Nutrition and Supplement Treatment of Covid-19

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**Abstract**

Covid-19 (Coronavirus Disease) is a lethal and infectious illness caused by SARS-CoV-2, which leads to vascular damage, angiogenesis, acute respiratory syndrome, microangiopathy, and a hyperinflammatory response. There are four identified stages of Covid-19. The first stage is characterized by upper respiratory tract infection; the second by the onset of pneumonia and dyspnea; the third by a cytokine storm and the resulting hyperinflammatory state; and the fourth by either death or recovery. Currently, there is no universally effective treatment for Covid-19 infection. Multiple classes of drugs are used depending on the clinical and pathological features of the disease. These include antiviral agents, low molecular weight heparins, anti-inflammatory inhibitors, hyperimmune immunoglobulins, and plasma therapy, especially for patients with moderate to severe symptoms. However, various other treatments are being investigated by researchers. These include Proprietary Blend I, which contains silica, vitamin C, and trace minerals; Proprietary Blend II, which includes N-acetyl L-tyrosine, anhydrous caffeine, L-theanine, velvet bean seed, pine bark, curcumin, and vitamin D; and Proprietary Blend III, which consists of black seed oil, resveratrol, turmeric, raspberry ketones, apple cider vinegar, aloe vera, and D-ribose. A patient who was initially fully vaccinated with the Pfizer vaccine developed acute symptoms of Covid-19 and was prescribed these nutritional blends. The patient fully recovered after one month of treatment. Based on these results, this study explores the relationship between immunity and nutrition in Covid-19 patients and investigates whether a nutritional formula can contribute to recovery during the pandemic.

**Nutritional and Supplement Treatment of Covid-19**

**Introduction**

Coronavirus was first reported in December 2019 in Wuhan, China. Since its outbreak, the disease has caused widespread economic disruption and fatalities worldwide. Its mortality rate varies significantly based on several factors, including but not limited to race, country, and socioeconomic status. According to Li et al. (2020), these differences are attributed to age structure, healthcare systems, patient immunity, and ethnicity. Vulnerability to the disease is further influenced by weakened immune function and lower socioeconomic conditions. A growing body of research indicates that individuals with underlying health conditions are more susceptible to Coronavirus than those without such conditions.

Low immunity is one of the major risk factors for respiratory viral infections. To mount an optimal immune response against viral pathogens, a proper diet is essential. This means that a poor diet with inadequate nutrient levels may increase an individual's susceptibility to contracting Covid-19. Research by Zu et al. (2020) has suggested a relationship between nutrition and the development of Covid-19. However, there is currently no comprehensive research assessing nutrient deficiencies among Covid-19 patients. Therefore, confirming nutrient status in these individuals is necessary.

**Aims and Objectives**

This research aims to investigate nutritional approaches for supporting the treatment of coronavirus infection. Since there are no pharmaceutical drugs currently proven to effectively cure the disease, exploring complementary medicine and nutrition-based methods is essential for aiding in its prevention, management, and potential recovery.

**Study Question**

The research question was formulated using the PICO method as a guiding framework: What are the effects of dietary supplements and nutrients on the treatment of COVID-19 through immune system support? In this context, the population (P) includes individuals with or without COVID-19 infection. The intervention (I) refers to the consumption of dietary supplements and nutrient-rich foods. The comparison (C) involves individuals who are deficient in essential supplements and follow a poor diet. The outcome (O) focuses on the absence of treatment in infected individuals or the prevention of infection in healthy individuals.

**Literature Review**

Covid-19 is a pandemic associated with mild to severe symptoms in people of all ages, regardless of gender. Coronavirus belongs to a large family of viruses found in various species, including bats, camels, humans, cattle, and cats. After initial infection, symptoms typically appear between the 2nd and 14th day and may include shortness of breath, cough, and fever. Although the exact molecular mechanisms associated with Covid-19 are not fully understood, Perlman (2020) notes that its replication involves both intra- and intermolecular interactions. The respiratory system is the primary target, often leading to pneumonia and multi-organ failure. While there are currently no approved pharmaceutical therapies to cure the disease, prevention methods include vaccination, self-quarantine, social distancing, and maintaining a strong immune system.

Covid-19 belongs to the family Coronaviridae and the subfamily Orthocoronavirinae. According to Lu (2020), "Coronavirus is an enveloped, positive-sense ribonucleic acid (RNA) virus, characterized by the club-like spikes projecting from its surface. Genetic sequencing of COVID-19 is somewhat difficult, as the virus exhibits a cytopathic effect." It shares a close genetic relationship with the BatCoV RaTG13 sequence, though RaTG13 does not perfectly match the novel virus variant. The virus primarily targets the lungs by binding to angiotensin-converting enzyme 2 (ACE2) receptors, which are abundant in type II alveolar cells. A specialized surface glycoprotein called a peplomer (Spike protein) enables the virus to attach to ACE2 and enter host cells. Diagnosis is typically performed using the standard method of reverse transcription polymerase chain reaction (RT-PCR) from a nasopharyngeal swab.

Individuals with low immunity are more severely affected by the disease than those with a stronger immune system. People with pre-existing conditions such as diabetes, cardiovascular disease, recent surgeries, or those taking immunosuppressant medications are especially vulnerable. Since no definitive treatment or cure currently exists, there is an urgent need for alternative strategies to address the disease. While there is limited evidence that diet alone can cure Covid-19, the inclusion of targeted nutritional interventions may help strengthen the immune system, potentially reducing the severity or fatal consequences of the infection.

**Role of Nutrition**

**Vitamin A**

This vitamin is categorized as fat-soluble and was quickly recognized for its solubility in fats. β-carotene, a plant-derived precursor of vitamin A, plays a vital role in supporting the body’s immune system. The body's ability to defend itself effectively against infections is closely linked to adequate intake of this nutrient. According to Stachowska et al. (2020), vitamin A is referred to as "anti-infective" due to its central role in immune defense. In the body, vitamin A exists in three active forms: retinoid, retinol, and retinoic acid. Retinoic acid is particularly important in regulating cellular maturation, differentiation, and immune function. It also influences the differentiation of dendritic cell precursors, which are specialized immune cells responsible for managing both innate and adaptive immune responses.

An increasing body of research suggests that incorporating vitamin A into the diet can help protect the body from diseases such as lung disorders, human immunodeficiency virus (HIV), coronary heart disease, and malaria. A severe deficiency in vitamin A is associated with impaired immune function, weakened barrier defenses, and a higher susceptibility to various infections. Given that there is currently no definitive cure or treatment for Covid-19, vitamin A may offer a valuable nutritional strategy. Its potential benefit is particularly relevant considering the severe impact of Covid-19 on the lungs and respiratory system.

**Vitamin C**

Vitamin C is water-soluble and plays a significant role in the formation of collagen in connective tissues. It directly neutralizes free radicals in the aqueous layer by converting itself into dehydroascorbic acid through oxidation. Additionally, it serves as a cofactor in various gene regulatory and biosynthetic enzymes, contributing to immune-modulating effects. Evidence from preclinical and clinical trials has demonstrated the barrier-enhancing properties of vitamin C. It is also known to regulate gene suppression in dermal fibroblasts, a process that promotes their proliferation and migration. This leads to enhanced gene remodeling, which supports wound healing. Vitamin C also participates in the stimulation of neutrophil apoptosis, helping to protect host tissues from damage and aiding in the removal of macrophages. Furthermore, the proliferation and maturation of T cells, which are lymphocyte immune cells that defend the body against pathogens and cancer cells, are dependent on ascorbic acid.

Flu-like symptoms such as sneezing, rhinorrhea, nasal congestion, and sinus congestion are alleviated by vitamin C due to its antihistamine properties. Recent studies on Covid-19 and related respiratory disorders suggest that vitamin C may play a supportive role in treatment. Research conducted by Formisano et al. (2021) indicates that vitamin C can effectively inhibit several viruses, including influenza, rabies virus, herpesvirus, parvovirus, avian RNA tumor viruses, and human lymphotropic virus, among others.

**Vitamin D**

Vitamin D is both a hormone and a vitamin produced in the body through exposure to sunlight. Research conducted by Fan et al. (2020) suggests that vitamin D plays a significant role in maintaining bone integrity. As a fat-soluble nutrient, it helps regulate both the adaptive and innate immune responses. According to Fan et al., "calcitriol, an active form of vitamin D, is activated by ultraviolet radiation, leading to an increase in the production of antiviral peptidase, enhancing the oxidative burst capacity of macrophages, and suppressing the excessive expression of proinflammatory cytokines," which are signaling molecules that promote inflammation. The study also demonstrates that vitamin D improves innate immunity by upregulating the expression and secretion of key antimicrobial peptides in immune cells, thereby strengthening mucosal defenses against various viral infections.

Vitamin D has demonstrated its effectiveness in enhancing immune defense through the expression and regulation of antimicrobial peptides in immune-related cells. This supports the mucosal barrier against a range of viral pathogens. Granje (2018) found that vitamin D encourages the binding of the SARS-CoV-2 cell entry receptor ACE2 to AGTR1, a process that reduces the number of viral particles able to attach to ACE2.

Vitamin E, a water-soluble vitamin that includes tocotrienols and tocopherols, plays a role in reducing oxidative stress by binding to free radicals. Its immune-enhancing effects are supported by depriving oxygen from oxygen-dependent species. Additionally, vitamin E protects polyunsaturated fatty acids from oxidation during the formation of new reactive species. Its high concentration in immune cells helps shield them from oxidative injury. Research from the CDC (2020) indicates that vitamin E can regulate the function of dendritic cells, which are essential for coordinating the body’s immune response. It has also been found to promote the development of the T cell immune synapse and initiate T cell activation signals.

**Vitamin E**

According to Bowser (2020), vitamin E supplementation restores the production of interleukin-2 (IL-2) in humans, a process that enhances the proliferation of T cells and improves overall immune system function. Kumar et al. (2021) observed that a deficiency in vitamin E increases the severity of viral and other diseases. Additionally, research conducted by Ahvanooei (2021) found that deficiencies in both vitamins E and D contributed to the development of bovine coronavirus infections in calves. These findings suggest that increasing dietary intake of vitamin E may benefit individuals suffering from various diseases, including Covid-19.

**Trace Minerals**

Zinc and silica play a significant role in supporting patients with Covid-19. Although trace elements are required in small amounts by the body, their overall contribution is vital. According to Islam et al. (2021), zinc is essential for the development of immune cells. Its deficiency can lead to a reduction in both passive and active immunity, increasing susceptibility to a wide range of infections. Previous studies have shown that the combination of zinc and pyrithione can inhibit the replication of SARS-CoV. Because zinc has the ability to block RNA polymerase activity, it may provide antiviral protection against various types of infections.

The human immune system is an efficient and complex network consisting of different types of cells, defense mechanisms, and signaling molecules. Nutrition is one of the primary factors influencing its functionality. A weakened immune system is often linked to nutritional deficiencies, making individuals more vulnerable to infections, including Covid-19. Providing adequate nutrients through supplementation can help strengthen the body’s natural defenses by supporting immune responses, cellular immunity, the integrity of epithelial barriers, and antibody production. A diet rich in immune-supporting components such as vitamins, proteins, and minerals can enhance resistance to infections. Therefore, it is important to investigate and identify the nutrients most effective in boosting the immune system against diseases like Covid-19.

**Methods**

Several case studies were used to investigate and analyze the role of nutrition and food supplements in the treatment and management of COVID-19 and other diseases. The following case studies were included in the research:

1. A 36-year-old female, fully vaccinated with the Pfizer vaccine, contracted COVID-19 in October 2021. She was a non-smoker, a regular athlete, and did not exhibit symptoms of obesity. She experienced severe symptoms including extreme fatigue, high fever, dyspnea, a persistent cough, and loss of taste and smell. Her first consultation occurred two weeks after the acute infection and two weeks after testing negative via PCR. Her treatment included the use of Proprietary Blends I, II, and III.
2. A 12-week iron therapy program involving 198 women experiencing fatigue.
3. Forty-one patients diagnosed with fibromyalgia and chronic fatigue syndrome were administered D-ribose, a naturally occurring pentose sugar, at a dose of 280 grams.
4. A 28-year-old male with mild intermittent asthma, no nasal or oral conditions, and no identifiable risk factors for ageusia or asthma was given a single capsule supplement containing 1000 mg of turmeric extract.
5. A 25-year-old male without chronic medical conditions, nasal or oral infections, or identifiable risk factors for ageusia or insomnia was also administered 1000 mg of turmeric extract.
6. Vitamin B1, B6, B12, vitamin D (25-hydroxyvitamin D), folate, selenium, and zinc levels were measured in 50 hospitalized COVID-19 patients.

**Results**

For patients with COVID-19, lower levels of vitamin D were recorded compared to the healthy control group. Among COVID-19 patients, 24% had severe vitamin D deficiency, whereas only 7.3% of individuals in the control group showed similar deficiency levels. Additionally, 11 out of 12 patients experiencing respiratory distress were deficient in at least one essential nutrient. Overall, 42% of patients were found to be deficient in selenium, while 76% were deficient in vitamin D.

In the cases of the 25- and 28-year-old men with intermittent asthma and taste and smell impairments, turmeric supplementation contributed to a return to normal health. For a 36-year-old woman, treatment with Proprietary Blends I, II, and III led to notable improvements, including better breathing, reduced fatigue, and relief from headaches. Her breathing normalized within one month, followed by the resolution of her cough and a marked improvement in concentration.

In another study, 41 patients diagnosed with fibromyalgia reported significant improvements in energy levels, mental clarity, sleep quality, and overall well-being while taking D-ribose. Approximately 66% of these patients experienced a noticeable benefit, with a mean energy increase of 45%.

**Discussion**

High-dose administration of vitamin C has shown a strong capacity to reduce oxidative stress and holds significant potential for restoring organ function and repairing endothelial layers. According to Vollbracht and Kraft (2021), vitamin C is "vital for the phagocytosis of consumed neutrophils by macrophages." In addition, D-ribose has demonstrated potential benefits in alleviating brain fog, improving sleep quality, and enhancing overall well-being (Teitelbaum et al., 2006). Research also suggests a connection between vitamin C intake and the severity of depression and anxiety symptoms. Tardy et al. (2020) found that low intake of vitamin C is associated with an increased risk of developing anxiety and depression.

**Conclusion**

Coronavirus was first reported in December 2019 in Wuhan, China. Since its outbreak, the disease has caused widespread economic disruption and significant fatalities worldwide. Its mortality rate varies considerably based on several factors, including but not limited to race, country, and socioeconomic status. There are four identified stages of Covid-19: the first stage is characterized by upper respiratory tract infection; the second involves the onset of pneumonia and dyspnea; the third is marked by a cytokine storm and a resulting hyperinflammatory state; and the fourth stage leads either to recovery or death. Currently, there is no pharmaceutical drug proven to effectively treat and cure Covid-19. However, practical dietary strategies and nutritional supplements have shown promise in supporting the treatment and management of the disease.

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