REVIEW ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

The role of nutrients in severe acute respiratory syndrome coronavirus 2 infection

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Submission: 16-01-2022 Revision: 29-03-2022 Publication: 01-05-2022

ABSTRACT

Balanced and healthy nutrition is a vital to attain a good immune response. Numerous studies have reported that boosting up adaptive immunity through nutritional interventions can impede viral infections. With the present leading challenge of the COVID-19 pandemic globally, maintaining good nourishment is indispensable to remain immune against the novel virus. By and large, ineffectively fed people are at a higher risk of creating different kinds of contaminations. In addition, constant and extreme contagion can cause health problems and demolish a patient's nourishing status, making them susceptible to different diseases. During the COVID-19 pandemic, everyone must screen their eating routine and nourishing status. Good nutrition can subside the ongoing unprecedented health complications and deaths. Evaluating the clinical status of COVID-19 cases at the hour of clinic confirmation is strongly recommended. Specific dietary help is prescribed to be given to those in the high-hazard bunch, asymptomatic transporters, and patients with moderate or extreme COVID infection. An assortment of micronutrients techniques to treat COVID-19 can prove beneficial at the preliminary stage of the clinical attendance. The prompt supplementation of specific supplements in gentle cases can forestall the movement of sicknesses.

Key words: Immune response; Nutrition; Public health; SARS-COV-2

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v13i5.42442

E-ISSN: 2091-0576

P-ISSN: 2467-9100

ABSTRACTO

La nutrición equilibrada y saludable está conectada con una susceptibilidad y sólida y aborda uno de nuestros aparatos más protentes en la emergencia continua de COVID-19. Numerosos estudios han informado que aumentar la inmunidad adaptativa a través de intervenciones nutricionales puede impedir infecciones virales. Una buena nutrición puede disnuir a las complicaciones de salud sin precedentes y muertes. Con el principal desafío actual de la pandemia de COVID-19 a nivel mundial, es vital lograr y mantener una buena nutrición para permanecer inmune contra el nuevo virus. En general, las personas alimentadas de manera ineficaz corren un mayor riesgo de crear diferentes tipos de contaminación. Además, las contaminaciones constantes y extremas pueden causar problemas de salud y demoler el estado nutricional de un paciente, haciéndolo impotente ante diferentes enfermedades. Durante la pandemia de COVID-19, todos deben evaluar su rutina de alimentación y estado nutricional. Existe una fuerte recomendación de evaluar el estado clínico de los casos de COVID-19 en el momento de la confirmación clínica. Se prescribe que se puede brindar ayuda dietética específica a aquellos en el grupo de alto riesgo, transportadores asintomáticos y pacientes con infección por COVID moderada o extrema. Una variedad de técnicas de micronutrientes para tratar COVID-19 ha llegado a la etapa clínica preliminar. La

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pronta suplementación de suplementos específicos en casos suaves puede prevenir el movimiento de la enfermedades.

INTRODUCTION

Individuals are closely connected with basic microorganisms. The immune system is a method for security against the harmful impacts of toxins, which cause contamination in our bodies. The immune system is a type of insurance that consists of the thymus, spleen, lymph hubs, and some particular invulnerability cells.[1] Invulnerability, on microorganism obstruction, acts both normally and gained an unpredictable system, yet, for the most part is a joint effort. One of the components that influence the characteristic obstruction is sustenance. Insufficient healthy sustenance separates the resistant capacities by stifling the safe framework.[2] The dietary factors that cause damage to resistance capacities are either inadequacy in micronutrient component admission (fat, sugar, and protein) or insufficiency in some particular micronutrient components (nutrient, mineral, and water).

Adjusted nourishment, particularly as far as a satisfactory nutrient, mineral, and protein consumption, upgrades the protection against diseases. Explorations revealed that decent nourishment sponsors the insusceptible framework and has imperative significance on the framework.[3] Sustenance affects body opposition and microorganisms. Inordinate strain, traumas, ambustions, etc., could cause protein obliteration, thereby diminishing body opposition. Unhealthiness, particularly in youth, assumes an imperative part in sickness and mortality. Unhealthiness makes us ready for diseases and confusion thereafter. This makes disease mutilate the sustenance and lessens the insusceptibility.[4] The impacts of dietary components on the safe framework have been a subject of investigation for some specialists in light of the huge effect on supporting the insusceptible framework and its inadequacy that cause a breakdown in the resistant framework.[2]

The immune system is a typical name for structures inside our bodies that secure living life forms against harmful substances. The human body has numerous components in self-preservation, of which one of the least difficult is the external creatine layer on the skin. Another component is biochemical body units.[5] The substance that animates the immune system is known as vague substances such as macrophages and neutrophils that upgrade the safeguard ability of phagocytes. A significant number of those substances hold fast to the surfaces of phagocytes and lymphocyte cells and invigorate the creation of interferon, interleukin, and modern pieces, thus initiating the resistant framework.[6]

The immune system has a construction that comprises a comparable neurologic framework. The main characteristics of the insusceptible framework are having the capacity of perceiving various dangers and recognizing them. Therefore, the functionary cells in the resistant framework identify the new article, retain it, and remember it when running over it later on. These constructions include the thymus, spleen, lymph hubs, and explicit invulnerability cells. The immune system gets down to fill in once pathogenic variables enter the body. This safeguarding is done by the insusceptible framework against microbes called "immune reaction."[7]

Aims and objectives

This study aimed to assess the role of nutrients in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.

Along with this, the following are some objectives for this study:

- To explore the role of nutrients in SARS-COV-2 infection prevention
- To examine the impact of various nutrients on the immune response to SARS-COV-2 infection
- To study the role of nutrients and dietary components in strengthening the immune system against and the dietary guidelines for maintaining a lifestyle for coronavirus disease-2019 (COVID-19) for control and prevention.

DISCUSSION

Overview of COVID-19 and immune response

With the COVID-19 pandemic, where no viable preventive and remedial medication are accessible, a sound insusceptible framework is the main weapon against viral contaminations. A few nutrients and minor components are available, which are fundamental for the typical immune framework.[8] In addition, its supplementation emphatically affects the improvement of insusceptibility in viral contaminations. Nutrients A and D supplementation has expanded the humoral invulnerability of pediatric patients following flu inoculation.[9] A high portion of zinc supplementation has shown upgraded resistance of patients with torque teno virus. In addition, selenium supplementation has shown a positive reaction after a challenging flu immunization.[10]

Notwithstanding micronutrients, a few homegrown, and probiotics have additionally shown adequate treatment and anticipation of viral diseases. In addition, a few nutraceuticals and probiotics have shown a steady job

in immune reaction improvements.[11] Hunger builds mortality and dreariness and causes critical monetary effects on the medical care frameworks; however, the financial circumstance of a nation impacts all parts of ideal sustenance care. The expanded danger of mortality and dreariness due to illness is an aftereffect of the expanded pace of contaminations, similar to postponed recuperation. Moreover, contaminations increase the interest for a few supplements.[12,13] Sustenance is very much perceived as a vital factor in tweaking resistant homeostasis. Insufficient protein-energy of healthy sustenance or even subclinical insufficiencies of one micronutrient may weaken the resistant reactions.

Lately, Calder et al.,[14] revealed the significance of ideal dietary status to be secured against viral contamination, and Wu and Zha[15] have given wholesome exhortation to lessen harm to the lungs from COVID-19 and other lung diseases.[12] Recognizing both these significant surveys, we utilized an efficient evaluation technique and assessed the greatest proof from clinical preliminaries for both viral infection prevention and treatment through health intercessions. Supplementation of nutrients, minor components, nutraceuticals, and probiotics has been emphasized. A few nutrients are fundamental for the legitimate function of the resistant framework. In addition, a different diet is fundamental to limit nutrient insufficiency and keep away from superfluous overabundant utilization or supplementation.[16] Our results revealed that nutrient supplementation, particularly Vitamin D, might be advantageous in individuals who are either nutrient insufficient or inadequate.

Hypothetically, Vitamin E is an intense cancer prevention agent, which adjusts the insusceptible capacities of the host. However, our examination results highlight the antagonistic impacts of Vitamin E supplementation on its safe reaction. However, Vitamin E supplementation in cardiovascular diseases and malignant growth prevention remains controversial. High-measurement of Vitamin E supplementation may cause mortality. Similar to nutrients, a few minor components are fundamental for appropriate safety capacities. A dysregulated zinc homeostasis influences immune cells by a few components that prompt strange lymphopoiesis, dysregulated intercellular correspondence by the cytokines, and poor intrinsic host protection through phagocytosis and oxidative burst.[14] Similarly, selenium has a complex immunological system but primarily fuse into selenoproteins. Chart 1 gives an overview of nutraceuticals having impressive interest for their properties in improving general well-being, preventing diseases, and postponing maturation, and expanding the future.[15]

The role of nutrients and dietary components toward immune system strengthening

Annually, 6 million youngsters worldwide die due to diseases brought by unhealthiness due to the breakdown in the immune framework. Accordingly, consumption of sufficient protein, particularly milk, dairy items, and eggs, which are naturally important proteins, should be ensured to keep our safe framework solid.[17] In addition, we should likewise routinely consume food varieties, which are believed to be our first safeguard against free revolutionaries, such as Vitamins E and C and food varieties that consist of beta-carotene. Despite the notorious standing of free extremists, they are profoundly required in our lives and possibly become hazardous when unreasonably consumed.[18] Micronutrients, called cell reinforcements, can give assurance against free revolutionaries. Cell reinforcement is a substance that forestalls food sources, particularly fats, from oxidation and decay. As the name recommends, it forestalls chain responses by checking the combination of oxygen with different substances, thus those substances need to be oxidized.[19] Unhealthiness separates the resistance capacities by curbing the immune framework.

Lately, weak immune system cases have been expanding. The dietary factors that cause a glitch in the immune framework could be inadequate energy and macronutrients (protein, carbohydrates, and fats) consumption or insufficient explicit micronutrients.[20] Figure 1 depicts the association between immunity and nutrition. Nutrients, which uphold

Chart 1: Nutritive substances targeting Coronaviridae family of viruses

Nutrients	Targeting Virus from Coronaviridae family
Vitamin A	Avian coronavirus
B vitamins	MERS CoV
Vitamin C	Avian coronavirus
Vitamin D	Bovine coronavirus
Vitamin E	Bovine coronavirus
Selenium	Avian coronavirus
Zinc	SARS-CoV

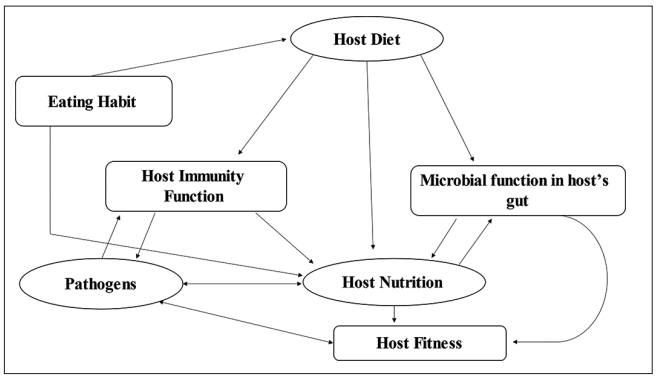

Figure 1: Relationship between immunity and nutrition

and animate the immune system, are classified as "immune nutritional components," and some powerful nutrients are remembered for this grouping.[21]

Nutritional impact on the immune response to SARS-COV-2 infection

The immune framework exists to shield the host from harmful natural specialists, particularly pathogenic living beings, which might be microorganisms, infections, growths, or parasites. The human insusceptible framework has developed to incorporate a horde of cell types, conveying atoms, and useful reactions to manage such a variety of dangers.[22] The safe framework is consistently dynamic, which completes observation, yet, its movement is upgraded if an individual gets contaminated. This elevated movement is joined by an expanded pace of digestion, requiring fuel sources, substrates for biosynthesis, and administrative atoms. These fuel sources, substrates, and administrative atoms are eventually acquired from the food regimen.

Consequently, a sufficient stockpile of a wide scope of supplements is crucial to help the immune framework ideally function.[23] The insusceptible framework is consistently working; however, cells become actuated by the presence of microbes. This initiation causes a huge expansion in the interest of the immune framework for energy-yielding substrates (glucose, amino acids, and unsaturated fats). Initiation of the resistant reaction actuates the creation of lipid-inferred arbiters, like prostaglandins and leukotrienes, and of various kinds of protein, including immunoglobulins, chemokines, cytokines, cytokine receptors, bond atoms, and intense stage proteins.[24] This requires accessibility of the substrate unsaturated fats and amino acids, individually.

The immune reaction includes critical cell expansion, thus expanding the number of resistant cells that are accessible for safeguard requires DNA, RNA, protein, and complex lipid amalgamation, with the help of the prepared substrate accessibility.[22] The associated metabolic apparatus with energy age and biosynthesis requires a wide range of nutrients and minerals as cofactors. Amino acids (e.g., arginine) are forerunners for the combination of polyamines, which have roles in DNA replication and cell division guidelines.[25] Different micronutrients (for example iron, folate, zinc, and magnesium) are additionally associated with nucleotide and nucleic corrosive combinations. A few supplements, such as Vitamins A and D, and their metabolites, are immediate controllers of quality articulation in safe cells and assume a vital part in the development, separation, and responsiveness of resistant cells.[26]

Making a supportive oxidant climate through the age of harming responsive oxygen, species is one component of natural insusceptibility; the host needs security against these through exemplary cancer prevention agents (Vitamins C and E) and cell reinforcement catalysts (superoxide dismutase, catalase, and glutathione peroxidase); the last requires manganese, copper, zinc, iron, and selenium. Accordingly, several various supplements support the capacity of the immune framework, thus seeing the value of a satisfactory and adjusted supply of these fundamental supplements, it is not difficult to achieve a proper safe reaction. Great sustenance establishes a climate, wherein the insusceptible framework can properly react to challenges, regardless of the test.[27] Helpless sustenance establishes a climate, where the immune framework cannot react well. This is adequately delineated in states of supplement inadequacy (either "reality" or tentatively prompted), which are joined by disabilities of both inborn and procured resistance and expanded vulnerability, and seriousness of diseases.[28]

Both the resistant hindrances and the powerlessness to disease can be switched by amending the deficiency that shows a causal connection between the accessibility of explicit supplements and insusceptible safeguards. This is perceived by the European Food Safety Authority, which grants cases of "upkeep of elements of the immune framework" for Vitamins A, B6, B12, C, D, and folate (vitamin B9), and minor components including zinc, iron, selenium, and copper.[29] Various exhaustive studies are conducted on the role of nourishment and insusceptibility, additionally, numerous complete supplement explicit surveys are conducted. Chart 2 gives a comprehensive idea about the reliable source of nutritious food that helps in improving the immune status of individuals.

Adoption of dietary guidelines and lifestyle to SARS-COV-2 infection

The restricted social connection and exercises with individual inhabitants, families, and staff because of social separation can likewise prompt weariness, dormancy, and stationary conduct in occupants, thereby further prompting forlornness. Both forlornness and social segregation have been connected to poor emotional wellness (for example, hopelessness, depression, and intellectual impairment), just as more regrettable actual well-being (for instance more terrible engine work, cardiovascular wellbeing, disturbed rest, and fragility) and higher mortality.[30] Forced detachment can likewise cause inactive conduct, which is basic for the anticipation of physical, mental, and social and medical conditions. In light of surviving information from the past pandemics, along with arising information from this pandemic, mental grimness is accepted to rise.

Chart 2: Sources of food that helps in boosting immunity

Food groups	Nutrient	Food Source									
		Fruits	Leafy vegetables	Other Vegetables	Grains	Pulses	Nuts and Seeds	Dairy products	Meat and meat products	Edible oils and fats and sweeten	Spices and Herbs
Nutrients											
Vitamins	Vitamin A	Ripe papaya, ripe mango, orange, and grape fruit	Spinach, amaranth leaves, coriander leaves, mint leaves, and fenugreek leaves	Carrot, pumpkin, sweet potato, and green chili				Milk	Goat liver	Sunflower oil, palm oil, and butter ghee	
	Vitamin B6	Bananas, mango, pineapple, and grapes.	Spinach	Sweet potato, potato, and green peas	-	-	Pistachio and cheat Nuts	Milk	Chicken liver, beef, pork, and eggs.	-	-
	Vitamin B9	-	Cowpea leaves, spinach, and mint leaves.	Cluster beans, ladies finger, tomato, and French beans.	Soybean flour, black millet flour, and whole wheat flour	Chickpeas, mongo, split bengal gram, split yellow gram, and soya bean	Sesame seeds and peanuts.	-	-	-	-
	Vitamin B12	-	-	-	-	-	-	All dairy products	Animal liver and kidney, beef, and eggs	-	-
	Vitamin C	Guava, orange, lime, black current, melons, and pineapple	swigs chard, turnip greens, and spinach	Yellow peppers, cabbage, tomato, and turnips	-	Brussel sprouts and peas	-	Milk (human, cow, and goats)	Lamb (liver, heart, and tongue)	-	-
	Vitamin D (*Fortified foods are more considerable)	Orange juice (fortified)	-	Mushroom	Oatmeal.	Soybeans.	-	Milk (Cow) and Yogurt.	Egg yolk, pork chops, and beef liver	Cod liver oil, margarine, and butter.	-
Trace element	Zinc	-	Spinach	Potato	wheat and rice	Kidney beans Chickpeas and lentils.	Hemp seeds flax seeds, sesame seeds, Cashew, and Peanuts	Milk and cheese	Chicken and eggs.	-	Garlic
	Copper	Lemon.	Swiss chard and spinach.	Potato and shiket mushroom.	-	Soya bean and kidney bean	Almond, cashew, pumpkin seed, and flax seed.	-	Liver, beef, pork, chicken, and eggs	-	Cumin, red chili, mustard, and coriander.

(Contd....)

Chart 2: *(Continued)*

Food groups	Nutrient	Food Source									
		Fruits	Leafy vegetables	Other Vegetables	Grains	Pulses	Nuts and Seeds	Dairy products	Meat and meat products	Edible oils and fats and sweeten	Spices and Herbs
	Magnesium	Bananas	Kale, spinach, collard greens, turnip greens, and mustard greens.	Peas		Lentil, soybean, and chickpeas	Almond and cashew.		Fat fish		
	Iron	Watermelon	Mint leaves, Cowpea leaves, and Spinach	Coconut dried, moth beans, and Cauliflower	Beaten rice, oatmeal, and whole wheat flour	Roasted Bengal gram, lentil, and Kidney beans	Garden Cress seeds, pistachio, raisin, walnut, almond, and sunflower seeds, poppy seeds.	-	-	Jaggery	Turmeric powder,
	Selenium	Banana.	Spinach	Backed beans and mushroom	Oats meal	Lentil	Sunflower seed and Cashew.	Cottage cheese, Milk, and Yogurt	Pork, beef, chicken, and eggs		

Functional Foods	
Probiotics	Yogurt, Idli (rice cake), Indian cheese, fermented soybeans, green peas, pickles, buttermilk, and probiotic drink.
Antioxidant-rich foods	Kidney beans, raisin, barley, broccoli, tomato, and walnuts.
Omega 3 and omega 6 rich foods	Soybean, walnut, canola oil, flaxseed, eggs, mustard seed, spinach, cauliflower, tofu, safflower oil, hemp seed, sunflower seed, peanut butter, almond, and cashew.

In addition, this grimness may later stop and suffer for more than the actual well-being results of the pandemic.[31] This pattern is found in a few viewpoint pieces in this version; wherein, the beginning stages of the pandemic did not proclaim an increment in emotional well-being introductions. Notwithstanding, the transformation to the new conditions forced by COVID-19 has expanded jobs on the bleeding edge of psychological wellness. Moreover, the expected expansion in psychological instability, with potential additional expanded suicidality, is probably considered in the mid- and post-pandemic stage, as monetary constriction, obliged mental medical care assets, singular weaknesses, and unmistakable truth of significantly adjusted ways of life mix.[32] Optimizing hygienic and health during this pandemic require to relate lifestyle habits with dietary patterns, social, and behavioral influences. Psychological and emotional reactions can manifest as stress response that in many ways can be averted by adopting healthy eating habits and adequate physical activity.[33]

CONCLUSION AND RECOMMENDATION

Our insusceptible framework is relied on sustenance by supporting the resistant homeostasis for the duration of our life. This safe system relied more on nourishment in a portion of our life stages such as in newborn, pregnancy, and old age. Nourishment backing as a base of COVID-19 treatment influenced its prevention, yet, not a solitary food or dietary segment cannot inoculate us. Late reports have recognized certain gatherings at higher danger of COVID-19-related difficulties, with the older people and those with comorbidities, such hypertension, diabetes, and malignant growth, all the more seriously affected. These risk factors are related to insufficient healthy sustenance, which may adjust the well-being of people. Without a particular antiviral treatment for SARS-CoV-2, a few strong and helpful medicines are suggested. These incorporate corticosteroids, ascorbic acid supplements, and interleukin-coordinated treatments. The general point is to deal with the cytokine storm and the movement of contamination. Boosting our invulnerability is certifiably not a solitary day

task. Until now, the immediate job of nourishment and SARS-CoV-2 is not set up, thus more exploration is yet to be conducted. In this self-isolated time, we can keep up with our eating regimen as a sound measure that we, as a whole, accomplish to endure. To keep up with non-stop cleanliness, rehearsing and controlling our eating routines are the only choices, we can do in this pandemic.

ACKNOWLEDGMENTS

We acknowledge heartfelt thanks to Scholars and Professors of the University of Calcutta and CK Birla Hospitals Doctors and Staff for their continuous support and encouragement in this project.

The authors sincerely recognize the guidance of Professor Bibhuti Saha, Professor and Head, School of Tropical Medicine, Kolkata and Professor (Dr.) Arup Ratan Bandopadhyay, Professor of Biological Anthropology, University of Calcutta, India and Dr. Kamalesh Sarkar, Director, ICMR-NIOH, India.

Acknowledging the contributions of Enago (www.enago.com) for the English language review. Mrs. Priyanka Ghosh Sarkar contributed in the Spanish language review.

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Source of Support: Financial assistance was received from UPE 2, while a research grant and teachers' research grant were received from the University of Calcutta, **Conflicts of Interest:** None.
Ethical guidelines: This article is based on previously conducted studies and does not contain any studies with humans or animals performed by any of the authors.