REVISTA CIÊNCIAS EM SAÚDE
HEALTH SCIENCES JOURNAL e-ISSN 2236-3785

ORIGINAL ARTICLE

Association between oral nutritional supplementation and clinical and nutritional outcomes in the management of hospital malnutrition

Associação entre a suplementação nutricional oral e os desfechos clínicos e nutricionais no manejo da desnutrição hospitalar

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Received on Apr 19,2021, accepted on Sep 17,2021, published on Dec 23, 2021

KEYWORDS

Malnutrition
Nutritional status
Nutritional supplements

ABSTRACT

Objective: To evaluate the association between oral nutritional supplementation and clinical and nutritional outcomes in the management of hospital malnutrition.
Methods: This is a longitudinal observational study conducted with data collected from electronic medical records of patients admitted to a university hospital between 2019 and 2020. Malnourished adult and elderly patients, who had been eating exclusively orally and using a nutritional supplement, were included. Sociodemographic, clinical, biochemical, nutritional risk, nutritional assessment, acceptance of nutritional prescription and characteristics of the nutritional supplement used were analyzed. An α = 5% was considered.
Results: Forty patients were evaluated, most of them elderly and male. Among the oral nutritional supplements, the hypercaloric and hyperprotein types were most prevalent, with twice daily servings, an average use of 39 days, and a total acceptance of the nutritional prescription by only 30% of the patients. This nutritional intervention resulted in a slight improvement in anthropometric variables, without any significant differences.
Conclusion: The use of oral nutritional supplements for a longer period with better adherence could potentially present greater nutritional benefits to patients.

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This study was conducted at the University Hospital of Lagarto.

https://doi.org/10.21876/rcshci.v11i4.1147

How to cite this article: Ferreira dos Santos AN, Silva KLN, Santos VE, Santos RAL, Rocha VS. Association between oral nutritional supplementation and clinical and nutritional outcomes in the management of hospital malnutrition. Rev Cienc Saude. 2021;11(4):46-52. https://doi.org/10.21876/rcshci.v11i4.1147

PALAVRAS-CHAVE

Desnutrição
Estado nutricional
Suplementos nutricionais

RESUMO

Objetivo: Avaliar a associação entre a suplementação nutricional oral e os desfechos clínicos e nutricionais no manejo da desnutrição hospitalar.
Método: Trata-se de um estudo observacional do tipo longitudinal, realizado mediante coleta de dados de prontuários eletrônicos de pacientes internados em hospital universitário, entre 2019 e 2020. Foram incluídos pacientes adultos e idosos desnutridos, que se alimentavam exclusivamente via oral e em uso de suplemento nutricional. Foram analisados os dados sociodemográficos, clínicos, bioquímicos, risco nutricional, avaliação nutricional, aceitação da prescrição nutricional e as características do suplemento nutricional utilizado. Foi considerado α = 5%.
Resultados: Foram avaliados 40 pacientes, a maioria idosos e do sexo masculino. Entre os suplementos nutricionais orais foram mais predominantes o uso do tipo hipercalórico e hiperproteico, com oferta duas vezes ao dia, média de uso de 39 dias e com aceitação total da prescrição nutricional por apenas 30% dos pacientes. Essa intervenção nutricional resultou em discreta melhora dos dados antropométricos, sem diferença significativa.
Conclusão: O uso de suplemento nutricional oral por um período maior e com uma melhor adesão possivelmente apresentaria maiores benefícios nutricionais aos pacientes.

INTRODUCTION

Malnutrition is a frequent occurrence in the hospital environment, with a prevalence of between 40% and 60% among patients, according to a systematic review covering Latin American countries[1]. Nutrient deficiency can trigger physiological, physical, functional, and mental changes, negatively impacting clinical outcome[2]. Malnutrition causes complications including diminished immune response, delayed healing processes, more significant infectious and surgical complication risks, increased chances of developing pressure ulcers, longer hospital stays, and a higher risk of mortality. Additionally, it results in increased hospital expenses[3].

Oral supplementation is essential for adequate nutritional support in malnutrition, minimizing physiological consequences such as depletion of muscle, adipose, and bone tissue, changes in muscular, cardiovascular, or respiratory performance, gastrointestinal and endocrine disorders, and impairment of immune function[4]. Therefore, to reduce the effects of hospital malnutrition, oral supplementation is recommended as a nutritional intervention in malnourished patients or at nutritional risk and food acceptance of less than 60%[3]. The availability of nutritional supplements to hospitalized patients improves muscle mass recovery, reduces the rate of clinical condition complications and hospital readmissions and improves the quality of life[5].

Studies evaluating the effectiveness of nutritional supplementation in malnourished patients in the hospital environment are scarce, so it is essential to analyze the type of supplement, the number of daily servings, and the duration of nutritional supplementation that improves the nutritional status of these individuals to enable intervention in a standardized and effective manner.

Considering the above, this study evaluated the association between nutritional supplementation and clinical and nutritional outcomes in the management of hospital malnutrition at the University Hospital of the Federal University of Sergipe, in the city of Lagarto, Sergipe, Brazil (HUL/SE).

METHODS

This is a longitudinal observational study conducted after approval by the Ethics and Research Committee of the Federal University of Sergipe (UFS), with the acceptance of a Term of Informed Consent waiver (CAAE 3040330.8.0000.5546, decision nr. 4.513.527). A sample of 40 individuals (Figure 1) of both sexes was selected from those admitted to the Medical Clinic of the HUL/SE, from January 2019 to December 2020, by non-probabilistic convenience sampling of electronic medical records.

As inclusion criteria, adult and elderly patients who remained hospitalized for a period equal or more than 30 days and presented a diagnosis of malnutrition done by the nutrition team of the HUL/SE were selected, according to a combination of the following tools:

- Analysis of the subjective global assessment, which diagnoses and classifies malnutrition by the degree of aggravation, according to the body mass index (BMI), using the cutoff points recommended by the World Health Organization[6] for adults and those determined by Lipschitz[7] for the elderly;
- Arm circumference (AC) adequacy using the following reference values: the percentage of AC adequacy < 70%, severe malnutrition; between 70 and 80%, moderate malnutrition; between 80 and 90%, mild malnutrition; between 90% and 110%, normal weight; between 110% and 120%, overweight; and > 120%, obesity[8].

In addition to these instruments, the calf circumference (CC) was also used in the elderly, with the following reference values: CC lower than or equal to 31 cm, loss of muscle mass in the elderly; CC greater than 31 cm, eutrophy in the elderly[9]. Other inclusion criteria were exclusivity of oral feeding and the use of a nutritional supplement at least once a day, as prescribed by the nutrition team. Patients under 18 years of age, pregnant or breastfeeding women, patients undergoing enteral nutritional therapy, and those with chronic kidney disease undergoing conservative treatment were excluded.

Sociodemographic and clinical data (underlying disease and physical examination - ocular mucosa, face,

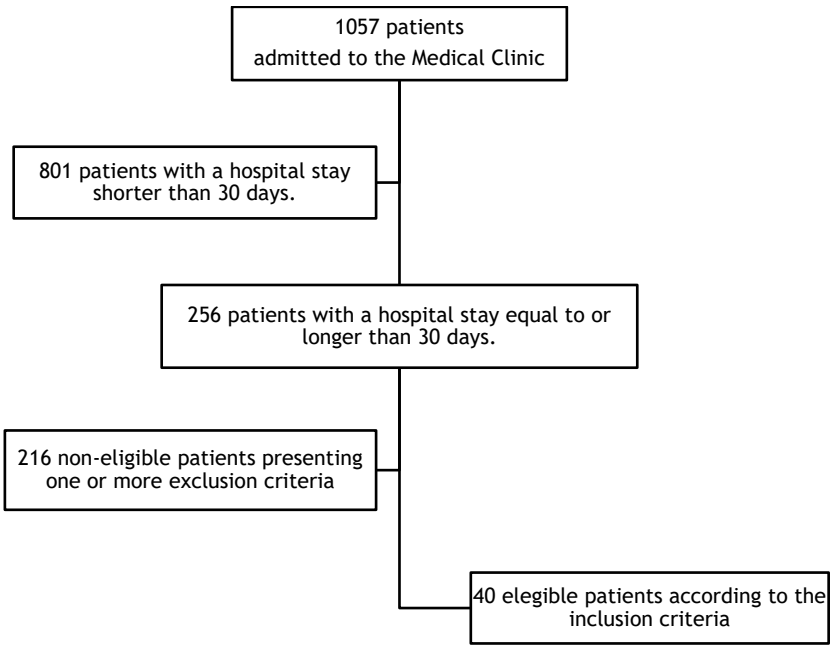

Figure 1 — Organizational chart of patient selection

abdomen, and skin to identify signs of muscle and adipose tissue depletion, presence of jaundice, pressure ulcers, edema, and ascites), biochemical (complete blood count, sodium, potassium, magnesium, creatinine, and urea), nutritional risk (Nutritional Risk Screening), nutritional assessment (Subjective Global Assessment), anthropometric (weight, height, knee height, arm and calf circumference, weight and height measured in patients who walked and in patients who did not walk, predictive equations were used to measure weight and height)[10,11], adherence to the nutritional prescription (evaluated according to the nutritionist's questioning of the patient about its adherence and recorded in medical records) and the use of the nutritional supplement were evaluated by electronic medical records twice, once up to 72 h after admission and again in the last week of oral supplement use.

The supplements were evaluated, and the patients who used them were selected according to their characteristics: hypercaloric and hyperprotein, hypercaloric and normoproteic, normocaloric and normoproteic, hypercaloric and hypoproteic. The daily offer of the supplement was also evaluated. The classification of protein-calorie content was used according to the term of reference of the HUL's diet bidding contract, based on RDC nr. 21/2015[12]. It considers hypercaloric supplements those with a caloric density of 1.5 in 100 mL and hyperproteic those offering 20%–30% of protein in 100 mL, normocaloric those with a caloric density of 1.0 to 1.2 in 100 mL, normoproteic those offering more than 10 to 12% of protein in 100mL, and hypoproteic those offering up to 10% of protein in 100 mL.

Statistical analysis was performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Testing for normality of data was conducted using the Kolmogorov-Smirnov test. Data were presented in number and percentage. Biochemical and anthropometric variables were analyzed according to the duration of dietary supplement use with the paired t-test. Data were also analyzed by independent samples t-test considering two supplement groups, hyperproteic and normo/hypoproteic. Group differences were considered significant if $p < 0.05$.

RESULTS

Forty individuals diagnosed with malnutrition were evaluated. Of these, 32.5% were adults, 67.5% elderly, and 70% male, and was hospitalized at the HUL/SE for cardiovascular diseases (20%), lung diseases (20%), sepsis (20%), neoplasm (10%), cirrhosis of the liver (7.5%), and other less prevalent diseases. Regarding the use of nutritional supplements, 80% were hypercaloric and hyperproteic, with a predominance of twice-daily servings, average use of 39 days during the hospitalization process, and total adherence to the nutritional prescription in only 30% of individuals. Most participants (75%) were discharged from the hospital (Table 1).

When comparing the use of oral supplements between the beginning and end of hospitalization, all anthropometric variables, except the calf circumference, had higher values at the end of the intervention, showing no worsening of malnutrition, without any significant differences (Table 2). Table 3 shows no statistical difference between most biochemical parameters when comparing the beginning and end of supplementation. The only exception was mean corpuscular volume, which showed a statistically significant increase at the end of supplement use. No statistical difference was observed when evaluating the parameters studied concerning the type of oral supplement administered (Tables 4 and 5).

Table 1 — General and clinical characteristics.

Variable	n (%)
Sex	
Female	12 (30)
Male	28 (70)
Age range	
Adult	13 (32.5)
Elderly	27 (67.5)
Underlying diseases	
Cardiovascular diseases *	8 (20)
Lung diseases †	8 (20)
Sepsis	4 (10)
Neoplasm	4 (10)
Cirrhosis of the liver	3 (7,5)
Erysipelas	2 (5)
Cholelithiasis	2 (5)
Anemia	2 (5)
Cerebral abscess	1 (2.5)
Chronic kidney disease	1 (2.5)
Urinary tract infection	1 (2.5)
Hematemesis	1 (2.5)
Ascites	1 (2.5)
Diabetes	1 (2.5)
Schistosomiasis	1 (2.5)
Type of oral supplement	
Hypercaloric, Hyperprotein	32 (80)
Hypercaloric, Normoprotein	1 (2.5)
Normocaloric, Normoprotein	1 (2.5)
Hypercaloric and Hypoproteic	5 (12.5)
Hypercaloric and unknown protein	1 (2.5)
Servings of supplement	
Data not available	5 (12.5)
Once daily	12 (30)
Twice daily	19 (47.5)
Thrice or more daily	4 (10)
Adherence to nutritional prescription	
Data not available	12 (30)
Low	2 (5)
Partial	14 (35)
Total	12 (30)
Clinical outcome	
Data not available	1 (2.5)
Discharge	30 (75)
Death	3 (7.5)
Transfer	6 (15)

*(Congestive heart failure, acute myocardial infarction, acute pericarditis and stroke). † (Pneumonia, bronchopneumonia, chronic obstructive pulmonary disease, pleural effusion, pulmonary edema and tuberculosis).

DISCUSSION

The main finding of this study was a higher prevalence of malnutrition in the elderly and that nutritional supplementation characterized by hypercaloric and hyperproteic composition, with twice-daily servings, reflected positively with an increase in the values of most anthropometric variables at the end of the analysis, demonstrating that there had been no worsening of malnutrition during the hospitalization process, without any significant differences.

Compared with similar studies, such as the observational study by Luis et al.[13], which evaluated the effectiveness of hypercaloric and hyperproteic supplementation on the nutritional status and quality of life of malnourished elderly individuals living in nursing homes or outpatient settings following an intervention of two servings of a nutritional supplement per day for 12 weeks, an improvement in nutritional status was observed.

Improvement in nutritional status was also corroborated in another study that analyzed malnourished or at nutritional risk elderly diabetics residing in communities or nursing homes with a prescription of a hypercaloric, hyperproteic supplement, with slow-absorbing carbohydrates, with a daily serving of two portions for three months[14].

Randomized controlled trials of nutritional intervention, similar to the beforementioned studies, with 90 days of nutritional supplement use after hospital discharge and another with 24 weeks follow-up, respectively, also showed improvement in the nutritional status of participants[15,16]. The absence of significant differences in anthropometric variables in this study, but with improvement in most of them and no worsening in the participants' malnutrition, may have been influenced by the short duration of nutritional supplement use. This study was conducted in the hospital environment, and the duration of nutritional supplement use is usually shorter as it depends on the length of patient stay.In contrast, in a community environment, the duration of the intervention is generally more prolonged[5]. The continuity of nutritional supplementation after hospital discharge was evaluated, with the outcome of improved nutritional status and a higher survival rate for participants using uninterrupted supplementation[15]. Furthermore, the use of nutritional supplements significantly reduced the number of hospital readmissions among the elderly and adults[17,18].

Table 2 — Anthropometric data at the beginning and end of oral nutritional supplement use. Mean values (standard deviation).

Variable	n*	Beginning of intervention	End of hospital stay	*p* value
BMI † (kg/m²)	39	19.2 (3.9)	19.3 (4.2)	0.837
Arm circumference (cm)	38	23.1 (3.1)	23.3 (2.9)	0.601
Percentage of arm circumference (%)	38	73.8 (10.2)	74.5 (9.6)	0.475
Calf circumference (cm)	22	28.4 (3.8)	28.4 (4.0)	0.962

*n = number of patients. † BMI = body mass index.

Table 3 — Biochemical data at the beginning and end of oral nutritional supplement use. Mean values (standard deviation).

Variable	n*	Beginning of intervention	End of hospital stay	*p* value
Erythrocytes (millions/μL)	39	3.6 (1.0)	3.4 (0.8)	0.089
Hemoglobin (g/dL)	40	10.2 (3.1)	10 (2.8)	0.623
Hematocrit (%)	40	31.1 (9.4)	29.9 (6.7)	0.347
MCV (fL)	39	84.6 (11.6)	88.7 (6.9)	0.020
MCH (pg)	39	27.1 (6.4)	28.9 (2.6)	0.057
MCHC (g/dL)	39	32.8 (2.4)	32 (4.9)	0.319
Leukocytes (μL)	40	16,278 (2,987)	8,491 (3,479)	0.105
Platelets (μL)	39	259,128 (145,292)	271,316 (169,994)	0.634
Sodium (mmol/L)	35	134.5 (6.1)	134.2 (6.4)	0.723
Potassium (mEq/L)	36	4.3 (0.6)	4.4 (0.5)	0.352
Creatinine (mg/dL)	40	1.66 (1.5)	1.54 (1.1)	0.504
Urea (mg/dL)	40	61.1 (43.4)	60.5 (35.8)	0.913

* n = number of patients.

Table 4 — Comparison between oral supplement use and anthropometric data. Mean values (standard deviation).

Variables	Type of supplement		*p* value
	Hypercaloric and hyperproteic	Normocaloric and normo/hypoproteic	
BMI (kg/m²) *	19.4 (4.5)	18.9 (2.6)	0.760
Arm circumference (cm) †	23.3 (3.1)	23.0 (2.1)	0.806
Percentage of arm circumference (%) †	69.5 (24.4)	73.2 (8.6)	0.480
Calf circumference (cm) ‡	28.3 (3.8)	28.7 (4.3)	0.830

* BMI = body mass index. For the BMI variable n = 31 with hypercaloric and hyperprotein supplement while n = 8 with normocaloric and normo/hypoproteic supplement. † For the arm circumference and percentage of arm circumference variables n = 30 with hypercaloric and hyperprotein supplement while n = 8 with normocaloric and normo/hypoproteic supplement. ‡ For the calf circumference variable n = 21 with hypercaloric and hyperprotein supplement while n = 5 with normocaloric and normo/hypoproteic supplement.

Table 5 — Comparison between oral supplement use and biochemical data. Mean values (standard deviation).

Variable	Type of supplement		*p* value
	Hypercaloric and hyperprotein	Normocaloric and normo/hypoproteic	
Erythrocytes(millions/μL) †	3.4 (0.8)	3.4 (0.8)	0.795
Hemoglobin (g/dL) ‡	10.0 (3.2)	10.8 (2.3)	0.560
Hematocrit (%) ‡	29.9 (7.0)	29.7 (5.7)	0.952
MCV (fL) †	89.2 (6.5)	86.5 (8.5)	0.333
MCH (pg) †	29.1 (2.4)	28.2 (3.4)	0.405
MCHC (g/dL) †	31.7 (5.4)	33.1(1.1)	0.455
Leukocytes (μL) ‡	9,005 (3,292)	6,431 (3,657)	0.060
Platelets (μL) †	285,462 (174,374)	216,500 (149,135)	0.313
Sodium (mmol/L) §	134.4 (6.0)	133.2 (8.0)	0.668
Potassium (mEq/L) //	4.3 (0.5)	4.5 (0.7)	0.595
Creatinine (mg/dL) ‡	1.5 (1.0)	1.7 (1.4)	0.562
Urea (mg/dL) ‡	63.5 (36.0)	48.5 (34.5)	0.293

† For erythrocyte, MCV, MCH, MCHC and platelet variables n = 31 with hypercaloric and hyperprotein supplement while n = 8 with normocaloric and normo/hypoproteic supplement. ‡ For hemoglobin, hematocrit, leukocytes, creatinine, and urea variables n = 32 with hypercaloric and hyperprotein supplement while n = 8 with normocaloric and normo/hypoproteic supplement. § For the sodium variable n = 28 with hypercaloric and hyperprotein supplement while n = 7 with normocaloric and normo/hypoproteic supplement. //For the potassium variable n = 29 with hypercaloric and hyperprotein supplement while n = 7 with normocaloric and normo/hypoproteic supplement.

ESPEN guidelines strongly recommend that individuals who are malnourished or at nutritional risk, without contraindications to oral nutritional therapy, can be evaluated using a hypercaloric and hyperproteic nutritional supplement to improve their nutritional status[19]. Another factor that may have influenced the lack of significant results was a low adherence to nutritional prescriptions by most participants. A relevant factor identified was a higher prevalence of malnutrition among elderly individuals[20], with this population representing the highest proportion of hospital admissions in medical wards[21].

The effectiveness of nutritional supplementation depends on patient adherence to nutritional prescription[21-23]. A factor that directly interferes with this adherence is the individual's age group. The older population is the one with the lowest adherence to nutritional supplements[23]. This is due since the aging process results in physical, physiological (sensory deficiency, hormones, alterations in gastrointestinal tract, and oral health) and cognitive changes that contribute to a decrease in food intake, which compromises their nutritional status[24].

Other factors that can aggravate and cause deterioration of the nutritional status in young and older adults are medical procedures during hospitalization[20], food inappetence, reduced functional capacity, extended hospital stay, prolonged fasting, high metabolic demand, and impaired absorption or loss of nutrients due to disease[1,3].

It is essential to understand that the nutritional status of elderly individuals is not only affected by adherence to nutritional prescription and changes due to the aging process but also by their health status. This occurs since acute and chronic diseases contribute to the pathophysiology of malnutrition, compromising the nutritional status through decreased appetite, increased resting energy requirements, stimulated catabolism, impaired absorption and altered metabolism, transport, and use of nutrients[25]. Also, the hospitalization process results in weight loss, increased nutritional demands, impaired absorption, metabolism and digestion of nutrients, food restrictions, and inappetence, resulting in exacerbation of malnutrition during hospitalization[26]. Thus, even despite diseases, weak adherence to nutritional prescriptions, and physiological changes resulting from the aging process and hospitalization, it is possible to observe that the prevalent nutritional intervention in this study contributed positively to preventing the worsening of malnutrition, reflecting in the clinical outcome that was predominantly hospital discharge.

Notably, retrospective observational studies, based on data from clinical records, may have as a limitation the impossibility of inferring cause and effect and the lack of adequate record of information, which reinforces the need for standardization protocols. Additionally, convenience sampling and the criteria for inclusion used in this study contributed to the small sample size; however, the latter ensured better homogeneity.

Therefore, the early identification of malnutrition and nutritional risk is essential, through validated instruments, to establish nutritional interventions for the recovery of nutritional status and the prevention of its decline. It is also essential to guide patients and caregivers on managing malnutrition after hospital discharge, seeking to avoid readmissions and worsening nutritional status[3] since oral nutritional support should only be interrupted when the individual has adequate food intake and nutritional status[27].

CONCLUSION

This study showed that using hypercaloric and hyperproteic supplements at two servings a day, instituted as a nutritional intervention in hospitalized malnourished individuals, improved most anthropometric variables and prevented the worsening of malnutrition. The nutritional intervention identified in this study requires a longer duration and better adherence, with continuation after hospital discharge being essential.

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Conflicts of interest: No conflicts of interest declared concerning the publication of this article.

Indications about the contributions of each author:
Conception and design of the study: ANFS, KLNS, VSR
Analysis and interpretation of data: ANFS, VES, VSR
Data collection: ANFS, VES, RALS
Writing - Original Draft Preparation: ANFS
Writing - Review and Editing: ANFS, KLNS, VES, VSR, RALS
Final approval of the manuscript*: ANFS, KLNS, VES, VSR, RALS
Statistical analysis: VSR
Overall responsibility: ANFS
*All authors have read and approved of the final version of the article submitted to Rev Cienc Saude.

Funding information: This research project was conducted with the scientific initiation grant from the National Council for Scientific and Technological Development - CNPq (PIG 8624-2020), by author Santos VE, through research coordination with UFS - COPES/UFS.