



## Immunity boosting diet during Covid 19

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### ABSTRACT

WHO declared Covid 19 /SARS -COV-2 as a global pandemic. Till date, there is no medicine for COVID-19. If the infection arises in the body then the defence mechanism activated against infection. A recent study suggests that temporarily augmenting the body's immune system in the early stages of COVID-19 can help patient to avoid severe symptoms as it is rightly said prevention is better than cure. Ayurveda approaches to develop physiological reactions to facilitate immunity. Planning of diet is most important to boost immunity. As per many researches to provide supplementary food which contains Zinc, Vitamin C, Vitamin D and immunity boosting foods such as citrus natural products, custard apple, apple, papaya is among the Fruits. Vegetables include broccoli, onion, garlic and green leafy vegetables. Nuts, ginger, turmeric, pepper, egg yolk, shellfish, mushroom. The need of the hour is a quick boost to immune system to keep it fit, fighting. One should get the right amount of nutrients from the diet, supplementation regimen to boost immune system. In this review, there are few common supplements and super food studies have been included. It might be a torch bearer as sample menu and their alternatives are given for a normal adult. Needs may change contemplated according to age, sex, body mass index and daily physical activities.

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2019, which is also called COVID-19 (Nisargandha and Dadarao Parwe, 2020).

Government's worldwide in early stages considered, lockdown as a one of the important ways to control the epidemic. The corona virus is spreading rapidly. In such situation, everyone should take all necessary measures to avoid its infection including Dhooan (Kurhadkar *et al.*, 2020). Extreme care must be taken to protect oneself from the growing contagion of the corona virus. These measures are also related to eating habits and cleanliness that include foods which increase immunity. A solid safe immune system can protect from corona virus infection.

### INTRODUCTION

The disease caused due to an infection with SARS-CoV-2, which stands for coronavirus disease

The body's 1st line of defence, the initiate immune response, starts right after an infection, like an

infantry going after a foreign invader, killing the virus and any cells damaged by it. The 2<sup>nd</sup> line of defence, the adaptive immune response, it can start one day later if any virus remains, employing what it has learned about the virus to mobilize a variety of special forces such as T cells and B cells (Du and Yuan, 2020).

The World Health Organization and the Centres for Disease Control states that, elderly and people with health problem such as heart disease, diabetes or lung disease are more prone to corona virus. Such individuals difficult to fight this infection. But precaution must be taken by young and healthy individuals too. Some common symptoms of COVID-19 include brevity of breath, cough that gets more severe as time of infection increases fever that gradually increases fatigue.

There is vital importance of proper nutrition and hydration. People who eat a well-balanced diet tend to be lower risk of chronic illnesses and infectious diseases and are healthier with stronger immune systems. So, diet must include variety of fresh and unprocessed foods every day to get the vitamins, dietary fibre, minerals, protein and antioxidants and enough water for hydration. Avoid sugar, fat and salt to significantly lower risk of obesity, stroke, diabetes, heart disease and various types of cancer (WHO, 2020). "Natural defence mechanism, 'immunity', to prevent the deadly corona virus infection," by adding Anti-viral foods like Garlic, Ginger, Star anise Coconut oil Foods rich in resveratrol such as peanuts, white wine, pistachios, grapes, red, blueberries, cranberries, strawberries, and cocoa and dark chocolate. Vitamin-C rich foods such as amla, red peppers, yellow peppers, Anti-viral herbs such as oregano, tulsi, dried thyme are great for immunity, and can be used in teas (The Indian Express, 2020).

COVID-19 is a respiratory virus (Rathi and Rathi, 2020b) and is not a food-borne disease. There is no evidence that the disease can be spread through contact with the food purchased. Continue to practice good food hygiene and food safety by five keys keep clean separate raw and Cooked, cook thoroughly, keep food at safe temperatures, use safe water and raw materials (WHO, 2020).

### Aim

To Study the role of Nutrition in Immune System.

To Study the role of Immune System in defence mechanisms.

### Objective

To study the different food having Anti-viral properties.

To study dietary modification in diet during Covid-19.

## MATERIALS AND METHODS

A healthy person has adequate resistance to infection. Infection is successful invasion, establishment and growth of microorganism in tissue of host. The ability is hampered by poor nutritional status. Such a person falls an easy prey to infection frequently either in the form of cold, cough, marginal fever, feeling of weakness and other minor complaints. An infection weakens the immune response of person (Joshi, 2010).

The ability of an organism to resist a particular infection or toxin by the action of specific antibodies or sensitized white blood cells is known as Immunity (Suchitra and Parthasarathy, 2020).

Defence mechanism in the body. The body has two type of defence mechanisms specific and non specific. In Figure 1 classification the Immunity in the two ways Specific & Non Specific.

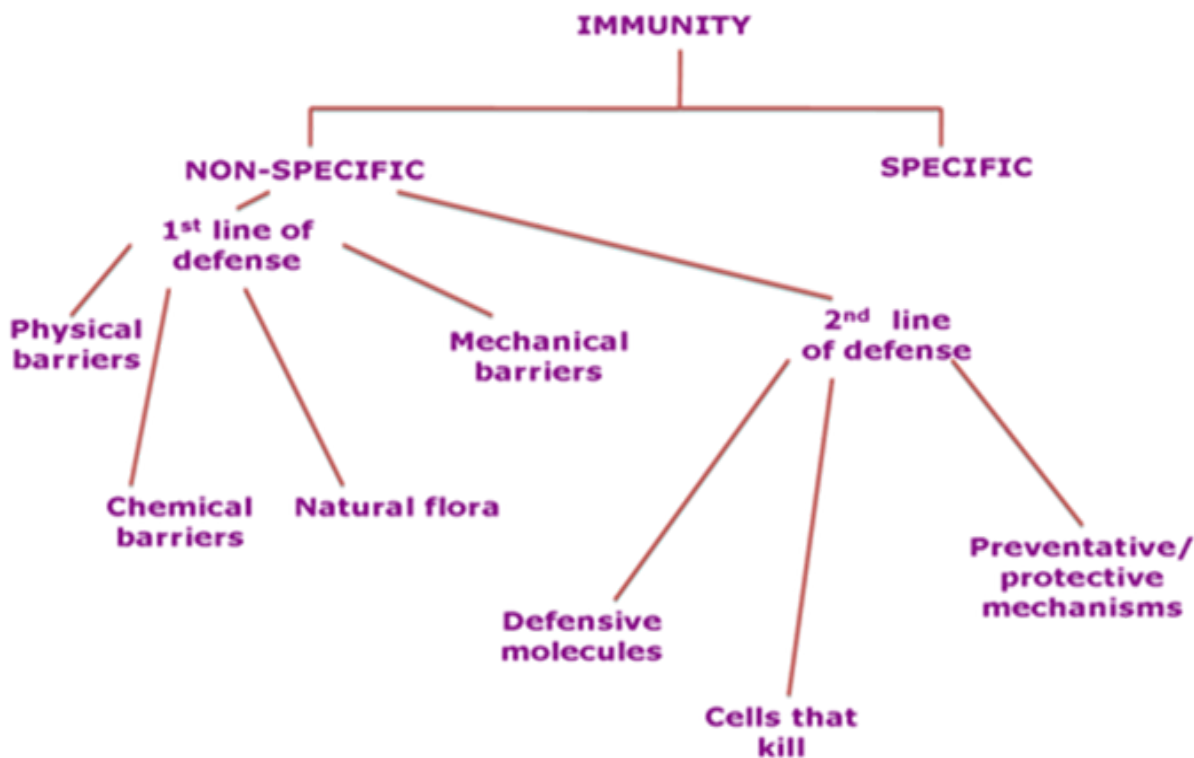
### Specific Cell

Medicated immunity, Humoral immunity, B lymphocyte, Plasma accessory cell, Antibodies.

### Non specific Cell

Skin, Mucous membranes, Collagen, fever, Various body secretion, Hormonal influence, Intestinal flora, Leucocytes, Certain nutrient like Vitamin A ascorbic acid (vitamin C) protein Zinc

Poor nutritional status will result in lowered resistance to infection and are prone to infection and take a longer time to recover (Rathi et al., 2017). In our country, infants and preschoolers are the most vulnerable group. Immunity is complex result of many component such as native and heritable and other acquired. Specific antibodies check the infection. These antibodies are made of up proteins, hence if the protein status of individual is good, these antibodies will be present adequate number to resist the invading Infection affects adversely and significantly to the nutritional status of the body (Mashhadi et al., 2013). There are increased loss of nitrogen, some electrolytes like phosphates and potassium and other elements such as magnesium and zinc. If there is fever with infection then metabolic rate also increases. There is decrease in food intake due to loss of appetite and nausea. Loss of nutrient is increased due to increased perspiration, vomiting and diarrhoea there is a decrease in absorption of nutrient especially in case of enteric infection. Even In the absence of fever protein catabolism



**Figure 1: classification of Immunity**

increases (Khabade *et al.*, 2020). The need for energy is increased by 10% to 30% during and after acute infection. Vitamin requirements are increased if infection is associated with swelling and necrosis of the tissue. Much readers may be familiar with mega doses of vitamin C advocated by scientists in prevention and cure of common cold. And suggests that supplement of vitamin C have effect in reducing the incidence and severity of symptoms of cold. Requirement of zinc and iron increases as both are involved in immunity process. Infected patients show a decreased blood zinc level because of migration to tissues and organs, Zinc excretion in urine also increases. Iron losses due to increased destruction of red blood cells (Rathi and Rathi, 2020a). The metabolic rate increases by 7% for rise of every degree Fahrenheit in body temperature and 13% for rise of every degree Celsius in body temperature. This increases the caloric need of the body during fever. Glycogen stores of the body are depleted as they are burnt up to meet the increases in caloric need. There are increases in the breakdown of proteins, especially in all types of fever. This causes an increase in excretion of protein waste through kidneys. There is excessive loss of body fluids due to increases in excretion. Energy level should be increased by almost 50% in case of high fever lasting for a longer period. But due to fever, appetite is poor and digestion may be hampered, so the maximum number of calories that can be tolerated should be

given. Carbohydrates should be high and as liberal as possible. It is advisable to add glucose in all liquids and fruit juices given to the patient, since it is well tolerated in large amounts and is easily assimilated by the body. As caloric need increases, need of protein also increases. A high protein diet supplying about 1.25 to 1.5 gram per kg body weight should be provided. When digestion is affected adversely, pre-digested protein beverages may prove useful.

Fats can be used liberally as in case of rich sweets and food which contain large amounts of fats. Minerals: loss of electrolytes sodium and potassium should be replaced. Sodium in the form of salt soups, dals, curries. Potassium which is also needed in greater amount, should be given through fruit juices and milk which are good sources of potassium. Vitamins: -all vitamins may be given as supplement to patient. Fluids: -Since loss of body fluids through perspiration and excretory wastes is high, plenty of water, coconut water, fruits and vegetables juices and soup are advised. These help to flush out excretory products from kidneys. Soft texture and fluid to semi-solid consistency are desirable to promote appetite and help the patient to consume a diet which is nutritionally adequate. The feeding should be small and as frequent as possible. In this short review, the food items with properties of enhanced immunity and anti-viral effects (Joshi, 2010).

Citrus fruit is one of the nature's best and eas-

**Table 1: Diet in Covid -19 of short Duration, or nutritious diet plan**

Time	Recipe	Alternative Recipe	Remarks
Tea	1Cup of herbal tea	Green tea with 80ml 4-5 almond slice	Anti-viral /Immunity
Breakfast	Rawa orSuji upma Sweet lime (mosambi) juice	Idly-4/dosa3 Onion-tomatochutney-1-2 tablespoon	Carbohydrate and protein Immune booster with antiviral property
Mid Morning	Egg nog with honey and cream	Sprouted green gram dal withlemon-20grams Protein	Protein Immune booster
Lunch	Cream of spinach or tomato soup, Phulkas Dudhi Curry Rice Mung usal or dal Butter milk or curds	Shell fish soup Rice Sweet potato rasam,- 2katori Carrot and greenleafy vegetables-cooked-2 cups Ginger raita	Immune booster /antiviral Calorie intake
Snacks time	Herbal Tea with Biscuits	Green Tea with one slice of Bread	Immune booster /Antiviral property
Evening	1 Sitaphal cusps/ /orangejuice/grape	Papaya-1and apple-1 (small)	Immune booster /Antiviral property
Dinner	Phulkas Red pumkin or Spinach Curry Rice Moong Dal or Tur Dal	Sesame rice Twokatori cups/lime sevaiTwo katori/Two KatoriSuji	Immune booster /Antiviral property/Energy or Calorie intake
Bed time	Haldi Milk or Milk with Protinules or Protinex	Combining garlic, ginger,lemon and honey as a single juice 150ml	Immune booster /Antiviral property

ily available source of vitamin C such as oranges, lemons, pomelos, and limes, a key nutrient in supporting immune system. Citrus fruits are known to have other benefits like antioxidant, anti-tumour, cardioprotective and neuroprotective effects. They have additional fibre content also. Citrus as juice especially with sugar may not give all the benefits of the ingredients. The most important chemicals are the flavonoids (Lv *et al.*, 2015).

Every fruit is good for health and human immunity, it has been proved that apple, custard apple and papaya have got antiviral effects against specific viruses (Suchitra and Parthasarathy, 2015; Konowalchuk and Speirs, 1978). Even-though extrapolation to corona virus is unscientific, the antiviral and immune boosting properties of the above said fruits is established.

Green tea botanically termed as *Camellia sinensis* contains a group of flavonoids called catechins. These chemicals appear to inhibit viral infections

by blocking the enzymes that is important in replication. Green tea has shown to be effective in inhibiting HIV, the hepatitis B and the herpes viruses (Chacko *et al.*, 2010).

Many nuts and seeds including almonds, peanuts and ground nuts have high vitamin E levels. Vitamin E, a lipid-soluble antioxidant commonly present in the membrane of all cells including immune cells. This is supposed to prevent stress induced damage to cells. Eating almond have been recently used to treat common flu symptoms. It has been suggested that almonds exhibit some antiviral actions. The peanut skin has also significant antiviral activities according to recent research (Makau *et al.*, 2018). Ginger and its products are being used to raise the function of the immune systems. The extracts of ginger have anti-inflammatory, digestive, and anti-tumour effects. Fresh Ginger (botanically - *Zingiber officinale*) has been shown to have anti-viral activity against Human Respiratory Syn-



cytial Virus in a Human Respiratory Tract Cell Line study. Hence to extrapolate for flu and a trial of such nutrient as an additive in our diet can prove useful. The immune system stimulates the production of TNF-alpha production from the ginger extract. Researchers also studied ginger along with other natural compounds in combination for inhibiting H1N1 influenza (Chang *et al.*, 2013) and demonstrated the inhibition of viral replication. Turmeric is a herbaceous perennial plant (botanical name: *Curcuma longa*) belonging to the ginger family. The medicinal properties of turmeric, the source of bioactive compound curcumin, the ability to know the exact mechanism of action and to determine the bioactive components are still not completely understood. The compound is known to have antioxidant, antibacterial, antiviral, cardio protective and immune stimulating properties. The bioavailability of curcumin is increased by the addition of black pepper. In a study, researchers have found that the inflammatory cytokines like the mean serum IL-1 and the vascular endothelial growth factor were found to be significantly reduced by curcumin therapy (Hewlings and Kalman, 2017). This assumes significance in the wake of corona epidemic where the cytokine surge is worsening patients rather than the virus replication. Broccoli and other cruciferous vegetables were proven to help boost immunity. Researchers claim that sulforaphane, a chemical found in this vegetable, switches on the antioxidant genes and enzymes in specific immune cells. This effect combats free radicals in our body and prevent the disease getting worsened. Broccoli has also been found to have anti-viral properties against influenza viruses (Antonenko *et al.*, 2013). Garlic has been known to have antioxidant, cardio-protective and anti-tumour effects. Allicin (chemically allyl 2-propenethiosul inate) is the primary bio-active chemical which is present in the aqueous extract of garlic. This chemical is also found even in the raw garlic homogenate. When garlic is chopped, the enzyme alliinase is activated to produce allicin. Many studies have noted the anti-viral activity of garlic extracts against HIV, herpes, cytomegalo-virus and the flu viruses (Bayan *et al.*, 2014). The exact mechanism is unknown. Beta-carotene is a powerful antioxidant that can reduce inflammation and boost immune function by increasing leucocytes in the body. Excellent sources of beta-carotene include sweet potatoes, carrots, and green leafy vegetables (Grune *et al.*, 2010). Coconut water is rich in vitamins like riboflavin, niacin, thiamine and folates and it also possesses antiviral and antibacterial properties (Chauhan *et al.*, 2014) that can help increase our body's immune system and increase

our capacity to fight viral infections like flu. Onions contain organosulfur compounds like quercetin and allicin (Sharma, 2019) which are associated with inhibition of viral infection. These bioactive compounds can hinder virus attachment to the host cell. They can alter transcription and translation of viral genome inside the host cell and hence also affect the viral assembly. Inhibition of viral entry into the cell and inhibition of RNA poly-merase have also been postulated as mechanism of antiviral actions of this vegetable. Tamarind leaves (Caluwé *et al.*, 2010), fruits and seeds with a multitude of uses have been also demonstrated to antiviral properties. Regular intake of probiotics allows their intimate interaction with the gut mucosa and mucosal immune system. Probiotics can modulate immune and inflammatory response in the human gut through their interaction with gut epithelial cells. It has been established about the presence of gut brain axis. The curd is a simple nutrient supplement for probiotics (Meydani and Ha, 2000). Lutein and zeaxanthin are the predominant carotenoid species found in egg yolk, although, carotene, and cryptoxanthin are also present at lower levels. The Avidin in egg white gets destroyed on cooking and hence the bioactive chemical biotin is made available to the body (Andersen, 2015). Apart from vitamins, cardioprotective compounds, shellfish has numerous amounts of carotenoids to increase immunity (Venu-gopal and Gopakumar, 2017; Hosomi *et al.*, 2012). Sesame is a simple nutrient food with enough zinc as its content. Zinc has always been noted for its antibacterial and antiviral properties (Suchitra and Parthasarathy, 2015). Zinc also has a positive effect on body's defence mechanisms. Oats as a diet is useful for giving calories but also has got fibre with vitamin D. This meal can have antioxidant effects. There is not much immune boosting nor antiviral effects for oatmeal (Rasane *et al.*, 2015). It's better to avoid bread Jam in these pandemic times as the base is Maida. Whey protein (West *et al.*, 2017) even though it has got antiviral properties, it's not advisable to include it in the night. Extracts of the plants and leaves of the mint family have shown antiviral effects (Herrmann and Kucera, 1967). Ragi usually preferred for its nutrients is not known to have anti-viral effects. The sample recipe with alternative menu will provide approximately 1800-2200 kilocalories. It changes according to the size of the ingredient, the method of cooking etc. Subtle changes can be done according to the necessity of the patients age, sex, height, weight and daily activities. The alternatives are given to switch the taste and also the problem of pandemic may decrease the availability of any one of these nutrients. The

immunology system must be strong to protect from the corona, and for this the Healthcare is necessary. To reduce stress, most people are eating fried food while at home, which is not good for health. Some people are sitting and sitting in the house, due to which their attention-bar leads to their favourite snacks. It is okay to eat a little salty or chips to change the taste of the mouth, but often need to be careful if finish the whole packet.

## RESULTS AND DISCUSSION

Generally, six to eight feeding should be sufficient . A diet can design short in Table 1.

The above example formula with elective menu will give roughly 2000-2200 kilocalories. It changes as per the size of the fixing, the strategy for cooking. Unobtrusive changes should be possible as indicated by the need of the patient's age, sex, stature, weight and every day exercises. The options are given to switch the taste and furthermore the issue of pandemic may decline the accessibility of any of these supplements

Ayurveda's immunity boosting measures for self care during COVID 19 crisis.

Spices like , Jeera (Cumin), Haldi (Turmeric), Lahsun (Garlic) and Dhaniya (Coriander ) are recommended in cooking

Herbal tea / decoction (Kadha) made fromKalimirch (Black pepper), Dalchini (Cinnamon), Shunthi (Dry Ginger),Munakka (Raisin) andTulsi (Basil), - once or twice a day. Add fresh lemon juice and / or jaggery (natural sugar) for taste.

Haridra Milk- Half tea spoon Haldi (turmeric) powder in 150 ml hot milk – OD or BD as per need.

fresh Pudina (Mint) leaves can be practiced OD.

Steam inhalation with ajwain (Caraway seeds)when dry cough or sore throat

Clove (Lavang) powder mixed with honey/natural sugar can be taken BD OR TDS in of throat irritation or cough. However, it is best to consult doctors if these symptoms persist. This has suggestive measure According Ayush ([Ministry of AYUSH, 2020](#)).

## CONCLUSION

The role of Nutrition in Immune System is very important. Immune System acts as a defence mechanism against infection in two ways in the body, 1. specific 2. Non-specific. The curative role of different element in diet is systematically studied, planning and taking a proper diet is necessary for tackling diseases. There is important role of mineral &

Vitamin as both are involved in immunity process. Zinc, Vitamin C & Vitamin D combined with AYUSH recommended measures regarding food menu to boost immune system should be included in the diet during Covid-19 pandemic. The Role of nutrition is to maintain and strengthen these defence mechanisms of the body to fight the invading germ. Ongoing research within this important field is urgently needed.

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## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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