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ORIGINAL ARTICLE

Association between nutritional therapy and complications in patients diagnosed with COVID-19 followed in the state of Pernambuco

Associação entre terapia nutricional e complicações em pacientes diagnosticados com COVID-19 acompanhados no estado de Pernambuco

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KEYWORDS

Coronavirus infections
Nutrition
Nutrition therapy
SARS-CoV-2
Signs and symptoms

ABSTRACT

Objective: To analyze the association between nutritional therapy and complications in patients diagnosed with COVID-19 followed in Pernambuco.
Methods: A prospective cohort study was conducted to investigate secondary data from multicenter research from June 2020 to June 2021. Patients of both sexes over 18 years old were hospitalized for COVID-19 in wards or intensive care units of eight hospitals. Sociodemographic and economic data, nutritional status, nutritional therapy, gastrointestinal complications, and clinical outcome were collected during admission and at the end of hospitalization.
Results: The sample consisted of 272 patients, with a median age of 67 years (IQR 54 - 76), equally distributed between men and women (50.4% vs. 49.6%). A higher frequency of overweight/obesity (40.31%) was observed. The most frequent alterations were inappetence (12.88%) and dysgeusia (8.28%). It was observed that 84.6% received an early diet, the caloric adequacy varied between 72.1% and 60.7%, the oral route between 82.4% and 70.7%, the majority (58%) received up to 1.3 g of protein per day, and 46.7% died. Caloric adequacy was associated with dysgeusia (p = 0.040) and clinical outcome (p = 0.044) and tended to be associated with vomiting (p = 0.077). No association was found with proteins.
Conclusion: Nutritional therapy is associated with gastrointestinal symptoms such as vomiting and dysgeusia and the clinical outcome of patients with COVID-19.

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PALAVRAS-CHAVE

Infecções por coronavírus
Nutrição
SARS-CoV-2
Sinais e sintomas
Terapia nutricional

RESUMO

Objetivo: Analisar a associação entre terapia nutricional e complicações em pacientes diagnosticados com COVID-19 acompanhados no estado de Pernambuco.
Métodos: Estudo do tipo coorte prospectiva, realizado a partir da análise de dados secundários de pesquisa multicêntrica, de junho de 2020 a junho de 2021. Foram incluídos pacientes de ambos os sexos, maiores de 18 anos, hospitalizados por COVID-19 em enfermarias e/ou unidades de terapia intensiva de oito hospitais. Foram coletados dados sociodemográficos e econômicos, de estado nutricional, terapia nutricional, complicações gastrointestinais e desfecho clínico, durante a admissão e término do internamento.
Resultados: A amostra foi composta por 272 pacientes, com uma idade mediana de 67 anos (IIQ 54 - 76), distribuindo-se de forma semelhante entre homens e mulheres (50,4% *vs.* 49,6%). Foi observada uma maior frequência de sobrepeso/obesidade (40,31%). Inapetência (12,88%) e disgeusia (8,28%) foram as alterações mais frequentes. Foi observado que 84,6% receberam dieta precoce, a adequação calórica variou entre 72,1% e 60,7%, a via oral entre 82,4% e 70,7%, a maioria (58%) recebeu até 1,3 g de proteína ao dia e 46,7% foram a óbito. A adequação calórica se associou a disgeusia (p = 0,040) e desfecho clínico (p = 0,044) e apresentou tendência de associação ao vômito (p = 0,077). Não se encontrou associação com as proteínas.
Conclusão: A terapia nutricional está associada a sintomas gastrointestinais, como vômitos e disgeusia e ao desfecho clínico dos pacientes com COVID-19.

INTRODUCTION

In December 2019, a new virus spread worldwide, causing a severe pandemic due to its rapid spread, reaching almost all countries in less than 6 months, being called by the World Health Organization (WHO) the "1st pandemic of the 21st century". Identified as a virus of the coronavirus family by sharing the same phylogeny of the severe acute respiratory syndrome (SARS-CoV) and the middle east (MERS-CoV) viruses, it was termed severe acute respiratory syndrome 2 (SARS-CoV-2) or coronavirus disease 2019 (COVID-19) [1].

The virus maintains a binding with the angiotensin-converting enzyme receptor 2 (ACE2) through the structural protein *Spike* (S), one of the four proteins that constitute the coronavirus. ACE2 is highly expressed in lung cells; however, it can affect other systems and organs, causing extra-respiratory symptoms, such as fever, sore throat, anosmia/hyposmia, ageusia, nausea, vomiting, diarrhea, and fatigue[2,3]. These symptoms can be mild or severe, or even not be expressed[4].

The importance of nutrition in the care of patients infected with SARS-CoV-2 is based on its purpose of enabling prognosis and favorable outcomes. The low intake of calories and proteins increases the risk of infections due to a reduction in antibody synthesis — which are essential to building an efficient immune system that acts in the anti-inflammatory and antioxidant processes present in the COVID-19 scenario, contributes to an increase in the length of hospital stay, reduced functionality, and higher mortality rates. Given this context, nutritional support is of paramount importance in the search for a better quality of life and recovery of the nutritional, clinical, and functional status of the individual[5-6]. Therefore, this study aimed to analyze the association between nutritional therapy and complications in patients diagnosed with COVID-19 followed up in the state of Pernambuco.

METHODS

This is a prospective cohort study, conducted from the analysis of secondary data from a multicenter research entitled "Clinical, nutritional and sociodemographic aspects associated with mortality in patients with COVID-19: a multicenter study in northeastern Brazil", carried out from June 2020 to June 2021. We included patients hospitalized for COVID-19 confirmed by RT-PCR test, hospitalized in wards and/or intensive care units of 8 hospitals in the state of Pernambuco (Hospital Barão de Lucena, Hospital dos Servidores do Estado, Hospital da Restauração, Hospital das Clínicas, Pronto Socorro Cardiológico de Pernambuco, Hospital Miguel Arraes, Hospital Provisório de Recife – Unidade Aurora, in the city of Recife, and Hospital Dom Moura in the city of Garanhuns), of both sexes, over 18 years old, registered in the study database, and were identified by health professionals of the services. Pregnant and postpartum women were excluded, as well as those with suspected COVID-19, but without diagnostic confirmation.

The sampling plan followed a non-probabilistic model for convenience, including patients who met the eligibility criteria during the data collection, were identified by the service professionals and agreed to participate in the study. It is worth mentioning that many individuals did not accept to participate in the research, in addition to the difficulty of making the collections considering the need to reconcile professionals with the routine in the care services.

Sociodemographic and economic data, nutritional status, nutritional therapy offered, gastrointestinal complications, and clinical outcome (discharge/death) were collected and analyzed.

The following socioeconomic and demographic variables were evaluated: age, gender, marital status (with or without a partner), education (in years of study, categorized into ≤ 9 and > 9 years, according to the median of the sample), and economic class assessed using the Brazil-CCEB[7] Economic Classification Criteria, collected in the first contact with the patient during

recruitment or an interview with the family member.

For the analysis of the nutritional status, weight (kg) and height (m) information were considered to calculate the body mass index (BMI) (kg/m²). BMI was interpreted according to the categories recommended by the *World Health Organization* (WHO)[8] for adults and the Pan American Health Organization (PAHO)[9] for the elderly. Weight and height data, collected at hospital admission, were reported by patients or family members when they did not present physiological conditions to answer them (unconsciousness, sedation, intubation, etc.). If it was impossible to obtain the weight or height, the BMI was estimated using the silhouette scale, in which the individual's body image was observed, and the corresponding figure was selected, thus verifying the mean BMI[10].

Regarding nutritional therapy, information on the route of administration of the diet (oral, enteral, or parenteral), dietary needs (estimated and offered values of calories and proteins), and the time of initiation of nutritional therapy were collected and analyzed, considered early when started up to 24 h after hospital admission[11]. The caloric supply was adequate when meeting ≥ 80% of the needs[12] through the ratio: energy prescription offered x 100/energy estimate. Protein supply was categorized as < 1.3 g/kg/day, 1.3 – 2.0 g/kg/day, or > 2.0 g/kg/day.

The presence of gastrointestinal changes (diarrhea, nausea, vomiting, inappetence, dysgeusia, and dysosmia) was considered a variable of clinical complications of COVID-19. The days of hospitalization were also quantified, considering the date of the hospital outcome minus the day of admission recorded in the medical records.

All data analyzed were collected during the main research by the professionals of the institutions that composed the team of researchers of the original study. The data of this study were restricted to the information collected and distributed in a database. Patients were identified and selected by the professionals of the services of the partner hospitals, considering the confirmed diagnosis of COVID-19. After identification, a screening team contacted the patients or legal guardians by phone to invite them to participate in the primary research and electronically fill out the informed consent form. After obtaining the signature, the team collected the data from the medical records.

The research was approved by the Research Ethics Committee (REC) of the Universidade Federal de Alagoas (coordinating center; CAAE 31113120.0.1001.50130) and by the REC of the Universidade Federal de Pernambuco (collaborating center; CAAE 31113120.0.2004.5208), following the resolution No. 466/12 of the National Health Council/Ministry of Health. All the proposed institutions were aware of and complied with the provisions of Resolution No. 466/2012.

Data were analyzed using SPSS software, version 13.0 (SPSS Inc., Chicago, IL, USA). Initially, the behavior of the continuous variables was verified using the normality test (Kolmogorov-Smirnov test). The variables with a normal distribution are presented as mean and standard deviation, and those with a non-normal distribution as median and interquartile ranges. Categorical variables are presented in absolute values and percentages. To test the association between nutritional therapy and complication variables, the chi-square test or Fisher's exact test was used, the latter when the expected value in any cell in the 2 x 2 table was less than 5. Statistical significance was considered at $p < 0.05$.

RESULTS

The sample consisted of 272 patients, with a median age of 67 years (interquartile range, IQR 54 – 76 years), with a higher prevalence of the elderly (65.07%) and being similarly distributed between men (50.37%) and women (49.63%), with self-declaration of black ethnicity (70%), with up to 9 years of study (50%), and classified socioeconomically in the median to low strata (94.88%), as shown in Table 1.

Table 1 – Socioeconomic, demographic, nutritional characterization, and clinical outcome of patients hospitalized for COVID-19 in the State of Pernambuco (2020-2021).

Variable	n	%
Age group	272	
Adult	95	34.93
Elderly	177	65.07
Sex	272	
Male	137	50.37
Female	135	49.63
Ethnicity/Race/Skin color	270	
Yellow/White	57	21.11
Brown	24	8.89
Black	189	70.00
Marital status	263	
With partner	146	55.51
No partner	117	44.48
Schooling	254	
≤ 9 years	153	60.24
> 9 years	101	39.76
Economic class	272	
A/B1	11	4.04
B2/C1/C2	147	54.04
D/E	57	20.96
Didn't want to answer	57	20.96
Nutritional status (BMI)	258	
Low weight	64	24.81
Eutrophy	90	34.88
Overweight	104	40.31
Outcome	225	
Discharge	120	53.33
Death	105	46.67
Length of stay	257	
< 7 days	119	46.30
≥ 7 days	138	53.70

BMI: Body Mass Index.

Table 2 — Nutritional therapy offered to patients hospitalized for COVID-19 in the State of Pernambuco - 2020-2021. Values in n (%).

Variable	D1	LD
Early offer	253	
Yes	214 (84.58)	-
No	39 (15.42)	
Supply route	222	133
Oral	183 (82.43)	94 (70.68)
Enteral	39 (17.57)	38 (28.57)
Parenteral	0 (0.00)	1 (0.75)
Calories	149	98
< 20 kcal/kg	40 (26.85)	26 (26.53)
20 - 25 kcal/kg	36 (24.16)	18 (18.37)
25.01 - 30 kcal/kg	36 (24.16)	19 (19.39)
30.1 - 35 kcal/kg	20 (13.42)	15 (15.31)
> 35 kcal/kg	17 (11.41)	20 (20.41)
Caloric adequacy	201	140
Yes	145 (72.14)	85 (60.71)
No	56 (27.86)	55 (39.29)
Protein	160	109
< 1.3 g/kg	93 (58.13)	61 (55.96)
1.3 - 2.0 g/kg	66 (41.25)	48 (44.04)
> 2.0 g/kg	1 (0.63)	0 (0.00)

D1: First day of hospitalization; LD: Last day of follow-up.

At the hospital admission, a higher frequency of overweight/obese individuals was observed, corresponding to 40.31% of the sample. As a clinical outcome, 46.67% of patients died. The median length of hospital stay was 7 days (IQR 1 - 15 days) (Table 1).

The most frequently observed gastrointestinal complications were inappetence (12.88%) and dysgeusia (8.28%) (Figure 1). Other non-gastrointestinal symptoms were reported, such as fever, hypotension, urinary tract infection, seizures, and edema.

Regarding the nutritional therapy offered (Table 2), it was observed that 84.58% of the patients received a diet within the first 24 h after hospital admission. The estimated median value for caloric supply was 1,700 kcal/day (IQR 1,400 - 1,935 kcal/day), and the prescribed value was 1,622.5 kcal/day (IQR 615.75 - 1,895 kcal/day) for day 1 (D1). At the end of the follow-up, the estimated median remained similar, at 1,740 kcal/day (IQR 1,471 - 2,000 kcal/day) and the prescribed at 1,585.5 kcal/day (IQR 0 - 2,000 kcal/day).

The energy supply of up to 20 kcal/kg/day and caloric adequacy were observed in most individuals receiving intake orally. The most used range for protein supply was up to 1.3 g/kg of body weight/day, both at admission and at the clinical outcome.

The analyses of the association between caloric adequacy and gastrointestinal complications and clinical outcome at hospital admission and at the end of follow-up are presented in Table 3. Patients discharged from the hospital (p = 0.044) showed better caloric adequacy at admission, while those who showed caloric adequacy at the final follow-up date showed less dysgeusia (p = 0.04). Additionally, patients who experienced less vomiting at admission had a tendency (p = 0.077) to achieve better caloric adequacy at that moment.

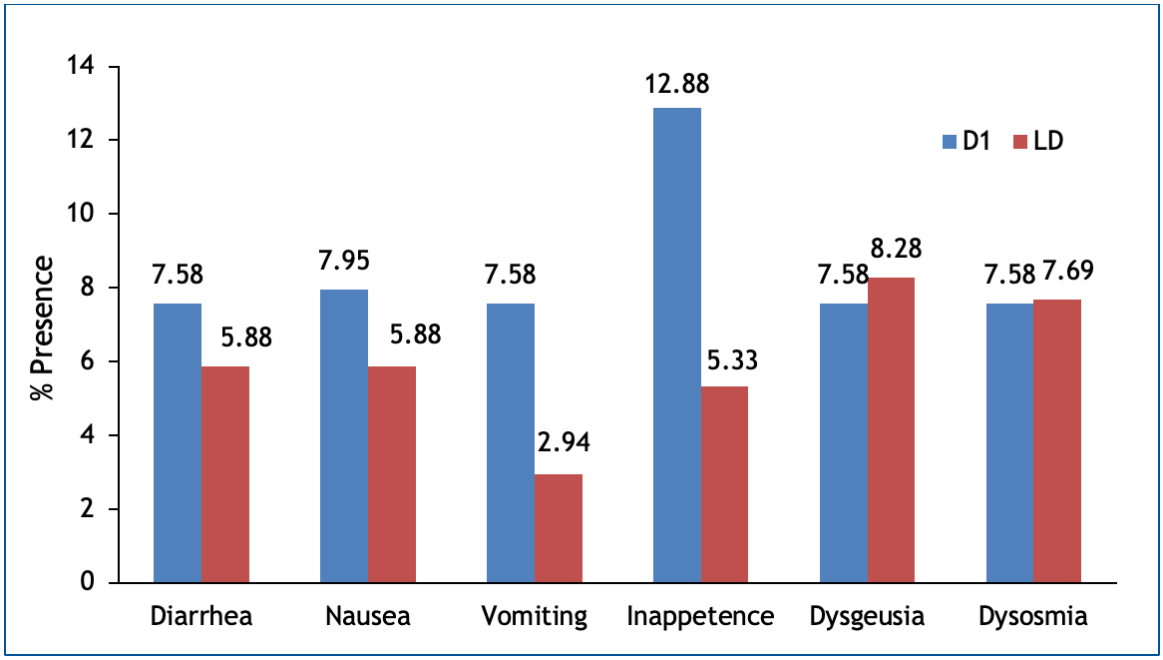

Figure 1 — Presence of the leading gastrointestinal complications observed during hospitalization due to COVID-19 in the State of Pernambuco - 2020-2021 (n = 272). D1: First day of hospitalization; LD: Last day of follow-up.

Table 3 — Association between caloric supply and gastrointestinal complications and clinical outcome in patients hospitalized for COVID-19 in the State of Pernambuco – 2020-2021. Values in n(%).

Variable	Caloric adequacy (D1)		p-value	Caloric adequacy (LD)		p-value
	No	Yes		No	Yes	
Diarrhea						
Yes	2 (13.3)	13 (86.7)	0.242**	0 (0.0)	0 (0.0)	†
No	53 (29.3)	128 (70.7)		37 (43.5)	48 (56.5)	
Nausea						
Yes	3 (20.0)	12 (80.0)	0.564**	3 (60.0)	2 (40.0)	0.649**
No	52 (28.7)	129 (71.3)		34 (42.5)	46 (57.5)	
Vomiting						
Yes	8 (50.0)	8 (50.0)	0.077**	0 (0.0)	2 (100.0)	0.503
No	47 (26.1)	133 (73.9)		37 (44.6)	46 (55.4)	**
Inappetence						
Yes	4 (15.4)	22 (84.6)	0.122*	3 (60.0)	2 (40.0)	0.650**
No	51 (30.0)	119 (70.0)		34 (43.0)	45 (57.0)	
Dysgeusia						
Yes	3 (20.0)	12 (80.0)	0.564**	6 (85.7)	1 (14.3)	0.040**
No	52 (28.7)	129 (71.3)		31 (40.3)	46 (59.7)	
Dysosmia						
Yes	4 (28.6)	10 (71.4)	1.000**	5 (71.4)	2 (28.6)	0.232**
No	51 (28.0)	131 (72.0)		32 (41.6)	45 (58.4)	
Outcome						
Discharge	17 (18.9)	73 (81.1)	0.044*	24 (40.7)	35 (59.3)	0.897*
Death	27 (36.0)	48 (64.0)		20 (38.5)	32 (61.5)	

D1: First day of hospitalization; LD: Last day of follow-up; †Variable not analyzed because they present constant data; * Pearson Chi-Square Test; ** Fisher's exact test.

DISCUSSION

The findings of this study revealed that nutritional therapy is associated with gastrointestinal complications and clinical outcomes in patients infected with COVID-19.

Gastrointestinal symptoms were found in at least 51% of the sample at hospital admission, with at least one symptom like nausea, vomiting, and diarrhea, corresponding to approximately 23%. Similarly to our results, Jin et al.[13], in a study conducted with 651 patients infected with COVID-19 in Zhejiang province, found that 11.4% of individuals also had nausea, vomiting, or diarrhea episodes at hospital admission.

Likewise, the review by Zarifian et al.[14], with 13,251 individuals, found a prevalence of 8.4% of diarrhea, 5.7% of nausea, 3.8% of vomiting, and 10.2% of inappetence. Flores-Silva et al.[15], in a study involving 1,072 neurological patients hospitalized for SARS-CoV-2, when confronting a group with and without new neurological changes after admission, found a prevalence of 8% of dysgeusia and 7% with anosmia, with no statistical differences between the groups. However, in contrast to all these results, a small longitudinal study by Bedock et al.[16], with 114 hospitalized patients, revealed a high prevalence of inappetence (62.3%) and anosmia or dysgeusia (36%).

This study revealed a trend of association between vomiting and energy nutritional supply after hospital admission of patients positive for the novel coronavirus. Although it is an obvious relationship since patients with vomiting tend to decrease oral intake or present intolerance to enteral diets, exposing this relationship reinforces the attention that we must have to the nutritional and symptomatological care of the patient once the imminent dietary risk. Because of this food reduction, nutritional needs may not be met, resulting in weight loss, malnutrition, and worse clinical outcomes[17].

A study[18] showed that patients with SARS-CoV-2 who had food intolerance, such as nausea and vomiting, were more likely to develop anorexia with prolonged duration and consequent weight loss. Although the relationship between this gastrointestinal symptom and inappetence was not the object of analysis in this study, this interaction directly reflects the achievement of nutritional goals, including caloric supply, in which we demonstrated in our results that the presence of emesis interfered with adequate energy intake. As previously mentioned, complications in the gastrointestinal tract and food intolerance may lead to a poor prognosis, with a risk of malnutrition, extended hospital stays, and increased mortality. Besides, malnutrition may be involved in the hyperinflammatory state caused by the coronavirus infection. Therefore, energy needs, food acceptance, and gastrointestinal tolerance must be

constantly evaluated in these patients so that the best nutritional management is carried out to provide adequate nutrition and minimize possible consequential harmful effects[19].

Our findings also found an association between dysgeusia and caloric intake of patients hospitalized for COVID-19. A single study, conducted by Vaillant et al.[20], using a validated questionnaire, showed a significant association of dysgeusia/ageusia/taste dysfunction, as well as nausea/vomiting, as a potential factor for the involution of food intake during hospitalization in patients infected by the coronavirus. In the same study, a reduction of up to 70% of the usual food intake of patients and a weight loss corresponding to 7.6% of the initial weight was also reported. However, dysgeusia may have contributed to this outcome, even without statistical association.

Taste dysfunction includes ageusia (total loss of taste) and dysgeusia (change in taste). Dysgeusia can be classified as mild, moderate, and severe hypogeusia. The relationship between the virus and dysgeusia is still uncertain, but some hypotheses in the literature tend to explain this connection. One assumption was that olfactory disorders interfere with taste perception. However, although nasal congestion is a risk factor for changes in taste, they are not directly related in patients with COVID-19, as they are not necessarily evaluated together[21].

Some studies have revealed that epithelial cells of the oral cavity mucosa express ACE2 receptors for SARS-CoV-2, mainly in the dorsal tongue, both in humans and in animals infected with COVID-19[22-25] and that the use of ACE2 and angiotensin II blocking drugs could compromise this sensitivity[26]. Changes in salivary mucin sialic acid concentrations, neurological disorders involving the peripheral nervous system through the cranial nerves, inflammation and local immune reaction in the tongue, and side effects of other drugs are other assumptions cited by authors[26-30].

Associated with the positivity of infection by the novel coronavirus, this taste dysfunction was not noticed or unreported in previous pandemics, such as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). However, this association can be seen as a significant symptom of SARS-CoV-2, and chemosensitive disorders such as this can alter, with other symptoms, oral dietary intake[30]. Considering the attribution of taste in eating behaviors, dysgeusia developed during COVID-19 infection may contribute to inadequate nutritional intake, causing nutritional deficiencies and unwanted weight loss[31].

Regarding the nutritional therapy (NT) offered, Alves et al.[32,] in a study of 153 patients infected with COVID-19, admitted to an ICU of a hospital in Bahia, Brazil, also observed that 85% of the sample received a diet early, corroborating what was found in our study. Pironi et al.[33], in a study conducted in Italy, observed that most individuals received an oral diet (OD) (81.3%), followed by enteral nutrition (EN) (13.5%) and parenteral nutrition (PN) (5.2%). These data are similar to our results during the first moment of the study, contrasting only the number of individuals who used the parenteral route since none of the patients needed it. If we compare it with the end of the follow-up, these data also differ, as there was a reduction in the percentage of the OD, an increase in EN, and one case of parenteral. However, the first two routes of supply remained the most frequent. Nonetheless, in a point-prevalence study involving 1,229 patients with and without COVID-19, involving several regions of the world, among patients infected with the coronavirus, 69.1% used EN, 27.4% OD, and 6.2% PN[34].

Regarding nutritional supply, the study by Nakamura et al.[34] observed that 47.5% of their sample had a caloric supply between 20 and 30 kcal/kg of weight/day and in 45% a protein supply greater than or equal to 1.2g/kg of weight/day, similar to our study. Cereda et al.[35], in a study with 222 patients admitted to the ICU, found that on days 4 and 7 of hospitalization, 65.2% and 77% of the individuals, respectively, were in caloric adequacy (greater than 80% of the estimated needs) and 1.3g/kg/day was used to calculate protein supply. Those who had an adequate caloric intake on the 4th day of hospitalization were associated with lower mortality in the ICU.

The mortality rate of this study was approximately 47%, with a significant association between the caloric supply provided and clinical outcomes, but no association with protein supply was found. Unlike our findings, the study by Miguélez et al.[36], conducted in Madrid with 176 individuals, did not show statistical significance between the nutritional therapy offered, caloric and protein intake, and mortality (mortality rate 36.4%). A Brazilian study[37] with COVID-19-infected patients admitted to the ICU showed that non-survivors had a lower number of calories and proteins per kg of body weight and lower total caloric values than those verified in survivors. In addition, an offer ≥ 25 kcal/kg/day (OR: 0.14; 95% CI 0.02 – 0.86) and ≥ 1.2 g protein/kg/day (OR: 0.10; 95% CI 0.01 – 0.97) were associated with the outcome of hospital discharge and death; however, the relationship between diet adequacy (≥ 80% of the target) and death was not statistically significant (OR: 0.54; 95% CI 0.84 – 3.51). Our study did not intend to analyze the percentage of protein adequacy. Still, if any range would impact the outcomes, it is undeniable that inadequate protein intake can also worsen the prognosis of these patients[35].

According to recommendations of nutritional guidelines for patients affected by COVID-19[11,38], the oral route is always preferred in mild patients, with possible initiation of enteral nutritional therapy in those with low intake, even with the use of oral supplementation. In a more severe context, the enteral route is preferable, but parenteral nutrition can be considered in cases of contraindication. It is recommended that, regardless of the route, the diet should be started as early as possible, within 24 h and 48 h. According to clinical conditions and severity, nutritional needs can be calculated using predictive equations or weight-based formulas.

Inadequate dietary therapy, in time and supply, associated with reduced food intake and extreme nutritional status, not only increases morbidity,

mortality, and length of stay but promotes rapid detriment to immunity, respiratory muscle function, and poor prognosis in patients affected by COVID-19[32,37].

Nutritional support in COVID-19 patients is not yet fully understood. Still, adequate nutritional therapy is critical due to the often intrinsic imbalance between nutritional intake and expenditure in severe COVID-19 patients. Increased energy expenditure due to fever, exacerbated activity of respiratory muscles and hypercatabolism, diseases involving glycemic and protein metabolic changes and increased mobilization and decomposition of fat, as well as insufficient food intake due to reduced appetite, dyspnea, mechanical ventilation and disorders of consciousness or intolerance to enteral nutrition, can be reported as causes for an inadequate and consequently harmful diagnosis and/or nutritional treatment, which may contribute to increased mortality[39,40].

The importance of nutritional care and adequate therapeutic management during hospital follow-up is confirmed to provide better recovery and clinical prognosis for infected patients.

The main limitation of this study is the divergence in the sample size of some variables, which may bias the information found. Nevertheless, this can be explained by the necessary precautionary measures and shortage of professionals during the first and second waves of the pandemic, as well as being based on a secondary database, which restricted the information. Another limitation concerns the evaluation of protein adequacy, which because it is distributed in ranges, was impossible to analyze.

The strength of our research is that it is one of the few longitudinal studies, until its writing, to evaluate the influence of nutritional therapy, especially caloric offer, on gastrointestinal complications and clinical outcomes simultaneously of patients infected with COVID-19. Additionally, it involved different hospital centers and was carried out during the initial critical periods of the pandemic.

Responses to the scientific community and health professionals could be provided with this work, ensuring the relevance of clinical nutrition, appropriate and individualized, given the current context of the new coronavirus. However, further studies should be conducted to resolve the limitations mentioned.

CONCLUSION

The lower outcome of death was associated with caloric adequacy at hospital admission. Simultaneously, the lower incidence of dysgeusia at the end of follow-up was also associated with caloric adequacy in patients affected by COVID-19. Additionally, the lower incidence of vomiting at admission showed a trend of association with caloric adequacy. Thus, patients who presented with adequate caloric intake had an improvement in signs and symptoms presented and a more favorable prognosis, such as hospital discharge.

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