



A Review On How Vitamins Help Strengthen Immunity

Renesha Kaur, Arvind Singh
Montfort College

***Corresponding Author:**
Renesha Kaur
Montfort college

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Abstract

The body uses vitamins for a variety of purposes, one of which is to enhance the immune system's defenses against infections. Life is protected by immunity in three ways: through the skin, cellular immune response, and humoral immune response. By controlling the production of T-lymphocytes, antibodies, and cytokines, vitamins both in quantity and quality inside the body support systemic immune functions. The role of water-soluble and fat-soluble vitamins in enhancing immunity activities will be outlined in this review. The fundamental purpose of vitamins A, C, and E is to improve the skin epithelial barrier function. The synthesis of antibodies is said to require all vitamins, with the exception of vitamin C.

Keywords: Vitamins, Immune system, Micronutrition, Immunomodulation, Lymphocytes, Supplementation

Introduction

Vitamins are micronutrients, which play an important role in our body such as growth regulation, illness prevention (including deficient disorders), and immune system performance. Vitamins are required in trace amounts to keep all of the immune system's barriers, such as the skin, cell-mediated, and humoral immune responses, functioning properly. [1] Vitamins are consumed regularly, along with a healthy diet, and are required in trace amounts to keep all of the immune system's barriers, such as the skin, cell-mediated, and humoral immune responses, functioning properly. Active tissues are prevented with the help of the immune system. Pathogens that cause sickness Vitamin bioavailability varies with age, sex, and physiological factors. Their levels in the body are largely determined by the kind of foods consumed and eating habits. Drugs, tea or caffeine, smoking, alcohol misuse, dietary fibers (phytates), and other factors can affect vitamin delivery. This review focuses on practically all vitamins, including water and fat-soluble vitamins, concerning the human immune system. Vitamin deficiency reduces overall immunity by affecting the

cell-mediated and adaptive immune responses, resulting in poor immunological balance and increased morbidity, malnutrition, and mortality. The skin epithelium barrier function is mostly aided by vitamins A, C, and E. All of the vitamins, except for vitamin C, are said to be necessary for antibody synthesis. Vitamins are also necessary for the development of innate and adaptive immunity in the body. Most vitamins, such as B6, B9, B12, A, and D, are used in our bodies to enhance the cell-mediated immune response by increasing the synthesis of cytokines and T-lymphocytes. Inadequate intake and nutritional status of certain vitamins and trace elements can result in reduced immunity, which makes people more susceptible to diseases and exacerbates malnutrition. As a result, including adequate levels of all of these critical vitamins in our daily diet can aid to strengthen the body's power, leading to overall wellness. [2,3,4]

What Is Our Immune System-

The immune system is in need, particularly in times when the immune system may need to fight back, particularly during the current pandemic. By

providing antioxidants to reduce cell damage caused by free radicals or supporting T-cell generation, a diet rich in nutritious foods rich in vitamins and minerals supports healthy immune system function. Even though there is currently no data on the impact of nutritional factors on the risk and severity of viral infections, the importance of nutrition in immunity has long been recognized. A study on the effect of vitamin A in the treatment of measles in children found that when vitamin A was given over a few days, the risk of mortality and pneumonia was lowered. The sophisticated, integrated immune system now requires many micronutrients that play critical, often synergistic functions at every stage of the immune system. Even minor nutritional shortages have been demonstrated to affect the immune system.

Vitamin C and provitamin A are found mostly in fruits and vegetables, which also contain phenolic chemicals and prebiotic fructans. Polyunsaturated fatty acids, B vitamins, and minerals like copper, iron, selenium, and zinc are all found in nuts. B group vitamin sources include whole grains and legumes. fiber, including oligo and polysaccharides, with a prebiotic impact in some circumstances, as well as minerals like Cu, Se, and Zn, as well as fiber, including oligo and polysaccharides. Polyunsaturated n-3 fatty acids, vitamin D, B group vitamins, and minerals like Fe and Se are all found in fatty fish. Vitamins A and D, as well as probiotic microorganisms, are found in milk and dairy products, particularly fermented goods. Eggs and meat products are also good providers of vitamin A, vitamin D, and vitamin B groups, as well as minerals like Fe and Se.[5]

What Is Micronutrient-

Micronutrients play an important part in the immune system's normal function and have a favorable impact on overall health and nutrition? Micronutrients should be obtained via a well-balanced and varied diet, which includes fruits, vegetables, and animal-source meals. The Mediterranean Diet concept fits wonderfully with the intake of the aforementioned micronutrients in a varied and balanced manner. The role of elements in each body system. The immune system relies heavily on iron. On the one hand, it is required for the growth and activity of many diseases, and its availability determines this. To prevent potentially hazardous germs from gaining access to

this trace element, the distribution of iron inside the body must be closely controlled and maintained. Inflammation generates anemia of inflammation, which is caused by increased secretion of hepcidin by hepatocytes driven by pro-inflammatory cytokines, particularly IL-6, as a result of infection, as well as a variety of chronic diseases and abdominal obesity. Hepcidin inhibits iron absorption in the duodenum and causes it to be sequestered by macrophages. Furthermore, in a hepcidin-independent manner, proinflammatory cytokines can reduce intestinal iron absorption and enhance iron uptake by macrophages.[6]

Do Vitamins Help Immunity-

Do vitamins help immunity quits and vegetables have elements that can improve immune function, such as beta-carotene, vitamin C, and vitamin E, according to research?

Antioxidants are abundant in many vegetables, fruits, and other plant-based diets, which serve to minimize oxidative stress.

Iron-

The immune system influences iron status, but iron status has its immune-modulating effects. T lymphocyte counts, particularly those of the CD4+ Th1 subpopulation, have been linked to iron insufficiency. Because Th2 lymphocytes have bigger and less labile iron reserves, they are more resistant to the actions of iron chelators and anti-transferrin receptor antibodies. By blocking the enzyme activation-induced cytidine deaminase, iron has been reported to reduce class switch DNA recombination in B lymphocytes (AID). This was produced by the replacement of Fe²⁺ for Zn²⁺ in the catalytic core of AID at concentrations within the physiological range. Suppression of class switching reduces autoreactive antibodies and impairs defense against bacterial pathogens in particular.[7,8]

Zinc-

Zinc is recognized to play a key function in the immune system, and those who are zinc deficient are more susceptible to a range of infections. Zinc controls increased susceptibility to infection via immunologic mechanisms that have been investigated for decades. Zinc has a wide range of effects on the immune system, from the skin's barrier

to gene regulation in lymphocytes. Zinc is essential for the appropriate development and function of neutrophils and natural killer cells, which mediate nonspecific immunity. Zinc deficiency also impacts acquired immunity development by limiting T lymphocyte expansion as well as some functions like activation, Th1 cytokine generation, and B lymphocyte assistance. B cell growth and antibody production, especially immunoglobulin G, are also harmed. Zinc deficiency can disrupt intracellular killing, cytokine synthesis, and phagocytosis, affecting the macrophage, a key cell in many immune activities. The various roles of zinc in basic cellular operations like DNA replication, RNA transcription, cell division, and cell activation explain zinc's impacts on these critical immunologic mediators. Zinc deficiency accelerates apoptosis. Zinc can also act as an antioxidant and help to keep membranes stable.[9]

Selenium-

Selenium is an essential micronutrient for the human body, particularly in children. Selenium is found in about 20 selenoproteins, which are involved in DNA synthesis, thyroid hormone metabolism, and reproduction. Selenium is required for the enzymes Glutathione Peroxidase (GPx) and Thioredoxin Reductase, which are the most significant antioxidant enzymes.

Selenium, in particular, improves the immune system and protects the body from pathogenic pathogens while preventing oxidative damage. Selenium has an impact on all aspects of the immune system, including white blood cell production, development, and function. Selenium helps protect immune cells including neutrophils, lymphocytes, and macrophages by stimulating cellular immunity. Simultaneously, selenium boosts humoral immunity and aids in the formation of antibodies known as immunoglobulins (IgA, IgM, and IgG), which aid in the body's pathogen-defeating abilities. Selenium also activates several immune system enzymes, helps to rebuild the genetic structure, and detoxifies heavy metals. Selenium is a powerful antioxidant and immunological booster. When the body is fully supplemented with selenium, the immune system will function optimally, enhancing its ability to fight illnesses and preventing pathogens like bacteria and viruses from invading the body.[10]

Vitamin-A-

Vitamin A (VitA) is a vitamin that is essential for sustaining vision, encouraging growth and development, and ensuring the integrity of the epithelium and mucus membranes in the body. Because of its important role in improving immune function, vitamin A is recognized as an anti-inflammation vitamin. Vita is engaged in the immune system's development and serves a regulatory role in both cellular and humoral immune responses. Vita is effective in the treatment of a variety of infectious disorders. The authors examine new literature on VitA in immunity research and briefly discuss VitA's clinical application in the treatment of many infectious disorders to better understand the relationship between nutrition and the immune system. Because the body can convert beta-carotene into retinol, you can receive vitamin A by having good amounts of beta-carotene in your diet. Beta-carotene is found in yellow, red, and green (leafy) vegetables like spinach, carrots, sweet potatoes, and red peppers. Mango, papaya, and apricots are examples of yellow fruits.[11,12]

Vitamin B6-

Vitamin B6 is responsible for the immune system's strength, the production of new red blood cells, and the transfer of oxygen throughout the body. Migraines have also been proven to be helped by vitamin B. Chicken, salmon, tuna, leafy greens, and chickpeas are high in pyridoxine. Vitamin B6 deficiency can affect your mood and limit your ability to fight infections. White blood cells and T cells, which govern immunological responses, are produced by vitamin B6. Vitamin B6 also aids in the production of interleukin-2, a protein that directs white blood cell activity each B vitamin is important for fueling the body and controlling biological responses. Riboflavin is a B vitamin that aids in the breakdown of lipids and medications. Folic acid is beneficial in preventing birth abnormalities during pregnancy. Vitamin B12 helps nerve cells function better and lowers the risk of anemia. The immune system relies on all vitamins. The immune system benefits from vitamin B6, but other vitamins and minerals can also help. Citrus fruits, green vegetables, strawberries, papaya, and other fruits and vegetables contain vitamin C. Vitamin E is an antioxidant present in peanuts, sunflower seeds, and

broccoli, among other foods. Vitamins and minerals that are vital for immunological function include Vitamin A, Vitamin D, Iron, Selenium, and Zinc.[13]

Vitamin B12-

Vitamin B12 is present in animal diets. It can also be used as a supplement or added to foods. Vitamin B12 is required for the production of red blood cells and DNA. It also plays an important role in the formation and function of brain and nerve cells. Vitamin B12 binds to the protein found in our diets. Hydrochloric acid and enzymes in the stomach break down vitamin B12 into its free form. Vitamin B12 then binds with a protein known as intrinsic factor, allowing it to be absorbed deeper down in the small intestine. B12 in its free form is found in supplements and fortified meals, making it easier to absorb. Vitamin B12 supplements come in a variety of forms. Although some believe that particular forms—such as sublingual tablets or liquids placed under the tongue to be absorbed through the mouth's tissues—absorb better than regular tablets, investigations have found no significant difference. Vitamin B12 tablets come in high doses considerably beyond the recommended dietary limit, however, these high doses are not always the amount that is absorbed because a suitable level of intrinsic factor is also required. Doctors may provide B12 injections in the muscle in cases of severe vitamin B12 insufficiency caused by a lack of intrinsic factor (pernicious anemia).[14]

Vitamin C-

Vitamin C is required for tissue growth and repair throughout the body, according to research. Vitamin C aids in the healing of wounds as well as the repair and maintenance of healthy bones, teeth, skin, and cartilage (a type of tough tissue covering the bones). Vitamin C fights free radicals in the body as an antioxidant, which may help to prevent or postpone certain cancers and heart disease, as well as promote healthy aging. Food-based vitamin C appears to lower the incidence of cartilage loss in people with osteoarthritis. Vitamin C comes in a variety of forms, including oranges and orange juice. This essential vitamin is found in a wide range of fruits and vegetables. Citrus fruits, tomatoes, potatoes, strawberries, green and red bell peppers, broccoli, Brussels sprouts, and kiwifruit are just a few examples of vitamin C-rich foods. These foods can be eaten fresh or cooked, but it's crucial to remember

that heated or stored fruits and vegetables lose their vitamin C content. Eat them as soon as possible after buying to receive the most nutrients, and try steaming or microwaving vegetables for brief periods to limit nutritional loss. Vitamin C aids in the absorption of non-heme iron, which is found in plant foods such as beans, spinach, and quinoa, which may be of particular importance to vegetarians. Combine vitamin C-rich foods with iron-rich plant foods in the same meal to reap this benefit. Combine black beans and salsa, for example, or make a refreshing spinach salad with strawberries and mandarin oranges.[15,16]

Vitamin D-Vitamin D insufficiency has been related to an increased risk of psoriasis, multiple sclerosis, and rheumatoid arthritis, among other inflammatory diseases. Furthermore, this vitamin aids in the activation and proliferation of white blood cells, bolstering our resistance to a variety of ailments. Vitamin D is found in the highest concentrations in red meat, liver, egg yolks, and oily fish like salmon, sardines, and mackerel. To prevent deficiency in the general population, many countries add vitamin D to foods including breakfast cereals,

plant-based milk, and mushrooms. Vitamin D deficiency can impair immune function and increase the risk of autoimmune disorders. Vitamin D appears to play a crucial role in immunological function, according to researchers' Trusted Source. They believe there is a link between long-term vitamin D insufficiency and the onset of autoimmune diseases like diabetes, asthma, and rheumatoid arthritis, but further research is needed to corroborate this theory. While test-tube studies have demonstrated that vitamin D has a favorable influence on human cell immunological responses, these findings have yet to be replicated in controlled human trials.[17]

Vitamin E-

Vitamin E is a fat-soluble vitamin that comes in numerous forms, but the human body exclusively uses alpha-tocopherol. Its primary function is to act as an antioxidant, scavenging free electrons that can cause cell damage. It also boosts immunity and prevents blood clots from developing in the arteries of the heart. Vitamin E and other antioxidant vitamins gained popularity in the 1980s as scientists realized that free radical damage was implicated in the early stages of artery-clogging atherosclerosis and could potentially contribute to cancer, eyesight loss,

and a variety of other chronic illnesses. Vitamin E can protect cells from free radical damage and, in some cases, limit the generation of free radicals. Plant-based oils, nuts, seeds, fruits, and vegetables all contain vitamin E.[18]

Conclusion-

Inadequate vitamin and trace element intake and status can contribute to lowered immunity, which makes people more susceptible to illnesses and exacerbates malnutrition. Evidence has accumulated that particular nutrients selectively alter the immune response in humans, that deficiency and overstock can cause dysregulation of the coordinated host response to infections, and that deficiency can affect the virulence of usually harmless viruses.

Micronutrients must be consumed in the right amounts for the immune system to function properly. The immunological response appears to be influenced by vitamins (A, D, E, B6, B1), as well as trace minerals (selenium, zinc, copper, and iron). They maintain physical barriers (skin/mucosa), cellular immunity, and antibody synthesis, all of which contribute to the body's natural defenses on three levels. Vitamins A, C, and E, as well as the trace mineral zinc, help to improve skin barrier function. The trace elements iron, zinc, copper, and selenium, as well as the vitamins A, B6, B12, C, D, and E, all work together to promote the immune cells' defensive functions. Finally, except for vitamin C and iron, all of these micronutrients are necessary for the formation of antibodies. Vitamin B6, selenium, copper, and zinc have direct effects on antibody formation or B-cell proliferation, whereas vitamins A, D, and E boost the Th2 response, which enhances humoral immunity, and the rest micronutrients act indirectly through their roles in protein synthesis and cell growth. Certain vitamins and trace minerals can result in weakened immunity, making people more susceptible to illnesses and exacerbating malnutrition. As a result, supplementing with these micronutrients can help to enhance the body's natural defense system by boosting all three levels of immunity.

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