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A diet protocol for patients on non-invasive ventilation admitted to a healthcare unit in a tertiary referral center in southern Brazil

Um protocolo de dieta em pacientes com ventilação não invasiva admitidos em uma unidade de internação de um centro terciário de referência do Sul do Brasil

Abstract

Introduction: The COVID-19 pandemic posed unprecedented challenges and threats to patients and healthcare systems worldwide. The high risk of malnutrition highlighted the importance of early nutrition intervention. *Objective*: To develop a personalized dietary protocol for patients requiring non-invasive ventilation (NIV). *Methods*: This was a descriptive observational study included adult NIV patients admitted to a tertiary referral center in southern Brazil between March and August 2021. Patients received a dietary protocol consisting of a fractionated, liquidized and pureed diet, supplemented with isolated whey protein. The protocol provided 2,000 kcal/day and 90 g of protein/day. Food intake was continuous monitored using a visual intake scale. The study was approved by the hospital's ethics committee. *Results*: A total of 176 patients were evaluated, most male (57%), with a mean age of 56 ± 15 years. The median onset of respiratory symptoms was 9 days. According to the NRS-2002, 83% of the patients were classified as being at risk of malnutrition. Upon admission, 86% required oxygen support, and 94% were exclusively fed orally, with 50% receiving the prescribed diet protocol. Patients on NIV consumed more than half of the prescribed diet and were able to progress to a regular consistency diet by discharge. *Conclusion*: A fractionated, modified-consistency diet that is easy to chew appears to be a feasible alternative to nasoenteric tube feeding for patients on NIV. In this context, nutritional therapy should be considered a fundamental component of care for these patients in all healthcare settings.

Keywords: COVID-19. SARS-CoV-2. Non-invasive Ventilation. Diet. Nutrition Therapy.

Resumo

Introdução: A pandemia de Covid-19 impôs desafios e ameaças sem precedentes aos pacientes e sistemas de saúde em todo o mundo. O alto risco de desnutrição destacou a importância da intervenção nutricional precoce. *Objetivo*: Desenvolver um protocolo dietético personalizado para pacientes em ventilação não invasiva (VNI). *Métodos*: Estudo observacional descritivo realizado com pacientes adultos em VNI internados em um centro

de referência terciário do Sul do Brasil, entre março e agosto de 2021. Os pacientes receberam um protocolo dietético composto por dieta liquidificada e pastosa fracionada, suplementada com proteína isolada do soro do leite. O protocolo fornecia 2.000 kcal/dia e 90 g de proteína/dia. O consumo alimentar foi monitorado continuamente por meio de uma escala visual de ingestão alimentar. O estudo foi aprovado pelo comitê de ética do hospital. *Resultados*: Foram avaliados 176 pacientes, a maioria do sexo masculino (57%), com idade média de 56 ± 15 anos. A mediana do início dos sintomas respiratórios foi de 9 dias. De acordo com a ferramenta NRS-2002, 83% dos pacientes foram classificados como em risco de desnutrição. A maioria dos pacientes (86%) necessitou de suporte de oxigênio na admissão, e 94% estavam em alimentação exclusivamente oral, dos quais 50% receberam o protocolo dietético prescrito. Pacientes em VNI consumiram mais da metade da dieta prescrita e conseguiram progredir para uma dieta de consistência regular até a alta hospitalar. *Conclusão*: Uma dieta fracionada, de consistência modificada e de fácil mastigação, parece ser uma alternativa viável à alimentação por sonda nasoentérica em pacientes em uso de VNI. Nesse contexto, a terapia nutricional deve ser considerada um componente fundamental do tratamento desses pacientes em todos os níveis de atenção à saúde.

Palavras-chave: Covid-19. SARS-CoV-2. Ventilação não invasiva. Dieta. Nutrição.

INTRODUCTION

The COVID-19 pandemic posed unprecedented challenges and threats to patients and healthcare systems worldwide. Patients with COVID-19 typically present severe acute respiratory syndrome, accompanied by inflammation characterized by proinflammatory cytokines, diarrhea, fever, and reduced food intake.[1]This scenario can lead to increased energy expenditure and muscle hypercatabolism.[2]

Hospitalized patients with COVID-19 are at high risk of malnutrition, and recent studies have linked this nutritional risk to worse outcomes.[3] The Nutritional Risk Screening2002 (NRS-2002) is a tool with high sensitivity for identifying nutritional risk and has showed better predictive validity for prolonged hospitalization.[4] A recent cross-sectional study found that 82.6% of patients hospitalized with COVID-19 were at risk of malnutrition, as assessedby NRS-2002.[5] The high risk of malnutrition in COVID-19 patients underscores the importance of nutritional screening and early nutrition intervention in this population.

Patients admitted with COVID-19 often require ventilation support in the hospital to improve respiratory effort and oxygenation. Various types of ventilation support can be used in non-critical settings to either increase oxygen delivery or enhance airway pressure.[6] However, masks that increase oxygen delivery need to be removed during feeding, which can cause respiratory instability in the patient by temporarily decreasing the oxygen fraction delivered.[6]

In this context, a modified diet designed to facilitate the patient's food intake, optimize respiratory function, improve nutritional status, and prevent malnutrition is essential in the nutritional therapy of hospitalized patients during the early phases of COVID-19.[2,7,8] This study aimed to develop a personalized dietary protocol with improved tolerance for patients requiring non-invasive ventilation (NIV) who were admitted to a tertiary referral center.

METHODS

This was a descriptive observational study conducted at a tertiary referral center in Southern Brazil, specialized in the treatment of severe COVID-19 cases. The center has 135 critical care beds (15% of total capacity) designated for COVID-19 patients, with non-critical beds made available as needed throughout the pandemic.

Adult patients presenting with respiratory symptoms who tested positive for COVID-19 via nasopharyngeal swab[9] were consecutively included in the study upon admission. All patients underwent nutritional screening using the NRS-2002[10] and anthropometric assessment atadmission (when feasible), followed by nutritional intervention based on their nutritional status. Exclusion criteria included pregnancy, receipt of palliative care, or prior use of tube feeding. The diet protocol was applied to all patients receiving NIV between March and August 2021. During this period, the second wave[11] of COVID-19 was underway in Brazil, leading to overcrowding in intensive care units (ICUs), with hospital occupancy rates exceeding 100%. Despite not being in an ICU, the clinical profile of the patients in this study was very critical.

Nutritional protocol

Several studies on nutritional intervention protocols for COVID-19 patients have supported the use of a personalized meal plan combined with oral food supplements to meet the high energy and protein requirements induced by disease in patients able to eat orally.[12-15]

Due to the increased volume of infections during the second wave of the pandemic,[11]a specific NIV diet protocol was developed based on the observation that nearly all patients admitted at the time of hospitalization presented severe inflammatory status, anorexia, and/or anosmia, which led to a significant reduction in food intake. Additionally, oxygen desaturation was observed when ventilation support was removed.[12]The protocol aimed to facilitate food intake with minimal effort from the patient, using foods that are easy to chew and have higher caloric and protein density.

Based on an assessment by the multidisciplinary team, some patients on NIV were subsequently treated with a personalized diet, consisting of a fractionated, liquidized, and pureed diet (standard diet: 2,000 kcal/day, 90 g of protein/day). Additionally, an isolated whey protein supplement, soluble in water, was included as part of the afternoon snack. When patients required more energy than the standard diet, meal portions were increased and/or high-calorie, high-protein oral nutritional supplements (ONS) were administered (200 ml; 300 kcal; 12 g of protein) to meet nutritional targets. The servings were prepared by the hospital's food service, following strict food safety protocols. Figure 1 shows the detailed composition of the NIV diet daily plan..

Figure 1. Daily dietary plan for patients requiring non-invasive ventilation (NIV)

Four clinical nutritionists responsible for the care of hospitalized patients and one nutritionist in charge of staff management and meal distribution logistics supported the Nutrition and Dietetics Service (NDS). Meals were prepared in a central production unit, and each care unit had a support pantry where meals were organized and stored. Since the beginning of the pandemic, meals have been delivered directly to patients' beds by the (NDS). This approach not only assisted the nursing staff with their daily responsibilities but also emphasized the fundamental role of nutrition in the rehabilitation of hospitalized patients. Study data were collected from the patients' electronic medical records and included age (in years), presence of comorbidities, use of ventilatory support (as recorded by the medical team), and food intake (as recorded by the nursing team). When possible, body weight and height were measured by the nursing team upon admission and after being registered in the medical record.

As part of a humanized protocol, motivational messages were sent to patients twice a week along with breakfast. In addition to meal delivery, there was a focus on the emotional well-being of patients, who were isolated from their homes and families.

Continuous monitoring

Body weight, food intake, and clinical status were monitored by the multidisciplinary team throughout hospitalization,with the frequency of assessments varying according to each patient's condition.Changes to the NIV diet protocol were made based on clinical progress. A food intake visual scale[16] (Figure 2) was used, with the support of the nursing staff, to record meal consumption in the electronic medical records.

Figure 2. Food intake visual scale.[16]

If any patient continued to have low oral intake, enteral nutrition (EN) support therapy (either total or partial) was prescribed based on their clinical progression.

Statistical analysis

Results were expressed as mean ± standard deviation (SD), median and interquartile range, or as the absolute number and percentage of patients exhibiting the analyzed characteristic.

Ethical aspects

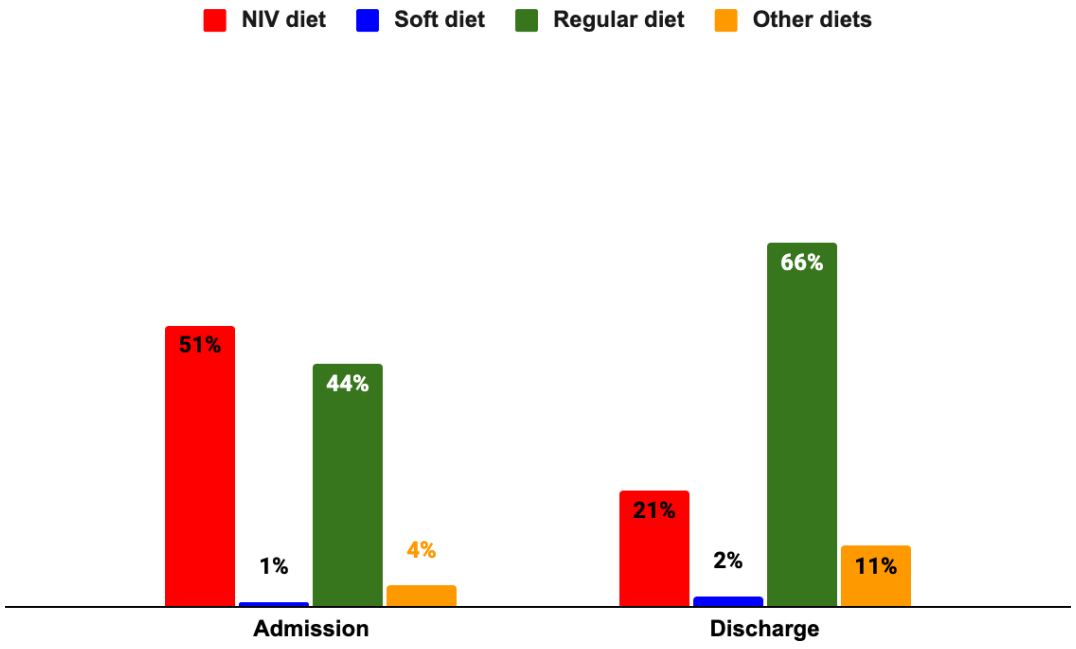
This study was conductedin accordance with the Helsinki Declaration, as revised in 2013, and was approved by the Scientific Committee/Research Ethics Committee (CEP) of the Hospital de Clinicas de Porto Alegre under approval number 2022-0048 and CAAE: 56740122.7.0000.5327, on May 11, 2022. For this study, the Term of Free and Informed Consent was waived by the CEP, and the Term of Commitment for the Use of Secondary Data was signed by the researchers.

RESULTS

A total of 176 patients were evaluated, with most being male 57% (n=100), with a mean age of 56 ± 15 years. The median onset of respiratory symptoms was 9 days. The most prevalent comorbidities were hypertension 46% (n=80), diabetes 19% (n=33), respiratory conditions 16% (n= 28), kidney disease 15% (n=26), and cancer8% (n=14), respectively. At screening, 82% (n= 145) were identifiedas being at risk of malnutrition according to the NRS-2002.

Most of the patients 86% (n=152)required oxygen support on admission at the hospital, and of these 94% (n=142)received an exclusively oral diet. The progression of diet consistency of all patients with NIV support is illustrated in Figure 3. At admission, approximately 50% of the patients required NIV diet with adapted consistency, with acceptance of at least half of the prescribed amount.At discharge, approximately 66% of the patients who used NIV were consuming a regular-consistency diet.

Figure 3. Progression of diet consistency for patients with NIV support (n=142).



Regarding clinical outcomes, most of the patients 60% (n=105)were discharged home, 26% (n= 46) were transferred from COVID unit to general care, 13% (n= 22) were transferred to ICU, and 2% (n= 3) died.

DISCUSSION

Patients admitted with COVID-19 often required ventilation support to improve respiratory effort and oxygenation, reflecting the severity of their clinical condition. In this context, the development of NIV diet protocol was fundamental to optimize ventilatory function, and avoid use of EN, there by prioritizing resources to ICU patients during the most critical phase of the pandemic.

Most patients who required oxygen support at admission received an exclusive oral diet. Furthermore, about half of the patients needed the NIV diet, with at least 50% of the prescribed amount being consumed. This finding is important because it shows that, despite their critical condition, most patients were able to tolerate a modified oral diet. Additionally, by the time of discharge, many patients had progressed to a regular-consistency diet, indicating significant recovery of oral function and feeding ability during hospitalization.

According to the European Society for Clinical Nutrition and Metabolism (ESPEN),[12] tube feeding should be considered when the oral route becomes impossible for more than three days or when food acceptance is less than half of the patient's nutritional requirements. The literature indicates that energy and protein intake in most patients on ventilation support is inadequate.[17,18] However, patients on ventilation support may have difficulties in starting and maintaining nutritional therapy. The first challenge is the placement of the nasoenteric tube, as these individuals cannot tolerate prolonged periods without ventilation and may desaturate. In patients who successfully tolerate tube feeding, ventilation may be compromised by air leakage, reducing the effectiveness of NIV.[12] Additionally, these patients may have a lower tolerance of EN with abdominal distension and gastrointestinal symptoms.[18] In these cases, systematic monitoring of these symptoms is recommended, as well as the provision of EN.[12] Adequate assessment of nutrient intake is crucial, with the use of ONS or EN when oral feeding is insufficient.[12] In this patient cohort, only 10 individuals (5.7%) who required EN received a high in protein (75g/L), hypercaloric (1.5kcal/ml), fiber-free polymeric formula administered via continuous infusion.

In clinical practice during the pandemic, even in patients with reduced food intake, medical teams mostly opted to maintain an exclusively oral diet with a nutritional supplement for those on ventilation support, prioritizing comfort, as tube feeding is an additional invasive treatment. Furthermore, the literature indicates that the use of enteral access is a risk factor for the development of delirium,[19] a condition common among elderly and isolated patients, both frequent characteristics of those hospitalized with COVID-19.

This study has some limitations. First, data were collected from medical records, which made verification challenging. Second, food consumption during meals was recorded by the nursing team using the subjective food intake scale; however, assessments of intake are susceptible to misinterpretation. Third, some additional information and assessments for nutritional status, such as arm and calf circumference measurements, could not be performed due to the high demand on the care team at the time.

It is important to highlight that, based on the findings of this study, changes were made in the care of patients receiving NIV, with an emphasis on prioritizing oral nutrition whenever possible. This protocol proved to be effective in optimizing food intake within this patient population and may serve as a useful strategy in clinical practice.

CONCLUSION

A fractionated, easy-to-chew, hypercaloric, and high-protein diet appears to be a good alternative to nasoenteric tube feeding for patients receiving NIV. This approach contributed to improved ventilation

support, better acceptance of oral intake, and a more rational use of enteral nutrition, helping to reduce hospital costs. Nutrition intervention should be considered a fundamental component of care for patients on NIV in all healthcare settings.

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Contributors

Antonio JP, Anele CR, Schwartz R, and Silveira MN participated in data collection and drafting of the manuscript; Antonio JP, Hammes TO, Falcetta MRR, Jochims AMK, Dall'Alba V, and Bosa VL contributed to the study design and manuscript drafting; Antonio JP, Anele CR, and Bosa VL were involved in data analysis and interpretation. All the authors reviewed and approval of the final version of the manuscript.

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