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Can oral nutritional supplements increase energy and protein intake among hospitalized patients?

¿Los suplementos nutricionales orales pueden aumentar la energía y la proteína en pacientes hospitalizados?

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ABSTRACT

Background: Oral nutritional supplements aim at offsetting dietary deficits and helping to meet energy and protein targets. Due to the absence of data about their role in food intake, it is necessary to evaluate the contribution of these products to the estimated needs of hospitalized patients. Methods: This is a prospective longitudinal study with hospitalized patients over 18 years of age, admitted to a public university hospital, who were given oral nutritional supplements, according to clinical guidelines. Food intake was quantified throughout the period such products were prescribed. Results: 805-day food intake follow-up and record of 128 patients, who took supplements for 6.4 days on average. The use of nutritional supplements demonstrated a significant contribution to the input of both energy (1576 kcal/day versus 1263 kcal/day, p<0.001) and protein (68.7 g/day versus 50.3 g/day, p<0.001). Conclusions: Nutritional supplements help increase food intake and achieve nutritional goals when prescribed in a hospital setting.
Keywords: Food intake; Hospitals; Malnutrition; Oral nutritional supplements; Patients.

RESUMEN

Antecedentes: los suplementos nutricionales orales tienen como objetivo compensar los déficits dietéticos y ayudar a cumplir los objetivos de energía y proteínas. Debido a la ausencia de datos sobre su papel en la ingesta de alimentos, es necesario evaluar la contribución de estos productos a las necesidades estimadas de los pacientes hospitalizados. Métodos: Este es un estudio longitudinal prospectivo con pacientes hospitalizados mayores de 18 años, ingresados en un hospital universitario público, que recibieron suplementos nutricionales orales, según la derivación clínica. La ingesta de alimentos se cuantificó durante todo el período en que se prescribieron dichos productos. Resultados: seguimiento de la ingesta alimentaria de 805 días y registro de 128 pacientes, que tomaron suplementos durante 6,4 días en promedio. El uso de suplementos nutricionales demostró una contribución significativa al aporte de energía (1576 kcal/día versus 1263 kcal/día, p< 0,001) y proteína (68,7 g/día versus 50,3 g/día, p<0,001). Conclusiones: los suplementos nutricionales ayudan a aumentar la ingesta de alimentos y alcanzar objetivos nutricionales cuando se prescriben en un entorno hospitalario.
Palabras clave: Desnutrición; Hospitales; La ingesta de alimentos; Pacientes; Suplementos nutricionales orales.

INTRODUCTION

Nutritional risk and malnutrition in hospitals is frequently described in the medical literature and presents high rates in several countries[1]. This clinical condition is associated with unfavorable outcomes, such as higher incidence of infections, healing problems, poorer treatment response, increased hospital stay, readmission rates and increased costs related to healthcare[2,3].

Malnutrition is a multifactorial condition characterized by an imbalance between food intake and macro/micronutrients demands, which may be related to reduced food intake, change in nutrient uptake as well as hypercatabolism resulting from a pro-inflammatory state of the underlying disease[4].

Eating in hospital settings might be understood by patients as a health promoting, maintaining, and recovering tool, playing an important role in the health-disease process[5]. However, food intake can be influenced by the underlying disease as well as by psychosocial factors[6].

Low food intake is generally the result of gastrointestinal symptoms and other effects related to clinical status. However, it might also be caused by patients' difficulty to adapt to the hospital routine, the uninviting environment for meals, bed confinement, frequent fasting periods so patients can undergo procedures, quality of the food served or food restrictions, self-feeding difficulties, nutrition history before hospitalization and other factors[5,7].

In order to compensate for food deficits and help meet energy and protein targets, oral nutritional supplements (ONS) are products designed for specific clinical purposes, are used in addition to daily diets to supply a dense solution of energy and nutrients[8]. ONS usually come in ready-to-drink liquid solutions, but also as powder, desserts or in bar form8. When provided early, they can be an effective first action against malnutrition[9].

There is existing evidence regarding the benefits of prescribing ONS to hospitalized patients, but data about the contribution of ONS in terms of food intake remain suboptimal. The significant increase in energy and protein input is associated with nutritional status improvements, with weight, muscle mass and body fat gains, which lead to improvements in quality of life, functionality, and increased physical strength, as well as to reduced inflammatory processes and other complications[10]. From the financial standpoint, significant savings related to the use of ONS are associated with shorter hospital stays and reduced complication and readmission rates[11].

Therefore, the purpose of the study is to assess the contribution of ONS in meeting the estimated energy and protein needs of hospitalized patients, because there are few studies performed exclusively in hospital settings.

METHODS

This was a prospective longitudinal study performed with 128 hospitalized patients in the medical and surgical clinics of a public university hospital. Patients over 18 years of age, of both sexes, with oral feeding and taking ONS were included in the study. Those using alternative feeding methods, such as enteral tube feeding (nasogastric, nasoenteric) or ostomies (gastrostomy, jejunostomy), with parenteral nutrition, pregnant patients and patients contaminated by multiresistant bacteria were not included in the study in order to minimize the risks for those in charge of collecting samples composed of consumed ONS. Ethical approval was provided by the Research Ethics Committee of the Hospital de Clínicas of the Paraná Federal University (CEP/HC/UFPR.CAAE: 41606615.0.0000.0096) and informed written consent was obtained from each patient.

Patients from cardiology, endocrinology, gastroenterology, hematology, infectious disease, nephrology, neurology, orthopedy, pneumology, rheumatology, urology and other clinics were included. Upon patient selection, the following data were retrieved from the clinical and nutritional files: age, sex, date of hospitalization, diagnosis by medical specialty, nutritional risk assessment according to NRS 2002[12], anthropometry (weight, height, body mass index [BMI])[13], nutritional needs estimated by the dietitian in charge (energy and protein), diet prescription and reason for the prescription of ONS.

Calculations of energy and protein demands were performed according to recommendations proposed by specific guidelines for the different clinical conditions presented by the research participants[14,15,16,17,18,19,20,21,22].

Food intake quantification was calculated through daily diet records obtained by a trained team, beginning 48 hours after the prescription of the ONS. A validated tool was applied to assist collection, consisting of graphic material containing diagrams featuring food illustrations[23], used by the patients to quantify the intake of food during hospitalization. Regarding ONS intake, a volumetric quantification was performed with measuring cylinders. Intake was calculated using technical files of the preparations made by the hospital production sector, with a table containing food intake for the calculation of external foods[24], and with nutritional information supplied by the manufacturer of ONS that were included in the study.

Energy intake adequacy was classified as sufficient when patients consumed ≥75% of the estimated energy demands and as insufficient when patients consumed <75% of the estimated energy demands[25]. The same percentage was used to calculate protein intake adequacy.

ONS were categorized according to energy density and protein percentage as normocaloric (0.9–1.2 kcal/ml), hypercaloric (energy value> 1.2 kcal/ml), normoproteic (energy value resulting from proteins <20%), and hyperproteic (energy value resulting from proteins≥ 20%)[15]. All ONS prescribed had polymeric characteristics.

In relation to ONS prescription, formulas were defined by the dietician in charge, and according to patients' needs. The reasons for prescribing ONS could be compromised nutritional state, hypermetabolism, low food intake and/or need for supplementation of specific nutrients, such as immune modulating and/or healing nutrients. Sometimes there was more than one reason for prescription. In order to achieve a better acceptance and adherence to treatment, flavor was chosen by the patients. ONS were discontinued when patients presented food intake increase, intolerance to the formula, change in the feeding method, discharge or death.

In order to minimize the effects of intrapersonal variability of the diet, data about food intake were assessed through the

Multiple Source Method (MSM), which applies the Box-Cox transformation to obtain a nearly normal distribution. Intake inadequacy was calculated by the z distribution (z-test), consulting the z-curve table to assess to which proportion the obtained value corresponds. This approach minimizes errors in the calculation of nutrient inadequacy prevalence by considering random characteristics of the diet[26].

Student's t-test was used to compare the two means of parametric data. The chi-squared test was used for the comparison of frequencies. Pearson's and Spearman's coefficients were used to correlate variables. The level of significance of the analyses was established at 0.05[27]. Statistical analyses were performed using the SPSS 22 software, Windows version[28].

RESULTS

A total of 128 patients were followed and registered, summing 805 days of food consumption.

Among the general characteristics of the population studied (Table 1), it can be mentioned the predominance of adult individuals with a body mass index (BMI) within the eutrophic range and low incidence of neoplasia. Even if these characteristics were observed in the group, it should be mentioned that 87.6% can be placed within the nutritional risk classification according to the NRS 2002, in addition to presenting low food intake and compromised nutritional status as the main reasons for the prescription of ONS. Hospital discharge was pointed out as the main reason for the discontinuation of ONS, and it should be highlighted that few patients presented intolerance to the supplied formulas. The average energy requirement per day was 1869 ± 289 kcal and 79.4 ± 18.9 protein.

Patients admitted to the gastroenterology clinic were the most represented in the sample. The distribution of the sample by clinic can be viewed in table 2.

The mean period of ONS prescription was 6.4 days

Table 1. General characteristics of the population.

	Total n= 128 Mean ± SD
Age (years)	55.8 ± 17.9
Weight (Kg)	62.5 ± 15.9
BMI adults (kg/m^2) (n= 72)	22.2 ± 5.8
BMI elderly (kg/m^2) (n= 57)	24.0 ± 5.1
Energy needs (kcal/day)	1869 ± 298
Protein needs (g/day)	79.4 ± 18.9
Nutritional Risk through the NRS 2002	113(87.6%)
Incidence of neoplasia	39(30.2%)
Reason for the indication of ONS*	
Compromised nutritional state	65(50.4%)
Hypermetabolism	32(24.8%)
Low food intake	71(55.0%)
Need for supplementation of specific nutrients**	38 (29.5%)
Reason for suspension of ONS	
Change in feeding method	7(5.5%)
Death	4(3.1%)
Discharge	96(75.0%)
Increase in food consumption	4(3.1%)
Intolerance to the formula	17(13.3%)

BMI= Body mass index. *There is the possibility of more than one reason for the indication of ONS. ** Need for supplementation of specific nutrients: indication of immunomodulatory formula for healing.

Table 2. Distribution of the sample by clinic.

Medical Specialty	Total n= 128 (%)
Cardiology	17 (13.3%)
Endocrinology	4 (3.1%)
Gastroenterology	47 (36.7%)
Hematology	9 (7.0%)
Infectious Disease	1 (0.8%)
Nephrology	10 (7.8%)
Neurology	7 (5.5%)
Orthopedy	4 (3.1%)
Other Clinics	7 (5.5%)
Pneumology	11 (8.6%)
Rheumatology	9 (7.0%)
Urology	2 (1.6%)

(range: 1 and 28 days). Most of the ONS were prescribed for the evening period, corresponding to supper (73.7%; n= 736), followed by the afternoon period, corresponding to a snack (26.3%; n= 262). The total volume of ONS prescribed varied between 125 and 440 ml, offered in original packages (125-220 ml each) and in 1-2 daily portions. The classification of ONS according to formula composition and prescription frequency can be viewed in table 3.

After the collection of food intake and intraindividual variability adjustment, it was observed that the consumption of ONS had a significant contribution to energy (1576 ± 627 kcal/day versus 1263 ± 606 kcal/day, p<0.001) and protein (68.7 ± 27.1 g/day versus 50.3 ± 25.0 g/day, p<0.001) input since these products provided 19.8% and 26.8% of energy and protein intake, respectively.

The median of energy consumed from the ONS was 308 kcal/day (interquartile interval of 79.5) and that of protein was 18.5 g/day (interquartile interval of 8.5).

While analyzing the frequency of participants achieving adequate energy and protein intake according to their needs, as proposed by White et al[25], a greater percentage of individuals met their nutritional goals with the combination of diet and ONS (Table 4).

Table 3. Classification of ONS according to formula composition and prescription frequency.

Classification of ONS	Total of prescriptions n= 998 (100%)
Normal energy and High protein formula	132 (13.2%)
High energy and High protein formula	531 (53.2%)
Normal energy, High protein and Fiber containing formula	35 (3.5%)
High energy, High protein and Fiber containing formula	5 (0.5%)
Normal energy, High protein and Immune modulating formula	32 (3.2%)
High energy, High protein and Immune modulating formula	198 (19.8%)
High energy, normal protein for nephropathy	65 (6.5%)

Table 4. Adequacy of energy and protein intake according to White et al[25].

	Total consumption n (%)	Consumption without ONS n (%)	P
Patients who consumed ≥75% of the energy needs	77(60.2)	45(3.2)	<0.001
Patients who consumed ≥75% of the protein needs	74(57.8)	43(33.6)	<0.001

Chi-square test. Asterisks (*) indicate statistically significant differences (p≤ 0.05).

A mild negative correlation was observed between BMI and energy/protein intake (r= -0.24 and -0.24, respectively). Age was also inversely and mildly correlated with energy and protein intake (r= -0.31 and -0.30, respectively).

Due to the performance of tests or perioperative care, the need for fasting during some time of the day was observed in 130 days (16.1% of the sample) during the collection period. The need for 24-hour fasting was observed in 43 days and during such period ONS were discontinued. While, 36.4% (n= 47) of the patients had their diets modified regarding the originally standardized composition and/or texture, because they had a hard time accepting the diets offered by the hospital.

DISCUSSION

This article shows that the use of ONS has proven effective as a nutritional therapy tool to increase energy and protein intake in hospitalized patients. A small percentage of participants had intolerance to the formula, whether in the form of gastrointestinal symptoms, caused by consumption or lack of adaptation to the flavor and/or other sensory characteristics of the product, leading to the suspension of the prescription. In most cases, suspension occurred due to hospital discharge. The successful adaptation of patients to the use of ONS and the meeting of estimated energy and protein requirements with the addition of ONS confirms that this is a convenient method to increase energy input, mainly in malnourished patients.

The risk of malnutrition in a hospital environment is multifactorial and promotes unfavorable outcomes[2]. Poor food intake is one of the factors involved in this process, that may be related to the clinical condition and underlying disease, as well as iatrogenic factors associated with hospitalization, such as the routine imposed by the hospital, quality of served meals and restrictive diets[5].

A considerable number of hospitalized patients report an important decrease in food intake, consuming approximately ≤50% of the total offered. These patients present greater probability of malnutrition[2]. Insufficient food intake is independently associated with outcomes such as hospital stay, readmissions and death of hospitalized patients[2,11].

According to what was observed in this study, low food intake and compromised nutritional status stand out as the main reasons for prescribing the use of ONS. Low food intake and malnutrition are modifiable risk factors. Therefore, the early provision of oral nutrition therapy becomes paramount in the prevention of hospital malnutrition and should be part of hospital practice[9].

International guidelines have pointed out that ONS contribute to an increase in the intake of energy, protein and micronutrients when food intake is insufficient and support the maintenance or improvement of nutritional status[15]. They are also related to improvements in functionality, response to treatment, and reductions in infections and hospital stays, morbidity and death. Therefore, ONS should be recommended to help treat digestive system and infectious diseases, as well as those related to aging; they also seem to help patients recover from surgeries[17,22,29,30].

As found in the present article, other studies also observed a significant increase in energy and protein intake with oral supplementation[10,31]. In a randomized study conducted with elderly patients during the perioperative period of hip fracture, supplementation contributed with a mean increase of 20.9 g (±4.9) of protein per day, in addition to a greater protein intake per body mass associated with better recovery of plasmatic proteins and less post-operatory complications[32].

In another randomized study with similar participants, the group that received ONS (18-24 g of protein and 500 kcal) presented a significant increase in energy (1480 Kcal ± 207 vs 1127 kcal ± 211, $p<0.001$) and protein (73.6 g ± 10.6 vs 63.5 g ± 12.3, $p<0.001$) intake during hospitalization[33].

In the work performed by Huynh et al[10], patients diagnosed with moderate or severe malnutrition were randomized in control and intervention groups with the use of ONS. In the group that received ONS an improvement in the quality of the diet was observed, as well as a significant increase in energy and protein intake. The intervention group also had better performances regarding other outcomes.

Similarly to the results found here, a 10-year prospective study showed an increase in the coverage of nutritional needs associated with the prescription of ONS throughout the period of investigation, during which there was a decrease from 70% to 36% ($p<0.001$) and from 52% to 31% ($p<0.001$) in the number of patients who did not meet their energy and protein needs, respectively. The intake of at least one ONS per day increased the meeting of the recommended protein needs from 80% to 115%[34].

Other studies conducted in different clinical situations and designed to analyze the use of ONS as nutritional support, in addition to indicating effective increases in energy and protein intake, found positive changes in quality of life, anthropometric parameters, functionality, reduction in length of stay and readmissions[11,31].

According to the mentioned study, analyses suggest an association between insufficient food intake and advanced age[7]. That is expected because elderly people tend to present less feelings of hunger and greater eating difficulty during the period of hospitalization[35]. In addition, there are other factors that interfere with food intake in elderly people, such as chewing and swallowing problems, cognitive impairment with the need for help with meals and adverse effects of polypharmacy such as xerostomia and dysgeusia[30].

In our study, BMI was negatively correlated with energy and protein intake, unlike other studies such as Schindler et al[7] and Curtis et al[6] in which low BMI or risk of malnutrition in hospitalized patients was associated with lower food intake. This can be explained by the reasons for indicating the use of ONS showed in the present study, which analyzed the need for specific nutrient supplementation and its relation to food intake reduction.

The frequent periods of fasting observed draw attention to the risk of nutritional status deterioration caused by a decreased food intake and muscle catabolism. In cases of surgical patients, reduction in the time of food deprivation and early return to eating protocols may contribute to the mitigation of complications[29].

In addition to a heterogeneous population, this study is limited by the fact that it did not assess food intake prior to the prescription of ONS. However, it is important to note that in this study, the ONS was monitored in addition to the hospital diet during the period of prescription of the supplement. There are few studies exclusively conducted in a hospital setting involving the quantification of food intake associated with the use of ONS. Studies assessing the daily intake of ONS throughout the period these products are used are also scarce.

CONCLUSION

When prescribed in a hospital setting, ONS contribute to greater energy and protein intake, helping patients meet nutritional requirements. In general, patients accept the proposed nutritional therapy and have low intolerance to the formulas. Considering the importance of hospital malnutrition, investigations about the benefits associated with the use of ONS are justified. For future studies, an investigation with more specific clinical populations in a hospital environment would be indicated.

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