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NUTRITION AND DIET FOR ELDERLY DURING COVID -19 PANDEMIC

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ABSTRACT COVID -19 infection is a public health crisis. The health care system of the entire world is facing a big challenge caused by Novel Corona virus (COVID-19), called SARS-CoV-2. Geriatric age group has potential risk of getting severely affected by Corona virus infection , as immunosenescence and increased malnutrition rates could be contributing factors. The present review article was focused on the importance of nutrition for geriatric age group individuals during COVID -19 pandemic.

KEYWORDS : COVID-19, SARS-CoV-2, Nutrition, Micronutrients, Elderly, Older Individuals.

INTRODUCTION:

The health care system of the entire world is facing a big challenge-caused by Novel Corona virus (COVID-19), called SARS-CoV-2. The spectrum of COVID-19 infection include fever, dyspnea, dry cough and fatigue. Conversely the severity of infection varies from asymptomatic, mild forms to severe forms with acute respiratory distress syndrome (ARDS) , multiorgan and systemic dysfunctions in terms of sepsis and septic shock, and death (1,2). The life-threatening acute respiratory distress syndrome (ARDS) due to the cytokine storm is associated with increased mortality rate (2). Though all the age groups have risk, Geriatric age group has potential risk of getting severely affected by Corona virus infection , as immunosenescence and increased malnutrition rates could be contributing factors (3,4). In addition, the course of disease could be more severe in case of elderly people resulting in higher mortality. The present review article was focused on the importance of nutrition for geriatric age group individuals during COVID -19 pandemic. We performed a literature search reviewing articles in PubMed, Google Scholar, and Research Gate from April1st 2020 to October 2020, using the following keywords *COVID-19*, *SARS-CoV-2*, nutrition, micronutrients, elderly,older individuals.

COVID-19 INFECTION IN ELDERLY INDIVIDUALS:

Immunosenescence is due to dysregulation of innate immunity, high levels of chronic inflammation, and altered T-cell and B-cell development (5). At the same time age is considered as a predictor for the mortality rate in patients admitted to the hospital, as most of the old people are vulnerable for other co morbidities (3,6). Loneliness, lack of exercise, reduced cognitive stimulation which result from isolation at home and lack of social communication aggravates physical and mental health of old people (7). In addition , many elderly patients also experience a loss of muscle mass and weight loss. When loss of muscle mass is associated with diminished muscle strength, then the person will be affected by sarcopenia (8). Sarcopenia along with other co morbidities like coronary vascular disease, obesity, chronic kidney disease, respiratory disease, and cognitive impairment are at higher risk and increase mortality (9). Social distensing , self isolation and frequent hand wash are the most effective methods to reduce the transmission of CoVID -19.

BALANCED DIET AND NUTRITION FOR ELDERLY DURING COVID-19 INFECTION:

Since poorly nourished individuals are at a enhanced risk of various bacterial, viral, and other infections at the same time nutrition is the most important contributing factor for the well being and for quality of life, nutrition plays a critical role in boosting the immunity. Malnutrition which is characterized by muscle wasting and weight loss, considered as geriatric syndrome and is related to frailty and negative outcomes (10). Balanced and nutritious diet , managing the comorbiditis with life style modifications and pharmacotherapy are the crucial factors to stay healthy and proper nutritional support could be the key point in the patient's prognosis also (11,12). It very essential to have awareness about diet and nutritional status especially during the COVID-19 pandemic. It's always desirable to eat fresh hot home cooked food, to hydrate frequently and to drink fruit juices to boost up immunity. Consuming good quality diets is always desirable. A balanced diet should contain good amount of proteins like meat, poultry, seafood, beans and peas, eggs, processed soy products, nuts, and seeds (13). There are many factors like financial burden, loss of appetite, impaired taste, dental issues ,which decrease the protein intake in elderly. Studies showed that adiponectin ,anti-inflammatory protein, which breaks down fatty acids, could be useful to prevent SARS-CoV-2 infection and treat or improve patient (13).Glutamine plays a vital role by controlling the proliferation of cells such as lymphocytes, neutrophils, and macrophages and activating proteins partaking in signal transduction(14). Elderly people require a protein intake of at least 1.0 g/kg of body weight/day to maintain muscle mass, intake up to 1.2–1.5 g/kg of body weight/day required in presence of acute or chronic illnesses. The protein requirement may be increased up to 2.0 g/kg of body weight/day in high catabolic states (15,16, 17). Several nutrients, including vitamins (A, B group, C, D, E) and minerals (zinc, iron, selenium, magnesium and copper), exert a crucial role in strengthening the immune system and modulating inflammation (18). As well, adaptive immunity is influenced by nutritional deficits, mainly lymphocyte maturation and differentiation, memory cell generation, and cytokine and antibody production (18,19).

MICRONUTRIENTS FOR HEALTHY IMMUNE SYSTEM :

The scientific Panel of the European Food Safety Authority (EFSA) concluded that six vitamins-vitamin D, C, A (and ß-carotene) and B-group vitamins (especially B_6, Folate, and B_{12}) are important for the healthy maintenance of the immune system (20,21,22). Vitamin D deficiency is common in elderly. This may be due to diminished mobility and exposure to sunlight, reduced rates of synthesis of vitamin D in the skin, reduced appetite and reduced vitamin D absorption from the gut (23,24,25) . Vitamin D has immunomodulatory effect. vitamin D receptors are expressed in all the cells of immune system which are sensitive to $1,25(OH)_2D$ (26). Vitamin D inhibits B-cell proliferation and differentiation as well as T-cell proliferation (27). Vitamin D also decreases the production of inflammatory cytokines and an increases anti-inflammatory cytokine production. So adequate vitamin D status may reduce the production of inflammatory cytokines during SARS-CoV-2 infection (27). Vitamin D preserves endothelial integrity and reduces vascular permeability, induces expression of ACE-2 and exerts a protective effect on alveolar epithelial cells (28). Vitamin A, known as anti-inflammation vitamin, is a key factor for development of the immune system (28). vitamin A is also vital for mucosal and epithelial barrier generation ,plays regulatory roles in cellular immune responses and humoral immune processes (29.30). Vitamin E , a lipid soluble antioxidant, is an effective nutrients enhancing immune function. Some studies have shown that vitamin E levels were significantly reduced in patients who were admitted to ICU with ARDS and vitamin E& C usage reduced the incidence of ARDS and pneumonia and shortened ICU length of stay in these patients (31,32). On the other hand, in other studies vitamin E supplementation was associated with higher IL-2 and IFN-γ production in animals and human beings after influenza virus infection (33). Vitamin C, a cofactor for a number of enzymes, has anti-inflammatory and immunosupportive properities. Vitamin C plays principal role in altering gene expression in dermal fibroblasts and enhances their proliferation, in the differentiation and maturation of T-cells and migration and important in wound healing (34,35,36).

B complex vitamins are helpful in activation of both the innate and adaptive immune responses. They also reduce pro-inflammatory

cytokine levels, prevents hypercoagulability, maintains endothelial integrity and, improves respiratory function (37,38). Riboflavin (vitamin B2) and UV light has been shown to effectively reduce the titer of SARS-CoV-2 to the limit of detection in human plasma resulting in high levels of reduction of SAR-CoV-2 infectivity (39). Niacin (vitamin b3) is a precursor for NAD and NADP, coenzymes required for various metabolic pathways. NAD^+ has lung protective and immunomodulatory properties, be able to decrease the pro-inflammatory cytokines, IL-1β, IL-6 and TNF-α (40,41). Pantothenic acid, precursor of coenzyme A, required for lipid metabolism improves wound healing, decreases inflammation and improves mental health (42). Folate plays pivotal role in DNA and protein synthesis and in the adaptive immune response. In recent studies it was shown that Folic acid inhibits furin, an enzyme associated with bacterial and viral infections, thus prevents binding by the SARS-CoV-2 spike protein, and virus turnover (43). Another interesting vitamin of B complex group is vitamin B12.Vitamin B12 deficiency is prevalent in elderly . Vitamin B12 is necessary in supporting a healthy gut microbiome, inturn plays a crucial role in the development and function of both innate and adaptive immune systems (44). In addition ,as the plausible symptoms of B12 deficiency, like increased homocysteine concentration, oxidative stress, activation of the coagulation cascade, low reticulocyte count, thrombocytopenia, intravascular coagulation, thrombosis, vasoconstriction, renal and pulmonary vasculopathies, elevated lactate dehydrogenase (LDH), are similar to covid-19 infection. It was hypothesized that Cobalmine deficiency is a consequence of covid virus infection because the virus interes with cobalamine metabolism (45,46).

Trace elements modulate immune responses through their critical role in enzyme activity (18). Grains like Millets (jower, bajra etc) which are loaded with micronutrients like calcium, zinc, antioxidants, fibre etc should be included in the diet. To boost up immunity 4 to 5 types of different fruits and vegetables should be included in the diet. Zinc is anr important trace element required to counteract the alteration in the immune response. Adequate zinc support enhances both total number and function of T cells (47). In addition , Deficiency of this trace element is related to reduced NK cytotoxicity (48). Some of the recent studies have shown that increasing the concentration of intracellular zinc markedly reduces the replication of different types of RNA viruses(49). Zinc acts as an antioxidant and protects against oxidative stress caused by reactive oxygen species (ROS) (50). Selenium is a trace element which has antioxidant effects, anti-inflammatory properties and is needed for the proper functioning of the immune system (51,52).Se is incorporated into antioxidant selenoenzymes, inturn provide protection against ROS (52). Selinium is a catalyst for the production of active thyroid hormone (51). Magnesium has many important physiological functions, influences both the cell-mediated and humoral immunity, protect DNA from oxidative damages and reduce the superoxide anion production at high concentrations. Normal Mg levels maintain healthy lung structure and functions, whereas its lower levels are often associated with increased respiratory complications (53,54). Copper is an essential trace dietary mineral, involved in the proper functioning of T helper cells, B cells, neutrophils, natural killer cells and macrophages. Copper exhibits strong antibacterial, antiviral, antifungal and anti-inflammatory effects. Dietary Cu deficiency affects both innate and adaptive immunity (55). Iron is an essential trace element that plays a pivotal role in systemic oxygen transfer. Iron acts as an electron donor or acceptor in many biological functions and contributes significantly to the development of immunity. Some retrospective studies on COVID-19 hospitalized patients showed that most of the patients suffering from functional iron deficiency are significantly linked with progressive inflammation and prolonged hospital stay (57,58).

CONCLUSION:

The coronavirus 2019 (COVID-19) pandemic has spread across the world . Geratric age group is more susceptible for COVID-19 infection and higher mortality rates were observed in older individual and with other co-morbidities. Balanced diet is necessary to maintain healthy immune system, to fight efficiently and to prevent SARS-CoV-2 infection. Especially micronutrients act as immune modulators. adequate micronutrient intake is necessary for proper body function and for strengthening of the immune system. They downregulates pro-inflammatory cytokines and improves outcomes and also reduce the length of stay in the hospital and mortality for COVID-19 patients.

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