HEALTHY EATING, PREVENTION OF OBESITY AND PROTEIN ENERGY MALNUTRITION INFECTION DURING COVID 19 PANDEMIC

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ABSTRACT

Eating well is vital as it helps us maintain good health. Eating healthy foods helps us to maintain a good healthy weight and decrease our risk of chronic diseases. During the COVID-19 pandemic, consumption of highly nutritious food remains paramount to good health. While there are no specific foods that can protect us from coronavirus infection, a balanced and nutritious diet can help you get-rid of its symptoms. This paper provides an insight into how best we can build our immune system through healthy eating of foods rich in nutrients and taking dietary supplements. It also gives food preservation method appropriate for food storage during Covid-19 pandemic.

Keywords: Healthy Eating, Obesity, Malnutrition, Infection, Covid-19

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Introduction

Coronaviruses are viruses belonging to the Coronaviridae family, order Nidovirales (Schoeman & Fielding, 2019). They are pleomorphic (60-200 nm), tiny and contain the largest ribonucleic acid (RNA) molecule which is single stranded(Castagnoli *et al*., 2020). Four unique genera of coronaviruses exist in human (Schoeman &Fielding, 2019). The viruses are well-established human and animal pathogens causing a broad spectrum of diseases. There are seven pathogenic human coronaviruses (hCoV) identified in the 1960s. They are α coronavirus (229 E and NL63) and β coronavirus (OC43 and HKU1). Others include Middle East Respiratory Syndrome coronavirus (MERS- CoV), severe acute respiratory syndrome coronavirus (SARS) and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Raoult *et al*., 2020). Human coronaviruses such as 229E, OC43 and NL63 are responsible for respiratory tract infections in immunocompetence people (Castagnoli *et al*., 2020). However, two novel human coronaviruses, SARS-CoV-2 and MERS-CoV are causative agents of mild and serious respiratory infections such as cold, pneumonitis and bronchitis leading to hospitalizations and possible deaths (Raoult *et al*., 2020). As a genus, coronaviruses are not limited to specific organs; target tissues include the kidney, immune system, nervous system and reproductive tract in addition to various parts of the respiratory and enteric systems (Liu *et al*., 2020; Raoult *et al*., 2020).

Coronavirus disease is an acute illness caused by SARS-CoV-2. COVID-19 disease originated from Wuhan and has since spread globally. This deadly disease has had great impact on the health systems, social and economic stability. Within a short time, COVID-19 has transformed into a worldwide public health emergency (Liu *et al*., 2020; Deng &Peng, 2020). Till now, no specific treatment exists for COVID-19, only preventive measures can help curb the menace of this infection. Along with considering public health and hygiene as well as drug management, it would be necessary to provide a diet with numerous health benefits for all individuals. The most common clinical signs and symptoms of the disease include cough, fatigue and sometimes fever. Very rare signs include pains, headache, passing watery stool, eye infection, loss of aroma or taste and discoloration of nails. However, very serious or deleterious signs are breathlessness, chest pain and inability to talk or move (Ong *et al*., 2020; Rothan & Byrareddy, 2020). COVID-19 disease also exhibits clinical signs similar to that of influenza. This is so because both viruses have a similar disease presentation; they both cause respiratory tract infection which may range from acute or asymptomatic cases to chronic disease and at-times death. Also both viruses are transmitted by contact, droplets and fomites (Shen *et al*., 2020). The upsurge of COVID-19 disease was quickly contained by protective measures put in place by the World Health Organization. These measures include, lockdown, contact-tracing and quarantine, distancing measures (in churches, parties, mosques, parks, restaurants)international travel measures and vaccines(Vellingiri *et al*., 2020). Although very important, these measures limit the activities going on in eateries, marketplace and other places. Therefore, for several individual, usual shopping routines and eating were turned upside down. The lockdown measure affected the food system which eventually leads to situations where people do not have access to adequate quantity of clean or properly handled nutrient rich-foods required for normal growth and development and an active and healthy life (Mustapha *et al*., 2020; Vellingiri *et al*., 2020).

There are very scanty reports on the effect of nutrition on COVID-19 infection. Thus under nutrition or malnutrition particularly protein energy deficiency (PEM) and obesity may become increased due to reduced access to food, insufficient food staples, limited culinary habits, inactive or seated lifestyle, change in eating habits and change in purchasing patterns and lack of appropriate food safety and preservation ideas (Muscogiuri *et al*., 2020). The higher consumption of foods rich in fats, carbohydrates and sugars in children and adults can increase the prevalence of obesity during COVID 19 pandemic while malnutrition may result in nutritional deficiencies of micronutrients and other essential substances needed by the body for growth, development and to promote immune function to enhance resistance to viral infections which in turn leads to increased short and long–term health problems, diabetes, slow recovery of wounds and immune disorder leading to increased susceptibility to human infectious diseases (Muscogiuri *et al*., 2020).

Obesity is having excess body fat (Folkvord *et al*., 2020). It's a health issue that increases human risk of developing heart disease, diabetes, high blood pressure and cancer. However, staying at home promote healthy eating and prevent obesity. This is because when people are at home, they cook more food, buy fresh foods and have changed eating habits (Di Renzo *et al*., 2020). A study conducted by Folkvord *et al*., (2020) have shown that consuming freshly prepared home foods as well as having proper cooking skills helps to promote a nutrient rich diet that is healthy and maintains proper nutritional status. Their study demonstrated that children watching TV cooking programs develop increased desire to cook which may change their food intake and choice for fresh fruits and vegetables. Their desire to cook gets them involved in the homemade food cooking process which in turns exposes them to healthier food.

PEM on the other hand, is a state of undernutrition and deficiency of multiple nutrients and energy (Grover & Eu, 2009). Clinical presentations of PEM include kwashiorkor and marasmus (John, 2020). This condition causes inadequate functioning of the immune system and eventually predisposes an individual to infection causing a metabolic disturbance enhancing catabolism. PEM is responsible for a large number of morbidity and mortality globally, particularly in people who are highly vulnerable. As recently discussed by John,

(2020) and Barazzoni *et al*., (2020), both PEM and obesity are risky to the seriousness of Covid disease, and has become known as critical factors increasing the disease mortality. Therefore, healthy diets and nutritional status might influence the individual risk for development and progression of SARS-CoV-2. Therefore eating healthy foods, that is foods containing sufficient protein and energy may be important to protect against SARS-CoV-2 infection. Nutrients such as fiber, minerals (zinc, selenium), vitamins and polyunsaturated fatty acids (PUFA) play a crucial role to boost the immune system of humans to help prevent and treat COVID-19 (Alpert, 2017; Barazzoni *et al*., 2020).

Vitamin A enhances **i**mmune function. Deficiency of the vitamin has been linked with numerous viral infections (Kańtoch *et al*., 2002; Huang *et al*., 2018). Research study conducted by Villamor & Fawzi, (2005) demonstrated that vitamin A supplementation to children and adults decrease the risks of mortality and morbidity from some forms of viral infections. According to World health Organization (WHO, 2009), vitamin A deficiency exists together with PEM and its deficiency is often corrected by PEM treatment. Animals from which adequate amount of protein can be obtained are good sources of vitamin A. Foods rich in protein such as fish, poultry meat, eggs and other dairy products could be included in meals to reduce vitamin A deficiency (Kańtoch *et al*., 2002).

Inthe human plasma and leukocytes, vitamin C concentrations often decrease rapidly due to ***infections (***Beveridge *et al.,* 2008*). Vitamin C* is water-soluble. In some foods, *vitamin C* is naturally present and readily available as a dietary supplement. Humans do not synthesize *Vitamin C,* so it must be obtained from diet rich foods (Beveridge *et al*., 2008). Rondanelli *et al*., (2018) study showed that regular intake of vitamin C helps to maintain the immune defense systems of humans and reduce the occurrence of infection and seriousness of common colds and flu-like illness. Clinical trials conducted by Wintergerst *et al*., (2006) on the supplementation of Vitamin C (1 g) with Zinc (30 mg) showed that supplementation increases the immune function of children and adults strongly, reducing the incidence of respiratory diseases. Also, the supplementation was found to reduce the occurrence and improve infections such as malaria, pneumonia and diarrhoea in children. Considering the effect of COVID-19 infection on the respiratory tract of human, higher intake of fruits and vegetables are necessary to prevent the disease (Subbarao & Mahanty, 2020)**.**

Fiber or roughage is a type of carbohydrate found occurring naturally in plant-based foods (Szmidt *et al*., 2019). Fiber cannot be completely broken down by human digestive enzymes. The two types of fiber that exists are soluble and insoluble. Fibers are beneficial to human. Soluble fiber are water soluble and causes slow digestion process aiding weight loss and insoluble fiber aid in the movement of bulk stool through the digestive tract (Papandreou *et al*., 2015). Fiber is an essential nutrient in a healthy, balanced diet. Fiber helps your body maintain good gut, regulate weight, reduces cholesterol and blood sugar levels of individuals. Research studies shows that increased fiber intake can help protect individuals against diseases such as heart disease, colon cancer and lung disease. Szmidt *et al*., (2019) evaluated the link between the intake of dietary fiber and the risk of COPD in a women population. In the study, COPD was found to decrease with long-term intake of dietary fiber with a daily consumption of 25 g of fiber per day. Reduced inflammation and good quality of life was reported in COPD patients. Plant based foods are good sources of fiber. These high fiber foods have been shown in several research studies to protect human against respiratory viruses responsible for COPD and other lung infections.

Zinc is an essential trace element(Read *et al*., 2019)**.** ***Zinc*** is not made by the human body; it has to be included in the diet. It has immuno modulating functions and plays vital role in generating and regulating immune responses in human (Read *et al*., 2019). Zinc significantly reduces the severity and duration of cold symptoms which include a runny nose, sneezing and congestion. Zinc supplementation has significantly helped reduced infection in people suffering from viral infections such as human immunodeficiency virus (HIV), autoimmune, immunodeficiency diseases (AIDS) and hepatitis C. Zinc deficiency is caused by malnutrition. Considering the enormous effect of COVID-19 on human immunity, children and adults were advised by WHO, to consume best food sources of zinc such as seeds, seafood, poultry, legume, and meat (Gammoh & Rink, 2017). A

research study conducted by Gulani & Sachdev, (2012) indicates supplementation with zinc (5–50 mg/day) reduced mortality associated with lower respiratory tract infection, diarrhea, and malaria and viral infection.

Long-chain polyunsaturated fatty acid (PUFA) enhances some immune functions (Shek *et al*., 2012). In animal models, supplementation with long-chain n-3 PUFA has been found to enhance the immune cells and reduced diseases. In a recent experimental study, fatty acids such as eicosapentaenoic acid (EPA) (omega-3) and docosahexaenoic acid (DHA) (omega-6) enhanced the function of immune B cells. A mice model fed with control and supplemented DHA and EPA rich fish oil for a period of five (5) weeks was found to have an enhanced B-cell activation and selected antibody production which was thought to aid their immune responses (Gutiérrez *et al*., 2019). Therefore, dietary intake of food sources such as flaxseed, walnut, fish and fish oils for example salmon sardine and their oils are highly recommended (Radzikowska *et al*., 2019; Siriwardhana *et al*., 2012).

Easy ways to start eating healthy during Covid-19 pandemic to boost your immune system

Boosting your immune system is the safest way to prevent coronavirus illness. Proper functioning of your immune system is enhanced by eating balanced diet and practicing a healthy lifestyle. Eating nutritious food and sleeping well prevents you from exposure to deadly coronavirus.

Previous research studies have shown that nutrients such as fiber, minerals (zinc, selenium), vitamins and PUFA help boost the *immune system* of humans to prevent and treat COVID-19 (Alpert, 2017; Bakar *et al*., 2017; Barazzoni *et al*., 2020; Muscogiuri *et al*., 2020; Folkvord *et al*., 2020).Below are easy tips to start eating healthy during Covid-19 pandemic.

Eat more of unprocessed or slightly processed plant foods instead of processed foods

Pizza andramen should be completely swapped with unprocessed or processed plant foods that are highly nutritious and healthy

Drinks that contain excess sugar should be completely avoided

Consumption of sugary drinks increases ones risk of having Type 2 diabetes and obesity as well as liver damage, premature aging and anxiety. So, instead of taking much of fruit juices, drink more of beverages with low sugar and water

Cook and keep healthy food within reach

Only keep snacks and foods highly rich in nutrient in easily accessible places. This is because you are prone to eat the first thing you see on the counter or in the cupboard when hungry.

Eat more of nuts and seeds

Seeds and nuts like flaxseed, pumpkin seeds, olive seeds, walnuts and cashew nuts are super foods that are excellent sources of antioxidants, protein, healthy fats to vitamins.

Consume fatty fish

Fatty fish like salmon and mackerel containing high amount of omega-3 fatty acids that is polyunsaturated fatty acid should be eaten twice a week. This is highly recommended by the American Heart Association to prevent cardiovascular diseases.

Eat in smaller plates to monitor your food consumption

Always eat on a smaller plate for early satisfaction and avoid overeating to prevent obesity.

Count nutrients obtained in healthy foods, not calories

Focus mainly on the nutrients in your food and not the calories if you want to improve your diet quality.

Consume more probiotic foods

Probiotic foods improve the activity of gut bacteria.

Drink plenty of water to stay hydrated

Water intake is very important take approximately 8-10 cups per day to aid absorption and assimilation of nutrients in the body(Jéquier & Constant, 2010).

Food preservation during COVID-19 pandemic

Food preservation helps you to keep food safe all year-round (Martindale & Schiebel,

2017).Preserving foods enables you to create delicious and nutritious food at home. It no doubt reduces your frequent trips to market during the COVID-19 pandemic. Safely preserving these foods at home can provide a sense of personal satisfaction with a readily available supply of food for you and your family. Proper food storage methods are important to reduce food waste and minimize the risk of illness (Sirijariyawat & Charoenrein, 2012). Therefore, freezing which is one of the modern methods of food preservation must be considered for staying healthy and minimizing food waste during Covid-19 pandemic. Freezing extends the storage stability of a product with little to no change in nutritional content. In order to effectively store your fruits and vegetables select proper food packaging, such as rigid containers or flexible bags or wraps. Choose vegetables and fruits for freezing, blanch all vegetables except peppers and onions, but do not blanch fruits, prior to freezing, prepare fruit for freezing, store food for freezing. Additionally, there are other foods like raw meats, such as poultry, beef, and pork and breads (such as baked breads, rolls) that are suitable for freezing (Martindale & Schiebel, 2017).

Conclusion and recommendations

In conclusion, there is paucity of information on diet and coronavirus infection. Also, researches on the nutrient supplementation have been limited to research studies based on animal models. Therefore based on this article we recommend that all people should eat healthy foods. Foods highly rich in nutrients with immunomodulating potentials must be consumed. In patients with obesity and PEM, preventive measures and supplementation of food with dietary intakes may help reduce the risk of exposure to the virus.

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