ disease COVID-19 is now recognised as having variety of signs and symptoms. The vast majority of people with COVID-19, the first COVID-19 variations caused fever, dry cough, tiredness, and myalgia in addition to, in some cases, bacterial superinfection. When symptoms are severe, they can lead to respiratory failure and acute respiratory distress syndrome (ARDS) caused by COVID-19, which necessitates intensive care unit (ICU)-level treatment. We have now reached the post-COVID age, which follows the COVID-19 era,

which is still very much ongoing with new varieties (such as BA.4 and BA.5 omicron) appearing [32]. Fortunately, COVID-19 has evolved over the years to resemble the flu in the majority of instances. The main concerns are the inconvenience of quarantine as well as the worry of spreading the illness to vulnerable people, those who have a history of pathologies (or diseases), or unvaccinated individuals. The next stage is the most concerning. In fact, many COVID-19 survivors developed new or persistent symptoms that persisted for a long period of time (weeks to months), medical professionals call this "post-COVID syndrome." SARS-CoV-2 has rapidly spread, and an increasing number of persons are showing symptoms. Autonomic symptoms such as chest discomfort, tachycardia, and palpitations were observed alongside neurocognitive post-COVID symptoms such as dizziness, lack of attention, disorientation, and brain fog. In addition, they comprise gastrointestinal issues like nausea and diarrhoea, respiratory issues including exhaustion, dyspnea, coughing, and throat discomfort, musculoskeletal issues like myopathy and arthralgia, and psychological issues like post-traumatic stress [33]. SARS-associated coronavirus type 2 infection is a new clinical entity, the second pandemic, also known as post-COVID syndrome, is finally being acknowledged. Since some post-COVID symptoms can be linked to contact with other infectious agents, to a terrible event like the present epidemic, or to other factors including lockdown, fear, unemployment, and distress, this disease is difficult to investigate. In addition, it is frequently exceedingly challenging to identify the variant that caused the disease to manifest because post-COVID syndrome only manifests later, sometimes years after the commencement of the illness. Determining whether "possible" and

"probable" consequently difficult to treat cases as post-COVID symptoms. Furthermore, depending on the COVID-19 variation that caused the disease, post-COVID syndrome may vary [34].

#### *Dietary fibres*

There are two types: water-soluble fibres and water-insoluble fibres. They are present in fruits, vegetables, grains, legumes, etc. They are used to correct constipation, bowel irregularities, and haemorrhoids.

Soluble versus insoluble fibre is the traditional distinction used to categorise food sources of dietary fiber. According to the viscosity and fermentability of the fibre, plant foods include both types in varied degrees. The benefits of ingesting fibre vary depending on the type consumed and the potential benefits to the gastrointestinal system [35].

#### *Effects*

- (1) It increases dietary volume without significantly raising the calorie content, as does digestible carbohydrate, resulting in satiety that may help curb hunger.
- (2) During digestion, water is drawn in and produces a viscosity that slows down the emptying of the stomach, speeds up intestinal transit, and lessens blood sugar level fluctuations.
- (3) It controls blood sugar, which lowers glucose and insulin levels in diabetics and lowers the chance of developing diabetes.
- (4) It encourages the formation of short-chain fatty acids through intestinal fermentation and balances the pH of the intestines.

#### *Plant pigments*

##### *Curcumin*

The main curcuminoid found in turmeric, or *Curcuma longa*, is called curcumin (diferuloylmethane). It has

demonstrated a variety of biological effects, including antioxidant, anti-inflammatory, antibacterial, and anti-cancer qualities. In addition to have antifungal and antibacterial characteristics, it may also have antiviral properties because it prevents a variety of viruses from replicating. Therefore, it was proposed as a possible treatment for COVID-19.

Curcumin's relative safety and broad breadth of antiviral effect against enveloped viruses, including SARS-CoV-2, make it an intriguing substance to examine for management or therapy of COVID-19. Direct targeting of the spike protein and/or ACE2 via NRF2 and HMGB1 may be possible and this may also activate the host's virus defences by blocking NF- $\kappa$ B, the inflammasome, IL-6, and HMGB1. NADPH oxidase is also inhibited which lowers the production of ROS and avoids oxidative tissue damage. It might further actively intervene by changing the ways that Ang II-AT1 receptor signalling pathways produce inflammation by lessening the discomfort that COVID-19 causes in the respiratory system after ingestion. In addition, they clarified that topical administration of curcumin in the form of an emulsion may successfully shield people from contracting SARS-CoV2 infections, taking into account the presence of the ACE2 receptor, which acts as the virus' entry point, in nasal cells, the surface of the eyes, and the mucosa lining of the respiratory system. Last but not least, Liu et al. advocated curcumin as a treatment for pneumonia and deadly CARDS in individuals in 2020. In numerous computational studies, curcumin has been demonstrated to interact with a number of SARS-CoV-2 target proteins [36].

Furthermore, curcumin therapy significantly reduced the amount of RNA from SARS-CoV-2 isolated from cell culture supernatants. Recent research

has looked at the influence of curcumin on in-hospital outcomes among COVID-19 patients. There were reductions in the frequency of fatalities, the length of hospital stays, and the occurrence of identifying symptoms after adjunctive curcumin in its many forms, as a therapy. Moreover, this treatment enhanced the visual appearance of cytokine storms by decreasing inflammatory pathways while enhancing their opposite counterparts. It is worth noting that piperine, when employed as an adjuvant, can increase curcumin bioavailability by a whopping 2000%. Injecting a combination of curcumin and piperine has been shown in a double-blind, controlled RCT to shorten the time it takes for symptoms to go away and the amount of oxygen that is needed. Curcumin is safe after 3 months of treatment, according to dose-escalating experiments [37].

### *Melatonin*

The pineal gland primarily secretes the hormone melatonin, also known as N-acetyl-5-methoxytryptamine, at night and in greater quantities in young children and teens compared to the elderly. To keep the body's circadian rhythm steady and to keep other hormones in check, melatonin is crucial. Age-related processes, stress reduction, and psycho-neuroendocrine immunology (PNEI) are all significantly influenced by melatonin. Additionally, it modulates COVID-19 by interacting with the cortisol, immunological, and inflammasome pathways. The mortality rate of COVID-19 patients who are in critical condition may be greatly lowered by melatonin plus conventional therapy. Melatonin largely influences the immune system.

Hence, it guards against variations brought on by gene mutations. Despite lacking virucidal properties, melatonin provides indirect antiviral effects through lowering inflammation and

oxidation and increasing immune activities [38]. Both nuclear factor kappa-B (NF- $\kappa$ B) and sirtuin-1 (SIRT-1) may have anti-inflammatory effects. In bone marrow and other organs, the development and expansion of monocytes, granulocytes, T and B lymphocytes are encouraged by melatonin. In other organs, such as bone marrow, it also promotes the development and growth of T and B lymphocytes, monocytes, and granulocytes. The interaction of melatonin with free radicals and the up-regulation of antioxidant enzymes like superoxide dismutase are what cause it to have an anti-oxidative impact. By interacting with both the ACE 2 and SARS-CoV-2 RBD, melatonin may have a dual-binding impact. Along with other pathways, melatonin also significantly blocking calmodulin's function, which is essential for ACE2 activation. Its receptor-binding and suppression of calmodulin may therefore be the causes of its protracted action on ACE2. Strong inflammasome inhibition may also indirectly lessen lung injury and cytokine storm intensity. It also functions as an adjuvant in COVID-19 by restoring the circadian rhythm and mitochondrial metabolism. Furthermore, along with traditional medication, the treatment plan includes remdesivir, levofloxacin, dexamethasone, and enoxaparin. In addition, 10 mg of melatonin was given to half of the patients.

It is interesting to note that the death rate was 17.1% for patients receiving conventional medication and 1.2% for those receiving melatonin. As a result, overall mortality decreased by 93% in those receiving melatonin therapy [39].

#### *Flavanoid*

Flavonoids, a sizable class of nutraceuticals with beneficial pharmacological properties like anti-inflammatory, antioxidant, and

anticancer activity, are present in a wide variety of vegetable foods in the diet. Some flavonoids have also been studied *in vivo* and *in vitro* for their potential antiviral properties. Because they control RNA polymerase, messenger RNA, viral replication, and infectiousness, flavonoids may have an antiviral effect. In addition, they have demonstrated effects on coronaviruses that are antiviral and immunomodulatory. Flavonoids are now used to obtain potential COVID-19 agents. Some of the inflammatory pathways that flavonoids may influence include the Nuclear factor erythroid 2-related factor 2, adenosine deaminase 2 (ACE2), toll-like receptors (TLRs), bromodomain-containing protein 4 (BRD4), and the NOD-like receptor protein 3 (NLRP3) inflammasome. They can also affect the body's defence mechanisms, the composition of macrophages, the activity of natural killer cells, and the strength of anti-inflammatory mechanisms. According to an exciting molecular modelling study, the ACE2 inhibitory substance Epicatechin, which is derived from the *Hypericum perforatum* plant, exhibited higher suppression of ACE2 with good pharmacokinetic properties than the other established ACE2 inhibitory substances. Another study has demonstrated that the citrus flavonoid naringin, which has an estimated docking energy of just 6.85 kcal/mol, can inhibit the ACE2 enzyme. Several flavonoids have been used to successfully prevent and/or treat COVID-19 and post-COVID infections. These flavonoids include apigenin, fisetin, luteolin, kaempferol, jusanin, and quercetin [40].

#### **Conclusion**

Despite its benefits, there is a dearth of clinical data on the use of nutraceuticals and dietary supplements for the prevention and decrease of COVID-19. Good nutrition boosts

immunity to acute respiratory virus infections. Dietary therapy may help hospitalised COVID-19 patients. Taking adequate vitamin C, D, and zinc supplements may boost immunity. Immunomodulators may fight viruses. Vitamin D deficiency is common. Therefore, people should watch their consumption. Most research suggests vitamin D deficiency may worsen COVID-19. Thus, some international bodies recommend vitamin D supplements for high-risk individuals. These findings require more extensive clinical trials. Unregulated supplements and nutraceuticals are sold worldwide. Thus, certain products may be hazardous or ineffective. The COVID-19 epidemic cruelly showed that weaker people are preyed upon. As previously reported, the FDA has warned many companies for falsely misrepresenting their drugs' preventive and anti-COVID-19 therapeutic qualities. These nutraceuticals' COVID-19 efficacy needs further study. Public health practices, including frequent hand washing with soap, wearing a face mask, covering a cough with an elbow, social seclusion, "stay at home" instructions, rigorous testing, and contact tracing, are the best prevention approaches. Accordingly, to preserve immune health, follow official nutrition and lifestyle requirements. Dietary supplements and nutraceuticals are popular and should be assessed.

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