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Role of nutritional therapy in the post-COVID syndrome rehabilitation process: a case report

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Abstract: The COVID-19 pandemic originated in Wuhan, China, and quickly became a global concern. Risk factors for complications, apart from age, are closely related to nutrition. In hospitalized patients, extended stays can lead to malnutrition and sarcopenia, highlighting nutrition's pivotal role in managing and alleviating symptoms. This study explores the efficacy of nutritional therapy for post-COVID patients within the Home Care Program framework. Following hospital discharge, the patient was enrolled in the Home Care Program and showed symptoms such as post-COVID-19 condition, significant pressure injury, low weight, and muscular atrophy. A multi-professional developed a therapeutic plan with a focus on nutrition. Within 70 days, a 58-year-old male patient, supported by nutritional supplementation including arginine, proline, and vital vitamins and minerals, exhibited considerable health improvements. These included a progression of nutritional status to eutrophy, a weight gain of 6 kg since the beginning of the intervention, and a 15.7% increase in MUAC adequacy. The nutritional intervention also effectively tackled issues like constipation. These enhancements enabled the patient to respond better to physical therapy, reclaiming significant daily activity autonomy. Comprehensive nutritional therapy is instrumental for recovering post-COVID-19 patients, accentuating the importance of personalized care in ensuring patient well-being and autonomy.

Keywords: Post-Acute COVID-19 Syndrome, COVID-19, Rehabilitation, Nutritional Therapy, Nutritional Status.

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1. Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, originated from a series of pneumonia cases noted at the end of 2019 in Wuhan, China [1]. The outbreak of this emerging infectious disease rapidly evolved, reaching pandemic proportions by March 11, 2020 [2]. The presentation of this virus can range from asymptomatic to moderate to severe, with symptoms including cough, fever, and shortness of breath, among other complications [3]. There are concerns that the complications associated with COVID-19 relate to the significant cytokine release triggered by abnormal viral replication and other immune system-related stimuli, leading to a hyperinflammation state [4]. The primary risk factors for COVID-19 complications, aside from older age [5], are related to obesity and cardiometabolic factors (e.g., hypertension and type 2 diabetes) [6,7]. A nutritional assessment is recommended for all COVID-19 patients [8]. Among hospitalized patients,

malnutrition and sarcopenia can arise from prolonged hospital stays characterized by immobilization and extended mechanical ventilation [9].

Hospitalized COVID-19 patients can experience changes in their caloric and protein intake, which can have significant implications depending on their nutritional status [10]. Weight loss is another significant concern for hospitalized COVID-19 patients. The severity of illness and prolonged hospitalization can lead to muscle wasting and weight loss [11]. This weight loss can further exacerbate the nutritional status of patients and impact their overall recovery and outcomes.

Following a period of hospitalization for COVID-19, a combination of symptoms such as fatigue, sleep disturbances, dyspnea, joint pain, anxiety, cognitive dysfunction, chest pain, thromboembolism, hair loss, and chronic kidney disease may not disappear [12]. Post-COVID syndrome, also known as post-acute COVID-19 syndrome or long COVID, refers to a range of persistent symptoms that develop during or after an infection with COVID-19 and continue for more than four weeks [13]. Nutrition can play an integral role in managing this syndrome, considering that various dietary compounds can have pleiotropic effects on multiple targets, thus helping to alleviate symptoms and promote physical and psychological well-being through independent and synergistic mechanisms [14]. The systemic inflammation triggered by the virus adversely impacts muscle protein synthesis and heightens nutritional demands, which becomes challenging due to the appetite, taste, and smell losses from the COVID-19 infection [15]. Hence, the loss of skeletal muscle mass and function (sarcopenia), combined with inadequate intake resulting from frailty, depressed mood, and changes in the gut microbiome, have led to a high prevalence of malnutrition [15]. Malnutrition impedes the recovery of all other systems affected by post-COVID syndrome. Therefore, it is a critical component that needs addressing, with dietitians potentially playing a pivotal role from the early onset of post-COVID syndrome and in the ongoing care of patients to improve clinical outcomes [14].

For post-COVID patients, home healthcare emerges as a beneficial practice rooted in the very existence of families as a unit of social organization. It is regarded by the Unified Health System (SUS) in Brazil as a continuity of health care, where health services are offered to individuals and their families in their homes to promote, maintain, or restore health. This approach aims to maximize levels of independence and minimize the effects of disabilities or illnesses, including those without a cure prospect, especially since hospital discharge does not always coincide with a complete recovery of nutritional status or the full capacity to eat and biologically utilize nutrients [16].

Thus, this study seeks to recognize the role of the dietitian within the multidisciplinary team of a Home Care Program. It hypothesizes that dietitians play a paramount role in post-COVID syndrome treatment and rehabilitation, understanding that a patient's nutritional status significantly determines the progression of COVID-19 after viral infection.

2. Case Report

A 58-year-old male was admitted on September 16, 2020, to a hospital specializing in infectious diseases, where he was hospitalized for 41 days. He had a 10-day history of flu-like symptoms with laboratory confirmation for COVID-19. He was administered a 15L/min reservoir bag for breathing but showed deterioration in respiratory patterns and gasometric parameters even after undergoing a pronation protocol. As a result, endotracheal intubation was needed, along with the use of vasoactive drugs for pressure control. After 15 days of intubation, he underwent a tracheostomy and suffered kidney injury, requiring dialysis sessions, but he improved and was discharged without needing a nephrologist's follow-up. The patient's medical record mentions a lesion in the sacral region. Despite using protective foams as a precaution, the lesion measured 10cm x 10cm, grade V, with a cavity, presence of slough, and wet necrosis, necessitating conservative instrumental debridement. At the time of his illness, he was off work as he was considered at risk.

Regarding food intake, there are no records of the patient's eating pattern before admission to the institution mentioned above. The first dietary record in his medical chart was the day after his admission. Given his health condition, he was fed enterally through a nasoenteral tube. There were difficulties in reaching his caloric and protein goals due to numerous breaks in diet administration for the pronation protocol and tests. During this time, because of the patient's psychomotor agitation, which might have been due to reduced sedation, the tube was accidentally removed, and the patient was reluctant to have it reinserted.

The transition to an oral diet consistency was initiated, which was well-received. Despite a history of constipation, there were no records of diarrhea episodes or the use of laxatives. The caloric prescription adopted during the intervention period was set at 30kcal/kg/day, with a protein offer of 1.5g/kg/day, in line with the guidelines proposed by the Brazilian Society of Parenteral and Enteral Nutrition [17]. The primary goal of nutritional therapy was to restore the patient's nutritional status, who was, at the beginning of the intervention, with indications of underweight, muscle depletion, and increased nutritional demands due to the pressure ulcer (PU) in the healing process.

The information in this clinical case report was gathered through a review of patient records and the database of the multidisciplinary team from the Home Care Program of a public hospital in Fortaleza, Ceará, Brazil. The data collection instrument used was the patient record from which general health information, patient feeding methods, physical examinations, gastrointestinal tract functioning, and anthropometric data—such as weight, height, mid-upper arm circumference (MUAC), knee height (KH), calf circumference (CC), and Body Mass Index (BMI)—were extracted.

The aim of gathering these details was to observe the nutritional status of the said patient throughout the nutrition monitoring process. The first anthropometric assessment took place in October 2020, with subsequent evaluations conducted every 14 days, and the last one was carried out after 28 days (Table 1). Details like the presence and staging of PUs were also noted. To access the data that elucidated this research, the lead researcher contacted the institution and subsequently scheduled a date and time to visit and gather information from the relevant departments. Additionally, the patient was on the following medications: omeprazole 40mg (once daily), clonazepam 0.5mg (once daily), and risperidone.

Table 1. Anthropometric data of the patient and his progress during post-COVID nutritional rehabilitation treatment.

Measurement Dates	MUAC	CC	KH	EW	EH	%MUAC	MUAC classification [a]	BMI (kg/m²)	BMI classification [b]
10/28/2020	23 cm	28.5 cm	53cm	50.1 kg	1.71m	72.6%	Moderate malnutrition	17.13	Underweight
11/11/2020	24 cm	29 cm		53.3 kg		75.7%	Moderate malnutrition	18.22	Underweight
11/25/2020	25 cm	29.8 cm		56.5 kg		78.9%	Moderate malnutrition	19.32	Normal weight
12/09/2020	26.8 cm	30.7 cm		62.3 kg		84.5%	Mild malnutrition	21.3	Normal weight

01/06/2021	28 cm	31.5 cm	66.1 kg	88.3%	Mild malnutrition	22.6	Normal weight

MUAC, mid-upper arm circumference; CC, calf circumference; KH, knee height; EW- estimated weight; EH- estimated height; %MUAC, Adequacy of the MUAC. [a] Nutritional status according to Mid-Arm Muscle Circumference by Blackburn and Thornton [25]. [b] Nutritional status according to BMI classification by World Health Organization [26].

The patient record used in this study was meticulously examined and analyzed retrospectively from admission until the conclusion of their interaction with the Home Care Program team. In this context, content analysis allows access to various contents, explicit or otherwise, present in a text. These contents may be expressed in the science of values presupposed in the content under analysis. It should be further emphasized that data collection took place in October and only after the approval from the hospital's ethics committee. Thus, the study occurred during the first wave of the COVID-19 pandemic, from October 2020 to January 2021.

The initial approach involved welcoming the patient and the reference family members involved in care. They were given guidance on healthy and appropriate nutrition for the rehabilitation context. Upon admission to the Home Care Program, the patient was bedridden, unable to leave the house unassisted, and dependent on others for daily activities. His nutritional state was compromised, evidenced by his BMI of 17.13kg/m², indicating he was underweight. A physical examination revealed signs of muscular atrophy, especially in the lower limbs, mild dehydration, a grade 5 PU in the sacral region, and a non-classified heel ulcer.

Upon integration into the Home Care Program, the patient was being fed a pasty-consistency diet, with a total caloric intake of about 1,900 kcal/day or 37.92 kcal/kg. This diet was mainly characterized by foods requiring less chewing effort, such as softer-consistency rice, various purees, and proteins in-ground or shredded forms. Concurrently, hypercaloric and hyperproteic supplementation was introduced at the beginning of nutritional therapy, specifically formulated to favor healing processes. This supplementation, administered in volumes of 200ml twice a day, provided an increase of 548 kcal, 40g of protein, 6g of arginine, 4g of proline, 22mg of zinc, 400 μg of vitamin A, 568mg of vitamin C, and 72mg of vitamin E.

After ten days on this diet, there was a successful transition to a soft-consistency diet, with an energy intake of approximately 2,000 kcal/day or 39.92 kcal/kg. Given the patient's socioeconomic circumstances, the multidisciplinary team decided to substitute the previously prescribed liquid supplementation with a more cost-effective powdered option in the subsequent stage. It was administered in doses of 2 to 3 scoops, twice daily, adjusted based on acceptance, aiming to match the protein intake of the prior diet for an estimated duration of 2 months. In the final week, as preparation for concluding therapy with the Home Care Program, the supplementation was adjusted to once a day after observing a marked improvement in PU healing.

4. Discussion and conclusion

After being discharged from the hospital, the patient began to be monitored by the Home Care Program. Post-COVID conditions are observed in individuals with a history of SARS-CoV-2 infection, lasting for months after the onset of COVID-19. Common symptoms include fatigue, shortness of breath, and cognitive dysfunction, usually occurring between 3 to 24 weeks post-hospital discharge [18]. The multi-professional therapeutic plan encompassed five professional categories, among which nutrition stood out as the focus of the present study.

The involvement of a nutrition professional during the rehabilitation process was pivotal for the patient's recovery. This is particularly significant because, after acute

inflammation, smooth muscle reduction can be reduced, which may compromise gastrointestinal (GI) motility. Zhou et al. have linked this to symptoms like early satiety, diarrhea, constipation, and cachexia [19]. Beyond the atrophy of smooth muscles in the GI tract, skeletal muscle atrophy also deserves discussion. Sarcopenic patients, or those with any degree of muscle compromise, can have their intestinal function affected. This can lead to significant impairment in nutrient ingestion and absorption and fecal production, thus contributing to the development and progression of cachexia [20]. Although the inflammatory process resulting from COVID-19 was resolved, the patient's nutritional needs remained high due to the extensive PUs requiring healing.

According to the Brazilian Society of Parenteral and Enteral Nutrition, the caloric recommendation for malnourished patients with existing lesions can range from 30 to 35 kcal/kg/day and protein intake from 1.5 to 2g/kg/day [17]. Given the patient's need for enhanced energy-protein intake, the recommendation was to use specialized supplementation with hypercaloric and hyperprotein characteristics formulated with arginine and proline to aid wound healing. This enriched with high levels of zinc, and vitamins A, E, and C. It is worth highlighting that aside from energy and protein intake, other micronutrients also play a significant role in the healing process. Arginine and proline accelerate wound closure, as they are precursors of essential substrates: nitric oxide and collagen [21]. The vitamins mentioned above, and minerals can reduce free radical production and speed up wound healing [22]. The patient also reported constipation, for which a diet focused on natural and minimally processed foods, fiber-rich foods, and adequate water intake based on weight was recommended. Laxative recipes were also introduced into his routine to improve bowel movement. Treating constipation is crucial, as neglecting it can lead to other upper gastrointestinal symptoms like heartburn or dyspepsia. Moreover, chronic constipation patients are more susceptible to anxiety and depression [23,24].

The multidisciplinary team monitored the patient for approximately 70 days, during which periodic visits were conducted as needed. Significant progress was observed in his rehabilitation and wound-healing process over this period. Not only did he gain weight, but there was also an apparent improvement in his body composition. After the intervention, the patient gained 6kg in weight, progressing to a eutrophic nutritional state. Furthermore, there was an improvement in the MUAC adequacy, with an increase of 15.7%, indicating growth in both adipose and muscular compartments (Table 1). In addition, this was also evident with the increase in calf circumference (Table 1), which, when less than 31cm, indicates potential loss of skeletal muscle. With improved nutritional status, the patient responded better to physiotherapy, regaining balance and enhancing sedation, bipedalism, and palmar movements. While these advancements did not lead to a full recovery, they granted the patient greater autonomy and reinstated a significant portion of his daily activities.

Upon reviewing the findings of this study, the benefits of well-executed nutritional therapy become evident, especially for those requiring post-hospitalization care. Nutritional therapy was able to recover and improve the patient's nutritional status, restoring his autonomy and quality of life.

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