



Mechanism of Boosting Immunity against COVID-19 and also its Immune Response: A Review

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Received: 16-Jun-2020, Manuscript No. IJMRHS-20-13578; **Editor assigned:** 19-Jun-2020, PreQC No. IJMRHS-20-13578 (PQ); **Reviewed:** 03-Jul-2020, QC No. IJMRHS-20-13578 (Q); **Revised:** 08-Sep-2022, QI No. IJMRHS-20-13578, Manuscript No. IJMRHS-20-13578 (R); **Published:** 06-Oct-2022

ABSTRACT

Coronaviruses possess a typical morphology, the name being derived from the outer fringe or “corona” of embedded envelope protein. Members of the family Coronaviridae cause a broad spectrum of animal and human diseases. The novel corona virus (COVID-19) was first identified in China and is pandemic worldwide and it has not the right treatment. Therefore, the current review focused on mechanism of boosting immune system against covid-19. The review concentrated on current literature on Corona virus, COVID-19, Vitamins and Immunity with scientifically proven efficacy was carried out using electronic databases such as Science Direct, Google Scholar, Cochrane library and PubMed. Among a total of 5000 studies, eleven studies were included in this review. The current review showed Vitamins (Vitamin C, Vitamin B6 and Vitamin D and Vitamin E are the most powerful way to boost immune system against coronavirus (COVID-19). However, further study should be done another option of boosting immune system by the aid of laboratory.

Keywords: Corona virus, COVID-19, Vitamins, Immunity

INTRODUCTION

Coronaviruses possess a typical morphology, the name being derived from the outer fringe or “corona” of embedded envelope protein. Members of the family Coronaviridae cause a broad spectrum of animal and human diseases. The disease was first defined in 1931, with the first coronavirus (HCoV-229E) isolated from humans in 1965. Until the outbreak of severe acute respiratory syndrome in late 2002, only two Human Coronaviruses (HCoV) were known HCoV-229E and HCoV-OC43. Once the SARS coronavirus (SARS-CoV) had been identified, two further human coronaviruses were identified. Three groups of coronaviruses exist; group 1 (HCoV-229E and HCoV-NL63), group 2 (HCoV-OC43 and HCoV-HKU1), group 3 (no human CoVs as yet).

SARS-CoV is an outlier to all three groups, although some place it in group 2. In addition to those diseases the novel coronavirus (COVID-19) was identified in 2019 it was identified from Wuhan, China, infected by a novel corona virus, now named as Severe Acute Respiratory Syndrome Coronavirus 2 ((SARS-CoV-2) and pandemic worldwide. It is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Because of their lower immunity, older people and those with underlying medical problems like

cardiovascular disease, diabetes, chronic respiratory disease and cancer are more likely to develop serious illness. According to New York City, 2020 Health report people with age group of 75 and older than are high number of death rate. This might be due to aging and low level of immunity [1-4].

LITERATURE REVIEW

The best way to prevent and slow down transmission is be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing your hands or using an alcohol based rub frequently and not touching your face. Our immunity is one of the most important defence mechanisms to protect us from viral infection like Coronavirus (COVID-19) so we have to boost our immunity *via* eating food and vegetables those are very important to our body to increase the immunity [5].

The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so it's important that you also practice respiratory etiquette (for example, by coughing into a flexed elbow) [6].

Immune response against COVID-19

The immune system has evolved to protect the host from a universe of pathogenic microbes that are themselves constantly evolving. The immune system also helps the host eliminate toxic or allergenic substances that enter through mucosal surfaces. Central to the immune system's ability to mobilize a response to an invading pathogen, toxin or allergen is its ability to distinguish self from non-self. Likewise our immune system reacts against coronavirus (COVID-19) through the mechanism of an immediate innate immunity and a slower adaptive immunity [7].

In viral infections the host innate immune system is meant to act as a first line defence to prevent viral invasion or replication before more specific protection by the adaptive immune system is generated. While the innate immune response is able to prevent or control some infections, it is limited in the ways in which it can react. The adaptive immune response, which includes both B cell-based humoral immunity and T cell-based cellular immunity, reacts much more specifically and powerfully to invading pathogens. Antibodies are proteins made by immune system cells called B cells. They stick around in the blood post-infection and can bind to the virus, either neutralizing it directly or marking it for destruction by other immune cells [8].

According to previous studies report SARS-CoV or MERS-CoV patients have antibody responses. Though, showed defective expression of types I and II Interferons (IFNs), revealing of poor protective immune responses. However, to date, there were few studies in characterizing the immune responses, especially adaptive immune responses to SARS-CoV-2 infection. Showed that COVID-19 patients exhibited Nucleocapsid Protein (NP)-specific antibody response and in one patient, Immunoglobulin M (IgM) peaked at day 9 after disease onset and then switched to IgG by week 2 [9].

Mechanism of boosting immunity against COVID-19: Immune system is the best way to fight against virus like corona virus. There are also some nutritional values and other tracing elements are used to boost our immunity such as vitamin C, D, E, zinc, vitamins B6 and B12, copper, folate, selenium and iron also play a role in a healthy diet [10].

DISCUSSION

Vitamin C

It is also known as ascorbic acid is one of the long-known super nutrients and it is relatively easy to get. Humans cannot synthesize vitamin C, because we don't have the specific enzyme needed. Hence, we need to get it from an exogenous source, also called food. Vitamin C plays a role in maintaining the immune system comprehensively through its antioxidant ability, collagen synthesis or directly strengthening immune cells in the fight against infection. Several studies have been suggested that Vitamin C may increase immunity to fight against corona virus [11-13].

According to report, New York post, medical teams at the North well health facilities immediately gave patients affected with corona virus 1500 milligrams of intravenous vitamin C. The same amounts of the powerful antioxidant were then re-administered three or four times a day. Each dose was more than 16 times the National Institutes of Health's daily recommended dietary allowance of vitamin C, which is just 90 milligrams for adult men and 75 milligrams for adult women [14].

Chinese scientists now call for early intravenous therapy with large doses of vitamin C to prevent oxidative stress and the life-threatening complications that follow in the wake of a derailed immune system. Many researchers also

claim that higher intake of vitamin C from dietary sources or supplements help prevent by boosting and regulating the immune system in the upper respiratory tract [15].

Vitamin D

It has long been recognized as essential to the skeletal system. Newer evidence suggests that it also plays a major role regulating the immune system, perhaps including immune responses to viral infection. Interventional and observational epidemiological studies provide evidence that vitamin D deficiency may confer increased risk of influenza and respiratory tract infection [16,17].

A latest review on the topic of the role of vitamin D in reducing the risk of the common cold grouped those mechanisms into three categories: physical barrier, cellular natural immunity and adaptive immunity. Vitamin D helps maintain tight junctions, gap junctions and adheres junctions [18]. Vitamin D has an important “non-classic” influence on the body’s immune system by modulating the innate and adaptive immune system, influencing the production of important endogenous antimicrobial peptides such as cathelicidin and regulating the inflammatory cascade [19].

Different observational studies and clinical trials reported that vitamin D supplementation reduced the risk of influenza, whereas others did not. Evidence supporting the role of vitamin D in reducing risk of COVID-19 includes that the outbreak occurred in winter, a time when 25-hydroxyvitamin D (25(OH)D) concentrations are lowest; that the number of cases in the Southern hemisphere near the end of summer are low; that vitamin D deficiency has been found to contribute to acute respiratory distress syndrome; and that case-fatality rates increase with age and with chronic disease comorbidity, both of which are associated with lower 25(OH)D concentration. In a study of systematic review and meta-analysis of the literature conclusion, Vitamin D supplementation was safe and it protected against acute respiratory tract infection.

According to systematic review finding, both daily and weekly doses of vitamin D were effective in reducing the incidence of Acute Respiratory Infections (ARTIs), but the doses used were much lower than the commonly used 10,000 to 50,000 IU bolus doses, which were ineffective in reducing ARTIs in the current meta-analysis. To reduce the risk of infection, it is recommended that people at risk of influenza and/or COVID-19 consider taking 10,000 IU/d of vitamin D3 for a few weeks to rapidly raise 25(OH) D concentrations, followed by 5000 IU/d. The goal should be to raise 25(OH) D concentrations above 40 ng/ml-60 ng/ml (100 nmol/L-150 nmol/L). For treatment of people who become infected with COVID-19, higher vitamin D3 doses might be useful [20,21]. A study posted on research square conclusion they advised that, Vitamin D supplementation to protect against SARS-CoV-2 infection [22-27].

Vitamin E

Vitamin E is a major antioxidant in the body. It works with selenium to help prevent the breakdown of certain enzymes that are vital to the body's metabolism. Vitamin E is found in all cell membranes of the body. It protects them from oxidative damage. It has been used to treat respiratory distress syndrome in preterm babies, prevents disease of the retina (retrolental fibroplasia) in preterm babies on oxygen, a potent antioxidant in the human body. In vitamin E deficiency most of the immune parameters show a downward trend, which is associated with increased infectious diseases and the incidence of tumors. In contrast, vitamin E supplementation has various beneficial effects on the host immune system. The current RDA level of vitamin E prevents clinical deficiency syndrome but in some situations, especially in older subjects or in a disease state, fails to maintain optimal host defences [28].

According to finding, Vitamin E were enhances T-cell differentiation through the increase of not macrophage but TEC function in thymus, which is associated with the increased binding capacity of TEC to immature T cells *via* increased expression of adhesion molecule, ICAM-1. These results suggested that vitamin E is a potent nutrient for promoting health in the aged *via* the improvement of cellular immunity decreased with aging. Animal model studies have been showed that Vitamin E-supplemented old mice exhibited a highly significant ($P < 0.05$) reduction in viral lung titer, while Vitamin E-supplemented young mice showed only a modest reduction in lung [29].

The oxidative stress in influenza virus-infected organism provokes free-radical oxidation of unsaturated lipid chains in the cell membranes. As vitamin E is a lipid-soluble substance and possesses a hydrophobic tail, it tends to accumulate within lipid membranes. There, it acts as the most important chain breaker, reacting with lipid peroxyl radicals much faster than they can react with adjacent fatty acid side chains. Among the antioxidants tested in influenza virus infections in mice, vitamin E occupies the leading position because of its efficacy in preventing oxidative damage through its free-radical scavenging activity and it could be recommended as a component in multitarget influenza therapy. It is not evidence that vitamin E treatment for COVID-19 but it is considered as a

general supportive treatment for coxsackievirus and bovine coronavirus in states of deficiency [30].

Vitamin B6 and B12

Good nutrition is tied to good health, as well as to the prevention and treatment of many conditions. Getting the recommended amounts of vitamins each day is an important part of the nutrition equation and B vitamins are essential for preventive care. Abundant in green vegetables, whole or enriched grains, dairy and meats, B vitamins help promote a healthy metabolism and are also linked to a reduced risk of the vitamin B complex comprises eight water-soluble constituents are thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), biotin (B7), folic acid (B9) and cobalamin (B12) [31].

Among those vitamins Vitamin B6, B9 and B12 particularly B6, B9 and B12, contribute to our body's first response once it has recognised a pathogen. They do this by influencing the production and activity of "natural killer" cells. Natural killer cells work by causing infected cells to "implode", a process called apoptosis [32].

Vitamin B6 is widely present in many foods, including meat, fish, nuts, beans, grains, fruits and vegetables. Additionally, B6 is present in many multivitamin preparations for adults and children and added to foods as a supplement to breakfast foods, power bars and powders [33].

Vitamin B6 is used for over 100 enzymatic reactions, including the metabolism of proteins in the body. It's involved in brain development, nervous system functioning and possibly slowing cognitive decline, just to name a few functions. It also works closely with the immune system to ward off infections like the flu [34].

Vitamin B6 deficiency can induce many negative effects because of a weakened immune system and a decrease in the production of Serum antibodies. Those negative effects may include convulsive seizures in infants, developmental delay, hypertension, susceptibility to atherosclerosis, flu and other respiratory infections. Conversely, the administration of vitamin B6 or the manipulation of vitamer-bound enzymes, has shown promise against cancer, parasitic diseases such as malaria and Parkinson's disease. Animal and human studies suggest that vitamin B6 deficiency affects both humoral and cell-mediated immune responses. Lymphocyte differentiation and maturation are altered by deficiency, delayed-type hypersensitivity responses are reduced and antibody production may be indirectly impaired. Although repletion of the vitamin restores these functions, megadoses do not produce benefits beyond those observed with moderate supplementation. Additional human studies indicate that vitamin B6 status may influence tumor growth and disease processes Deficiency of the vitamin has been associated with immunological changes observed in the elderly, persons infected with Human Immunodeficiency Virus (HIV) and those with uremia or rheumatoid arthritis [35,36].

Vitamin B12

It is an essential water-soluble vitamin that is commonly found in a variety of foods, such as fish, shellfish, meat, eggs and dairy products. Vitamin B12 is frequently used in combination with other B vitamins in a vitamin B complex formulation. Vitamin B12 is important in DNA synthesis. Vitamin B12 is bound to the protein in food. Acid in the stomach releases B12 from protein during digestion. Once released, B12 combines with a substance called Intrinsic Factor (IF) before it is absorbed into the bloodstream. Study VitaminB6 and Vitamin B12 are important nutrition value against COVID-19 also indicated that Vitamin B12 is important drug against COVID-19 [37].

CONCLUSION

Because of the pandemic of COVID-19 and without the finding of right treatment, nutritional value and trace elements is the optional way to boost the immune system. In this study we have reviewed the relevance of vitamins against COVID-19. Therefore taking of those vitamins are very important to enhance our immunity and defense of the novel corona virus. Further studies should be done detail with the aid of laboratory how those vitamins and trace elements defines against COVID-19. In the case of "immune boosting" in the time of COVID-19, social media is promoting science-free content for commercial ends.

CONFLICT OF INTEREST

All authors declared they have not conflict of interest.

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