COVID19 Infection——Recommendations for Nutritional Adjuvant Therapy in Elderly Patients

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Abstract. New coronaviruses are wreaking havoc all over the world. The elderly have the highest number of coronavirus infections and the longest duration of illness, and they are more prone to acute respiratory distress syndrome, shock, metabolic acidosis, coagulation disorders, and multi-organ failure. They are also the most likely to suffer from the sequelae of chronic illnesses after recovering from the disease. The elderly have a significantly greater risk of obtaining new coronavirus infections as well as chronic illnesses due to the natural decrease of their immune systems that comes with advancing age. As a result, it is of the utmost importance to broaden the use of nutritional adjuvant treatment in order to revive the immune systems of aged patients. The findings of a literature review on the effects of nutritional adjuvant therapy and multiple micronutrients on elderly patients infected with new coronaviruses indicate that micronutrient supplementation and nutritional adjuvant therapy are essential for elderly patients infected with new coronaviruses.

Keywords: Coronavirus, micronutrients, elderly health, nutritional adjuvant therapy.

1. Introduction

COVID-19 is the term given to pneumonia brought on by a new coronavirus infection by the World Health Organization (WHO). According to case studies, upper respiratory symptoms such nasal congestion, runny nose, diarrhoea, and gastrointestinal issues may occur in a small proportion of patients with pneumonia brought on by new coronaviruses, along with fever, dry cough, and malaise. Within a week of respiratory distress, patients may get acute respiratory distress syndrome, septic shock, untreatable metabolic acidosis, hemorrhagic coagulopathy, and multi-organ failure. In 16 nations or areas throughout the globe, more than 10 million new cases of influenza have been confirmed since the pandemic began. Worldwide, there have been more than 690 million confirmed cases as of June 20 at Beijing time, and there have been more than 6.89 million confirmed fatalities. Even people who have recovered from the illness may have complications such as fatigue, respiratory issues, and heart issues. The elderly, in particular, are at high risk for nutritional risks and malnutrition, they usually have underlying medical conditions and relatively weakened immune systems, and the loss of appetite and gastrointestinal symptoms caused by the underlying medical conditions and neo-coronavirus infections further exacerbate the occurrence of malnutrition, studies have shown that malnutrition is as high as 52.7 per cent of the elderly patients with neo-coronavirus infections, and malnutrition adds to the symptoms of the neo-coronaviral condition, or Malnutrition can increase symptoms of recurrent coronary disease, or make a person more susceptible to complications and increase the likelihood of developing cardiovascular, cerebrovascular, hypertensive and other chronic diseases.

Nutritional immunity is a crucial element in the treatment of Covid-19 and in the prevention of chronic illnesses after healing, in addition to immunization and treatments that have been shown to be useful. A sufficient quantity of diverse nutrients is necessary to sustain the immune system and enable it to function to its maximum capacity since innate immunity serves as the body's first line of defense against invasive invaders [1]. Numerous scientific studies have shown that a variety of vitamins (A, B6, B12, folic acid, C, D, and E) and trace minerals (zinc, copper, selenium, and iron) are crucial for boosting immunity and lowering the risk of illness. Following an infection with a new

coronavirus, it is critical to ingest sufficient quantities of key micronutrients in order to provide the immune system the support it requires in order to combat the infection [2]. This essay seeks to summarize the contribution of micronutrients to older individuals' response to COVID-19 infection and to post-recovery prevention of chronic illness.

2. Characteristics of the Condition of Elderly Patients

In terms of laboratory testing, the percentage of elderly patients with elevated leukocyte and neutrophil counts was substantially greater than in the groups of young and middle-aged patients combined. This suggests that older patients among 2019-nCoV-infected patients are more susceptible to bacterial infections. In addition, there are older patients with a decreased percentage of lymphocytes, which is much higher than that of the young and middle-aged patients. This could be due to changes in the lung anatomy of older people.

Atrophy of the muscles causes changes in respiratory physiology, including a narrowing of the airways, a reduction in lung reserve function, and a weakening of the defense barrier function. On imaging, the frequency of multilobar lesions was substantially greater in old patients than in young and middle-aged patients; similarly, C-reactive protein levels were significantly higher in elderly patients than in young and middle-aged patients.

According to research studies, the new coronavirus pneumonia epidemic has resulted in an exponential increase in the detection of anxiety symptoms in the elderly population when compared to the usual rate, and attention should be paid to the psychological state of the elderly in rural areas, as well as those who are medically isolated themselves or have someone close to them.

3. Reasons why Older People are More Susceptible to Infections

During the COVID pandemic, the demographic mix of the number of cases and fatalities changes greatly. Older age groups have the greatest incidence rates. With age, the immune system goes through a variety of physiological changes, and decreased immunity is one of the causes leading to an increased risk of viral infections, cancer, and autoimmune illnesses. The immune system's capacity to combat latent infections and new infections with new coronaviruses, as well as react effectively to immunizations, reduces with age. A rise in blood inflammatory mediators such IL-6, IL-1RA, TNF-a, IL-1, and C-reactive protein (CRP) is a defining aspect of the immunosenescence process [3].

4. Guidelines for the Treatment of Pneumonia

COVID-19 is the term given to pneumonia brought on by a new coronavirus infection by the World Health Organization (WHO).

According to Expert Consensus on Diagnosis and Treatment of Severe Pneumonia in New Coronavirus Infections in Shandong Province (First Edition), the treatment of neo coronavirus infection pneumonia includes general therapy, oxygen therapy, antiviral therapy, immunotherapy, anticoagulation therapy, and immunonutrition therapy [4].

The metabolic state of patients with severe and critical neo coronavirus infection changes rapidly after infection and is characterized by hypermetabolism, resulting in increased net nitrogen loss and negative nitrogen balance. Therefore, early nutritional risk assessment and treatment (nutritional therapy can be started within 24 ~ 48 h of ICU admission) is recommended for heavy and critical patients with new coronavirus infection. Heavy and critically ill patients often have difficulty eating orally, and the nasogastric tube route is preferred for patients with good gastric dynamic emptying function, and the Nas jejunal tube route is preferred for patients with impaired gastric emptying. Enteral nutrition should be used when the intestines are functional and can be used safely. Parenteral nutrition can be given to those who cannot tolerate enteral nutrition with full thermocarb tube feeding, i.e., enteral nutrition is preferred [5]. Nutritional therapy target for the early ICU (week 1) nutritional therapy target intake calories for 20 ~ 25 kcal/kg (if BMI < 30 kg/m^2, according to the actual body

mass; obese patients according to the corrected body mass); admitted to the ICU late, according to the clinical manifestations of the patient to increase calorie intake, to reach 30 ~ 35 kcal/kg. daily protein intake of 1. 2 ~ 1.5 g/kg [6,7].

The treatment of pneumonia in the elderly should be evaluated and guided by a healthcare professional based on the patient's specific situation. Therefore, it is recommended that older adults work closely with their physicians and follow their professional guidance when treating pneumonia.

5. The role of Micronutrients in Therapy

Micronutrients are important dietary components that contribute to the metabolic processes of carbohydrates, proteins and lipids. In addition, they contribute significantly to the enhancement of immune function and play important roles in antioxidant mechanisms, endocrine regulation, DNA synthesis and repair, and cell signaling pathways. Micronutrients are small amounts of essential nutrients (trace elements and vitamins) that are normally required by living organisms. The following is an introduction to six micronutrients and their functions.

5.1. Vitamin C

Vitamin C has antioxidant properties that can help neutralize free radicals and reduce cell and tissue damage from oxidative stress. This helps protect cells from damage, benefiting health and preventing chronic disease. For older patients, the new coronavirus may exacerbate chronic conditions that they themselves suffer from, making VC supplementation necessary.

VC is essential for the proper functioning of the immune system. It promotes the function of white blood cells, enhances antibody production and improves the body's defense against pathogens. Vitamin C assists in strengthening the immune system's resistance and reduces the risk of infection [8].

Vitamin C is an essential nutrient for the synthesis of collagen. Collagen is one of the most abundant proteins in the body and is essential for maintaining healthy connective tissue, skin, bones, blood vessels and teeth. Vitamin C is involved in the synthesis and maintenance of collagen and helps support the structure and function of these tissues.

VC enhances the absorption of non-heme iron. Non-heme iron is found primarily in plant foods such as grains, legumes and vegetables. It binds to non-heme iron and promotes its absorption and utilization, helping to prevent iron deficiency anemia. Reducing the symptoms of anemia is good for strengthening the immune system and helping patients recover better.

Vitamin C also plays an important role in the nervous system. It is involved in the synthesis and regulation of neurotransmitters, which helps to maintain the proper function and health of the nervous system.

Overall, vitamin C plays an important role in your health. It has a variety of roles including antioxidant, immune support, iron absorption and anti-aging. Maintaining a proper vitamin C intake is important for maintaining adequate antioxidant capacity, immune function and tissue health. The best way to get vitamin C is through a diverse array of fresh fruits, vegetables and supplements.

5.2. Vitamin D

Vitamin D plays a key role in the absorption and metabolism of calcium and phosphorus. It helps promote calcium and phosphorus absorption and calcium deposition in the bones, helping to maintain bone health and strength. Vitamin D deficiency may lead to bone problems such as osteochondrosis, rickets and osteomalacia.

VD plays an important role in the immune system. It is involved in regulating the function of immune cells and plays a key role in maintaining immune balance and defense against infection. Proper vitamin D levels help to enhance immune function and reduce the risk of autoimmune diseases. It is thought to have a regulatory role in the immune system and may help increase the body's

resistance to viruses. In addition, vitamin D is involved in the regulation of the inflammatory response and immune cell function, helping to reduce pathological processes [9].

Vitamin D is closely linked to cardiovascular health. Proper vitamin D levels are associated with a reduced risk of hypertension, coronary heart disease and heart disease. It is also involved in regulating the function of blood vessel walls and inflammatory responses, helping to maintain the normal function of the cardiovascular system. Individuals with cardiovascular disease (e.g., high blood pressure, heart disease, etc.) may face a higher prevalence and severity of neo coronavirus infection. Therefore, maintaining normal cardiovascular function may reduce the risk of infection with neo coronaviruses and reduce the severity of the disease if infection occurs.

Vitamin D is a specialized vitamin, and humans synthesize its precursors primarily through skin exposure to sunlight, and can also ingest it through certain foods and supplements. However, vitamin D insufficiency is a common problem, especially among people who are less exposed to sunlight or who do not consume enough. Vitamin D supplementation may be recommended on the advice of a healthcare professional.

However, it is worth noting that excessive vitamin D intake may also be dangerous. Consultation with a healthcare professional is recommended to understand the individual recommended vitamin D intake and to evaluate and adjust it according to the individual's health status.

5.3. Vitamin E

Vitamin E is a powerful antioxidant that helps neutralize free radicals in the body and reduces cellular damage caused by oxidative stress. It helps protect cell membranes, DNA and other important molecules from oxidative damage.

VE is closely linked to cardiovascular health. It helps prevent the development of atherosclerosis, reduces inflammation and oxidative stress in the lining of blood vessels, and lowers the risk of heart disease and stroke [10].

Vitamin E is critical to the function of the immune system. It enhances the activity of immune cells, promotes antibody production, and improves the immune response to pathogens. Proper vitamin E intake helps boost immunity and resistance to disease.

VE is believed to have a role in anti-aging. It can help reduce cell and tissue damage from oxidative stress, slow the aging process, and protect the health and elasticity of skin and other tissues.

VE can be consumed through foods such as nuts, seeds, vegetable oils (such as olive and sunflower oils), green leafy vegetables and whole grains. In general, a balanced dietary intake of vitamin E usually meets the body's needs. However, in special cases, such as gastrointestinal absorption problems or specific diseases that result in the need for increased vitamin E requirements, medical professionals may recommend vitamin E supplements.

5.4. Zinc

Zinc is essential for the proper functioning of the immune system [11]. It promotes normal development and function of immune cells and is involved in antibody production. Zinc not only strengthens the body's resistance and helps to fight off infections, but also plays an important role in wound healing and the regulation of inflammation.

Zinc is a component or cofactor of a number of enzymes involved in many biochemical reactions. These enzymes are essential for important physiological processes such as protein synthesis, nucleic acid metabolism and energy production. The presence of zinc promotes the activity of these enzymes and helps maintain normal cellular function and metabolic processes. Maintaining normal cellular function and metabolism helps to improve the body's immunity and overall health, resulting in better protection against new coronavirus infections.

Zinc is an essential element in the process of DNA synthesis. It is essential for maintaining the structure and stability of DNA strands and is involved in the regulation of gene expression. A proper supply of zinc helps maintain DNA integrity and normal cellular function. New Coronavirus infections have a direct effect on cells, involving changes in DNA replication, protein synthesis and

cellular function within the cell. Therefore, maintaining DNA integrity and normal cellular function strengthens the body's defense against viral infection and accelerates the recovery process.

Zinc is also important for oral health. It is involved in the growth, repair and maintenance of oral tissues and is essential for the health of teeth, gums and oral mucosa. The presence of zinc is protective against mouth ulcers, gingivitis and tooth decay.

Maintaining an adequate zinc intake is essential for the maintenance of immune function, enzyme reactions and oral health. Zinc can be consumed through dietary sources such as meat, seafood, legumes, nuts and whole grains.

5.5. Calcium

Calcium is a major component of bones and is essential for maintaining their health and strength. Adequate calcium intake helps prevent osteoporosis and increased risk of fractures. In addition, calcium is involved in muscle contraction and nerve conduction.

Ca is an important ion in the process of nerve conduction [12]. It is involved in potential changes inside and outside of nerve cells, contributing to the transmission and regulation of nerve signals. Proper calcium levels are essential for the proper function and health of the nervous system. New Coronavirus infections have a direct effect on cells, involving changes in DNA replication, protein synthesis and cellular function within the cell. Therefore, maintaining DNA integrity and normal cellular function strengthens the body's defense against viral infection and accelerates the recovery process.

Calcium plays a key role in heart muscle contraction. It is involved in regulating the contraction and diastole of the heart muscle cells and helps maintain normal heart function and rhythm.

Ca is involved in the activation of clotting factors during blood clotting. It plays an important role in the wound healing process, helping to form blood clots to stop bleeding. Calcium deficiency may lead to abnormalities in blood clotting. Neo coronavirus infection may lead to blood clot formation and abnormal coagulation phenomena, which in turn increase the risk of complications such as deep vein thrombosis and pulmonary embolism in patients. Therefore, calcium supplementation is important for the normal regulation and control of coagulation with the treatment and prevention of neo coronavirus infection.

Ca is involved in a variety of intracellular signaling and regulation, including the processes of apoptosis (programmed cell death), cell differentiation, and cell proliferation. The presence of calcium is important for the maintenance of normal cellular function and biological activity, and enhances immunity and suppresses inflammation.

5.6. Iron

It is a component of hemoglobin and myoglobin, which are protein molecules within red blood cells responsible for transporting oxygen to various tissues and organs in the body [13]. Proper iron intake helps maintain normal oxygen supply and metabolic function. Adequate oxygen supply is essential to maintain normal cellular function during neo coronavirus infection.

Iron is an important coenzyme for many enzymes and is involved in key reactions during energy production. It plays an important role in cellular respiration and oxidative phosphorylation, helping cells to produce energy.

Iron is essential for the normal function of the immune system. It is involved in the normal development and function of immune cells and promotes the immune response against infection. A proper supply of iron helps boost immunity and fight disease.

Iron is one of the elements necessary for DNA synthesis and is involved in DNA synthesis and repair processes in cells. In addition, iron plays an important role in maintaining normal cell division and stability of genetic material.

Iron is also important for the function and development of the nervous system. It is involved in the synthesis and storage of neurotransmitters, which contribute to normal nerve conduction and maintenance of brain function.

The coexistence of multi-system diseases in the elderly leads to complexity and multiple disease interactions. Patients with dysregulated inflammatory responses are likely to have severe deficiencies in a wide range of micronutrients, and experts recommend appropriate nutritional supplementation to be initiated in high-risk areas and/or shortly after suspected SARS-CoV-2 infection. Nutritional adjuvant therapy should be prioritized for high-risk groups and should be initiated prior to specific and supportive medical measures.

6. Dietary patterns

In the case of older adults with neo-coronary pneumonia, nutritional therapy with the Mediterranean diet is recommended as one of the main strategies that can be beneficial. However, the specifics should be determined in the context of the individual's health status and the recommendations of the healthcare professional.

The Mediterranean diet is known for its rich source of antioxidants, anti-inflammatory components, and vitamins and minerals that help support the immune system, reduce inflammatory responses, and improve overall health [14].

However, when older adults are suffering from neuronitis, their nutritional needs may change. During treatment, special attention is paid to ensuring that older patients maintain good water intake to help maintain levels and prevent dehydration. Protein is important for muscle health and rehabilitation in older adults. Ensure adequate protein intake to support immune function and muscle recovery. In conditions of impaired appetite or syncope, food intake needs to be moderately controlled to prevent over- or under-eating.

When preparing and handling food, it is important to observe food safety to avoid cross-contamination and food poisoning [15].

Most importantly, older adults with nociceptive pneumonia require close monitoring and individualized care. Therefore, it is advisable to work with healthcare professionals (e.g., physicians, dietitians) when developing a nutritional treatment plan that is evaluated and adapted to the patient's specific condition. They will be able to provide specialized advice based on medical knowledge and individual health conditions.

As shown in the table 1 below, the recommended nutritional intake of micronutrients, their roles and recommended foods for the elderly are organized according to the table of Dietary Nutrient Reference Intakes for Adult Chinese Residents published by the Chinese Nutrition Association.

Table 1. Micronutrient, RNI, role and recommended food

Micronutrients	RNI	Role	Recommended Food
Vitamin C	100(mg/d)	Antioxidant effects Immune support Iron absorption Anti-aging Nervous system function	Fresh fruits and vegetables
Vitamin D	15(ug/d)	Bone health Immune regulation Cardiovascular health Nervous function Muscle function	Fish, eggs, dairy
Vitamin E	14(mga-TE/d)	Antioxidants Maintaining cardiovascular health Immune support Anti-aging effects	Nuts, seeds, vegetable oils (such as olive and sunflower oils), green leafy vegetables and whole grains
Zinc	10 (mg/d)	Immune function Enzyme reactions Growth and development DNA synthesis Oral health	Meat, seafood, beans, nuts and whole grains
Calcium	1000(mg/d)	Bone health Nerve conduction Heart function Blood coagulation Maintenance of cell function	Dairy, fish, soy products
Iron	12 (mg/d)	Oxygen transportation Energy production Immune function DNA synthesis and maintenance Nervous system function	Red meat, offal, poultry, etc.

7. The Effect of Micronutrients on the Prevention of Healing Chronic Diseases

Older people are often at risk of chronic diseases, and there is a link between chronic diseases and the new coronavirus. In addition, micronutrients play an important role. Older adults are more susceptible to chronic diseases such as hypertension, diabetes and heart disease due to decreased immune system function and deterioration of physiological functions. These chronic conditions weaken the body's resistance to neo coronaviruses, leading to a more severe condition when infected.

Micronutrients play an important role in chronic disease management and prevention of neo coronaviruses. For example, zinc is critical in immune function and resistance in the elderly [16]. Adequate iron intake helps maintain normal hemoglobin levels, supporting immune function and oxygen transport by red blood cells. In addition, adequate calcium intake helps maintain bone health and immune function.

Therefore, for older adults and individuals with chronic medical conditions, maintaining an appropriate micronutrient intake is an important factor in maintaining immune system function and overall health, as well as helping to reduce the risk of infection with the new coronavirus and

complications. However, appropriate intake and supplementation should be determined on an individual basis under the guidance of a healthcare professional.

8. Conclusion

This article highlights the importance of micronutrients for older adults who have or have had novel coronavirus infections, as well as the role of effective nutritional adjunctive therapy in enhancing immune function, reducing the likelihood of developing chronic diseases, and shortening the duration or severity of viral infections. This article also highlights the importance of effective nutritional adjunctive therapy in these areas. On the other hand, there are no statistics that can definitively state how many elderly persons have been cured of new coronavirus infection with nutritional treatment with vitamin supplementation. We will need to carry out further studies in this field in the years to come.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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