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Food intake and nutritional status influence outcomes in hospitalized hematology-oncology patients

Alicia Calleja Fernández, Begoña Pintor de la Maza, Alfonso Vidal Casariego, Rocío Villar Taibo, Juan José López Gómez, Isidoro Cano Rodríguez and María D. Ballesteros Pomar

Unidad de Nutrición Clínica y Dietética. Sección de Endocrinología y Nutrición. Complejo Asistencial Universitario de León, Spain.

Abstract

Background: **malnutrition in oncology and hematology-oncology patients is important due to its prevalence and associated mortality and morbidity. The aims of the study were to assess the prevalence of malnutrition in oncology and hematology patients and determine if intake or malnutrition influences hospitalization outcomes.**

Methodology: **a cohort study was performed in all patients admitted to the oncology and hematology wards in a 30-day period. Nutritional assessment was performed within 24-hours of admission and repeated after 7 days of hospitalization, including Subjective Global Assessment, anthropometry, dietary assessment (24-hour recall) and estimation of caloric and protein needs. Medical records were reviewed 30 days after discharge.**

Results: **seventy-three patients were evaluated on admission and 29 on day 7 of hospitalization. The prevalence of malnutrition was 47.7%. On admission, patients consumed 71.6 (SD 22.0)% of the prescribed dietary calories and 68.2 (SD 23.5)% of prescribed proteins. The death rate was 2.8% among patients who ate ≥75% and 17.9% among those who ate <75% (p = 0.040). No significant differences were observed between the intake of calories (p = 0.124) and protein (p = 0.126) on admission and on day 7 of hospitalization. Nutritional status was related to readmission rate, being 35.1% for malnourished vs. 8% for well-nourished (p = 0.014). Nutritional status and food intake were not related to the rest of the studied outcomes (length of stay and mechanical, metabolic or infectious complications).**

Conclusions: **intake did not decrease during hospitalization. There was an upward trend between reduced intake and mortality. Malnutrition was related to hospital readmission.**

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Key words: *Malnutrition. Nutritional assessment. Energy intake. Medical oncology.*

Correspondence: Alicia Calleja Fernández.
Unidad de Nutrición Clínica y Dietética.
Sección de Endocrinología y Nutrición.
Complejo Asistencial Universitario de León.
Altos de Nava s/n. 24008 León, Spain.
E-mail: calleja.alicia@gmail.com

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INFLUENCIA DE LA INGESTA Y EL ESTADO NUTRICIONAL EN LAS COMPLICACIONES DE LOS PACIENTES ONCOHEMATOLÓGICOS HOSPITALIZADOS

Resumen

Introducción: **la malnutrición en el paciente oncohematológico es importante debido a su prevalencia y a su morbimortalidad asociadas. El objetivo de este estudio fue analizar la prevalencia de malnutrición en el paciente oncohematológico y determinar si la ingesta o la malnutrición afectan a las complicaciones del paciente hospitalizado.**

Metodología: **estudio de corte realizado en todos los pacientes admitidos en las plantas de oncología y hematología durante un periodo de 30 días. La valoración nutricional se realizó durante las 24 primeras horas tras el ingreso y se repitió a los 7 días de hospitalización, incluyendo Valoración Subjetiva Global, antropometría, recuerdo de 24 horas y estimación de las necesidades calóricas y proteicas. Las historias médicas fueron revisadas a los 30 días tras el alta.**

Resultados: **setenta y tres pacientes fueron evaluados al ingreso y 29 a los siete días de su hospitalización. La prevalencia de malnutrición fue 47,7%. Al ingreso, los pacientes consumieron 71,6 (DE 22,0)% de las calorías prescritas y 68,2 (DE 22,0)% de las proteínas prescritas. La tasa de fallecimientos fue 2,8% entre los pacientes que consumieron ≥75% y 17,9% entre aquellos que consumieron <75% (p = 0.040). No se observaron diferencias significativas entre la ingesta calórica (p = 0.124) y proteica (p = 0.126) en el ingreso y a los 7 días de hospitalización. El estado nutricional estaba relacionado con la tasa de reingreso, siendo 35,1% en malnutridos vs. 8% en pacientes sin desnutrición (p = 0.014). El estado nutricional y la ingesta no se relacionaron con el resto de las complicaciones estudiadas (duración de hospitalización y complicaciones metabólicas, mecánicas o infecciosas).**

Conclusión: **la ingesta no aumentó durante la hospitalización. Hubo una tendencia ascendente entre una ingesta reducida y la mortalidad. La malnutrición se relacionó con los reingresos.**

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Palabras clave: *Malnutrición. Valoración nutricional. Ingesta. Oncología médica.*

Abreviations

APMT: Adductor Pollicis Muscle Thickness.
HGS: Handgrip Strength.
LBM: Lean Body Mass.
LMI: Lean Mass Index.
MM: Muscle Mass.
SGA: Subjective Global Assessment.
SGA-PG: Subjective Global Assessment – Patient Generated.

Background

Malnutrition in cancer can be defined as the set of deficits induced by tumor disease in different body compartments[1]. Oncological and oncohematological diseases are highly prevalent and influence quality of life, morbidity and mortality[2]. In Spain, cancer accounted for nearly 30% of all deaths in 2011[3].

Between 15 and 40% of oncological and oncohematological patients present with malnutrition at the time of diagnosis. This situation may be aggravated with progression of the disease, increasing the number of malnourished patients to 80% in advanced stages[4]. Nutritional status can vary depending on the tumor type, location and stage of disease[5]. The worsening of nutritional status can be multifactorial, due to the tumor itself or its treatment: anorexia, metabolic alterations, malabsorption, obstruction, diarrhea, vomiting, fatigue, depression, anxiety and pain[6].

Decreased food intake is one of the most common problems in cancer patients. This situation might arise due to different factors such as taste alterations, anorexia, vomiting and tumor location[7]. This decreased intake directly affects nutritional status[8].

The consequences of malnutrition can lead to complications, reduced tolerance to treatment, prolonged hospital stay, higher economic cost and higher mortality and morbidity. An early diagnosis is essential to initiate an adequate nutritional regimen, improving the patient's evolution. Nutritional screening tools have been developed to identify those patients who are malnourished or at risk of suffering from it. Performing an early nutritional assessment allows classification of cancer patients according to their level of malnutrition and identifying adverse clinical situations that affect intake (vomiting, anorexia, nausea, etc.)[7]. Implementing screening and nutritional assessment allows malnourished patients to be recognized and protocols to be established to achieve a good nutritional status, increase weight, improve neoplastic treatment response, reduce the occurrence of complications and shorten the length of stay[9].

The objective of the study was to determine the prevalence of malnutrition in patients admitted to the oncology and hematology wards, assess their intake and causes that lead to non-consumption of the prescribed diet, and determine the morbidity and mortality associated with dietary intake and malnutrition during hospitalization.

Methodology

A cohort study performed in the University Hospital of León during March and April 2011. Every adult patient (older than 18 years) admitted to the Oncology and Hematology wards was included, excluding those admitted to isolation rooms.

Nutritional assessment was performed within 24 hours of admission, and patients who remained hospitalized more than a week were reassessed using the same methodology on day 7 of hospitalization.

The nutritional assessment included Subjective Global Assessment (SGA)[10]. All patients were weighed standing, wearing light clothes (hospital pajamas) and barefoot on a digital scale OMRON TBF 500® (Tanita Corp., Kyoto, Japan). Percentages of muscle mass (% MM) and lean body mass (%LBM) were also obtained. Lean mass index was calculated (LMI) [Lean mass (kg)/height (m)^2]. Height was estimated using ulna length [methodology validated by British Association for Parenteral and Enteral Nutrition (BAPEN)][11]. A handgrip strength (HGS) test was carried out with a Smedlay's Dynamo Meter® in the non-dominant arm and the maximum value of three measurements performed consecutively was taken. Also, the adductor pollicis muscle thickness (APMT) in the hand was measured in both the dominant and non-dominant hand by a Holtain 98610 ND® mechanical caliper, taking the maximum value of three measurements performed consecutively.

The Harris-Benedict formula was used to calculate energy and protein needs, including a mild (1.1) or moderate (1.2) stress factor. Patient protein requirements were calculated by multiplying their actual weight by a factor of 1.2 g/kg/day.

According to our center's experience and the study by Barton et al, complete energy diets were considered those above 2100 kcal (normal, admission, complete diabetic, low-fat), moderately hypocaloric diets those between 1700 and 2100 kcal (mildly hypocaloric diabetic, easily digestible, astringent, liver protection) and hypocaloric diets those with less than 1700 kcal (crushed, low-fat soft, diabetic-soft, liquid)[12].

The 24-hour intake was assessed through a self-administered visual scale. The 24-hour intake recalls were divided into the number of items on the hospital menu (first course, second course and dessert for lunch and dinner, breakfast and snack). The amount ingested was recorded depending on whether they had eaten the entire menu, more than half or less than half (along the scale used in NutritionDay)[12,13]. In those patients who refused food, reasons for non-consumption (anorexia, taste, texture or other reasons) were requested. The 24-hour recalls were subsequently analyzed nutritionally

with Dietsource 3.0® software (Novartis Medical Nutrition SA, 1997-2003).

At 30 days of admission, patients' medical records were reviewed to assess the length of hospital stay, death rate, readmission rates and the presence of complications during admission: mechanical (e.g. paralytic ileus, intestinal obstruction), infectious (e.g. pneumonia, diarrhea) and metabolic (e.g. hyperglycemia, ionic imbalances).

The normal distribution of quantitative variables was examined by the Kolmogorov-Smirnov test. Those with normal distribution were summarized as the mean and standard deviation (SD), and compared by Student t test (for independent samples or dependent, as appropriate); when more than 2 groups were compared an ANOVA test was used. Categorical variables were summarized with percentages and compared with the χ^2 test. A *p* value less than 0.05 was considered significant.

Results

Seventy-three patients were evaluated, 53 in Oncology and 20 in the Hematology wards. Of these, 61.6% were male and the mean age was 65.3 (SD 11.7) years. Twenty-five percent had a gastrointestinal tumor, 20% lung, 17%, lymphoma, 9% gynecological, 7% breast, 6% head and neck, 6% myeloma and the remaining 11% had other types of tumors. The primary reasons for admission were complications related to treatment (84%), followed by receiving chemotherapy (14%) and staging of the disease (2%).

At day 7 of hospitalization, 29 patients from the initial 73 studied were still admitted (31.51%), 15.1% had died during hospitalization and 45.2% had been discharged.

Nutritional status

On admission, 37.3% of the patients exhibited risk of malnutrition or mild malnutrition (category B according to SGA) and 23.2% had severe malnutrition (category C). After 7 days of hospitalization, SGA results showed that 45.5% of patients were at risk of malnutrition or had mild malnutrition (category B), while 36.4% were severely malnourished. There were no differences in the prevalence of malnutrition between the two time points (p=0.725).

On admission, weight loss was 5.6 (SD 9.5) % [4.2 (SD 7.3) Kg] and 35% of patients showed hypoalbuminemia. The results of both nutritional assessments, on admission and after 7 days, are summarized in Table I.

Food Intake, consumption and requirements

The prescribed diets on admission were: complete (41.0%), hypocaloric (41.0%), potentially hypocaloric (11.0%) and "nil per os" (NPO) (7.0%). No differences between prescribed diets on admission and on the 7th day of hospitalization were found. The prescribed diets covered 93.0 (SD 56.7) % of the energy requirements and 99.8 (SD 51.2) % of the protein requirements. On

Table I
Anthropometric, biochemical and functional data on admission, on the 7th day and the difference between the two results

	Admission (SD) (69 patients)	*7th day (SD) (24 patients)*	*Dif (SD) (24 patients)*	*P*
Weight (kg)	68.44 (12.72)	69.29 (12.70)	↓0.48 (2.70)	0.373
Lean mass (kg)	26.13 (11.98)	33.07 (5.00)	↓1.30 (2.24)	0.100
Fat (kg)	32.78 (6.29)	24.58 (9.26)	↑2.27 (3.54)	0.073
Dynamometry (kg)	21.97 (9.38)	22.02 (9.48)	↓2.06 (4.84)	0.044
Adductor thumb thickness dominant hand (mm)	17.73 (3.36)	15.95 (2.52)	↑1.26 (2.82)	0.034
Adductor thumb thickness non-dominant hand (mm)	15.85 (3.50)	14.18 (2.66)	↑0.972 (1.88)	0.016
Protein (g/l)	6.11 (0.82)	5.81 (0.84)	↑0.27 (0.87)	0.172
Albumin (g/dl)	3.64 (0.61)	3.62 (0.56)	↓0.75 (0.39)	0.502
Cholesterol (mg/dl)	173.65 (56.60)	252.00 (90.51)	↓75.50 (4.95)	0.029
Lymphocyte (mm^3)	965.36 (315.48)	1213.04 (716.88)	↓300 (674.87)	0.044
Total metabolic rate (Kcal)	1697.21 (272.89)	1723.05 (326.89)	↓7.59 (81.71)	0.724
Protein needs (g)	81.73 (17.74)	82.33 (18.14)	↑0.13 (4.81)	0.914

the 7th day, the prescribed diets covered 93.6 (SD 6.03) % of the energy needs and 89.6 (SD 51.4) % of protein needs. No significant differences in the coverage of energy needs (p=0.976) or protein needs (p=1.000) by the prescribed diets were found between admission and day 7.

The results of the 24 h-recall analyses, both at admission and after 7 days of hospitalization, are listed in table II. Overall, there was low intake in patients who were hospitalized more than 7 days. On admission, breakfast (65.6%) and snack (78.2%) were the meals with the best acceptance; also, desserts at lunch (75.9%) and dinner (76.0%). Table III shows a complete consumption analysis of dishes in the hospital diet.

The semiquantitative analysis (everything, > 50%, < 50%) of the 24-hour recall on the 7th day showed a decreasing trend in food intake, which was statistically significant for breakfast (p=0.003), snack (p=0.050), first course at dinner (p=0.024) and dinner dessert (p=0.003) (Table II). The reasons for non-consumption on admission and after 7 days of hospitalization are listed in table IV. No differences in the causes of non-consumption were detected in any of the meals: breakfast (p=0.513), first course at lunch (p=0.135), second course at lunch (p=0.500), first course at dinner (p=0.667) or second course at dinner (p=0.323).

On admission, patients consumed 71.6% (SD 22.0) of the prescribed calories and 68.2% (SD 23.5) of prescribed proteins. At 7 days, the energy consumption was 73.9% (SD 26.3) and protein consumption was 70.5% (SD 28.8). No significant differences were observed between the consumption of calories (p=0.124) and protein (p=0.126) on admission and on the 7th day of hospitalization. Comparing energy and protein needs with caloric and protein intake, no statistical differences were observed either in calories consumed (p=0.566) or in protein consumption (p=0.742). With the prescribed diets, the energy and protein contributions compared to the patient's needs on admission and at 7 days are listed in table V.

Only 59.1% of patients received a diet that covered their energy requirements and just 67.2% received their full protein needs. Just 14.3% of patients consumed 100% of the received food, 71.4% consumed 50-99% of the received food and 14.3% ingested 0-49%.

The energy and protein contribution of the intake toward covering the patient's nutritional needs were 100% of the energy for 28.1% of the patients and 25.0% for protein; 99-50% of the energy for 43.8% of the patients and 39.1% for protein; and 0-49% of the energy for 28.1% of the patients and 25.9% for protein.

For a second assessment, the menu consumption on admission was grouped as ≥ 75% (meaning they did not need nutritional intervention) and < 75% (patients requiring nutritional intervention). It was observed that 56.3% of patients who consumed ≥ 75% of the menu covered their energy requirements and 45.3% covered their protein requirements. No statistically significant differences were found between being well-nourished or malnourished and having a reduced intake (p=0.311).

Table II
Hospital menu intake on admission

	All	*≥50%*	*<50%*
Breakfast	65.6%	31.1%	3.3%
Lunch	42.2%	40.6%	17.0%
1st course	34.0%	41.5%	24.5%
2nd course	75.9%	5.6%	18.5%
Dessert			
Snack	78.2%	18.2%	3.6%
Dinner	66.1%	21.4%	12.5%
1st course	27.5%	31.3%	41.2%
2nd course	76.0%	6.0%	18.0%
Dessert			

Complications, length of hospital stay, readmission and death

Of the 73 patients evaluated on admission, 29 remained hospitalized after 7 days. Readmission rates were higher among those patients with malnutrition (31%) compared to those who were well nourished (8%) (p=0.014) [OR 6.23 (CI 95% 1.26 – 30.69)]. No statistically significant differences were observed between nutritional status and readmission on the 7th day of hospitalization or on admission (p=0.522). Reduced intake was not related to the patient's readmission rate (p=0.887) [OR 0.92 (CI 95% 0.30 – 2.87)]

During hospitalization, 7.4% of patients with a good nutritional status and 12.1% of malnourished patients died (p=0.525) [OR 1.74 (CI 95% 0.31 – 9.67)]. Reduced intake was related to patient death. The death rate was 2.8% for patients that ate ≥ 75% and 17.9% for those who ate <75% (p=0.040) [OR 7.60 (CI 95% 0.83 – 69.40)].

The difference in length of hospital stay was not statistically significant [malnourished patients [8.6 (SD 6.7) days] vs. well-nourished [7.7 (SD 7.2) days] (p=0.604). There was an upward trend between decreased intake and length of hospital stay. Those who consumed 100% were in hospital for 5.7 (SD 3.3) days, 99–50% for 8.6 (SD 7.0) days and those who consumed 0–49% for 10.5 (SD 8.1) days (p=0.091). Hospital stay was slightly higher in patients who consumed < 75% of the diet [7.0 (DS 3.7)] versus those who consumed ≥ 75% [10.0 (SD 9.04)], although it did not reach statistical significance (p=0.070).

Similar rates of complications were found between well-nourished and malnourished patients [metabolic (p=0.678) [OR 1.67 (CI 95% 0.15 – 18.87)], infectious (p=0.795) [OR 1.39 (CI 95% 0.12 – 16.23)], mechanical (p=0.865) [OR 0.80 (CI 95% 0.06 – 10.56)] complications] or considering food intake (consuming more

Table III
Comparison between intake on admission and on the 7th day

	Admission	*7th day*	
	Breakfast		p
Nothing	5.3%	5.3%	
Almost nothing	-	-	
Half	15.8%	10.5%	0.003
Almost all	5.3%	15.8%	
All	73.6%	68.4%	
	Lunch - 1st course		p
Nothing	0%	10.5%	
Almost nothing	15.8%	5.3%	
Half	26.3%	10.5%	0.596
Almost all	21.0%	10.5%	
All	47.4%	52.6%	
	Lunch - 2nd course		p
Nothing	6.6%	13.3%	
Almost nothing	13.3%	0.0%	
Half	33.3%	20.0%	0.212
Almost all	20%	13.3%	
All	26.6%	53.3%	
	Lunch - Dessert		p
Nothing	23.5%	23.5%	
Almost nothing	-	-	
Half	5.9%	-	0.168
Almost all	-	-	
All	70.6%	76.5%	
	Snack		p
Nothing	-	6.3%	
Almost nothing	-	6.3%	
Half	6.6%	18.8%	0.050
Almost all	6.6%	6.3%	
All	86.6%	62.5%	
	Dinner – 1st course		p
Nothing	11.1%	11.1%	
Almost nothing	5.5%	5.6%	
Half	5.5%	5.6%	0.024
Almost all	11.1%	16.7%	
All	66.6%	61.1%	
	Dinner – 2nd course		p
Nothing	14.2%	7.1%	
Almost nothing	14.2%	7.1%	
Half	21.4%	21.4%	0.099
Almost all	14.2%	21.4%	
All	35.7%	42.9%	
	Dinner - Dessert		P
Nothing	6.2%	18.8%	
Almost nothing	-	-	
Half	-	6.3%	0.003
Almost all	6.2%	-	
All	87.5%	75%	

Table IV
Reasons for non-consumption of hospital food

	Anorexia	*Flavor*	*Texture*	*Others*
Breakfast	78.9%	10.5%	0.0%	10.5%
Lunch	69.7%	18.2%	0.0%	12.1%
1st course	74.2%	3.2%	9.7%	12.9%
2nd course	30.8%	7.7%	0.0%	61.5%
Dessert				
Snack	63.6%	9.1%	0.0%	27.3%
Dinner	52.6%	31.6%	5.3%	10.5%
1st course	64.9%	18.9%	2.7%	13.5%
2nd course	58.3%	16.7%	0.0%	25 .0%
Dessert				

Table V
Energy and protein in both prescribed diets and patient intake

	Admission (69 patients)	*7th day (24 patients)*	*Difference (24 patients)*	*p*
Prescribed energy (kcal)	2014.8 (SD 2624.4)	1605.1 (SD 855.0)	↑ 61.9 (SD 931.2)	0.748
Prescribed protein (g)	77.8 (SD 38.4)	71.9 (SD 39.8)	↑ 2.6 (SD 41.4)	0.759
Energy intake (kcal)	1216.1 (SD 705.3)	1209.1 (SD 795.7)	↑ 157.4 (SD 582.3)	0.219
Protein intake (g)	51.6 (SD 32.2)	51.8 (SD 36.4)	↑ 61.9 (SD 931.2)	0.748

than 75% or less than 75%) [metabolic (p=0.782) [OR 1.33 (CI 95% 0.17 – 10.25)], infectious (p=0.572) [OR 1.86 (CI 95% 0.21 – 16.18)], mechanical (p=0.265) [OR 4.00 (CI 95% 0.31 – 52.07)] complications].

Discussion

Malnutrition is a major problem in cancer patients due to its prevalence and incidence, especially during hospitalization and at advanced stages of the disease. According to SGA results, on admission 60.5% of patients had some form of malnutrition, which shows the importance of nutritional screening and assessment in cancer patients. In a study by Gómez Candela et al, 129 cancer patients were assessed using SGA-PG resulting in 49% of patients being identified as at risk of malnutrition and 7% with severe malnutrition[14]. These results are lower than ours, which could be explained because we evaluated inpatients and Gómez Candela et al studied outpatients. On the contrary, Sotelo González et al assessed 28 oncology inpatients by SGA, obtaining an 82.1% rate of malnutrition, with 57.1% severely malnourished; these values were higher than those obtained in our study[15].

APMT has been described in various studies as a reliable method for nutritional assessment. APMT is fast and inexpensive and correlates well with various anthropometric methods currently used to check nutritional status[16,17]. The APMT is decreased in both the dominant and non-dominant hands, which can be caused either by the presence of edema or by inter- and intra-observer variability. Bragagnolo et al studied adductor thickness in 87 surgical patients, obtaining a direct relationship between adductor thickness and patient nutritional status; values obtained in their study are slightly lower than ours[13]. Caporossi et al evaluated 248 critically ill patients admitted, noting that those with severe malnutrition had a lower adductor thickness than those who were well nourished, and associating this with an increased mortality in patients who had abnormal values on the APMT[18].

After a week of hospitalization the overall intake decreased in hospitalized patients, although there were no changes in causes of non-consumption. The hospital where this study took place has a weekly menu, so it could be hypothesized that repetition of dishes (especially breakfast and lunch, which are the same every day) could lead to monotony and rejection of the hospital menu. Ferreira et al conducted a study involving 100 inpatients and evaluated the acceptance of the menu[19]. In this case they performed an evaluation between 3 and 6 days of hospitalization in order to avoid monotony. They found that the absence of taste (40%), the monotony of the preparations (33%), poor appetite (26%), very large plates (29%) and improper temperature (24%) were the main causes of rejection in well-nourished patients, while the malnourished referred mainly to

anorexia or dysphagia. In 2010, Agarwal et al conducted a multicenter study in Australia and New Zealand analyzing the acceptance of inpatient hospital diets (including cancer patients)[20]. In this study it was found that cancer patients ate less than half of the prescribed diet. A study made in Geneva by Thibault et al compared the results of hospital menu intake in 1999 and 2008[21]. The results from 1677 inpatients showed that the main reasons to consider a diet unacceptable were inadequate flavor, time of receipt, inadequate cooking and little variability in the menu. As a result, patients didn't cover their caloric and protein needs.

In Nutrition Day 2006 a relationship between decreased intake and deaths was found[8]. It was observed that 30 days after the survey 634 patients had died, this being related to decreased intake. Of all patients surveyed, 73% gave a reason as to why they rejected the hospital menu; among the causes of non-consumption were anorexia, nausea and inadequate food flavor. The results obtained in Nutrition Day 2006 confirmed the relationship between reduced intake and mortality[8]. In our study was a statistically significant difference between lower intake and higher death rate was observed with χ^2 that could not be confirmed by OR, which could be related to an insufficient sample size. It should also be taken into account that lower intake can be related to the severity of a disease that could not be checked.

Fuchs et al evaluated 117 inpatients in México[22]. They calculated the energy and protein coverage of the prescribed diets in cancer patients, obtaining approximate consumptions of 1000 Kcal and 42 g of protein, which was 67% of inpatient requirements. Those values are similar to our own data. A similar study was conducted by Barton et al evaluating whether hospital diets and actual intake covered energy and protein needs and also the percentage of food rejected by patients[12]. They determined that although hospital diets covered only between 71% and 77% of their needs, taking the minimum recommended by the Health Department in the UK, which is 1800 kcal. Schindler et al observed that 47% of patients studied in 2008 didn't meet their energy and protein needs even though they ate 100% of the hospital diet[13].

It is interesting to see that those patients who consumed ≥ 75% still did not cover their energy and proteins needs, proving that the diets in our center are not well calibrated and have insufficient energy and above all protein which will have to be solved.

Finally, although it was not significant, an upward trend to a longer hospital stay being related to reduce food intake of the prescribed diet was observed. Fuchs et al in their study in Mexico related the length of hospital stay to malnutrition[22]. They related severe malnutrition with a reduced intake that did not meet the energy and protein requirements of the patients. As in our results they did not find differences between those who were malnourished or at risk and patients with a good nutritional status.

Limitations

Possible limitations of this study are related to the sample size, especially after 7 days of hospitalization. In addition, the intake assessment was not performed by a double weighing technique; instead, it was the patient himself who estimated intake visually, lacking proper training that can affect quantitative results between patients. Also, the severity of disease was not known in most patients who were studied, which could also influence intake and nutritional status.

Conclusions

Oncological and hematological patients, as shown in previous studies, have a high rate of malnutrition. Malnourished patients showed a higher rate of readmission but no relationship was observed with other complications, length of stay or death. The food intake did not change after a week of admission except for those meals or dishes repeated every day. Monotony in hospital diets may be one of the main reasons for non-consumption after one week of hospitalization. There was an upward trend between reduced intake and a higher death rate. Hospital menus usually do not cover nutritional needs, even in patients with a high intake; therefore, it is necessary to reevaluate them and plan a specific one for oncohematologic patients.

Statement of human and animal rights

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki Declaration and its later amendments or with comparable ethical standards.

Informed consent was obtained individually from all participants included in the study.

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