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Nutritional Management of Covid-19 Disease

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Abstract: *This review deals with the relationship among nutrition, the immune system, and coronavirus disease 2019 (COVID-19). The influence of nutrients and bioactive molecules present in foodstuffs on immune system activity, the influence of COVID-19 on the nutritional status of the patients, and the dietary recommendations for hospitalized patients are addressed. Deficient nutritional status is probably due to anorexia, nausea, vomiting, diarrhoea, hypoalbuminemia, hypermetabolism, and excessive nitrogen loss. There is limited knowledge regarding the nutritional support during hospital stay of COVID-19 patients. However, nutritional therapy appears as first-line treatment and should be implemented into standard practice. Optimal intake of all nutrients, mainly those playing crucial roles in immune system, should be assured through a diverse and well-balanced diet. Nevertheless, in order to reduce the risk and consequences of infections, the intakes for some micronutrients may exceed the recommended dietary allowances since infections and other stressors can reduce micronutrient status. In the case of critically ill patients, recently published guidelines are available for their nutritional management. Further, several natural bioactive compounds interact with the angiotensin-converting enzyme 2 (ACE2) receptor, the gateway for severe acute respiratory syndrome (SARS) and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Natural bioactive compounds can also reduce the inflammatory response induced by SARS-CoV-2. These compounds are potential beneficial tools in the nutritional management of COVID-19 patients.*

Key Word*: COVID-19; SARS-CoV-2; nutrition; malnutrition; nutritional support; bioactive compounds*

Aims & Objectives: *To find out any connection between COVID-19 with diet, To establish proper dietary guide to COVID-19 patients.*

I. Introduction

On the twentieth of December 2019, an outbreak of pneumonia with an unknown cause occurred in Wuhan, Hubei Province, China, affecting more than 60 persons. The World Health Organization (WHO) was notified on December 31 by the Wuhan Municipal Health Committee that 27 people had been diagnosed with pneumonia of unknown origin, with seven of them severely ill [1]. The first cases of coronavirus disease 2019 (COVID-19) outside of China were reported in January: two in Thailand and one in Japan. The disease's rapid spread prompted the WHO to declare it a public health emergency of worldwide concern, citing the virus's potential impact on developing countries with little health infrastructure. By that time, the disease has been discovered in all of mainland China's provinces, as well as cases in 15 other countries. The disease had already spread to over 100 countries by March, and the WHO had declared it a pandemic. The number of confirmed cases is currently increasing.

COVID-19 is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), an enveloped positive-sense RNA virus that primarily affects the respiratory system, with droplet transmission being the primary mode of transmission. When SARS-CoV-2 attaches to angiotensin-converting enzyme 2 (ACE2) receptors in alveolar epithelial cells, the immune system responds by inducing inflammation and recruiting antigen-presenting cells. The condition might be asymptomatic or cause minor upper respiratory tract irritation, but it can also cause acute respiratory distress syndrome, heart failure, and septic shock in the most severe instances [2]. Multi-organ failure has also been documented as a result of uncontrolled acute inflammation as the disease progresses. Indeed, the uncontrolled inflammation that triggers an immune reaction against the virus causes pulmonary tissue damage, which lowers lung capacity. SARS-CoV-2 causes tissue damage at the alveolar level, which includes pathological alterations in the tissue, infiltration, and hyperplasia. Other characteristics that have been noted as typical in critically ill COVID-19 patients include immune cell infiltration into lung injuries, high levels of inflammatory response, thrombosis, and multi-organ failure [3].

Furthermore, the existence of other chronic conditions in the patient may increase the COVID-19-induced inflammatory response, raising the likelihood of severe consequences and mortality. In this context, systemic inflammation found in people with noncommunicable diseases (NCDs), such as diabetes, tends to exacerbate the infection's respiratory symptoms [4]. Excessive body mass index (BMI) and/or obesity, on the other hand, have been identified as risk factors for COVID-19-related problems, particularly in patients with reduced heart and lung function [5]. Similarly, the damage to blood arteries that is typical in people with diabetes and/or high blood pressure raises the risk of COVID-19-related thrombotic events in these individuals.

Because of the pandemic's novelty, scientists are now searching for effective vaccines and medications to treat the disease. One of the most difficult difficulties is to reduce inflammation without jeopardizing the patient's proper immunological response. In this situation, research should concentrate not just on developing efficient treatments, but also on improving nutrition. In the COVID-19 pandemic, the need of adequate nutritional status and dietary habits has been emphasized widely, not only as a means of preventing the existence of NCDs, which can lead to more severe infections, but also as a means of modulating the inflammatory status of the patients. Indeed, the importance of nutrition is undervalued in COVID-19 patients can dramatically affect the outcome of these patients [3,6].

II. The Role of Specific Dietary Nutrients on Immune System Function and COVID-19 Disease

Nutrition's impact on the immune system has been well documented. Furthermore, new research has underlined the importance of both a healthy nutritional status and the proper intake of certain nutrients in COVID-19. Nonetheless, because of the disease's novelty, knowledge on the effects of certain nutrients is limited, and some of it comes from ecological research. As a result, it appears possible that some of the information in this section will be changed in the future months as a result of the continuing research. Protein shortage has been related to weakened immune system function, owing to its detrimental effects on both the number of functional immunoglobulins and the lymphoid tissue in the stomach (GALT). Protein quality, in addition to quantity, is a crucial element in the interaction between this macronutrient and the immune system. In this vein, it has been suggested that adding high biological value proteins (such as those found in eggs, lean meat, fish, and dairy) that contain all of the essential amino acids may have anti-inflammatory properties. Furthermore, several amino acids, such as arginine and glutamine, are well known for their immune system modulating properties [7].

Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are omega-3 fatty acids that can inactivate enveloped viruses by changing the ideal host lipid environment for viral reproduction. EPA and DHA, on the other hand, block cyclooxygenase enzymes (COX) and may thus aid in the suppression of prostaglandin (pro-inflammatory) production [3]. Furthermore, they are transformed to pro-resolving mediators (SPMs) such as protectins, resolvins, and maresins, which reduce inflammation [8]. According to these findings, DHA and EPA supplementation may be beneficial in reducing the severity and/or improving the recovery of COVID-19 patients. Polar lipids, on the other hand, such as phospholipids, glycolipids, and sphingolipids (found in omega 3 fatty acid-rich foods like fish and fish oils) can inhibit platelet-activating factor (PAF) and its receptor, resulting in anti-inflammatory actions that may be useful in COVID-19. Furthermore, these lipid species have been shown to down-regulate enzymes involved in PAF manufacturing as well as up-regulate enzymes involved in its breakdown [9]. The inhibition of platelet activation may also help to reduce COVID-19-related thrombotic problems [3].

Carbohydrates and dietary fiber have also been linked to immune system performance. When it comes to carbohydrates, those with higher glycemic indices (highly processed carbs) can cause mitochondrial overload and subsequent free radical production. Consumption of these carbs has been linked to higher levels of inflammatory cytokines such C reactive protein (CRP), tumor necrosis factor alpha (TNF-), and interleukin-6 (IL-6) in the blood [10]. Because of the inflammatory state that often occurs with respiratory illnesses like COVID-19, restricting the consumption of foods high in these carbs may be a good idea.

Fiber's relevance in maintaining proper metabolic function has long been recognized. A sufficient fiber intake (25–35 g/day) has been shown in several trials to help reduce both systemic and intestinal inflammation. Consumption of high-fiber meals has been linked to reduced levels of inflammatory cytokines (CRP, TNF-, and IL-6) as well as higher levels of short-chain fatty acids (SCFAs) [7]. Different SCFAs (acetate, propionate, and butyrate) have been shown to have a direct anti-inflammatory effect by blocking the production of pro-inflammatory chemicals and lowering the expression of nuclear factor B (NF-B) in this regard. Furthermore, SCFAs contribute to the maintenance of a healthy gut microbiota by boosting diversity and promoting the presence of particular health-associated bacteria [11]. Nasopharyngeal microbiota, in addition to gut microbiota, may play a role in respiratory infections. Indeed, this type of infection has been linked to changes in gut microbiota and innate immune system response [12]. Given that COVID-19 has been linked to respiratory and gastrointestinal symptoms, it's possible that gut microbiota dysfunction could occur, leading to an increase in inflammatory status.

Vitamins A, C, D, E, B6, B12, and folate, as well as iron, magnesium, and trace elements including zinc, selenium, and copper [13,14], all play a role in disease susceptibility and immune function maintenance [15]. Deficiencies and/or inadequate status in certain nutrients can have a deleterious impact on the immune system, resulting in a reduction in infection resistance.

Because they are involved in cytokine production, lymphocyte differentiation and proliferation, antibody creation, and memory cell generation, the vitamins and minerals mentioned are crucial for adaptive immunity. They also contribute to the maintenance and development of physical barriers and differentiation of innate cells, the production and activity of antimicrobial proteins, neutrophil and macrophage phagocytic activities, and the regulation of the overall inflammatory response in terms of innate immunity.

The use of vitamin C as a cold cure has been the subject of extensive research for decades [3]. There is currently no data to support the supplementation of COVID-19. In this regard, a clinical trial in Wuhan (China) is examining the efficacy of vitamin C (24 g/day for 7 days) in 140 patients with severe COVID-19 (Identifier: NCT04264533) [16].

The link between vitamin A and infections has been studied extensively. Vitamin A is important in the treatment of respiratory infections because it aids in the production of a healthy mucus layer and enhances antigen non-specific immune response [17]. Indeed, vitamin A insufficiency has been linked to histological changes in the pulmonary epithelium and parenchyma, resulting in reduced respiratory performance [18]. As a result, to avoid future difficulties in the case of COVID-19, adequate intakes of this vitamin should be ensured.

The link between vitamin D deficiency and respiratory infections and lung damage has long been known. Vitamin D agonists have been proven to be useful in treating the aforementioned diseases [19]. Furthermore, previous studies have shown that high-dose vitamin D supplementation (250,000–500,000 IU/day) is safe and effective in improving the health status of mechanically ventilated critically ill patients (improving blood oxygen transport capacity and increasing haemoglobin levels), leading to shorter hospital stays [20].Vitamin E has been related to the correct function of the humoral and innate immune functions. Indeed, the ability of vitamin E to scavenge reactive oxygen species (ROS) plays an important role in oxidative stress reduction, exerting anti-inflammatory effects. In addition, vitamin E also protects polyunsaturated fatty acids (PUFAs) and immune cells from oxidation. To date, there is little evidence regarding the use and/or dosage of vitamin E as a prophylactic or therapeutic agent against COVID-19.

In COVID-19, iron is a nutrient with a variety of effects. On the one hand, the need of iron for proper immune system function is well understood. Iron-containing enzymes, on the other hand, are well known to be required for the completion of the virus replication process, particularly in coronaviruses [21].

Uncontrolled diabetes mellitus in ketoacidosis, other forms of metabolic acidosis, corticosteroid treatment, organ or bone marrow transplantation, neutropenia, trauma and burns, malignant hematologic disorders, and deferoxamine therapy in hemodialysis patients are all major risk factors for mucormycosis (Tewari et al., 2021) [68].

III. Recommendations for Nutritional Treatment

In this condition patient should take therapeutic diet. Therapeutic diet is a diet which is given to the patient who is suffering from any type of disease condition (Tewari, 2019) [66]. A well-balanced diet will help you maintain a robust immune system that will help you withstand any virus attacks. Except for Vitamin C, there is currently no evidence that any supplement may ‘boost' our immune system or treat or prevent viral infections [22]. Vitamin C is one of the most important water-soluble vitamins for maintaining a healthy immune system. Vitamin C has a daily recommended dietary requirement of 90 milligrams per day for men and 75 milligrams per day for women. In order to combat COVID-19 in the current circumstances, it is vital to be aware of the specific forms of food that might enhance our immune system. [23] To combat COVID-19, here are some professional and authentic dietary guidelines[24]:

- Eat fruits daily (guava, apple, banana, strawberry, cantaloupe melon, grapefruit, pineapple, papaya, orange, Longman fruit, blackcurrant, pummelo) with a serving size of two cups (4 servings).
- Eat fresh vegetables (green bell peppers, garlic, ginger, kale, lime, coriander (dried), broccoli, green chili pepper) 2.5 cups of vegetables (5 servings) legumes (beans and lentils).

- Eat whole grains and nuts, 180 g of grains (unprocessed maize, oats, wheat, millet, brown rice or roots such as yam, potato, taro or cassava)
- Use nuts like almonds, coconut, and pistachio.
- Red meat can be eaten once or twice per week, and poultry 2−3 times per week. Use foods from animal sources (e.g. fish, fish, eggs, and milk) and 160 g of meat and beans.
- For snacks, choose fresh fruits and raw vegetables rather than foods that are high in sugar, salt or fat. Avoid irregular snacking.
- Do not overcook vegetables as it leads to the loss of important nutrients such as vitamins and minerals.
- When using dried or canned fruits and vegetables, choose varieties without added sugar or salt.
- Make sure the food is prepared and served at acceptable temperatures (≥72°C for 2 mins).
- Limit the salt intake to five g a day.
- Consume unsaturated fats (found in avocado, fish, nuts, soy, olive oil, canola, corn oil, and sunflower) rather than saturated fats (found in butter, fatty meat, coconut and palm oils, cheese, ghee, and cream).
- Drink 8–10 glasses of water every day. It helps to transport nutrients in the blood, gets rid of waste, and regulates the body temperature.
- Avoid all fizzy, carbonated, concentrated juices, and all drinks which contain sugar.
- Maintain a healthy lifestyle of exercise, meditation, and regular sleep. Adequate sleep will help to support immune functioning.
- Eat at home to avoid contact with other people and try to reduce the chance of being exposed to COVID-19.

IV. Practical guidance of the nutritional treatment of the patients with COVID-19 in the ICU

Based on the recommendations of the European Society for Clinical Nutrition and Metabolism (ESPEN) on nutrition in the ICU [25], a COVID-19 patient's nutrition protocol is proposed in. The main specificities are listed below and then further discussed:

- COVID-19 patients should be considered for malnutrition.
- Nutritional evaluation based on the Global Leadership Initiative on Malnutrition (GLIM) [26] should be adapted to the COVID-19 epidemic.
- Indirect calorimetry should be proposed only for patients staying for more than 10 days in the ICU or those on full parenteral nutrition (PN) to avoid overfeeding.
- Refeeding syndrome (RS) [27] and complications related to propofol use must be prevented.
- Enteral nutrition (EN) should be preferred over PN and started within 48 h of admission.
- Gastric EN is generally possible, including in the prone position, and should be preferably performed using a pump with flow regulator.
- PN is indicated if EN is impossible, contraindicated, or insufficient and should be prescribed using a case-by-case decision making.
- The use of EN enriched with omega-3 fatty acids should be preferred in case of ARDS. Fish oil-enriched intravenous fat emulsions should be prescribed if PN is required.
- After extubating, the nutritional support is promoting patient's recovery and rehabilitation and should be continued until the patient resumes sufficient oral intake.

V. Nutritional Considerations in COVID-19 Patients During the Post-ICU Phase

Here are some practical recommendations for post-ICU nutrition:

- Use ESPEN guidelines for the nutritional management of individuals with SARS-CoV-2 infection[28].Avoid premature removal of feeding tubes until patients have demonstrated ability to meet most of their requirements. If a patient is eating 3 days, enteral nutrition should be commenced.
- Focus on practical issues. If they cannot eat enough, proactively provide oral nutritional supplements. To rebuild muscle mass and function, patients will need ongoing nutrition support, likely oral nutritional supplements and those with leucine and Vitamin D.
- Utilise a crisis situation to learn and apply new protocols, improve decision making, use telemedicine etc.
- Follow-up on survivors and monitor their nutritional information, including their intake, body weight and muscle mass.

- Provide patients relevant and practical nutritional related information at discharge. This is to ensure patients and carers are aware of what is required and why, and especially to support compliance to eating sufficiently at meals or additional nutrition support measures such as oral nutritional supplements or enteral nutrition.
- Use home enteral nutrition programmes. Only when proactive feeding strategies are used (longer EN, overnight EN or oral nutritional supplements), are patients likely to meet their nutritional needs[29].

VI. Nutritional management of older people

Population aging is a global trend and although it is a positive that most people live longer it also presents challenges with respect to health, quality of life, and economics.[30] The World Health Organisation (WHO) criteria on aging set the beginning of old age at 65 years, followed by the early elderly stage between 65 and 74 years, and 75+ years is considered late elderly.[31]

Healthy aging can be described as "leading a healthy, active, social and independent life in late years, through maintaining vitality and good quality of life for as long as possible." [30]

Nutrition is an area that can be addressed to benefit older people and enhance healthy aging in a population. With aging, there is also an increased likelihood of developing. [32]

- Chronic diseases
- Decreased functional ability
- Cognitive decline
- Disability

Factors associated with aging that leads to inadequate nutrient intake are[30]:

- Impaired appetite
- Reduced food intake
- Repetitive dietary choices

these will have consequences on:

- Weight
- Nutritional status
- Quality of life
- Mortality risk

Aging adults are more susceptible to [30]:

- A decrease in body weight
- A loss of muscle mass

Impaired appetite in older people may lead to reduced food intake. This can result in difficulties achieving recommended intakes for macro-nutrients such as protein and micro-nutrients such as vitamin D. This leads to reduced body weight and muscle mass.[30]

Good protein intake is necessary for older people to support [33]:

- Healing
- Skin integrity
- Immunity
- Recovery from illness

The recommended protein reference nutrient intake is 0.8 g protein/kg body-weight in healthy adults of all ages.[34] There are emerging evidence-based studies that recommend that increased protein intake may be beneficial to older people, especially those with chronic diseases.[35]

Calcium and Vitamin D are recommended for older people to[36]:

- Prevent bone loss
- Maintain existing bone density

This may reduce the risk of falls and fractures.[36]

Intakes higher than the recommended nutritional intake have been shown to be beneficial for Vitamins A, B, E, Calcium, and Zinc.[37]

Causes of nutritional deficiencies such as physical and physiological changes in the body may lead to a reduced metabolic rate and loss of muscle mass in older people. This can lead to sarcopenia (the progressive depletion of muscle mass and loss in strength, which is associated with a risk of adverse outcomes) in older people.

The coronavirus effects on immune systems in human body. This virus is mainly breakdown the balance of immunity, so in this condition, people have to maintain immunity and should increase immune power to fight against coronavirus (Tewari et al., 2020) [67].

VII. Immune-Boosting, Antioxidant and Anti-Inflammatory Food Supplements against COVID-19

In the following section, the beneficial effects of some of the nutrients are described.

Curcumin: Curcumin has a broad spectrum of biological actions, including antibacterial, antiviral, antifungal, antioxidant and anti-inflammatory activities [38]. It inhibits the production of pro-inflammatory cytokines (IL-6 and TNF- α) in lipopolysaccharide (LPS)-stimulated BV2 microglial cells [39]and IL- 1β and IL-6 in TNF-α treated HaCaT cells via inhibiting the NF- κB and MAPK signaling pathways [40]. The curcumin also inhibits cyclooxygenase-2 (COX-2), as well as STAT signaling pathways [41]. Curcumin exerts antiviral effect on a broad range of viruses including influenza virus, adenovirus, hepatitis, human papilloma virus (HPV), human immunodeficiency virus (HIV), herpes simplex virus‒2 (HSV-2) and Zika viruses [42]. It exerts antiviral effect by various mechanisms ranging from inhibiting the virus entry into cells, inhibiting encapsulation of the virus and viral protease, inhibiting the virus replication, as well as modulating several signaling pathways [43]. Recent study has shown that curcumin potentially inhibits ACE2, modulates characteristics of lipid bilayer, as well as viral S protein inhibiting entry of virus into cells [43,44], inhibits the viral protease [45], stimulates host interferon production to activate the host innate immunity [44], etc. Furthermore, curcumin is a potent antioxidant. It exerts its antioxidant effects both by neutralizing free radicals and enhancing the production of antioxidant enzymes [46-49]. These studies reveal potential immune-boosting, antioxidant and anti-SARS-CoV-2 effects of curcumin. Therefore, curcumin could be a potential supplement in combating the COVID-19 pathogenesis.

Cinnamaldehyde: Cinnamaldehyde is a naturally occurring chemical molecule found in abundance in cinnamon essential oils. Cinnamon's flavor and odor are primarily derived from the trans-isomer form of it[50]. Cinnamaldehyde is a well-known phytonutrient with anti-inflammatory activity in the diet. Cinnamaldehyde suppresses TNF-induced inflammation via suppressing NF-B activation, according to a study by Liao et al. [51]. Endotoxin-mediated hyperexpression of TLR4 and the NOD-, LRR-, and pyrin domain-containing protein 3 (NLRP3) inflammasome signaling pathways have also been found to be suppressed in studies [52]. Cinnamaldehyde is also known to inhibit the formation of prostaglandins (PGEs) in a dose-dependent way by inhibiting IL-1-induced COX-2 activity and therefore reducing the risk of excessive inflammation [53]. All of the evidence suggests that cinnamaldehyde is a possible anti-inflammatory bioactive molecule that could help reduce SARS-CoV-2-induced lung hyperinflammation.

Allicin: Garlic is a well-known plant/ herb classified under Allium (onion) family and has been used from ages for its several nutraceutical properties. The predominant thiosulfinate in fresh garlic extract identified as allicin, has shown a number of health benefits due to its anti-inflammatory, antioxidant and antiviral properties. Allicin suppresses the inflammation via inhibiting the TNF-α induced expression levels of IL-1β, IL-8, IP-10, and IFN-γ and also through suppression of degradation of NF-κB inhibitory protein IκB in intestinal epithelial cells [54]. It inhibits inducible NO nitric oxide synthase expression in activated macrophages [55,56]. Several garlic associated compounds have found to possess a strong viricidal activity against a wide range of viruses including parainfluenza virus type 3, human rhinovirus, herpes simplex virus (HSV)-1, HSV-2, and vesicular stomatitis virus (VSV). Some of the garlic compounds that show viricidal activity are ajoene, allicin, allyl, methyl thiosulfinate and methyl allyl thiosulfinate[57,58]. Most of the above-mentioned functional effects were observed at 200 ng/ml concentrations. Studies also have found that only fresh samples with no processing such as heat induction or drying were successful to induce most of the biological activities of garlic [59]. Therefore, fresh garlic extract may be useful as a prophylactic against COVID-19.

Piperine: Black pepper has been used in numerous cuisines for a long time, and it has a special place among medicinal herbs. Piperine is a prominent alkaloid of the cinnamamides group that is produced from an ethanolic extract of black pepper[60]. Piperine has a high anti-inflammatory effect and can thus be repurposed for the inhibition of COVID-19-induced hyper inflammation. It inhibits the expression of IL-6 and matrix metalloproteinases (MMP-13), which lowers PGE levels [60]. Piperine is known to suppress LPS-induced production of IRF-1 and IRF-7 mRNA, phosphorylation of IRF-3, type 1IFN mRNA, and down-regulation of STAT-1 activity [61]. It also improves innate immunity by boosting phagocyte phagocytic activity. Piperine suppresses LPS-induced TNF-, IL-6, IL-1, and PGE2 production in BV2 cells, according to a few investigations conducted on microglial cells [62]. In human peripheral blood mononuclear cells (PBMCs), it was also discovered to decrease the production of IL-2 and IFN- [63]. In the brain ischemia-reperfusion-induced inflammation rat model, piperine administration was observed to lower the production of pro-inflammatory cytokines such as IL-1, IL-6, TNF-, COX-2, nitric oxide synthase-2, and NF-B. These findings point to piperine's potent anti-inflammatory properties. Piperine is also a powerful antioxidant that protects against oxidative damage by neutralizing free radicals, reactive oxygen species (ROS), and hydroxyl radicals. It has an IC50 of 1.82 mM for scavenging superoxide radicals and a 1.23 mM for inhibiting lipid peroxidation. These findings suggest that piperine has a direct antioxidant impact on a variety of free radicals [65]. Piperine can be used as a prophylactic or therapeutic agent to protect against oxidative stress and excessive inflammation generated by the COVID-19 because of these qualities.

VIII. Conclusion

Finally, because to the situational stress-eating caused by the quarantine, nutrition becomes a concern at this time. Because food stores remain open throughout the quarantine, many people are likely to have much of what they need at home. There is no need to rush out and buy goods, which could contribute to the spread of COVID 19. Keeping foods that are good sources of immuno-supportive nutrients on hand, organizing meal times, amounts, and having a cut-off time for eating, as well as keeping a happy mindset in mind, could all be beneficial in combating the bad health impacts of quarantine. To limit the possibility of viral spread, guidelines for safe food handling from manufacturing to consumption are essential. The general guideline is to eat a diet rich in fresh foods such fruits, vegetables, whole grains, low-fat dairy, and healthy fats (olive oil and fish oil), while limiting sugary drinks and high-calorie, high-salt processed meals. Individuals with or at risk of respiratory viral infections, as well as those who have a deficiency, should take dietary supplements (vitamins C and D, zinc, and selenium). Breast milk is the safest and healthiest meal for babies, and it should be encouraged even in women who have COVID-19.

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