

NUTRITION AND MICRONUTRIENTS IN CANCER PATIENTS POSITIVE FOR COVID-19

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ABSTRACT

Nutrition is an important component of human health that influences the immune response, especially in those who are at risk of cancer. It is critical in the COVID-19 era to respond to cancer in a more coordinated and timely manner. So far, there are only a few systematic studies on the increased prevalence of COVID-19 or SARS-CoV2 symptomatic or asymptomatic infections in cancer patients with no comprehensive care plan. The goal of this research is to learn more about the function of diet in cancer patients with in COVID-19 period. The importance of diet in the predisposition, prevention, and management of COVID-19 in cancer patients, as well as the role of dietary supplementation with vitamins or minerals, and microbiota in the COVID-19 period, was discussed in this study. The results might aid in the development of nutritional maintenance and complication control guidelines for all patients with cancer during the continuing COVID-19 pandemic.

Keywords: COVID-19, nutrition, cancer, cancer nutrition, micronutrients.

INTRODUCTION

Since December 2019, COVID-19 has been identified as a new pandemic in Wuhan, China, and has been declared a worldwide health emergency affecting more than 200 regions (1,3). In many afflicted countries, the rising number of affected people and death has put a strain on healthcare systems.

With the global increase in cancer incidence, oncology care is being harmed by a lack of beds, which is delaying elective cases in order to prevent the spread of pandemic among those susceptible individuals for whom a proper and early treatment has a significant influence on the result. Nutrition is an

important component of human health that influences the immune response, especially in those who are at risk of cancer.

So far, there are only a few systematic studies on the increased prevalence of COVID-19 or SARS-CoV2 symptomatic or asymptomatic infections in cancer patients with no comprehensive care plan. Data from China, Italy, and the United States all point to a larger danger (2). This review included all available data on nutrition in cancer patients with COVID-19 positivity, with the goal of laying out a nutritional strategy for cancer patients with positive COVID-19.

COVID-19 Infection Increases Cancer Patients' Sensitivity

A search of the literature for recorded death instances of cancer patients with COVID 19 infection turned up a few papers with diverse analyses and no uniform obvious mortality risk strategy. Since the outbreak of the pandemic began, COVID-19 has been an important risk factor for cancer patients with a serious health problem worldwide. Because research show that COVID-19 is more common in cancer patients than in non-cancer individuals. (4). In the COVID-19 cohort, which included 1.590 COVID-19 patients conducted in March 2020, the percentage of cancer patients was reported to be higher compared to the general population (1% vs 0.29%) (5). In the study consisting of 67 cancer patients with COVID-19, showing the sensitivity of cancer patients to be infected with the virus, it was determined that 23 patients (34.3%) were actively receiving anticancer treatment. in this cohort, lung cancer patients ranked first when the number was evaluated by cancer type. followed by colorectal, thyroid, and urinary tumors, respectively. It has been reported that the risk of being infected with COVID-19 among cancer patients in the population (47.7%) is higher than the general population (15.6%) (6). In another case series consisting of 28 cancer patients who received active cancer treatment and received antitumor treatment such as chemotherapy, radiotherapy and immunotherapy within 14 days, conditions requiring intensive care service and mechanical ventilation were encountered in 54% of the patients (7). In cancer patients, "tumor necrosis factor α (TNF- α)" and "N-terminal pro-B type natriuretic peptide (NT-pro BNP)" are increased with advanced tumor stage. Conversely, decreased "CD4+ T cells" and "albumin-globulin levels" may assist clinicians in the surveillance of COVID-19 progression of patients with cancer (4).

Also in a prevalence study which was conducted with 108,215 former cancer patients (cancer survivors) and 523,541 healthy individuals, the risk factors involved to COVID-19 and severe influenza risk was evaluated and it was concluded that cancer survivors had higher risk of severe COVID-19 results including respiratory, cardiac and renal diseases. In the same study, higher risk of hospitalization due to influenza or higher risk of mortality were concluded in hematological malignancy survivors for after 10 years from diagnosis and solid cancer survivors for after 5 years from diagnosis (8).

Another study investigating COVID-19 results of hematological cancer patients in Turkey demonstrated an increased risk of serious events related to COVID-19 such as mechanical ventilation support, ICU admission or mortality in hematological cancer patients with COVID-19 as compared to that of COVID-19 patients without cancer (9). In a meta-analysis that comprise data of 3.377 patients over 3 continents, the mortality risk of hospitalized hematological cancer patients with COVID-19 was not significantly different than the risk of mortality of hospitalized solid tumor patients however both cancer patient groups had elevated risk of mortality compare to that of general population (10). On the other hand another study conducted with 1.044 patients with active cancer showed that SARS-CoV-2 susceptibility was elevated in hematological cancer patients with regard to that of cancer patients with solid tumors. In addition, patients who recently received chemotherapy also had increased risk of mortality (11).

COVID-19 Infection Results in Cancer

There are six big studies investigating the impact of COVID-19 on outcome in various types of cancer patients in both adults and children. The largest one of which is a multicenter Chinese cohort research (9 hospitals in Wuhan on 751 patients). According to these research, in addition to the previously known risk factors for older age; including elevated "IL-6, procalcitonin, D-dimer, TNF- α , NT-proBNP" and decreased "lymphocytes, CD4+ T cells, and albumin-globulin ratio", the authors highlight some risk factors increasing the progression of clinical findings, and recommend their use monitoring disease development at an early stage (12).

The other study, conducted in Hubei, China, looked at 205 cancer patients who had received chemotherapy in the one month prior to appearance of symptoms, and found that those patients had a high case-fatality rate, particularly in the male sex (13). Two different breast cancer studies have confirmed inconsistent findings: the American study confirmed a worse outcome among male patients (14) in line with a previous Chinese study, but on a smaller scale, while the French study argued against the function of chemotherapy in the clinical outcomes of cancer in COVID-infected patients and emphasized the importance of comorbidities (15).

Nutrition in Covid-19 Infection

The Covid-19 infection is currently posing a serious threat to people all over the world. It is critical to acquire and maintain a good nutritional level in order to fight virus. "Age, sex, health issue, lifestyle, and medicines" all have an impact on an individual's dietary patterns (16).

While the number of coronavirus cases continues to rise, the guidelines that should be followed in the diet of people who have positive test results are becoming increasingly important. Everyone now understands that the disease is linked to the strength of the immune system. The best way to maintain strong immunity is to consume a well-balanced diet. Optimal nutritional status can influence the immune response to numerous microorganisms that cause viral infection by altering gene expression, cell activation, and signaling molecules. Furthermore, multiple dietary components influence gut microbial ecology and, as a result, immunological responses in the organism (16).

Vitamin C

In studies, researchers have shown a connection between pneumonia, sepsis, low vitamin C levels and increased oxidative stress. The more seriously sick individuals who got vitamin C treatment had a substantially lower death rate. The results of the larger RCTs that are presently being conducted will give more conclusive data (17). Vitamin C intake is also recommended to be at least "90 mg daily for men" and "75 mg for women" (18).

Antioxidants

Antioxidants abundant in natural functional foods such as "lycopene, selenium, vitamin A-C-E, and β -carotene" can enhance the number of T-cell subsets, improved lymphocyte responsiveness to mitogen, increased interleukin-2 production, and boosted the activity of natural killer cells. "Sweet potatoes, carrots, and green leafy vegetables" are high in carotene, whereas "red peppers, oranges, strawberries, broccoli, and the other specific fruits and vegetables" are high in vitamin C. Oils of vegetable which are especially soybean, sunflower, corn, wheat germ, and walnut, on the other hand nuts, seeds, spinach, and broccoli are all great source of vitamin E (19).

Vitamin D

The relative vitamin D status of populations is one commonly disregarded factor that might impact the

result of COVID-19 since vitamin D decreases the risk of viral infection and mortality through various pathways, as revealed by recent studies (20–23). In addition, a recent study revealed that vitamin D may significantly minimize the risk of COVID-19 diseases and mortality by regulating cellular junctions and gap junctions, increasing immune response by reducing the cytokine storm with effects on interferon and TNF. Vitamin D can also regulate adaptive immunity by suppressing type 1 T cell responses and boosting T cell induction (24).

Supplementation with vitamin D has been significantly related to lower the risk of respiratory infections in randomized control studies (25, 26). This vitamin supplementation dramatically lowers the incidence of respiratory tract infections, according to a placebo-controlled research with 5.660 participants (27). According to a analyses of five clinical investigations, the vitamin D therapy group had significantly fewer respiratory tract infections than the control group (28). In another research that comprised 25 randomized clinical trials with a total of 10.933 individuals from 14 different countries found that supplementing with vitamin D reduced the incidence of at least one acute respiratory tract of infection (29).

According to randomized controlled studies and meta-analyses, vitamin D supplementation is protective against respiratory track diseases. As a result, those who are more at risk of vitamin D insufficiency during this worldwide Covid-19 pandemic may consider taking vitamin D supplements to keep their circulation 25(OH)D levels at optimum ranges (75–125 nmol/l) (30).

Fish Oils

EPA and DHA were used in several research on fish oils, which showed immunomodulatory properties (31). Increased fish consumption in diet might supply nutrients and bioactive compounds that could affect COVID-19 pathomechanisms and consequences including inflammation and thrombosis (32). According to the WHO, a daily diet consisting of a range of fresh and unrefined foods is suggested to give the organism with the vitamins, minerals, dietary fiber, protein, and antioxidants it requires.

Microbiota in Covid-19

The host's relationship with the gut bacteria are complicated and bidirectional. Antimicrobial peptides are produced by intestinal commensals. Besides

compete for nutrients and habitat, and also assisting in the maintenance of homeostasis (33). Following the discovery of SARS-Cov2 RNA in stool of certain COVID-19 patients (34) and the occurrence of diarrhea in such individuals, recent findings have highlighted the potential of involvement of the gut-lung axis and perhaps the microbiota (35). As a result, for particular demographic groups and especially cancer patients, a successful dietary approach and specialized functional foods aimed at the microbiota may be required (36).

Foods and Beverages to Recommended Consume on a Routine Basis

Every day, consume fresh, unrefined foods such as “fruits, vegetables, legumes, nuts, whole grains, and animal products (chicken, fish, etc.)”. Suggestions for daily portions: “2 cups fruit (4 servings); 2.5 cups vegetables (5 servings); 180 g grains; 160 g meat and beans (red meat once or twice a week, poultry or fish twice or three times a week)”; Snacks should mostly consist of fresh vegetables and fruit. To avoid losing vital vitamins, stop overcooking vegetables and fruit. If you're going to use canned fruit or vegetables, pick wisely and stay away from types that have extra salt or sugar (37).

Water is essential for carrying nutrients and chemicals in the blood, regulating body temperature, eliminating waste, and lubricating and cushioning joints, so drink lots of it every day. Drinkable 8–10 glasses of water each day in addition to other beverages such as lemon juice (diluted in water and unsweetened), tea, and coffee. However, limit your intake of coffee, sweetened fruit juices, carbonated beverages, and sugary drinks (37).

What Should the Nutritional Approach of COVID-19 Positive Cancer Patients Be?

Nutrition in Non-ICU Patients

COVID-19 predominantly affects the respiratory tract and can progress to multi-organ failure, which can be fatal (38). Older age (39) is also associated with a higher risk and prevalence of malnutrition, as well as poorer outcomes. Immobilization, catabolic processes in the musculoskeletal system and malnutrition are the causes of disease-related malnutrition and hospitalization in the ICU (intensive care unit), which can be worsened in older individuals (40). In addition, in the course of COVID infections, an increase in the above-mentioned changes can be

observed with the development of inflammation and sepsis.

People with cancer who are at risk for poor outcomes and increased mortality after infection with COVID-19 should be screened and assessed for malnutrition. Appropriate nutritional evaluation and therapy have been shown to decrease complications and enhance clinical outcomes in a variety of situations, including ICU stays, hospitalization, and a variety of chronic illnesses (41).

Protein needs are often calculated using equations like (41):

- Although it varies according to the amount of nutrition, physical activity level, disease status and tolerability in the elderly, a daily protein intake of 1 g/kg is recommended.
- Protein intake of ≥ 1 g/kg is recommended in polymorbid medical inpatients to prevent weight loss, minimize the risk of hospital readmission, and improve functional outcome.

Fat-carbohydrate ratios to meet energy needs; It should be adjusted as 30:70 in patients without respiratory problems and 50:50 in patients with ventilation support. “Oral nutritional supplements” (ONS) should be used if dietary supplementation is insufficient to meet the patient's needs, improve dietary intake, and achieve nutritional goals (41).

ICU Patients' Nutrition

Considering nutritional requirements, the use of enteral nutrition (EN) should be considered when there is no oral intake for more than three days or if it is estimated that less than half of the energy needs will be met by oral intake for more than one week. The medical nutrition treatments and nutritional needs of patients hospitalized in ICU (42) and receiving different levels of respiratory support are listed below according to ESPEN's recent recommendations.

Pre-Intubation Period

If the energy target is not met with oral intake in non-intubated COVID-19 patients in the intensive care unit, the necessity of ONS should be evaluated first and then enteral nutrition should be considered. If enteral feeding is hampered by the use of a nasal gastric tube (NGT) for nutrition, this can lead to patient hunger, particularly in the first 48 hours of ICU admission, and an increased risk of malnutrition and associated problems (43). In these circumstances, peripheral parenteral feeding may be explored.

Period of Ventilate

EN should be started with a nasogastric tube in patients with COVID-19 who are intubated and ventilated in intensive care. After prokinetic therapy, post-pyloric therapy should be fed who patients with high aspiration risk or patients with gastric intolerance. The prone position during EN is not a limitation or contraindication. Energy management: in the early stages of acute sickness, hypocaloric nutrition (not exceeding 70% of EE) should be provided, with improvements up to 80–100% after DAY 3, and protein needs should be 1.3 g/kg protein equivalents each day. This goal has been demonstrated to increase patient survival, particularly in fragile patients. In the absence of physical composition data, 1.3 g/kg “adjusted body weight” protein equivalents per day are advised for obese people (41).

Dysphagia and the Post-Mechanical Ventilation Period

Patients who received mechanical ventilation support are more likely to experience dysphagia after extubation, which can severely limit their oral nutrition. Especially in the elderly and after extended intubation, the post-extubation swallowing problem might last up to 21 days (44, 45).

If swallowing is deemed dangerous, EN should be provided. Texture-adapted meals might be recommended following extubation in ICU patients with dysphagia. In situations when there is a high danger of aspiration, postpyloric EN or, if that is not possible, temporary PN during swallowing training with the nasoenteral tube withdrawn can be utilized.

CONCLUSION

COVID-19 infections and carcinoma, whether or not treated with chemotherapy, results in a coarser and poorer prognosis, specifically in male adults, regardless of the kind of tumor. A healthy diet can aid in ensuring that the body is in the best possible condition to fight the infection. Providing proper nutritional treatment to cancer patients in ICU and non-ICU settings during this exceptional emergency is a difficult task. The impact of vitamin or mineral treatment on outcome is mainly unclear. Furthermore, in this new COVID-19 pandemic, all effort should be made in conjunction with active therapy and sufficient nutritional assistance for people with cancer to avoid the catastrophic effects of malnutrition on clinical results and life quality. To forecast patient prognosis,

further evidence on the influence of nutritional status and nutritional change on COVID-19 must be examined.

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