

Use Of Vitamin C, Vitamin D and Zinc Supplements To Avoid COVID-19 Infection

Review Article

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Abstract

Today, the whole world is exposed to the coronavirus (COVID-19) epidemic, the mutated SARS-CoV-2 virus disease that is spreading from person to person. Although the infection shows symptoms such as fever, loss of smell, dry cough and fatigue, it can result in severe pneumonia, respiratory distress syndrome and death. The effects of COVID-19 are often severe in the elderly due to chronic diseases and weakened immune systems. COVID-19 directly affects the immune system as it often produces a systemic inflammatory response or cytokine release syndrome. Nutrition and food supplements are the main determinants of maintaining health and strengthening the immune system. Since vitamins and minerals with well-structured immunomodulatory effects positively affect the immune system response, people have added these food supplements to their daily diets to protect against COVID-19. Clinical studies on the effect of vitamins and minerals as nutritional supplements on COVID-19 treatment are limited and studies are on going. In addition, serious side effects occur when vitamins and minerals are consumed above the daily intake limit. Therefore, the effects of vitamins D, C, and Zinc on human health and daily intake limits are explained in this study.

Keywords: SARS-CoV-2; COVID-19; Vitamin C; Vitamin D, Zinc.

Introduction

Corona virus disease (COVID-19), which poses a significant threat worldwide today, is the global infection caused by the new corona virus SARS-CoV-2. It was first detected in some individuals resulting in pneumonia symptoms in Wuhan, China, in late 2019. It is thought to be similar to Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) viruses. It was originally referred to as 2019 nCoV, but was later named COVID-19 by the World Health Organization. The virus is transmitted from person to person through respiratory droplets, contact and fomites. SARS-CoV-2, an enveloped RNA virus, has two types, "type L" (70%) and "S" (30%). L type is more effective and contagious [1-4]. COVID-19 ranges from asymptomatic to severe, with symptoms such as fever, dry cough, malaise, acute respiratory distress syndrome and pneumonia [5, 6]. Covid-19 is more easily transmitted to older people, especially those with weak immune systems. Since the immune system pro-

tections the human body from various diseases, when its response decreases, the risk of contracting infections such as coronavirus or various diseases increases [7].

Currently, there is no approved treatment for COVID-19 that is certain to be free of side effects [1, 8, 9]. Therefore, the best strategies to reduce COVID-19 have been individual hygiene, social distancing, and wearing a face mask. Current clinical studies and studies show that food supplements can play a positive role in the treatment of COVID-19 patients. It has been suggested that the administration of higher than the recommended daily dose of supplements such as Vitamins D, C and Zinc may have healing effects, potentially reducing the SARS-CoV-2 viral load and hospital stay [1, 10-13]. These food supplements are already known to have antioxidant properties and protect the immune system. Lack of these nutrients can increase the risk of weakening the immune system and getting infections. Although mostly elderly, patients with severe COVID-19 infection have low vitamin and mineral levels and it has been claimed that this increases

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the risk of morbidity and mortality [1, 14]. Decreasing nutrient richness and weaker immunity due to immune-aging in the elderly has made adequate nutrition twice as important as it significantly increases the risk of poor outcomes from COVID-19. The role, status and potential therapeutic roles of Vitamins D, C, and Zinc in the immune system in patients infected with SARS-CoV-2 are still debated and investigated [1].

During this pandemic period, the number of patients in the intensive care units of hospitals is increasing and the treatment processes are difficult. In addition, the effect of the COVID-19 virus on human physiology is not known exactly, and it has a different effect on each person. Therefore, people have increased the use of supplements to avoid exposure to COVID-19 infection, even if they do get caught, to help their acute treatment and to strengthen their immune systems. Therefore, vitamin C, vitamin D and zinc, which are the most frequently used vitamins and minerals, have been presented.

Vitamin C

Vitamin C, or ascorbic acid, is a water-soluble vitamin that people can obtain from food. Vitamin C acts as an antioxidant by scavenging reactive oxygen species, namely radicals. Thus, it prevents oxidative damage and dysfunction of proteins, lipids and nucleotides. Vitamin C accumulates in leukocytes at higher concentrations than in plasma. Vitamin C found in leukocytes enables it to be used rapidly during Infection. Disrupting the balance between antioxidant defenses and oxidant production can alter multiple signaling pathways involving proinflammatory transcription factors such as nuclear factor- κ B (NF- κ B). NF- κ B plays an important role in the pathogenesis of some diseases, inflammatory responses and viral infections. The activation of NF- κ B increases with the increased levels of oxidant and oxidative species, and the production of inflammatory mediators [1, 15].

Vitamin C has a protective effect in infectious diseases. It is used to prevent viral infections, including the common cold, and some serious illnesses. Vitamin C supplements support respiratory defense mechanisms, prevent viral infections, and reduce the duration and severity of infection. It is also known to have anti-histamine properties, which have positive effects on diseases such as flu. In patients with acute respiratory infections such as pneumonia or tuberculosis, plasma vitamin C levels decrease dramatically, and vitamin C supplementation decreases the severity and duration of pneumonia, especially in elderly patients [1]. These protective properties of vitamin C have made it attractive to be used in protection from COVID-19 and in the treatment process.

COVID-19 is caused by a new corona virus in which a different genome sequence is effective, unlike the common cold. Therefore, it should not be thought that the successful results obtained with Vitamin C treatment in colds will have the same positive results when a Vitamin C treatment is applied in COVID-19. However, the use of Vitamin C in patients with septic shock has been investigated in recent studies. In this clinical trial, intravenous Vitamin C was administered along with drug therapy. For four days, 50 mg / kg intravenous (IV) vitamin C was administered every 6 hours. Compared with placebo, it did not significantly alter the severity of the disease, C-reactive protein levels or thrombomodulin levels in patients with sepsis and acute respiratory distress syndrome.

However, the 28-day all-cause mortality was significantly reduced with the use of vitamin C [8, 16].

In addition, it has been stated that vitamin C has a positive role in pneumonia, which is also seen in COVID-19. It was stated that 50 Chinese patients with severe symptoms applied high-dose vitamin C supplements and had positive results in the course of the disease [17]. Based on such results, the use of vitamin C supplements in people suffering from COVID-19 infection has become an option as it helps support the immune system [1]. However, in clinical studies, Vitamin C supplementation is still being evaluated in COVID-19 patients.

Nevertheless, although research on the treatment of vitamin C in the treatment of COVID-19 is not sufficient, the studies are being recorded in the National Institutes of Health Clinical Trials [8]. Recommended daily doses range from 500 mg to 3000 mg, and higher doses may be recommended during acute infection [9]. In addition, vitamin C should not be used in high doses and unconsciously as it may cause gastrointestinal disorders, headache and kidney stones in those with high oxalate levels [8, 9].

Vitamin D

Vitamin D is produced by exposure of 7-dehydrocholesterol to ultraviolet B (UVB) radiation in the skin epidermis. It is a fat-soluble steroid hormone precursor converted to the circulating precursor cholecalciferol [1, 18]. Vitamin D can be found in foods and foods in the form of D2 (ergocalciferol) and D3 (cholecalciferol) [8]. Vitamin D has important roles in body immune systems. Vitamin D enhances innate cellular immunity by stimulating the release of some antimicrobial peptides. These antimicrobial peptides increase the dominance of anti-oxidative genes. Some viruses that cause infection increase the risk of infection and pulmonary edema by damaging the epithelial tight junctions. Vitamin D plays an important role in maintaining the integrity of these bonds [1, 19]. Low vitamin D levels lead to inflammation with decreased levels of receptor expression. Vitamin D also increases superoxide production, phagocytosis and bacterial destruction, and strengthens the immune system by reducing the production of pro-inflammatory cytokines [1, 20].

It has been claimed that vitamin D supplementation helps to reduce the incidence and severity of viral infection, and that there is an inverse relationship between upper respiratory tract infection and serum 25-hydroxyvitamin D levels. Although the effect of vitamin D on SARS-CoV-2 infection has not been clarified, it has been stated that it can potentially reduce pro-inflammatory cytokines in COVID-19 patients and also reduce mortality caused by acute respiratory distress syndrome [1, 14].

According to the data obtained as a result of the researches, low vitamin D levels were associated with acute respiratory diseases and it was stated that patients with low vitamin D levels could be exposed to acute respiratory distress syndrome [8, 21, 22]. In a meta-analysis of more than ten thousand people, it was concluded that oral vitamin D3 supplementation reduced respiratory tract disorders. In addition, no serious adverse effects were detected except for the very rare kidney stones (0.2%) and hypercalcemia (0.5%) [8, 23]. Based on these studies, some researchers have suggested that Vitamin D supplementation may have a role in treat-

ing COVID-19 and respiratory ailments. However, no data on this have been presented [1, 8, 24, 25]. Although it is unclear whether vitamin D intake affects infection rates, it has been claimed to play a role in reducing the severity of the disease [1, 26]. Studies that do not aim to evaluate the effect and effectiveness of vitamin D supplementation on prognosis in COVID-19 patients are ongoing. Whether daily vitamin D supplementation has positive results in the treatment of COVID-19 is unknown without clinical studies specific to COVID-19 [8]. Therefore, until scientific evidence emerges, people should not consume vitamin D above the daily intake limits (<50 nmol / L) in hopes of preventing or treating COVID-19. It is also predicted that excessive consumption of Vitamin D may cause hypercalcemia [8, 9, 23].

Zinc

In addition to being vital in both innate and acquired responses to viral infection, zinc is an important trace mineral involved in many biological processes, including the immune system. It has been found that zinc deficiency significantly increases proinflammatory cytokines and contributes to lung tissue remodeling. This effect is partially offset by zinc supplements [7, 27]. Additionally, zinc deficiency regulates IFN- γ , TNF- α and Fas receptor signaling and causes a change in cell barrier function in lung epithelial tissues through in-vitro apoptosis. It has been reported that zinc inhibits the synthesis, replication and transcription complex of coronaviruses [1, 28]. It has also been claimed that it can provide positive and therapeutic effects against viral infections by directly playing a role in protein synthesis and viral replication [29].

Additionally, zinc has been postulated to inhibit viral replication and adhesion to the nasopharyngeal mucosa, and through this mechanism, it plays a role in the management of the common cold [8, 30]. In-vitro studies claim that zinc alters the effects of various respiratory pathogens, including rhinovirus, respiratory syncytial virus, and SARS-CoV-2 [8, 28, 31].

There are some clinical studies evaluating zinc supplements for the common cold [8, 32]. According to the results of multiple meta-analyses, it depends on whether zinc significantly affects the duration of the cold and the extent to which patient and regimen characteristics alter treatment effects [8, 33-36]. According to some studies, there is evidence that zinc supplementation reduces the duration of a cold by 1.65 days [8, 33]. Based on such studies, claims that zinc may play a role in COVID-19 management have started to emerge. A doctor in New York claimed that he had an almost perfect clinical response by prescribing a combination of hydroxychloroquine, azithromycin and zinc to his patients [8].

It has been stated that zinc has effects that will alleviate the course of the disease in the treatment of COVID-19 due to its immunomodulatory and anti-viral properties [1]. Studies are currently underway to test the use of zinc as a supplement to the regimen to treat COVID-19 [8]. It has been stated that zinc supplementation produces positive results in the treatment process in which hydroxychloroquine and other drugs are applied [37]. Some studies have suggested that, based on the positive results of zinc supplementation in lower respiratory tract infection, it may reduce the effects of COVID-19 infection [1]. Four COVID-19 patients were treated with high-dose zinc supplementation and reported clinical symptomatic improvement [38].

Some people exposed to this epidemic take zinc supplements, but reliable data on this are still lacking. However, oral zinc supplementation in adults up to 40 mg / day may be safe. Zinc intake at high doses above the recommended daily dose, i.e., 40 mg / day, is not safe. This has negative side effects such as nausea, vomiting and taste changes [8, 9]. High doses may cause copper deficiency and only short-term treatment is recommended. According to the World Health Organization, there are no approved guidelines for the use of zinc in COVID-19 [9].

These vitamins and minerals are used by people to protect against COVID-19, with or without prescription. However, taking vitamin and mineral food supplements above the daily intake limits causes serious side effects. In addition, there are insufficient research data on their clinical use. Based on all these, it is essential to measure the blood level of these analytes in a short time, simultaneously and with high accuracy. The aim of this study is to design electrochemical sensors that can detect these analytes instantly, simultaneously, with high precision and accuracy.

Conclusion and Future Prospects

In the COVID-19 outbreak, those with low immunity and the elderly are most affected. Since vitamins C, D and zinc positively affect the immune system, possible benefits are offered to those infected with this infection. The death of the COVID-19 pandemic process and the increasing number of cases make it inevitable to use vitamins and minerals that strengthen the immune system. Vitamins and minerals have an appropriate role in supporting COVID-19 patients. However, clinical studies on the effect of these supplements during COVID-19 treatment are ongoing. Therefore, vitamins D, C and Zinc supplements can have a positive effect on the treatment process of COVID-19 disease, but should not be consumed above daily intake limits. However, in order to be protected from COVID-19, which can also result in death, and to overcome the disease more easily, it is predicted that it is appropriate to consume vitamins and minerals that positively affect the response of the immune system below the daily intake limits. As a result (ultimately), detailed clinical studies are needed on the role of vitamins, minerals, and even antioxidants, which are effective in DNA synthesis, cell proliferation, and enhancing cellular resistance, in the treatment of COVID-19. In order to enlighten people in this process, these research data should be brought into the literature.

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