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Nutrición Hospitalaria

Trabajo Original

Valoración nutricional

A short nutritional intervention in a cohort of hematological inpatients improves energy and protein intake and stabilizes nutritional status

Una intervención nutricional en una cohorte de pacientes hospitalizados hematológicos mejora la ingesta calórico-proteica y estabiliza el estado nutricional

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Abstract

Introduction: Oncohematological diseases are associated with an important prevalence of malnutrition.

Aim: Our aim is to determine if early recognition and treatment of malnourished hematological inpatients can improve their oral intake, nutritional status and reduce the length of hospital stay.

Methods: Prospective 2-year study conducted in a cohort of hematology inpatients. Malnutrition Screening Tool (MST) was carried out on the first day of admission. Patients with a positive screening were recruited to have a complete nutritional evaluation and intervention, following usual clinical practice. Nutritional evaluation was repeated after one week.

Results: Six hundred and seventeen hematological patients were screened (37.8% with positive screening). After one week, median diet intake increased from 80% to 90% ($p < 0.001$), and an increase of 407.36 Kcal (SD 679.37) and 17.58 g of protein (SD 31.97) was also achieved. More patients reached their energy and protein requirements (41.6 *vs.*% 63.3%, $p = 0.009$) and nutritional parameters remained stable. A trend to a lower stay (3.5 to 4.5 days less) was detected in the groups of patients who covered their needs.

Conclusions: The implementation of early malnutrition screening and short nutritional interventions improved energy and protein intake, increasing the percentage of patients who meet their requirements and avoiding deterioration of nutritional status.

Key words:

Malnutrition. Nutrition assessment. Nutritional status. Hematological neoplasms. Energy intake.

Resumen

Introducción: las enfermedades oncohematológicas se asocian con una elevada prevalencia de malnutrición.

Objetivo: nuestro objetivo es determinar si la detección y el tratamiento precoz de la malnutrición en los pacientes hematológicos hospitalizados pueden mejorar su ingesta, su estado nutricional y reducir la estancia hospitalaria.

Métodos: estudio prospectivo de 2 años de duración realizado en una cohorte de pacientes hematológicos hospitalizados. El Malnutrition Screening Tool (MST) fue el método de cribado efectuado el primer día del ingreso. En los pacientes con un resultado positivo en el cribado se realizó una valoración nutricional completa y una intervención terapéutica cuando fue preciso, siguiendo la práctica clínica habitual. La valoración nutricional se repitió una semana después de la inicial.

Resultados: se evaluaron 617 pacientes hematológicos (de los cuales el 37,8% tuvo un resultado positivo en el cribado). Tras una semana de ingreso, la mediana de ingesta aumentó del 80% al 90% de la dieta ($p < 0,001$), y se logró un incremento en el consumo de 407,36 (DE 679,37) Kcal y 17,58 (DE 31,97) g de proteínas. El número de pacientes que alcanzaron sus requerimientos calórico-proteicos aumentó (41,6% *vs.* 63,3%, $p = 0,009$) y los parámetros nutricionales permanecieron estables. La estancia hospitalaria tendió a ser menor en los pacientes que cubrían sus necesidades nutricionales (3,5 a 4,5 días menos).

Conclusiones: la implantación de un método de cribado nutricional precoz y la realización de intervenciones nutricionales cortas consiguió mejorar la ingesta calórico-proteica, aumentando el porcentaje de pacientes que cubrían sus necesidades y evitando el deterioro del estado nutricional.

Palabras clave:

Malnutrición. Valoración nutricional. Estado nutricional. Neoplasias hematológicas. Ingesta calórica.

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INTRODUCTION

Malignant diseases have an important health impact, related to their high prevalence and influence on morbidity, mortality and quality of life (1). In 2011, cancer represented nearly 30% of all deaths in Spain, and was the second leading cause of mortality behind cardiovascular diseases (2).

Oncohematological diseases, such as leukemias or lymphomas, are increasing in prevalence. Lymphomas represent 5% of all cancer diagnoses and are the fifth leading cause of cancer death in United States, while leukemias are the most frequent malignancies in pediatric population (3).

Despite medical advances in cancer, malnutrition is still a frequent problem in oncological patients. The relationship between nutrition and cancer is bidirectional. Inadequate nutrition patterns can promote certain cancers; however, cancer can also induce the occurrence of malnutrition. Malnutrition plays an important role in cancer prognosis and patient outcomes. In fact, as many as 20% of patients with cancer die from the effects of malnutrition rather than from the malignancy (4). At the time of diagnosis, malnutrition is present in 15 to 40% of oncological patients, and this prevalence can increase to 40 to 80% in advanced stages of the disease (5). In the subgroup of hematological neoplasias, the literature shows a prevalence of malnutrition ranging from 27 to 50.4% (6,7). A previous study performed in our hospital revealed a prevalence of malnutrition of 47.7% among inpatients with hematological or solid malignancies (8).

Many factors can negatively affect nutritional status in oncohematological patients. Adverse effects related to chemotherapy or radiotherapy, frequent hospitalizations, gastrointestinal symptoms, fatigue, depression, anxiety or pain are considered risk factors for the development of malnutrition (9,10). A decrease in food intake is also common in cancer patients, due to numerous causes such as vomiting, anorexia or taste alteration (9).

The aim of this study was to determine if early recognition and treatment of malnourished hematological inpatients can improve oral intake, nutritional status and reduce the length of hospital stay.

METHODS

This prospective interventional cohort study was conducted from November 2011 to November 2013 in the Hematology ward of the Complejo Asistencial Universitario de León (Spain). The Ethics and Clinical Research Committee of the hospital approved the study protocol, and patient anonymity was preserved. The study also complies with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines

Our primary endpoint was the improvement in energy and protein intake in oncohematological patients one week after nutritional intervention. The evolution of nutritional parameters and the difference between lengths of stay in patients who met or not their nutritional requirements were our secondary endpoints.

Nutritional screening was performed in every patient older than 15 years old, on the first day of admission. Patients in their terminal phase or those admitted less than 24 hours were excluded.

Malnutrition Screening Tool (MST) was the selected screening method because it was been validated in cancer patients and in patients during acute hospitalizations (11). A positive result identifies individuals who are at risk of malnutrition. MST has been demonstrated to be a simple, quick, valid and reliable tool that any healthcare worker is capable of using. It is based on weight loss and appetite changes, and no anthropometric measurements or biochemical parameters are required.

In our study, the nurses in the Hematology ward collaborated to carry out the MST at admission. All screening tests were checked daily by the Clinical Nutrition and Dietetics Unit (CNDU). No further evaluation was performed in patients with negative results and they were followed on a routine care basis. On the contrary, patients with a positive screening were recruited to have a complete nutritional evaluation. This nutritional assessment included anthropometry, laboratory tests and estimation of nutritional requirements. Nutritional classification of patients followed SENPE (Spanish Society of Enteral and Parenteral Nutrition) and SEDOM (Spanish Society of Medical Documentation) definitions (12). Patients were weighed standing, wearing underwear and barefoot in a Seca 762® mechanical scale with a precision of 0.1 kg. Height was estimated using ulna length (13). Blood tests included levels of albumin, prealbumin, cholesterol and protein bound to retinol (PBR). They were measured following the usual practice of our laboratory. Following our established protocol for nutritional assessment, energy requirements were calculated with the Harris-Benedict formula, using the actual weight in most patients except in case of obesity, when the adjusted weight was selected. We added a stress factor between 1.2 and 1.3 in most patients, following recommendations in hospitalized patients (14). Protein needs were calculated at 1.2 g of protein/kg weight/day. In patients with renal failure without renal replacement therapy, protein calculation was adjusted to the severity of the disease (between 0.6 to 1 g of protein/kg weight/day) (15).

The 24-hour intake was also assessed through a semiquantitative self-administered test, during the first day of admission. The 24-hour recall, which was validated in our center, was divided into the four intakes of the hospital menu and the amount ingested was registered according to the scale used in the Nutrition Day (all, more than a half, half, less than a half, nothing) (16,17). Actual intake was calculated based on the content of protein and energy of the hospital diet components, and the intake recorded by the patient during 24-hour recall.

Based on the nutritional requirements in the patient population estimated in a previous study, we classified our hospital diets as complete diets [above percentile 95 (> 2,100 Kcal and > 112 g of protein)], potentially incomplete diets [between percentile 75-95 (1,700 to 2,100 Kcal, and 91 to 112 g of protein)] and incomplete diets [below percentile 75 (< 1,700 Kcal and < 91 g of protein)] (18).

After the initial assessment, nutritional interventions were prescribed in those patients who did not meet their energy or protein requirements, following standard clinical practice. These interventions included changes in the menu, changes in the type of diet, and prescription of oral supplements, enteral nutrition (EN), and parenteral nutrition (PN). Changes in the menu involved modifica-

tions of the meals included in it with others of similar nutritional characteristics (e.g. roasted chicken instead of baked fish; yogurt instead of milk; etc.); and changes in the type of diet meant the selection of a diet with different therapeutic characteristics (nutritional composition, texture, allergens, etc.). For example, the low fat diet would be provided instead of the blended diet. Nutritional evaluation was repeated once a week and patients were followed by the CNDU during their hospital stay.

Statistical analysis was performed with SPSS 19.0 (SPSS Inc., Chicago, IL, USA). The normal distribution of quantitative variables was examined by the Kolmogorov-Smirnov test. Variables matching normal distribution were presented as mean and standard deviation (SD) and those without normal distribution as median and interquartile range (IQR). Quantitative variables were compared with Mann-Whitney and Wilcoxon tests, for independent or related samples, respectively. Categorical variables were expressed as percentages and compared with the χ^2 test. A *p* value lower than 0.05 was considered statistically significant.

RESULTS

During the study period, 792 patients were admitted to hematology ward, and 77.9% of them met inclusion criteria and completed the nutritional screening within the first 24 hours of admission. The percentage of positive results of the screening test was 37.8% and 218 patients were finally recruited (Fig. 1). Baseline characteristics of the 218 patients included are shown in table I.

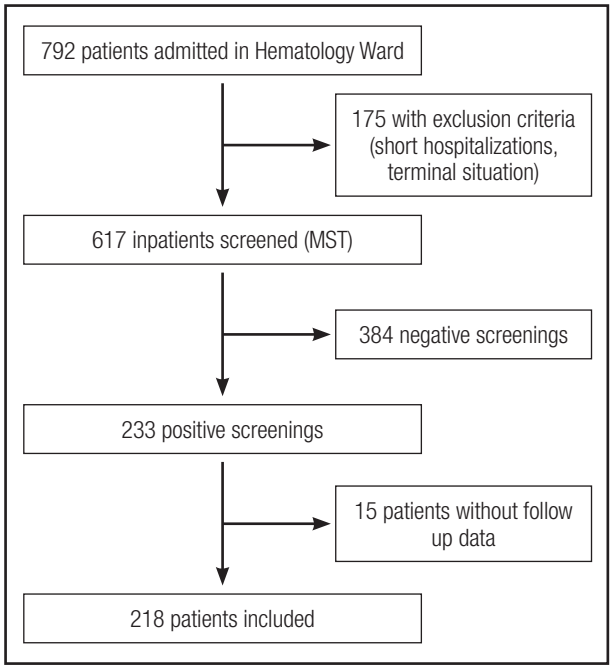

Figure 1.

Flow chart of patients included in the study (flow chart of all patients admitted in Hematology Ward, screened with the MST and finally recruited in the study).

A complete nutritional evaluation was carried out by the CNDU to assess the nutritional status of the patients with positive screening. These results are shown in table I. Weight loss before hospitalization was recorded in 70.1% of our patients, with a median weight loss of 8% (IQR 35.5%).

After nutritional evaluation, caloric and protein requirements were estimated in all the subjects, with a median energy requirement of 1,589 (IQR 1,633) Kcal and a mean protein need of 77.7 (SD 15) g.

In the first intervention, changes in oral diet and/or artificial nutrition were prescribed, according to usual clinical practice. In most cases, only changes in the menu or a change in the type of diet were required (40.3% and 16.5%, respectively). Oral supplements were prescribed in 24.3%. Only 4 patients needed artificial support with either enteral (1 patient) or parenteral nutrition (3 patients). No intervention was required in 17.1%.

PRESCRIPTION OF DIETS

On admission, 43.6% of patients had potentially incomplete or incomplete diets, regarding energy, and 98.2% had potentially

Table I. Baseline characteristics of the patients

Baseline characteristics	n (%)
Age (mean and SD)	69.4 years (16.4)
Sex (% males)	57.3%
Diagnoses	
Hematological malignancies	83%
Autoimmune diseases	7.8%
Myelodysplastic syndromes	4.6%
Other diagnoses	4.6%
Cause of admission	
Cancer staging and/or therapy	42.3%
Infectious complications	21.6%
Hematological complications	18.8%
Therapy complications	2.8%
Other causes	8.3%
Mortality during admission	13.3%
*Nutritional status**	
Well-nourished	20 (9.2%)
Energy malnutrition:	
– Mild	37 (17%)
– Moderate	22 (10.1%)
– Severe	20 (9.2%)
Protein-energy malnutrition:	
– Mild	12 (5.5%)
– Moderate	38 (17.4%)
– Severe	38 (17.4%)
Protein malnutrition	31 (14.2%)

**Nutritional status was defined based on SENPE and SEDOM hospital malnutrition definitions (12).*

incomplete or incomplete diets, based on protein content. We found a median of 2,351 (IQR 3,251) Kcal and 101 (IQR 138) g of protein prescribed.

After nutritional intervention, no significant differences were found either in the percentage of complete or incomplete diets, or the calories and proteins theoretically prescribed by hematology ward and CNDU.

REAL CONSUMPTION OF DIET

Before the intervention, patients consumed by median 80 (IQR 100) % of the diet. Categories of diet intake (> 75%, 50 to 75% and < 50%) are represented on figure 2.

After the intervention, diet consumption significantly increased to 90% ($p < 0.001$). In addition, we observed a higher percentage of patients with an intake > 75% of the diet, and fewer patients with an intake between 50 a 75% or less than 50%. However, this tendency did not reach statistical significance ($p = 0.069$).

In the total study population, we found a significant improvement in energy and protein intake after our intervention (Fig. 3).

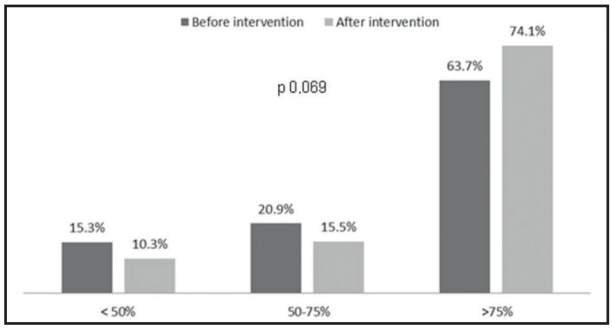

Figure 2.

Diet consumption before and after nutritional intervention. Groups of diet consumption: < 50% (intake less than half), 50-75% (intake between 50 and 75%), > 75% (intake more than 75%).

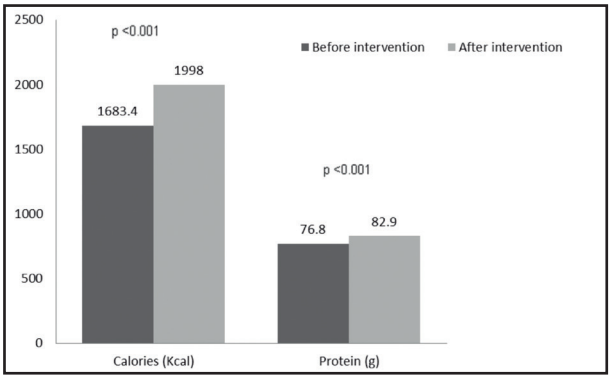

Figure 3.

Changes in nutritional intake after intervention in total study population. Increase in both, caloric and protein intake, after nutritional intervention.

Moreover, considering only the 52 patients who remained admitted after one week, the energy intake rose from 1,577 (SD 723) Kcal to 2,050 (SD 524) Kcal ($p = 0.009$) and protein intake from 69.20 (SD 31.32) g to 89.25 (SD 24.40) g ($p = 0.041$). We therefore achieved a mean increase of 407.36 (SD 679.37) Kcal and 17.58 of protein (SD 31.97) g.

DIFFERENCES BETWEEN INTAKE AND ESTIMATED REQUIREMENTS

On admission, caloric intake was sufficient to cover 100% of estimated requirements in 50.3% of subjects, protein intake in 44.3% and both of them in 41.6%. After nutritional assessment and modifications, 70.9% patients consumed their caloric needs, 64% their protein needs and 63.3% met both protein and energy requirements. These changes were statistically significant ($p = 0.001$ for Kcal, $p = 0.016$ for protein, and $p = 0.09$ for protein and Kcal) (Fig. 4).

CLINICAL COURSE

After 1 week of admission, the nutritional parameters evaluated in our sample remained stable. No significant changes in weight [65.22 (SD 14.08) kg *vs.* 64.79 (SD 14.26) kg; $p = 0.280$]; albumin [3.35 (SD 0.54) g/dl *vs.* 3.41 (SD 0.56) g/dl; $p = 0.707$]; prealbumin [17.25 (SD 11.31) mg/dl *vs.* 18.17 (SD 11.23) mg dl; $p = 0.715$]; RBP [6.60 (SD 1.83) mg/dl *vs.* 4.87 (SD 2.61) mg/dl; $p = 0.593$] or in cholesterol [149.4 (SD 46.69) mg/dl *vs.* 149.8 (SD 32.90) mg/dl; $p = 0.858$] were detected.

NUTRITIONAL INTERVENTION AND HOSPITAL STAY

The median length of stay of the 218 episodes was 11.5 (IQR 69) days. However, we observed a trend towards a shorter length of stay (3.5 to 4.5 days fewer) in the groups of patients who covered their caloric or protein needs, although it did not reach statistical significance (Table II).

DISCUSSION

PREVALENCE OF MALNUTRITION IN ONCOHEMATOLOGY INPATIENTS

Malnutrition is a relevant concurrent problem in both, hospitalized and oncohematological patients. Several national and international studies have described the high prevalence of inpatient malnutrition, with a wide range from 20 to 50% (19-22). One of the most recent studies is the multicenter PREDyCES® study, performed in 1,707 inpatients, which found a 23% of risk of malnutrition at admission, using the Nutritional Risk Screening-2002

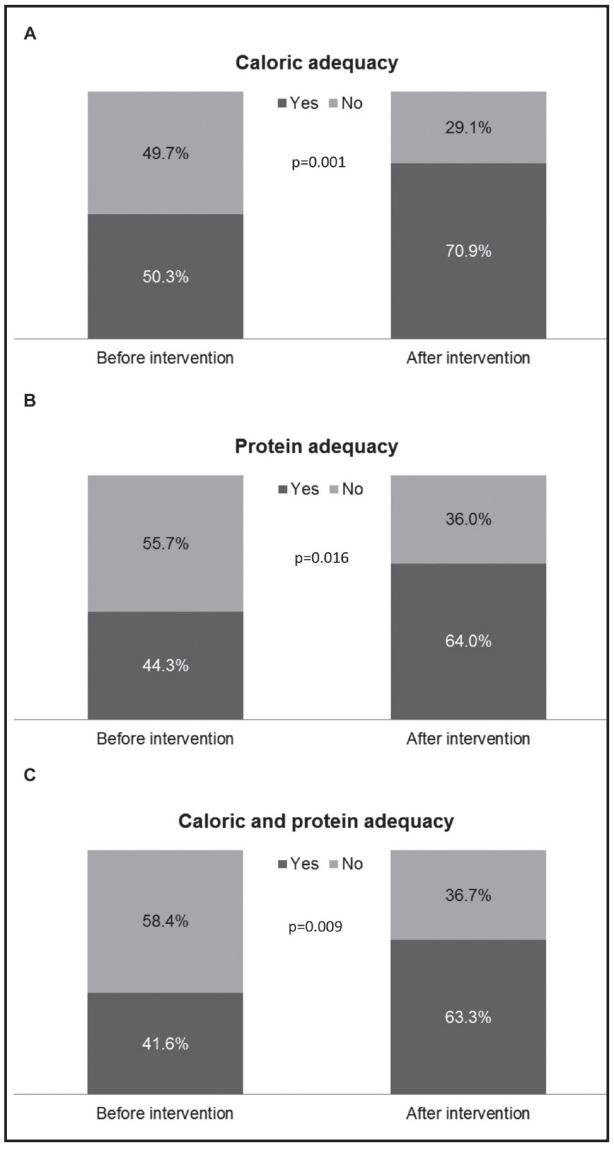

Figure 4.

Nutritional adequacy of the intake respect to estimated requirements. A. Caloric adequacy. B. Protein adequacy. C. Caloric and protein adequacy.

Table II. Hospital stay and nutritional adequacy

Intake after nutritional intervention	Days of hospital stay (median and range)		
Sufficient intake after intervention	*Yes*	*No*	*p value*
Caloric adequacy	15.0 (66)	18.5 (60)	0.165
Protein adequacy	14.5 (43)	20.0 (34)	0.078
Caloric and protein adequacy	12.0 (68)	12.5 (63)	0.357

Difference in hospital stay between patients who covered their nutritional needs after the intervention and patients who did not covered them.

(NRS-2002). In the oncohematological subgroup, this increased to 36.8% (23). Differences in malnutrition rates reported in the literature could be partially explained by the wide set of tools used to make the diagnosis. Thus, some studies reported risk of malnutrition, detected by screening methods, while others reported malnutrition diagnosis, after complete nutritional assessment.

In our study, we obtained a similar percentage of patients with positive screening to those reported in the PREDyCES® (36.8% *vs.* 37.8%), even though the screening tools were different. Both tools reflect weight loss and changes in food intake, but MST does not take into account the severity of the disease. At present, no ideal method of nutritional screening has been proposed in oncohematological diseases, but we selected MST because is well validated in oncology patients and it was the most suitable in our clinical setting (24).

With complete nutritional assessment, 90.8% of our positive patients were found to be malnourished, being moderate or severe in the 54.1%. This represents a 25% rate of malnutrition in the total population screened at baseline (792 patients) and it was in lower limit of the range reported by other studies.

CONSEQUENCES OF MALNUTRITION IN ONCOHEMATOLOGY INPATIENTS

The relationship between nutrition and inpatient outcomes has been widely illustrated in literature. In general, malnutrition in hospital increases the incidence of complications, length of stay, costs and mortality. It is also associated with severe comorbidities such as intestinal or renal failure, respiratory and urinary infections, hyperglycemia and risk of death; not only during hospitalization, but even 6 months after discharge (23,25-27).

In cancer patients, this relationship is even more pronounced. Malnutrition in cancer reduces the response and tolerability to radio and chemotherapy and elevates the risk for surgical complications. It also has important consequences on functional status and quality of life, due to a decrease in muscle mass and strength, making these patients more dependent on their caregivers (28). In adults with hematological malignancies a poorer survival has been evidenced, associated with moderate or severe malnutrition or with lower levels of albuminemia (29). Similar results can be found in pediatric population (30). Data from our own hospital showed worse outcomes in oncological and hematological malnourished patients, with higher readmission rates and mortality (8).

Although malnutrition can be present at admission and should be detected as soon as possible, nutritional surveillance is essential during hospitalization. Metabolic stress, frequent fasting periods for diagnostic or therapeutic procedures or deficiencies in hospital menus can deteriorate nutritional status throughout hospitalization. Many studies have reflected the worsening of nutritional situation during hospital stay. In the PREDyCES® study, the 9.6% of the well-nourished patients at admission developed malnutrition during their hospitalization, and 72% of patients who were malnourished at admission remained malnourished at discharge. Cancer was one of the conditions associated with a higher prevalence of malnutri-

tion at discharge, and nutritional worsening has been associated with prolonged hospital stays and increased costs (23). However, no deterioration in anthropometric or biochemical parameters was observed, and this was one remarkable finding of the present study. Despite hospitalization and severe illness, nutritional status in our sample remained stable. No fall on prealbumin level was detected even though it is known that prealbumin decrease in case of inflammation. This suggests that even short and simple interventions may have an effect on patient´s nutritional evolution.

NUTRITIONAL INTERVENTION DURING HOSPITALIZATION

Nutritional intervention during hospitalization provides both health and cost benefits. Early screening and standardized nutritional care in malnourished patients reduced hospital costs, due to a shorter length of stay (31). In patients with autologous hematopoietic stem cell transplantation, the intervention of a multidisciplinary nutritional support team reduced the duration of total PN, absence of oral food intake, hospitalization and therapeutic antibiotic usage, with a decrease in total hospitalization cost (32).

Despite all this evidence, malnutrition remains unrecognized and untreated in many oncological patients. It is remarkable that patients perceived the relationship between oncohematological diseases and nutritional status as important, but only half of them received dietary advice (33). Therefore, nutritional assessment and individualized nutritional support should be included in routine clinical practice.

Nutritional interventions, especially dietary counseling, have demonstrated a significant impact in oncological patients. Several studies conducted by Ravasco et al. evidenced a positive effect in gastrointestinal and head and neck cancer patients. Individualized nutritional counseling improved prognosis, quality of life and food intake during radiotherapy, 3 months after and even in long-term follow-up (34-37).

In our experience, the implementation of a nutritional protocol in hematological inpatients can lead to a better detection of malnutrition, improving the process of therapeutic decisions. As observed in other studies, before the intervention our patient´s intake was low and a significant percentage did not cover their nutritional requirements (30,38). After our intervention, changes in oral diet were prescribed in most patients, and less than 25% needed oral supplementation. However, these simple modifications improved real calorie and protein intake, in more than 400 Kcal and 17 g of protein, which was not an easy achievement, considering that anorexia, gastrointestinal symptoms or taste alteration are common in these patients (9).

Fulfillment of nutritional requirements is very difficult in this setting, even when oral supplementation is used in all patients, as Peñalva et al. study showed (38). But in our study, after one week, a 21.7% increase in the percentage of patients who met their caloric and protein needs was obtained.

It must be pointed out that caloric and protein content of prescribed diets was similar before and after intervention. Nevertheless, nutritional intake was improved. A better adaptation of the prescribed diet to the patient's situation, nutritional and texture needs or preferences, may explain this improvement. Artificial support was also initiated when food intake was not enough. Some of our hospital menus, specially blended, astringent or easily digestible ones, are used very frequently in oncohematological patients, but their protein content is lower than desirable. Thus, nutritional supplements may be required to achieve protein needs.

Although no economical evaluation was performed, it is presumable that the changes we prescribed did not significantly increase costs. Only a quarter of our population needed artificial support, and the rest of cases were managed with dietary modifications, using the available hospital menus. The increase in dietary intake referred after one week may associate a reduction in food wasting and a better use of resources.

STRENGTHS AND LIMITATIONS

Our main limitations were the absence of control group, for ethical reasons, and the short duration of nutritional intervention (median 11 days).

We were treating patients with severe diseases (83% had hematological malignancies), admitted to receive aggressive treatments or with acute complications. Consequently, it will be very difficult to find a positive effect in outcomes, such as tumor response or mortality in this short period of time. However, after our intervention, the patients who reached a sufficient intake, especially those who fulfilled their protein needs, had a trend to a reduction in hospital stay.

CONCLUSIONS

In summary, malnutrition represents a serious problem in patients with hematological malignancies. Its high prevalence and health and economic burden should lead us to implement routine nutritional assessment and care protocols in hospital setting. Early detection and treatment of malnutrition can improve patient´s energy and protein intake, increasing the percentage of patients who meet their requirements and stabilizing nutritional status.

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