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Review Article

Effective food habits to improve immunity against Covid-19

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Abstract

SARS-CoV-2 coronavirus disease (COVID-19) is the world's most severe biological disaster. There is no effective medication throughout the globe that can control this morbidity and mortality. Currently the second wave of the infection is more dangerous that takes lots of lives all over the world. India is also severely affected by the second wave of infection. Immune system do a remarkable job of defending you against disease-causing microorganisms. Sometimes its natural defense system failed. A germ invades successfully and break the homeostasis of the body. A healthy immune system is one of the most important weapons to fight against COVID-19. To overcome the stage immunity build up through proper nutritional foods is essential to combat the infection. Dietary supplements is a way which naturally increase the immunity. Daily intake of various antiviral food, antiviral herbs, vitamins etc. boost the immunity which fight against COVID19 infection.

Keywords: SARS-CoV-2, COVID-19, Dietary supplements, Antiviral food, Antiviral herbs, Immunity

1 Introduction

After World War II, the coronavirus disease (COVID-19) is humanity's worst crisis on the earth [1]. The social, political, and financial consequences of this greatest pandemic will remain felt for years and decades [2]. All over the world, the COVID-19 pandemic is causing significant loss of life, disrupting livelihoods, and impacting the recent advances in health and progress [3-5]. Since then, the crisis has led to several challenges disrupting life in all aspects, especially the socio-economical and medical consequences [6]. Currently, people of India are suffering towards devastating second wave of the corona virus. Expert physicians believe the surge is partly fuelled by new strains of coronavirus, including a more infections homegrown variant (7-8).

One of the strategies to combat the onslaught of the pandemic worldwide has been the development of effective vaccines [9]. Mass scale vaccination is the only solution to develop immunity within the body which fight against this black dragon. To control the spread of the coronavirus disease and subsequent mortality by acquiring herd immunity, two doses vaccination through government control programme is essential at this time [10].

Currently, there are no approved treatments for COVID-19 but various prevention strategies such as public hygiene, social distancing, public awareness and wearing facial masks & gloves are the best current approaches to reduce COVID-19 infection [11]. Recent evidence has highlighted that nutritional supplementation could play a supportive role in COVID-19 patients and boost the immune power. Good health and immunity are mainly determined by what type of food we consume [12]. Proper health requires a well-balanced diet enriched with antioxidants, minerals and vitamins. This balanced food plays a key role in health-promoting, disease fighting activities of our body. Immunity is the main mechanism of host defence against infectious agents [13]. A good immune system easily can fight against infection and decline the stressful condition in human being. During the pandemic situation role of vitamins is very important for maintaining body's homeostasis as well as to build up immune system. Macro and microelements also take part in developing immunity. Maintaining good immune system is the only way to prevent infection mainly viral disaster [14, 15].

Undoubtedly, nutritional deficiency can impair immune functions – which are meant to protect against disease or potentially-damaging foreign bodies. Accordingly, maintaining a healthy immune system is critical at all times specially during the COVID-19 outbreak [16-18]. Multiple factors weaken immunity, particularly poor diet and malnutrition, stress, lack of sleep, excess alcohol consumption, smoking and similar bad habits [19, 20]. Scientific study proved that foods with antiviral property can play a key role in optimising immune functions by

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boosting the body's defense mechanism and resistance to infection [21]. Recent research show that higher intakes of antioxidant-rich fruits, vegetables, and other food ingredients are associated with a lower risk of oxidative stress-related diseases like COVID 19. If the immune system is weakened, neutralizing antioxidants rush is urgently required to repair and defend it from further damage. Thus, it's important to eat a wide variety of nutritious and antiviral foods that provide good sources of antioxidants to help your immune system stay strong. In this review, the role of various anti-viral food supplements for developed immunity to fight COVID-19 infection and suppressed the virus related mortality are discussed.

2 Symptoms of COVID-19

People affected with COVID-19 have mild to moderate symptoms but sometimes the symptoms are very serious which do not resolve without hospitalization. Runny nose accompanied by fever, dry cough, sore throat, breathing difficulty, headache, inflammation in the lungs are the most common symptoms of COVID-19 infection. General incubation period of the virus is 14 days but sometime it may be extended up to 21 to 28 days according to severity of the infection. So, if anybody have any of the above symptoms persisting for more than six-seven days, consulting a medical practitioner is highly recommended [22].

Table 1. Various Symptoms of COVID-19

Most common symptoms	Less common symptoms	Serious symptoms
Fever	Aches and pains	Difficulty breathing or shortness of breath
Dry cough	Sore throat	Chest pain or pressure
Tiredness	Diarrhea	Loss of speech or movement
	Conjunctivitis	
	Headache	
	Loss of taste or smell	
	A rash on skin, or discolouration of fingers or toes	

3 Way to boost immunity

Scientists and medical practitioners have suggested basic hygiene practices such as washing hands and include antiviral foods in daily diet [23-25]. The basic step for health & hygiene are listed as follows:

- Washing hands: Wash the hand with soap
- Use hand sanitizer.
- Keep the hands and fingers away from mouth, eyes and nose.
- Avoid crowded places.
- Avoid consumption of raw foods including raw meat, raw egg, and raw vegetables.
- Wear a face mask covering nose and mouth.
- Social distancing: Stay 6 feet apart from others

Figure 1. Different ways to boost immune system (adapted from: https://the.ismaili/pakistan/covid-19/resources/covid-19-7-ways-boost-your-immune-system)

4 Eat a balanced and varied diet

There are no specific foods or supplements that can 'boost' our immune system and prevent or treat COVID-19. To overcome this situation, consumption of a well-balanced diet, with plenty of fruits and vegetables, whole grains, medicinal plants, animal proteins and healthy fats is the best way to get all the essential nutrients we need for good health and normal immune function [26, 27]. As self-isolation may lead us to be less active, it is also important to pay close attention to food portions and to keep our energy balance adjusted to meet our needs.

Table 2. Essential balanced diets for boosting immunity

Sl. No.	List of essential balanced diet
1.	Vegetables and legumes (beans)
2.	Fruit.
3.	Grains and cereals.
4.	Lean meat, poultry, fish, eggs, legumes (beans) tofu, nuts, and seeds.
5.	Milk, cheese, yoghurt or alternatives.

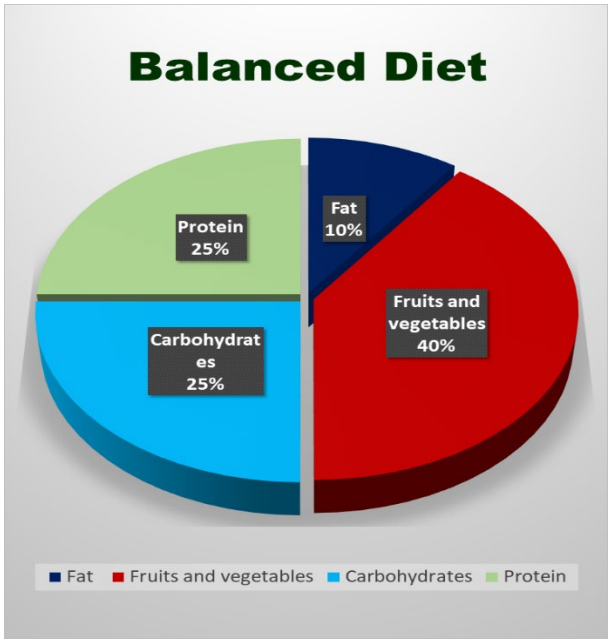

Figure 2. Percentages of food components in balance diet (adapted from Source: https://www.femina.in/wellness/diet/the-perfect-balanced-diet-chart-to-be-healthy-111567.html)

5 Establish a routine and practice mindful eating

During the unfavourable and uncertain situation people normally feel anxious, sad, stressed and scared. Change of lifestyle and food habit somehow can help to manage some of this stress. One possible way to avoid this is by sticking to regular mealtimes and planning meals in advance. This can help us better control hunger levels, meet our nutrient requirements and allow us to get the most out of the food we have, reducing food waste [28].

Long term stress or chronic stress people may find ourselves eating more than they need. Comfortable staying at home for longer periods may also lead us to snack out of boredom. Practising mindful eating can be a useful strategy to maintain a healthy relationship with food and to help us balance our energy intake [29, 30].

Some changing habits that can help people to practice mindful eating:

- Don't eat on the go - it's difficult to be aware of how much you are eating. Have a seat.
- Take small bites and chew well, while focusing on the smell, taste and texture of the food. Try to get 30 chews out of each bite.
- Try putting your utensils down after each bite. Don't pick them back up until you've swallowed what you already have in your mouth.
- Resist eating straight from the bag/box. Serve your food – you'll be able to see and appreciate what and how much you're eating.
- Remove distractions. Turn off the TV and everything else with a screen, like computers, phones, etc. while eating
- Don't try to finish the whole plate. If you feel full, safely keep the leftovers.

6 Maintain water balance

Intake of plenty of water is essential for maintaining normal health. When body loses water, sufficient water is immediately needed for functioning the body's mechanisms. Required amount of water depends on our age, sex, weight, height, level of physical activity and environmental conditions (i.e., hot weather will likely require you to drink more water). Around 20-35% of water comes from our food and rest amount comes from drinking water [31].

Table 3. Tips for staying hydrated

Sl. No.	Tips for staying hydrated
1.	Don't wait till you're thirsty to drink. By the time you feel thirsty, you're already slightly dehydrated.
2.	Flavor your water.
3.	Eat water-rich fruits and vegetables.
4.	Stay inside when it gets too hot.
5.	Dress for the weather.
6.	Be aware of the signs of dehydration

7 Safe food hygiene

Still now there is currently no evidence that COVID-19 is transmitted through eating food. However, good food safety practices are important to minimise the risk of foodborne illnesses [32, 33]. When handling or preparing food, make sure to:

- Wash hands with soap for at least 20 seconds and after preparing or eating food.
- Cover mouth and nose always with a tissue or sleeve when cough or sneeze. After coughing or sneezing always wash hands for maintaining proper hygiene.
- Wash fruits and vegetables before eating them.
- Disinfect surfaces and objects before and after use.
- Keep raw and cooked foods separate to avoid harmful microbes from raw foods spreading to ready-to-eat foods.
- Use different utensil/chopping boards for raw and cooked foods to prevent cross-contamination.
- Make sure to cook and reheat foods to adequate temperatures (≥ 72°C for 2 mins).

8 Antiviral foods in your diet

Anti-viral foods may be helpful to fight against COVID-19 [34-36]. Some antiviral foods are:

8.1 Garlic

Garlic have powerful anti-viral capacity. It can be eaten raw, mashed or can be added to soups. Mix chopped raw garlic with a tablespoon of unpasteurised, raw honey and consume a clove every day after two to three days. It's a fantastic way to boost your immune system [37].

8.2 Star anise

The flower-shaped spice contains shikimic acid that is used as a base material for the production of Tamiflu, which is used for influenza virus. It is super powerful as an anti-viral. Take star anise and boil it in water and add it to your teas like green tea or black tea.

8.3 Ginger

Intake of mashed ginger and star anise build immunity which fight against different diseases.

8.4 Coconut oil

Lauric acid and caprylic acid present in it are essential for boosting the immune system against viruses.

8.5 Resveratrol

Foods rich in resveratrol such as peanuts, pistachios, grapes, red, white wine, blueberries, cranberries, strawberries, and even cocoa and dark chocolate are helpful to fight fungal infection, ultraviolet radiation, stress, and injury [38, 39].

Table 4. Recommended daily intake of anti-viral foods

Sl. No.	Food ingredients	Recommended daily intake	
		Male	Female
1.	Fresh raw garlic	2 to 6 g	2 to 5 g
2.	Dried garlic powder	0.4 to 1.2 g	0.4 to 1.0 g
3.	Dried garlic extract	300 to 1,000 mg	300 to 800 mg
4.	Ginger	1.5-5.5 g	1.5-4 g
5.	Coconut oil	25-35 ml	22-30 ml
6.	Resveratrol	1500-2500 mg	1500-2200 mg

Figure 3. Six essential anti-viral food to boost immune system

9 Vitamin C rich foods

Vitamin C is an essential vitamin as recommended daily intake for vitamin C is 75 mg for women and 90 mg for men. This is a strong antioxidant that can boost your blood antioxidant levels. It is recommended that vitamin C supplements is essential to boost the immunity, as vitamin C is involved in many parts of the immune system. Firstly, vitamin C helps encourage the production of white blood cells known as lymphocytes and phagocytes, which help protect the body against infection. Secondly, vitamin C helps these white blood cells function more effectively while protecting them from damage by potentially harmful molecules, such as free radicals. Finally, vitamin C is an essential part of the skin's defense system. It's actively transported to the skin, where it can act as an antioxidant and help strengthen the skin's barriers. Vitamin-C rich foods such as amla, red peppers, yellow peppers, strawberry, lemon, broccoli. Vitamin C supplements may be helpful to fight against Covid-19 infection [40-42].

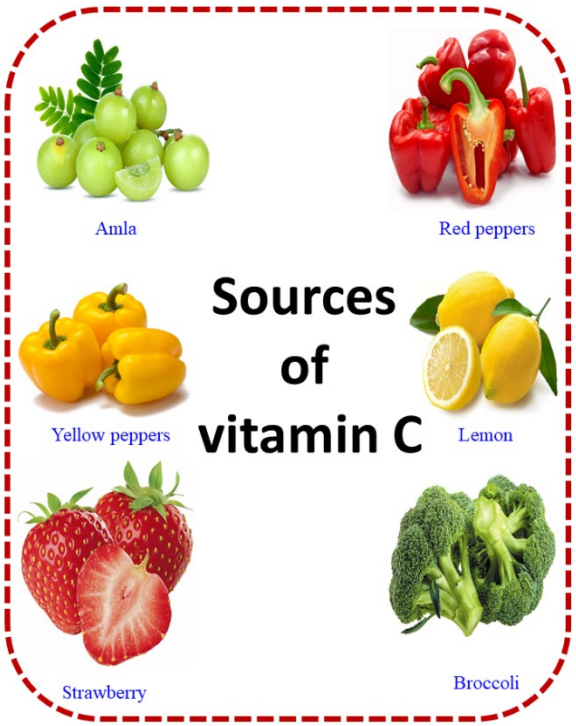

Figure 5. Sources of Vitamin C

10 Recipe for build good immunity

Consumption of immunity-boosting soup daily may be helpful in increasing the immunity faster.

Table 5. Ingredients used for preparing the soup

Sl. No.	Quantity	Item
1.	1 no (70-80 g)	Sweet potato
2.	1 no (2-3 g)	Garlic
3.	Some (50 g)	Spring onions
4.	Few (50 g)	Parsley
5.	Few (30-40 g)	Rosemary
6.	Small amount (5-6 g)	Ginger

10.1 Method

Mix all the ingredients together and make it into a soup. The soup helps boost the immune system against cold, flu and viral infection.

10.2 Antiviral herbs

Virus is a small infectious agent that replicates only inside a living cell and can infect all forms of life, including humans, animals, plants and microorganisms. A viral infection is mostly seasonal and is often treated with proper medication. However, there are some herbs, which have antiviral properties and can be used in moderation when you are under the weather. It inhibits the growth of the virus, boosts immunity and fights the foreign pathogens. These are safe and effective herbs that anybody can take to boost their immune power. Some plants like *Allium sativum, Daucus maritimus, Helichrysum aureonitens, Pterocaulon sphacelatum* and *Quillaja saponaria* emerged to have broad spectrum antiviral activity. Ashwagandha and Tulsi also reported to have potential antiviral activity.

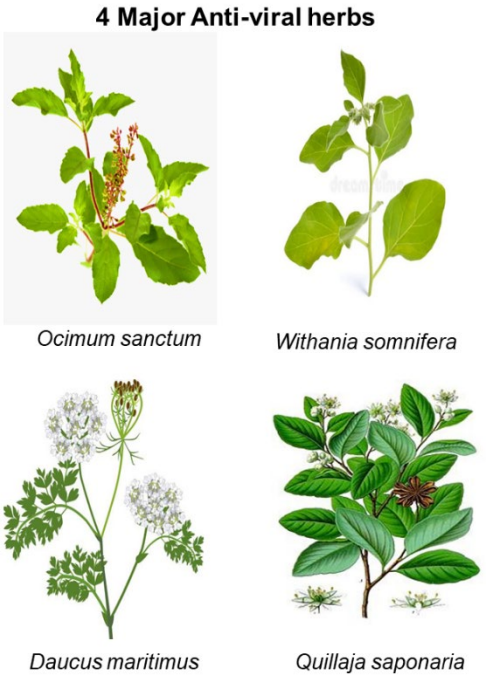

Figure 5. Four essential antiviral herbs to boost immune system (adapted from https://www.bedfordareamastergardeners.org/2020/02/26/list-of-antiviral-herbs-and-their-uses/)

11 Other antiviral foods

Good prebiotic or probiotic can be taken to keep gut healthy. The healthier your gut, the stronger is your immune system. One can also have rice or beetroot *kanji*. Deficiency of Vitamin D3 decline the immune power. To build immunity white sugar is also an important ingredient. Minerals like zinc and selenium, almonds, pumpkin seeds, sunflower seeds, unsalted cashew nuts and unsalted pistachios are others key ingredients those provide immunity stronger.

12 Conclusion

Immune cells play a crucial role in the protection of our body against the many foreign substances, pathogens and viruses. No drug is still available in the market to fight against COVID19 infection. Proper and scientifically validated vaccination increases the immunity against COVID-19. Apart from vaccination, daily intake of antiviral food, vitamin C, antiviral herbs etc. partially support our body and build up the immunity. Consumption of antiviral food may help to decline the mortality rate. So, to overcome the harmful effect of COVID19, people may take antiviral supplementation for better immunity.

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Conflict of Interest

We declare that we have no conflict of interest.

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