

Malnutrition and Nutritional Care in Patients with COVID-19

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Cite this article as: Öztürk Y, Halil M. Malnutrition and nutritional care in patients with Covid-19. *Clin Sci Nutr* 2022; 4(1): 28-32.

ABSTRACT

Malnutrition causes serious morbidities and mortalities for both individuals and communities burdens healthcare systems. Its prevalence has become higher during the coronavirus disease 2019 (COVID-19) pandemic. COVID-19 may lead to weight loss, loss of muscle mass, malnutrition, sarcopenia, frailty, and obesity not only at the time of disease but also after disease. Nutrition risk should be assessed for all patients, and individualized nutritional care plan including one during post discharge should be generated. The fact that the risk of malnutrition and loss of muscle mass continue even several months after disease should be considered. Being aware of the increased risk of malnutrition and loss of muscle mass and their consequences during COVID-19 and in the following months would be appropriate.

Keywords: Covid-19, Diet and Foods, inflammation, malnutrition

INTRODUCTION

Coronavirus disease 2019 (COVID-19), a primarily respiratory disease caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. It has brought unprecedented difficulties for healthcare systems globally thus far with inflammation, hypercatabolism, and increased energy expenditure observed during COVID-19 and predisposal to malnutrition and sarcopenia. Preexisting malnutrition and sarcopenia also worsen disease progression and related complications. Moreover, quarantine and social isolation measures may result in lack of physical activity, difficulties in accessing food, worsening in socioeconomic status, change in dietary habits, depression, anxiety, loneliness, sleep problems, deterioration in cognitive functions, and worsening of chronic diseases. All of these contribute to the development of malnutrition. Malnutrition is known to be associated with higher morbidity and mortality rates, longer length of stay in hospitals, infections, sarcopenia, frailty, delay in wound healing, and decreased life quality. Screening, diagnosing, assessing, treating, and monitoring malnutrition play a crucial role now more than ever. As the risk of malnutrition continues after the disease, following up nutritional status after COVID-19 is vital.

Clinical nutrition concepts and COVID-19

The definitions and terminology of clinical nutrition was defined by the European Society of Clinical Nutrition and

Metabolism (ESPEN) guidelines in 2017.¹ According to these guidelines, clinical nutrition was classified as:

- a) Malnutrition (undernutrition)
 - Disease-related malnutrition (DRM) with inflammation
 - ▶ Chronic DRM with inflammation (cachexia)
 - ▶ Acute disease or injury related malnutrition
 - DRM without inflammation (non-cachectic DRM)
 - Malnutrition/undernutrition without disease (non-DRM): Hunger-related malnutrition and socioeconomic or psychologic related malnutrition
- b) Sarcopenia
- c) Frailty
- d) Over-nutrition: Overweight, obesity, sarcopenic obesity, and central obesity
- e) Micronutrient abnormalities: Deficiency, excess
- f) Refeeding syndrome

Nutrition impact syndromes like nausea, vomiting, anorexia, diarrhea, loss of taste and smell, malnutrition, micronutrient deficiencies, sarcopenia, and obesity are common in COVID-19.²

Patients with COVID-19 are at high risk for malnutrition owing to heavy inflammation, hypercatabolism, and increased energy expenditure. Furthermore, advanced age, polymorbidities, and obesity increase the risk of malnutrition. Prolonged hospitalization, immobility, and prolonged ventilation can cause malnutrition and sarcopenia or vice

versa. Anorexia, dyspnea, dysosmia, dysgeusia, and digestive symptoms (diarrhea, vomiting, or abdominal pain) observed during the disease may block adequate food intake. Acute malnutrition induced by COVID-19 infection may reduce muscle mass and weaken the immune system that could contribute to the severity of COVID-19.

Malnutrition prevalence is estimated to be higher in patients with COVID-19. Most of the patients hospitalized with COVID-19 have reduced food intake, weight loss, and heavy inflammation. Risk of malnutrition and malnutrition were found to be 77% in hospitalized patients in a recent study.³ Flippo et al.⁴ revealed COVID-19 as being associated with significantly weight loss and risk of malnutrition independently of hospitalization in their prospective cohort study. Weight loss was related with systemic inflammation, impaired renal function and longer disease duration. The prevalence of the risk of malnutrition in patients with COVID-19 is reported as 37% in general medical inpatients, 53% in older inpatients, and 67% in those in the intensive care unit (ICU).⁵ Malnourished patients were also 30% less likely to be discharged. High nutritional risk was significantly associated with the length of hospital stay.⁶ In a systematic review of 14 articles with 4,187 participants, the pooled prevalence of malnutrition among hospitalized patients with COVID-19 was 49.11%. Patients with COVID-19 and malnutrition had a 10-fold higher mortality rate than patients with COVID-19 who were well-nourished.⁷

Currently, there are emerging studies about the importance of malnutrition and persistence of the loss of muscle mass after COVID-19 as a part of long COVID or post COVID-19 syndrome.⁸⁻¹¹ NutriCovID30, a multicenter and longitudinal study, assessed hospitalized patients with COVID-19 and followed them for 30 days after hospital discharge. There was substantial weight loss, and only half of the patients regained their weight within one month of hospital discharge. Malnutrition affected 67% of hospitalized patients, and 41% of them had persistent malnutrition after one month from discharge.¹² Ramos et al. conducted an observational and prospective study as-

sessing 936 inpatients with a mean age of 63.7 ± 15.3 years. All the patients admitted with COVID-19 for whom enteral or parenteral nutrition was indicated following an institutional protocol still presented with malnutrition at hospital discharge. The risk of malnutrition was present in only 1.7% of the patients, although the risk of sarcopenia persisted in 49.2% patients six months post discharge, highlighting the need for prolonged nutritional support and monitoring.¹³

Sarcopenia is defined as a progressive and generalized skeletal muscle disorder resulting in adverse outcomes, including falls, fractures, physical disability, and mortality. Sarcopenia is called primary sarcopenia when it is age-related. However, sarcopenia can emerge secondary to systemic diseases (especially inflammatory processes), physical inactivity, and malnutrition and is called secondary sarcopenia. Acute sarcopenia, associated with acute illness or injury, lasts less than six months, whereas chronic sarcopenia lasts more than six months.¹⁴ Sarcopenia prevalence in patients with COVID-19 is higher than ever and also persists longer. In a prospective study, in patients with serious COVID-19 infection, sarcopenia can persist in about one-third of cases six months post discharge, when present at three months.^{11,15}

Nutritional management of patients with COVID-19

ESPEN expert statements and practical guidance about nutritional management of individuals with SARS-CoV-2 infection was published recently.¹⁶ This guideline mostly refers to previous guidelines about patients with polymorbidities in internal medicine, geriatrics, and ICUs.¹⁷⁻¹⁹ Later, ESPEN reported the guideline about nutritional management of individuals with obesity and COVID-19.²⁰ The American Society for Parenteral and Enteral Nutrition (ASPEN) reported on "Nutrition therapy in critically ill patients with COVID-19" in September 2020.²¹ The emergence of "long COVID" or "post COVID-19 syndrome" including post COVID-19 acute sarcopenia (9, 11) has led to reviews about the nutritional care in patients during the COVID-19 pandemic being published.^{2,5,22}

Nutrition-impact syndromes, such as nausea, vomiting, anorexia, diarrhea, loss of taste and smell, malnutrition, micronutrient deficiencies, sarcopenia, and obesity are common in COVID-19 as mentioned above. As these increase morbidity and mortality rates, it is crucial to screen and assess malnutrition after a COVID-19 diagnosis. Individualized nutrition support and monitoring should be constituted,² and a checklist for screening and diagnosis of malnutrition and nutritional assessment in patients with COVID-19 should be made, which should be continued for at least three to six months after the disease.

Main Points

- Malnutrition and other nutrition-related conditions are common with COVID-19.
- Early screening and assessment of malnutrition, sarcopenia, frailty, obesity, and micronutrient abnormalities are the vital issues for patients with COVID-19
- Patients with COVID-19 should be monitored for malnutrition and other nutrition-related concepts for at least 3-6 months after COVID-19 disease.

Screening and diagnosis

Patients with risk factors such as older age, polymorbidity, and obesity are at risk for poor outcomes and mortality from COVID-19. Screening malnutrition with validated tools like the Malnutrition Universal Screening Tool and Nutrition Risk Screening 2002 (in hospitalized patients) is recommended by all the guidelines. The Mini-Nutritional Assessment criteria validated for geriatric patients, and the NUTRIC score criteria for ICU patients are also acceptable in clinical practice.¹⁶ After screening, diagnostic assessment using GLIM criteria is recommended for patients who are at risk for malnutrition.²³ Malnutrition diagnosis requires at least one phenotypic and one etiologic criterion. Evaluation of reduced muscle mass using dual-energy absorptiometry (DXA), bioelectrical impedance analysis (BIA), computed tomography (CT), or magnetic resonance imaging (MRI) is recommended. Physical examination or standard anthropometric measures such as mid-arm muscle or calf circumference may be used when the other methods are unavailable, and handgrip strength can be considered a supportive measure. Severe inflammation in acute disease is likely to be associated with major infection, burns, trauma, or closed head injury. It is not generally associated with chronic disease conditions. Chronic or recurrent mild to moderate inflammation is likely to be associated with malignant disease, chronic obstructive pulmonary disease, congestive heart failure, chronic renal disease, or any disease with chronic or recurrent inflammation. Transient inflammation of a mild degree is not considered as an inflammation criterion. C-reactive protein may be used as a supportive value. Once malnutrition is diagnosed, severity grading should be performed as defined by the GLIM consensus.²³

Sarcopenia can occur when systemic diseases (especially inflammatory processes), physical inactivity, and malnutrition are present. Screening and diagnosing sarcopenia during a pandemic is very important. EWGSOP2 recommends screening using a SARC-F questionnaire. SARC-F is a 5-item questionnaire that is self-reported by the patients. Strength, walking ability, rising from a chair, stair climbing, and fall events compose the questionnaire. EWGSOP2 recommends using grip strength and chair stand measures to assess muscle strength, and DXA, BIA, CT, and MRI are recommended to confirm sarcopenia by evaluating muscle quality and quantity. Finally, measuring physical performance (short physical performance battery, timed up and go, and 400-m walk tests) are recommended to assess the severity of sarcopenia.¹⁴

On discharge, the nutritional risk of patients should be reassessed, and individualized nutrition plans should be

constituted, especially for high risk, frail, and sarcopenic patients and those with a history of ICU stay. Therefore, muscle mass should be assessed periodically. At this point, dysphagia should be identified in patients discharged from the ICU (post-extubation dysphagia). In addition, refeeding syndrome should be considered.⁵

Nutritional assessment²

- Dietary requirements versus intake; energy, protein, micronutrients, and fluid
- Social, physical, environmental; social (family support), physical (dentures, sight), age, and dependency (self-care, eating/drinking assistance)
- Clinical; disease (type, severity), comorbidities, nutrition impact symptoms, nutritional uptake (diarrhea, vomiting), and fever
- Body composition, muscle wasting, sarcopenia; weight loss, body mass index, muscle wasting (anthropometry, BIA, DXA, ultrasound, CT), muscle function (handgrip strength, leg muscle strength), physical function, and sarcopenia (SARC-F)
- Biochemistry; inflammation (albumin, prealbumin, CRP) and micronutrients (vitamin D, selenium)

Nutrition intervention

Multi-modal nutritional therapy should be performed on the course of disease. A combination of nutritional interventions like dietary counselling, food fortification, food texture modification, thickened fluids, oral nutritional supplements, and enteral or parenteral nutrition should be used based on the patient's needs. Specific micronutrients should be included, and other treatment modalities with physical activity should be planned.^{10,24}

Nutritional requirements should include 25–30 kcal/kg/day energy and 1–2 g/kg body weight of protein. The nutritional requirements should be adjusted according to nutritional status, physical activity level, disease status, comorbidities, and tolerance.⁵ Patients hospitalized with COVID-19 should be ensured their recommended daily allowance of vitamins and micronutrients with an oral diet or medical nutrition treatments. Vitamin C, D, B12, selenium, and iron are recommended to be replaced as their deficiency increase the risk of hospitalization and mortality owing to COVID-19. It is also recommended to maintain an adequate microbiome profile.²² An active lifestyle is indispensable in nutritional management. Exercising every day for >30 minutes or every second day for >1 hour is recommended to maintain fitness, mental health, and muscle mass. Oral nutrition supplements (ONS) and enteral and parenteral nutrition should be administered whenever needed after assessment. When ONS is prescribed, it is recom-

mended to be continued for at least one month after discharge.¹⁶

Monitoring and review

Body weight, body mass index, food intake, compliance to dietary advice, ONS, blood tests, clinical condition, functional tests (such as sit to stand), self-reported activity, progress toward agreed goals, and ability to perform activities of daily living should be monitored. Under and overfeeding should be assessed. The patients should be reassessed weekly and high-risk patients every two to seven days during hospitalization for low to moderate nutrition risk. Patients dwelling in the community should be reassessed at one-week to three-month intervals.⁵

CONCLUSION

COVID-19 is associated with malnutrition, loss of muscle mass, obesity, micronutrient deficiencies, and increasing mortality and morbidity risks. Malnutrition screening and assessment should be performed, and individualized nutrition plans should be constituted, especially for high-risk and sarcopenic patients, and continued for several months post discharge.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – Y.Ö., M.H.; Design - Y.Ö., M.H.; Supervision – Y.Ö., M.H.; Resources – Y.Ö., M.H.; Materials – Y.Ö., M.H.; Data Collection and/or Processing – Y.Ö., M.H.; Analysis and/or Interpretation – Y.Ö., M.H.; Literature Search – Y.Ö., M.H.; Writing Manuscript – Y.Ö., M.H.; Critical Review - Y.Ö., M.H.

Declaration of Interests: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

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