

Develop Immunity through Optimum Nutrition to Conquer Corona Virus COVID-19

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Abstract: Public health practices including hand washing, personal hygiene, wearing masks, social distancing can help reduce the spread and the impact of Corona Virus. These measures are not sufficient to fight corona Virus. The vital role nutrition plays in supporting the immune system is well-established. Several studies have proved that vitamins A, B₆, B₁₂, C, D, E, and folate; trace elements, including zinc, iron, selenium, magnesium, copper; and omega-3 fatty acids play an important and complementary roles in supporting the immune system. Inadequate intake and status of these nutrients is projected leading to a decrease in resistance to infections and as a consequence an increase in disease burden. The following conclusions are reported 1) Supplementation with the above micronutrients and omega-3 fatty acids is a safe, effective, and low-cost strategy to help support optimal immune function 2) Supplementation above the RDA, but within recommended upper safety limits, for specific nutrients such as vitamins C and D is warranted and 3) Public health officials are encouraged to include nutritional strategies in their recommendations to improve public health.

Keywords: immune system; COVID-19; micronutrients; vitamins; omega-3 fatty acids; minerals; vitamin C; vitamin D

1. Introduction

Acute respiratory infections are a major cause of mortality and morbidity which includes the recent outbreak of Corona Virus COVID-19 too. Corona Virus- COVID-19 – is a disease with no known medication available, therefore there is an urgent need to take precautions and protect ourselves. A number of Public Health practices have been developed like wearing masks, avoiding crowds, washing hands properly, personal hygiene, social distancing etc., they may not be sufficient, vaccinations can be an effective mechanism, but vaccines can take years to create and are not available against all viruses, (including COVID-19 Virus). The present mortality and morbidity numbers highlight the need for additional strategies to support the immune system (1)

A permanent method to fight against this disease is to prepare the body to attack the deadly virus—through improving immunity. A well-functioning immune system is critical for survival. Of the various methods to develop immunity, nutrition plays a very crucial role.

2. Impact of Nutrition on Immunity

Public health discussions around immunity and infections, often miss the nutritional strategies to support the optimal function of the immune system. Several vitamins – Vitamin A, B₆, B₁₂, C, D, E and folate and trace elements including zinc, iron, selenium, magnesium, copper play an important and complementary roles in supporting the innate and adaptive immune systems.(1)

The innate immune- system is fast, non-antigen specific and adaptive immune system, is slower and antigen specific responses. The innate immune system is comprised of physical barriers that help prevent pathogen entry (e.g. skin, gut epithelium), antimicrobial peptides, the complement system, and a variety of phagocytic and other cells (e.g. neutrophils, macrophages, natural killer cells), that

recognize the presence of pathogens via the expression of nonspecific pathogen-recognition receptors. The innate system moves quickly to recognize and destroy “non-self” threats, typically via inflammatory processes, and then resolve the inflammation and repair the damage caused by these events [2].

The adaptive response includes antigen-specific cells, e.g. T lymphocytes, subsets of which coordinate the overall adaptive response or kill virally-infected cells. B lymphocytes, which can be activated to secrete antibodies specific to the infecting pathogen. While slower to respond than the innate system, the adaptive system is responsible for generating immunological “memory”, whereby a repeated infection with the same pathogen will generate a vigorous, fast antigen-specific response (3.) The induction of immunological memory is the mechanism by which vaccines can provide protection against subsequent pathogen exposure.

Deficiencies or marginal status in micro-nutrients, negatively affect the immune system function and can decrease resistance to infections (4, 5) Omega 3 fatty acids also support an effective immune system by helping to resolve the inflammatory response (6). People deficient in Vitamin C are susceptible to severe respiratory infections such as pneumonia (7, 8, 9). Studies have shown that in patients with low vitamin C dietary intake, Vitamin C supplementation reduced the risk of pneumonia, in older patients-disease severity and risk of death was reduced, decreased the severity and duration of upper respiratory tract infections like common cold, reduced the risk of infection under enhanced physical stress (8, 9, 10). Deficiency of Hydroxy-vitamin D leads to respiratory tract infections. Supplementation with vitamin D reduces the risk, both in children and adults.

Zinc deficiency can impact immunity, it can lead to diarrheal and respiratory morbidity (11, 12) Deficiency of Selenium and Vitamin E can lead to reproducible genetic mutations

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and increases the virulence of certain viruses, including polio virus. (13, 14)

Selenium is required for proper activity of enzymes – glutathioneperoxidases – they play a major role in body's detoxification system and protect against oxidative stress. (oxidative stress is a physiological circumstance which may lead to oxygen related damage to the body. Of the eight glutathione hormones five require selenium. It is also involved in recycling vitamin C active form. Sources of Selenium: shrimp, sardines, salmon, mushrooms chicken, beef, eggs, veg: sources: tofu, brown rice, sesame seeds, cow's milk, flax seeds, cabbage, spinach, garlic, broccoli.

Optimal intake can be achieved through well balanced and diverse diet.

Immunity-Boosting Foods and Nutrients

Proteins, calories, vitamins and minerals are necessary to fight any infection, in particular, to develop immunity, concentration is to be laid on Vitamin A, B₆, B₁₂, C, D, E and minerals - Zinc, Iron, Selenium, Magnesium and Copper.(2)

Immune boosting foods are (15). Watermelon, yoghurt, spinach, sweet potato, broccoli, garlic, ginger, pomegranate juice. Watermelon has glutathione, an antioxidant; wheat germ has fiber, protein and fat; yoghurt has probiotics; spinach has folate, fiber and vitamin C. Take tea instead of coffee. Sweet potatoes have beta-carotene, which remove damaging free radicals, improve immunity and slows the aging process.

Citrus fruits: grape fruit, oranges, tangerines, lemons, limes, red bell peppers. Provide Vitamin C Broccoli: Vitamin A, C and E, anti-oxidants and fiber.

Garlic: decreases inflammation

Spinach: Vitamin C, anti-oxidants, and beta-carotene, it increases the infection fighting ability. Light cooking releases other nutrients from oxalic acid.

Yoghurt: has probiotics, which stimulate the immune system

Almonds: Vitamin E is key to boost immunity, almonds have Vitamins E and A., around 6 whole almonds per day is said to provide required vitamin E.

Green Tea: it has epigallocatechin gallae (EGCG) which has immune function.

Papaya: Vitamin C, B vitamins and folate- helps in the overall health maintenance.

Kiwi fruit: Potassium, Vitamin K, folate, Vitamin C- helps WBC to fight against infection

Poultry: has B₆, helps in the formation of RBC

Sunflower seeds and Avocados: have Phosphorous, Magnesium, Vitamin B₆, Vitamin E

Cauliflower, strawberries, lemon, parsley, kiwi, citrus fruits have Vitamin C

Parsley, broccoli, apricot, bell pepper, grapes, apples, mango, watermelon has beta carotene

Peas, carrot, avocados, nuts, sunflower seeds, raspberries, olives, kiwis, provide Vitamin E

Anthocyanins (16, 17): The purple color fruits and vegetables protect vital organs and support immune system. Blue berries, black berries, strawberries, pomegranate, red cabbage, cherries and cranberries.

Zinc: legumes (chickpea, lentils, and beans) and red meat. Zinc can also be taken as tablet but better is through diet.

Herbs and spices like turmeric, ginger, pepper, garlic, cinnamon, thyme and cardamom.

Sugar intake: candies, cookies and sugary beverages have a negative impact on immune system. This does not apply to sugars in fruits.

A well-functioning immune system is crucial for survival. An activated immune system increases the demand for energy during infections. Plant based foods are rich in antioxidants, vitamins and minerals- Quickest way to support the body's immune system is balance and not over dose.

Drink water: Water is essential to make the body function properly. Water requirement is 50% of body's weight in fluid ounces. Maximum water intake can be up to a hundred fluids oz. /day. Dehydration weakens the immune system and hinders the body's ability to fight off diseases.

Keep the gut healthy: eat foods that promote healthy microbes in the gut, use fermented foods like sauerkraut, yoghurt, cures, pickles and fermented batters have probiotic bacteria, fiber, ghee, coconut oil, . Healthy gut supports a strong immune system.

In addition to nutrition other components that boost immunity

Choose A Healthy Life Style (18)–protect yourself from environmental assaults by practicing healthy living strategies like

- 1) Exercising regularly
- 2) Release stress by music therapy
- 3) Consume Vitamin D foods
- 4) Avoid excess medication
- 5) Take green tea
- 6) Do not smoke
- 7) Do not drink or if accustomed to drink, take moderately
- 8) Eliminate toxic foods
- 9) Maintain good hygiene
- 10) Laugh your heart's content, Maintain positivity
- 11) Maintain Healthy weight
- 12) Adequate sleep

Exercise: Exercise increases microphages, which attack bacteria that cause upper respiratory tract infections. The cells that promote immunity are capable of killing both bacteria and viruses that are circulating in the system.

Release Stress through Music therapy: listening to music of your choice for 30 minutes daily or singing or playing a musical instrument reduces stress and promotes immunity. Due to the lockdown, all are at home; it may result in psychological problems creating stress they can be easily reduced through music.

Impact of music therapy on senior citizens, diabetic professionals with diabetes, patients with blood pressure and Attention deficiency hyperactive children (ref nos) have shown that music therapy had a significant improvement on blood parameters thereby health. The book written by Music Therapist Mrs. Rajam Shanker titled “The Healing Power of Music” demonstrates how music can be used as a complementary remedy for several problems. It can be true even for Corona Virus and the related stress.

Vitamin D: vitamin supplements are not for everyone. They can be given for those who have low levels of vitamin D in blood, under a physician’s advice. Expose skin to the morning sun instead of having to depend on tablets. A blind rule is that your shadow should be shorter than you, then the sunlight is sufficient.

Excessive Medicines: hampers immune system, liver function, kidney function and reproductive function. Excessive use of medicines or medicines of your choice or over the counter medicines reduces cytokines – hormone messengers of the immune system. Unnecessary medicines should be avoided to increase the natural immunity of the body.

Coffee: coffee has antioxidants but large amounts of coffee prevent the absorption of calcium, magnesium and potassium and may dehydrate the body.

Green tea: has disease fighting polyphenols and flavonoids. Tea identifies cell-damaging free radicals, and destroys them.

Smoking and Drinking: high risk of infections, decreases immunity

Eliminate Toxic Foods: avoid food additives, artificial colors, and preservatives. Commercial foods contain chemical additives, preservatives and pesticides weaken the immune system.

Good Hygiene: avoid touching contaminated substances, avoid touching the eyes, nose or mouth, brush your teeth twice daily, trim nails to keep clean, and take frequent baths, especially after having gone outside.

Get Enough Sleep to Increase Immunity: lack of sleep decreases the T-cells, leading to fatigue and thus lowers the body’s immunity.

Laugh to Your Heart’s Content: laugh heartily to increase mental health. Strong mental health provides a backbone of support to the body’s ability to fight against anything.

In Lockdown period (curfew like situations), purchasing vegetables and other perishables on a regular basis may not be possible. Panic buying, resulting in large uncontrollable crowds at the stores on a daily basis is unhealthy and not advisable. We need to take this situation as a challenge and set an example. My tips are not new; they are common. However, following them and by listening to the Government’s Instructions about managing COVID-19, we can keep our families and ourselves safe and healthy.

Tips to make nutritious meals during the lockdown period

- Store potatoes, yams, peas and onions, Rajma, Whole Bengal gram (Kabuli Chana), Cowpea, whole black gram, soybean, ragi and millets.
- Fresh vegetables can be cut, grated or made into a paste, packed in daily usable quantities and frozen. Thawed whenever required E.g. Ladies fingers, drumsticks, carrots, peas, beans, etc.
- Curry leaves, mangoes, onions can be dehydrated (dried).
- Fresh lime/lemon juice with added salt can be stored, and used in curries/chutneys.
- Powders can be made with curry leaves and most other herbs.
- Fresh coconut grated and frozen, thawed when required, tastes fresh.
- Palak, Gongura and fenugreek can be sautéed, made into a paste, can be stored for a week and if required for a longer period, freeze them.
- Keep whole/skim milk powder, reconstitute whenever required or store tetra pack milk sachets Other types of milk available are soya milk and groundnut milk
- Keep ginger garlic paste ready.
- Alternatives for tamarind are mango powder (amchor), Lemon/lime juice, Kokum, pomegranate molasses.
- Tomatoes can be made into a puree and stored, can be used to get a thick gravy.

Lockdown time can be used to grow greens on your roof garden. Make a bed of a manageable size with nutrient rich soil, spray seeds that can sprout within a week like fenugreek, coriander, mustard etc., grow the sprouts for a maximum period of two weeks. Cut leaves using scissors. These leaves have a higher mineral and vitamin content than the leaves sold in the market and the sprouts made at home.

It is an established fact that the immune system is the first line of defense against an alien microorganism entering the body. With a little change in diet and routine, immune system can be made strong to protect you against any infection, even corona virus.

Cooking with herbs like garlic, ginger, turmeric and rosemary are all natural ways to develop immunity (19). She said when patients ask for supplements to boost immunity, “I always ask them to go back to food, food and food – Food is Medicine, from supplements to exercise to nutrition there are lots of natural ways to make sure you are fighting fit.” In

general, the stronger you maintain your immune system, the higher the chances that you are safe from infections and diseases.

3. Conclusion

A set of clear nutritional recommendations are made (2)

- 1) Supplementation with Vitamins A, B₆, B₁₂, D, E, C and folate and trace elements - Zinc, iron, selenium, magnesium, copper and omega 3 fatty acids is a safe, effective and low cost strategy to help support optimal immune function.
- 2) Supplementation above the RDA but within upper safety limits for specific nutrients such as vitamin C and D is warranted
- 3) Public health officials are encouraged to include nutritional strategies in their recommendations to improve health

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Recommended Intakes of Selected Nutrients to Support Optimal Immune Function (2)

Nutrients	Rationale	Recommendations
Vitamins and trace elements	These micronutrients play important roles in supporting the cells and tissues of the immune system. Deficiencies or marginal status in these micronutrients negatively affect immune function and can decrease resistance to infections.	A multivitamin & trace element supplement that supplies the nutrient requirements (100% US RDA)(20) for age and gender vitamins and trace elements including vitamins A, B ₆ , B ₁₂ , C, D, E, folate, trace elements - zinc, iron, selenium, magnesium and copper, in addition to consumption of a well-balanced diet
Vitamin C	Doses of ≥ 200 mg/day provide saturating levels in the blood, support reduction in the risk, severity, duration of upper, lower respiratory tract infections. Requirements for vitamin C increase during infection.	Daily intake of at least 200 mg/day for healthy individuals. In individuals who are sick, 1-2 extra g/day is recommended.
Vitamin D	Daily supplementation of vitamin D reduces the risk of upper respiratory tract infections	Daily intake of 2000 IU/day (50 µg/day).(USA)
Zinc	Marginal zinc deficiency can impact Immunity. Those deficient in zinc, particularly children, are prone to increased diarrheal & respiratory morbidity	Daily intake in the range of 8-11 mg/day
Omega-3 fatty acids (EPA + DHA)	Omega-3 fatty acids support an effective immune system, including by helping to resolve inflammation.	Daily intake of 250 mg/day of EPA + DHA