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Original article

Consumption of oral hospital diets and percent adequacy of minerals in oncology patients as an indicative for the use of oral supplements☆

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SUMMARY

Background & aims: Deficiencies in the consumption of foods and nutrients favor malnutrition in patients. Considering the recommendations for the ingestion of minerals, the content, consumption and percent adequacy of the minerals (Ca, Cu, Fe, Mg, Mn, K, P, Na, Zn and Se) were evaluated amongst oncology patients who received oral diets isolated or associated with an oral food complement (OFC), evaluating the need and composition of an oral supplement.
Methods: The mineral composition as determined by ICP-OES, and the food consumption of the patients served regular, bland and soft diets, were evaluated on six non-consecutive weekdays. Patients with increased nutritional needs received OFC. The consumptions were calculated by deducting the weight of the leftovers from the value served.
Results: A total of 163 patients took part of which 59.5% were men, the mean age was 57 ± 15 years old, and 126 (77.3%), 27 (16.6%) and 10 (6.1%) were served the regular, bland and soft diets, respectively, with (23.0%), 8 (30.7%) and 4 (40.0%) receiving the OFC. Patient consumption was lower when the regular (74.2 *vs* 79.7%) and soft (68.9 *vs* 74.2%) diets were combined with OFC. For all diets, less was consumed at the lunch (61.2%–65.7%) and dinner (39.9%–62.8%) meals. Patients that received the OFC showed reduced meal consumption and higher Ca ingestion. The mineral contents of the diets were inadequate, with 66.8% of the patients ingesting Na above the UL and K below the nutritional recommendation (100%).
Conclusion: The diet consumption, isolated or associated with OFC was insufficient, and hence the exclusion of OFC and the inclusion of a mineral supplement (without P and Na) was indicated to adequate ingestion to the nutritional recommendations.

1. Introduction

Oncology patients are frequently victims of malnutrition, a situation which corroborates with a greater incidence of morbid-mortality, in addition to an increase in hospital expenditure.[1–3] However, although the role of the nutritional state of the patients in the prognosis of diseases has been recognized,[4] there are still no specific nutritional recommendations for the patients. Thus the nutritional recommendations for healthy individuals have been used to plan and evaluate the diets.[5]

The adequate consumption of food and nutrients by hospital patients can be favored by adaptations to the diet, resulting in an improvement in the nutritional status of the patient, causing reductions in the time and costs of the internment.[6,7] The nutritional adequacy of a patient can be evaluated from his food consumption, and subsequently an action plan established to attend the deficiencies found.[5,7] The use of oral nutritional supplements stands out amongst the most adopted methods to achieve nutritional adequacy for hospital patients.[8]

However, there is a total lack of information about the ingestion of mineral nutrients and the nutritional status of hospital patients,[9,10] these nutrients having been shown to be essential in the prevention and treatment of cancer.[9] Thus considering the recommendations of the Institute of Medicine (IOM)[5] for the ingestion of minerals, the content, consumption and percent adequacy of the

Non-standard abbreviations: OFC, Oral food complement; OG, Oral group; NT, Nutritional therapy.

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minerals (Ca, Cu, Fe, Mg, Mn, K, P, Na, Zn and Se) was evaluated amongst oncology patients who received oral diets (regular, bland and soft) isolated or associated with an oral food complement (OFC), evaluating the need and mineral composition of an oral supplement for these patients.

2. Methodology

2.1. Samples

Regular, bland and soft diets were studied isolated or associated with an oral food complement (OFC), formulated from whole bovine milk with cereals, fruits and powdered milk. The diets consisted of 6 meals: breakfast, morning snack, lunch, afternoon snack, dinner and bedtime snack, all produced by the Food and Nutrition Unit of an Oncology Hospital in Belo Horizonte, MG, Brazil (Appendix 1). After collecting the meals, each was weighed, homogenized in a food multiprocessor with a plastic helix and 50 g samples transferred to duly identified zip-lock plastic bags and frozen at −18 °C until analyzed. A total of 120 samples of the diets were taken in two non-consecutive weeks in the months of May and September, 2010 and January 2011, including all the meals of the regular, bland and soft diets as well as the OFC on the 6 investigation days.

2.1.1. Determination of the minerals (Ca, Cu, Fe, Mg, Mn, K, P, Na, Zn and Se)

After digesting the samples, the minerals in the diet samples were determined in duplicate according to the methodology described by Moreira et al. (2012).[10] Following digestion and dilution of the samples, the minerals were determined using induced coupled plasma optical emission spectrometry (ICP OES). The technical suitability of ICP OES for determination of all mineral concentrations was considered appropriate for this study, given that all values exceeded the limit of detection (LOD) and the limit of quantification (LOQ).

2.1.2. Instrumentation

The mineral elements were quantified using a model Vista MPX ICP OES (VARIAN, Mulgrave, Australia) equipped with a 40 MHz radio frequency source, CCD (Charge Coupled Device) type solid state simultaneous multi-element detector, peristaltic pump and a sea spray nebulizer coupled to the nebulizer chamber. The ICP Expert software was used and 99.996% pure liquid argon (Air Liquid, SP, Brazil) as the plasma gas. The following ICP OES operating conditions were used: power of 1000 W; nebulizer rate of 0.9 L/min; liquid argon and auxiliary gas rates of 15 and 1.5 L/min; integration and reading times of 10 and 3 s; number of replicates, 3. The wavelengths used were: Ca, 317.933 nm; Cu, 324.754 nm; Fe, 259.940 nm; K, 766.491 nm; Mg, 279.553 nm; Mn, 257.610; Na, 589.592 nm; P, 213.618 nm; Zn, 206.200 nm and Se, 196.026.

2.1.3. Quality guarantee of the results

The methodologies used were validated for the parameters of precision and exactness using certified reference material (CRM) of the diet for the mineral elements studied in this work. The CRM used was the Typical Diet (1548a) obtained from the National Institute of Standards and Technology (NIST).

2.2. Casuistry

The food consumption and percent adequacy of the minerals Ca, Fe, P, Na, K, Mg, Mn, Zn, Cu and Se were examined in hospital oncology patients who received regular, bland or soft oral diets isolated or

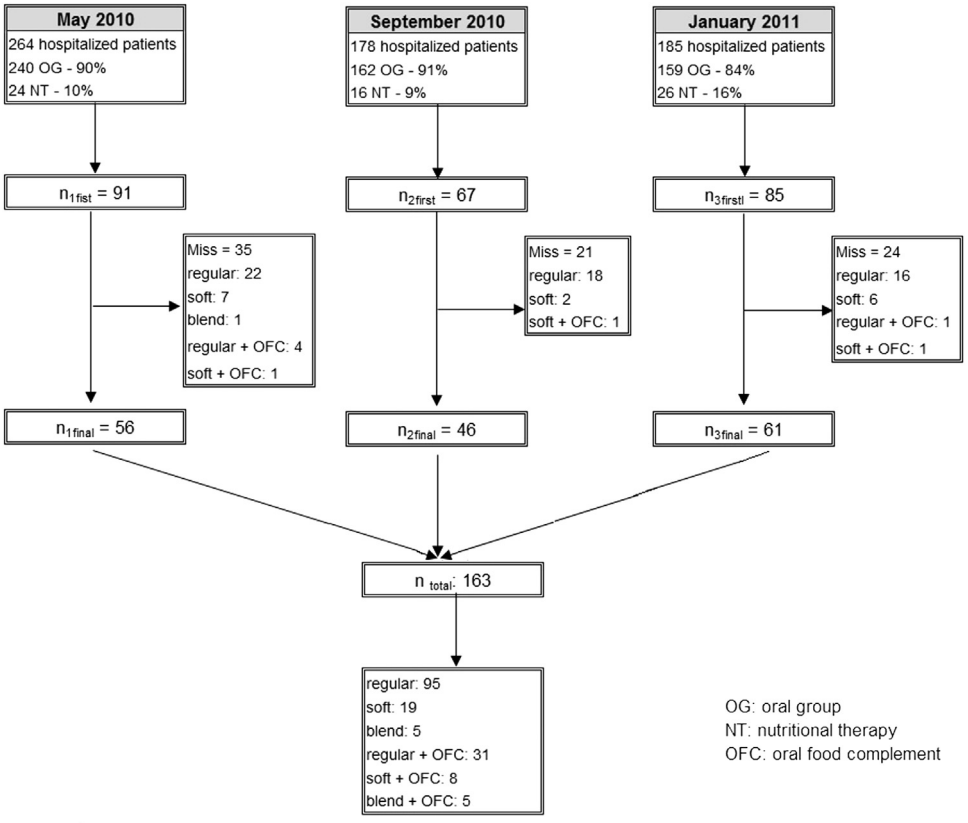

Fig. 1. Casuistry.

associated with an OFC. The diet consumption was analyzed from the difference in weight between the amount offered and the leftovers.

Patients whose prescription diet was altered or suspended or who were released from hospital during the data collection days (Fig. 1) were not included in the study. The participants in the study were not communicated about the research to avoid food consumption errors. The research was evaluated and approved by the Ethics in Research Committee of the Mario Penna Foundation (CAE 0001.0.261.238-11).

The distribution and collection of the meals and OFC to the patients followed the hospital standard, including the time. After collecting the trays, the leftovers were separated and weighed individually on an electronic Pluris Top balance (Filizola S.A. Pesagem e Automação, São Paulo, SP, Brazil) with a capacity for 15 kg and sensitivity of 2 g. The total weight of the meals served, after deduction of the weight of the utensils and leftovers, allowed one to determine the food ingestion by the patients. These procedures were adopted on the same days as the collection of the diets submitted to chemical analysis.

The Estimated Average Requirements (EAR) or Adequate Intake (AI) values, and also the Tolerable Upper Intake Levels (UL) were used as the parameters to analyze the adequacy of mineral consumption by the patients.[5] The mineral consumption was considered adequate when the values were situated between the EAR (or AI) and the Recommended Dietary Allowance (RDA), and inadequate when below the EAR (or AI) or above the UL.

The percent adequacy of the minerals in the regular, bland and soft diets, isolated or combined with an OFC, was calculated for elderly adults of both sexes. Adults were considered to be individuals between 19 and 59 years of age, and elderly those $\geq$ 60 years.[5]

The difference between the nutritional recommendations (RDA) and the mean mineral content consumed, always respecting the UL value, was used to calculate an estimate for the mineral content of an oral mineral supplement to attend the nutritional requirements.

2.3. Statistical analysis

The programs Statistical Package for the Social Sciences (SPSS), version 17 and the Minitab, version 15 were used for the statistical analyses. The Shapiro–Wilk test was used to evaluate normality of the data and homoscedasticity to analyze the residues.

Tables with the absolute and relative frequencies were used for each of the levels to evaluate the association between the type of diet and the use of an OFC with the adequacy levels, and also the Fisher Exact test to evaluate if the differences or associations between the factors for each mineral were or were not significant, using a significance level of 5%.

3. Results

A total of 163 patients took part in the study, of which the majority (59.5%) were male, with mean ages of 59.1 $\pm$ 15.0 and 53.8 $\pm$ 13.6 for the male and female sexes, respectively. Less than half of the participants (47.8%) were 60 years old or older.

The main reasons for their hospital admission were: surgery (50.9%), clinical intercurrence (35.6%), chemotherapy (12.9%) and radiotherapy (0.6%), the mean internment time of the patients being 6.3 $\pm$ 1.2 days. The most frequent type of cancer was urological (25.2%), followed by the digestive (14.1%) and gynecological (10.4%) apparatuses. Skin cancer and Hodgkin's lymphoma showed the smallest percentages of 3.7% and 4.9%, respectively.

Regarding the dietary prescriptions, 126 (77.3%) patients were on the regular diet, 27 (16.6%) blend diet and 10 (6.1%) soft diet. With respect to the food complement, 122 (74.8%) were not given the OFC, but of those that did, 29 (23.0%) were on the regular diet, 8 (30.7%) on the blend diet and 4 (40.0%) on the soft diet.

The diet consumption percentages of the patients fed a diet or diet associated with OFC were 79.7% and 74.2% for the regular diet, 75.3 and 78.0% for the bland diet and 74.2 and 68.9% for the soft diet, respectively. The meals showing the greatest percentages of leftovers were lunch (regular = 65.7 and 57.7% *vs*. bland diet = 64.9 and 49.7% *vs*. soft diet = 61.2 and 30.7%) and dinner (regular = 62.8 and 60.3% *vs*. bland diet = 57.6 and 56.8% *vs*. soft diet = 39.9 and 27.4%), with the lower percentages being observed for the patients receiving the OFC, independent of the type of concomitant oral diet (Fig. 2A–C).

Amongst the patients on the regular diet with OFC, the greatest acceptance was found in the morning as compared to the afternoon (81.9% *vs*. 58.3%). The contrary was observed for the acceptance of the OFC for the patients on the bland and soft diets, where the highest acceptance of the OFC was found in the afternoon (bland 82.6 *vs*. 100% and soft = 84.7 *vs*. 96.8%) (Fig. 2A–C).

Table 1 shows the results for the analyses of the adequacy of mineral consumption according to the type of diet. The dietary consumption for the patients on the diets studied did not surpass the UL for the minerals investigated with the exception of Na, for which the consumption was not merely above the recommended level, but extrapolated the UL value in the regular, bland and soft diets (67.5, 77.8 and 30.0%, respectively). However, in the case of the soft diet, 5 (50.0%) of the patients showed Na ingestion below the AI. In parallel, an insufficient consumption of K was noted in relation to the recommended limit for 100% of the patients on the three diets studied.

In relation to Ca an association was observed between the type of diet and the adequacy level ($p < 0.006$), the consumption being below the recommended values for 96 (76.2%), 24 (88.9%) and 4 (40.0%) of the patients on the regular, bland and soft diets, respectively. An association was also found for the consumption adequacy of Fe amongst the diets ($p < 0.027$), all the patients on the soft diet showing adequate consumption of this mineral. Most of the patients showed insufficient consumption of Mg, and in the case of the patients on the soft diet, only 1 (10.0%) showed adequate consumption of this mineral (Table 1).

An association ($p < 0.004$) was found for Mn between the type of diet and the level of consumption adequacy, with only 2 (20.0%) of patients on the soft diet showing adequate consumption, whereas 95 (75.4%) and 17 (63.0%) of patients on the regular and bland diets, respectively, showed adequate consumption. The consumption of P and Se showed high percentages of adequacy for all the diets studied, although in the second case there were more patients on the regular and bland diets with consumption below the recommended limits (Table 1).

There was an association ($p < 0.001$) between the type of diet and the consumption adequacy of Zn, the majority of patients on the regular diet showing consumption below the recommended limit (87 patients – 69.0%), to the contrary of those on the soft diet, where 8 (80.0%) showed nutritionally adequate consumption of this mineral (Table 1).

An analysis of the consumption of minerals by patients on diets complemented with OFC, represented by 41 (25.2%) of the patients taking part in the study, showed that the combination with OFC made no difference to the adequacy of consumption in the majority of cases, only making a difference in the case of Ca ($p < 0.001$), as can be seen in Table 2.

An estimate for the mineral composition of an oral supplement aimed at attending the mineral recommendations (RDA or AI) and respecting the respective UL value, was calculated from the data for the dietary ingestion by the patients studied who did not receive the OFC. The results showed the need for two complements with

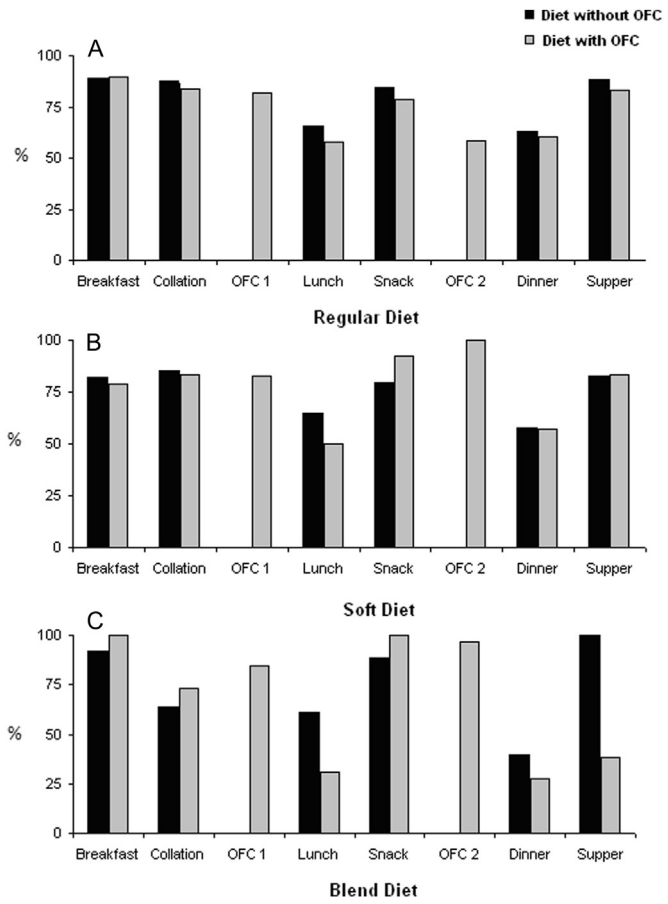

Fig. 2. (**A**–**C**): Percentage of acceptance of meals for hospital patients on oral diets with or without oral food complement.

distinct compositions, considering the differences between the profiles of the diets and also the respective nutritional support received by these patients (Table 3).

In the case of patients on the soft diet, although some showed consumption below the recommended levels, it was also shown that another part consumed Na at levels above the UL. Considering that the recommended value for Na is based on the AI, the mineral supplement proposed for patients on the soft diet did not include this mineral.

The prescription of an oral mineral supplement with the suggested chemical composition (Table 3) would make it possible for hospital patients to receive the minerals in safe amounts, compatible with the nutritional recommendations, supplanting the use of the current OFC and reducing the negative effect of food consumption by these patients.

4. Discussion

The mean internment time for the patients in this study (6.3 ± 1.2 days) was close to that found in a Spanish study with hematological patients of (7.0 ± 3.6 days).[11] A study carried out in Brazil involving 25 hospitals, also showed that the mean internment time was higher amongst malnourished patients.[12] On the other hand, Stanga et al. (2003)[13] found a negative correlation between internment time and satisfaction of the patients with the diet offered.

Hospital patient acceptance of the diet is fundamental to attend the nutritional needs of the patient and contribute to his recovery.[7] Nevertheless, studies on food wastage in hospitals in Switzerland and Australia indicated that 25–30% of the food offered to patients was not consumed,[14,15] values surpassing the wastage reported for other types of catering service.[15] The deficit in food ingestion by the patients in the present study resulted in a reduced amount of nutrients being consumed, including that of the minerals, with the exception of Na (Table 1).

The reasons for the low consumption of oral hospital diets include the clinical condition of the patient, the flavor, variety, presentation mode, odor, texture, portioning, meal times, interruptions and even the atmosphere of the ward.[13–16] In addition, the inadequacy of the dietary prescriptions is also amongst the motives for the low consumption,[17] since the diets aim to adapt the food to the physical and pathological conditions of the patients, including alterations in the consistency and preparation of the foods.[18]

Dupertuis et al. (2003)[14] analyzed the energetic and protein adequacies of hospital meals, and found that, despite the adequate offer of these items in the diets, the nutritional requirements of 57% of hospital patients were not attended, consuming a maximum of 75% of the energy carried by the diets, the lowest consumption being found for the patients on an oral diet with modified consistency.[14]

A study carried out in Brazil reported a reduction in food ingestion in 50% of the patients, of which 25% had been prescribed oral diets with modified consistency.[19] The percentage cited was similar to that found in the present study, where 23% of the prescriptions were for oral diets with modified consistency (soft diet), resulting in lower food ingestion by the patients who received them (Fig. 2A–C).

Researchers have reported that the oral diets with modified consistency, including soft diets, prescribed for dysphagic patients, carried Fe and Ca contents below the recommended values,[20] to the

Table 1
Adequacy of intake of minerals according to the type of oral diet received by hospitalized patients.

Mineral	Percentage of adequacy				Value *p*
	<EAR	EAR–RDA	RDA–UL	>UL	
	n (%)	*n* (%)	*n* (%)	*n* (%)	
Ca					
Regular diet	96 (76.2)	7 (5.6)	23 (18.2)	–	0.006
Bland diet	24 (88.9)	1 (3.7)	2 (7.4)	–	
Soft diet	4 (40.0)	4 (40.0)	2 (20.0)	–	
Average (%)	76.0	7.4	16.6	–	
Cu					
Regular diet	53 (42.1)	34 (26.9)	39 (31.0)	–	0.563
Bland diet	11 (40.7)	7 (25.9)	9 (33.4)	–	
Soft diet	7 (70.0)	2 (20.0)	1 (10.0)	–	
Average (%)	43.6	26.4	30.0	–	
Fe					
Regular diet	25 (19.8)	30 (23.8)	71 (56.4)	–	0.027
Bland diet	11 (40.7)	6 (22.2)	10 (37.1)	–	
Soft diet	0 (0.0)	1 (10.0)	9 (90.0)	–	
Average (%)	22.1	22.7	55.2	–	
Mg					
Regular diet	75 (59.5)	49 (38.9)	2 (1.6)	–	0.064
Bland diet	23 (85.2)	4 (14.8)	0 (0.0)	–	
Soft diet	9 (90.0)	1 (10.0)	0 (0.0)	–	
Average (%)	65.7	33.1	0.6	–	
Mn					
Regular diet	31 (24.6)	7 (5.6)	88 (69.8)	–	0.004
Bland diet	10 (37.0)	3 (11.1)	14 (51.9)	–	
Soft diet	8 (80.0)	0 (0.0)	2 (20.0)	–	
Average (%)	30.1	6.1	63.8	–	
P					
Regular diet	22 (17.5)	8 (6.3)	96 (76.2)	–	0.409
Bland diet	3 (11.1)	2 (7.4)	22 (81.5)	–	
Soft diet	1 (10.0)	2 (20.0)	7 (70.0)	–	
Average (%)	16.0	7.4	76.7	–	
Zn					
Regular diet	87 (69.0)	24 (19.1)	15 (11.9)	–	<0.001
Bland diet	13 (48.2)	5 (18.5)	9 (33.3)	–	
Soft diet	2 (20.0)	0 (0.0)	8 (80.0)	–	
Average (%)	62.6	17.8	19.6	–	
Se					
Regular diet	28 (22.2)	33 (26.2)	65 (51.6)	–	0.524
Bland diet	9 (33.3)	5 (18.5)	13 (48.2)	–	
Soft diet	1 (10.0)	4 (40.0)	5 (50.0)	–	
Average (%)	23.3	25.8	50.9	–	
K[a]					
Regular diet	126 (100.0)	–	–	–	–
Bland diet	27 (100.0)	–	–	–	
Soft diet	10 (100.0)	–	–	–	
Average (%)	100.00	–	–	–	
Na[a]					
Regular diet	11 (8.7)	–	30 (23.8)	85 (67.5)	0.009
Bland diet	2 (7.4)	–	4 (14.8)	21 (77.8)	
Soft diet	5 (50.0)	–	2 (20.0)	3 (30.0)	
Average (%)	11.0	–	22.0	66.8	

[a] Minerals with AI values (<AI and AI–UL).

contrary of that observed in the present study, where better Fe and Ca adequacy was found amongst patients prescribed the soft diet (Table 1). The differentiated profile for the ingestion of these minerals in the soft diet could be explained by the fact that the menus of the soft diet included a cereal cream enriched with Fe and Zn in the breakfast and afternoon snack, this cream being prepared with cows milk (Appendix 1).

However, in the present study, the patients prescribed the soft diet also showed the lowest food ingestion when compared with the regular and bland diets, the main meals (lunch and dinner) being those showing the lowest consumption for all the diets. On the other hand the snacks showed the highest consumption (Fig. 2A–C). These results indicate the need to implement changes in the menus of the meals making up these diets, including the question of the density of the nutrients they carry.

Table 2
Adequacy of intake of minerals from diets, offered with and without oral food complement (OFC) to hospitalized patients.

Mineral	Percentage of adequacy				Value *p*
	<EAR	EAR–RDA	RDA–UL	>UL	
	n (%)	*n* (%)	*n* (%)	*n* (%)	
Ca					
Diet without OFC	105 (86.1)	3 (2.5)	14 (11.5)	–	<0.001
Dieta with OFC	19 (46.3)	9 (22.0)	13 (31.7)	–	
Cu					
Diet without OFC	54 (44.3)	32 (26.2)	36 (29.5)	–	0.973
Dieta with OFC	17 (41.5)	11 (26.8)	13 (31.7)	–	
Fe					
Diet without OFC	27 (22.2)	33 (27.0)	62 (50.8)	–	0.053
Dieta with OFC	9 (21.9)	4 (9.8)	28 (68.3)	–	
Mg					
Diet without OFC	84 (69.0)	37 (30.2)	1 (0.8)	–	0.150
Dieta with OFC	23 (56.1)	17 (41.5)	1 (2.4)	–	
Mn					
Diet without OFC	37 (30.3)	9 (7.4)	76 (62.3)	–	0.601
Dieta with OFC	12 (29.3)	1 (2.4)	28 (68.3)	–	
P					
Diet without OFC	23 (18.9)	7 (5.7)	92 (75.4)	–	0.110
Dieta with OFC	3 (7.3)	5 (12.2)	33 (80.5)	–	
Zn					
Diet without OFC	82 (67.2)	19 (15.6)	21 (17.2)	–	0.103
Dieta with OFC	20 (48.8)	10 (24.4)	11 (26.8)	–	
Se					
Diet without OFC	31 (25.4)	35 (28.7)	56 (45.9)	–	0.096
Dieta with OFC	7 (17.1)	7 (17.1)	27 (65.9)	–	
K[a]					
Diet without OFC	122 (100.0)	–	–	–	–
Dieta with OFC	41 (100.0)	–	–	–	–
Na[a]					
Diet without OFC	13 (10.7)	–	26 (21.3)	83 (68.0)	0.819
Dieta with OFC	5 (12.2)	–	10 (24.4)	26 (63.4)	

[a] Minerals with AI values (<AI and AI–UL).

A survey carried out with a Tribal Nation in the northwest of the Pacific reported that the majority of the natives ingested mineral contents below the recommended values, but that a significant part of these individuals consumed Na at a level above the UL.[21] In the present study, the elevated Na content of the diets at a level that also extrapolated the UL resulted in an excessive ingestion of this element.

The Na content of the diets can be reduced by using seasonings based on herbs, reducing the use of industrialized products[22] and substituting the sodium chloride by potassium chloride. Considering that large amounts of K can be found in fresh fruits and vegetables,[23] the menu, associated with the low food ingestion by the patients, was involved in the ingestion of this mineral below the recommended value (Table 1).

On the other hand the formulation of the OFC included the use of fresh fruits, and the artisanal beverage was offered to 25.2% of the participants, a percentage higher than that reported in hospitals in

Table 3
Estimated composition of oral mineral supplement proposed, according to the type of diet prescribed oral.

Minerals	Oral supplement for patients under general and blend diets	Oral supplement for patients on soft diet
Ca (mg)	710	375
Cu (mg)	0.1	0.3
Fe (mg)	0.6	0.0
Mg (mg)	215	290
Mn (mg)	0.1	1.1
P (mg)	–	–
Zn (mg)	4.9	–
Se (mg)	0.01	0.01
Na (mg)	–	–
K (mg)	2615	3155

the United Kingdom, where 14% of hospital patients receive the nutritional complement together with the prescribed diet, which is formulated considering the lack of appetite, bad food ingestion and weight loss of the patients.[24]

In the present study, the OFC, which is distinguished from the nutritional supplement by containing no added nutrient or specific dietetic substance, or any herbs or other botanical substance,[25] was only prescribed for patients considered to have greater nutritional requirements. This scheme has been reported to improve acceptance by the patients.[26]

The patients who consumed the OFC showed an improvement in the Ca ingestion adequacy (Table 2), since the formulation contained cow's milk. Moreover, in September (2010) and January (2011), Ca enriched protein modules were included in the OFC (Appendix 1). The use of the OFC did not significantly alter the adequacy of the other minerals, indicating that the formulation was below the nutritionally desirable amount. A Brazilian study compared the use of artisanal and industrialized oral supplements in the recovery of the nutritional status of oncology patients, and reported that the artisanal supplement presented about 25% less K, Cu, Mg and Fe than the industrialized supplement.[27]

In the present study the consumption was lower for lunch and dinner amongst the patients that received the OFC than amongst those who did not (Fig. 2A–C), the OFC being offered before the meals. Although the studies have not indicated a reduction in food ingestion due to the concomitant use of a nutritional supplement,[28] it has been reported that nutritional supplements with a smaller volume and higher energy density were better accepted.[29] Nevertheless, since the nutrients are minerals, the use of capsules could be a valid alternative, collaborating to avoid an error in the dietetic consumption of the patients.

There is disagreement with respect to the parameter to be used for the recommended amounts of nutrients for hospitalized patients.[7,30] The use of the values recommended for healthy individuals can be interpreted as promoting health, contrary to the idea of specific recommendations for the sick based on distinct nutritional demands resulting from the pathology and nutritional status of the patient.[29] However, considering there are no specific recommendations for oncology patients, the present study aimed for adequacy using the recommendations for healthy populations as the parameter.[5]

A study evaluating the habitual dietary intake among patients with severe short bowel syndrome shows that fo multiple micronutrients the intakes in a large percentage of patients were below the Recommended Dietary Allowances (RDA): vitamin A (47%), vitamin D (79%), vitamin E (79%), vitamin K (63%), thiamine (42%), vitamin B6 (68%), vitamin B12 (11%), vitamin C (58%), folate (37%), iron (37%), calcium (63%), magnesium (79%) and zinc (68%).[31] Even when considering the limitations intrinsic to a hospital unit, and to the number of days and patients involved, and also the severity of the disease among the patients studied, the results of this research indicated the need to pay more attention to the menus of the oral hospital diets, the composition of the OFS or nutritional supplement prescribed, and to accompany the dietetic consumption of the patients. A comparison of the results obtained also presents limitations due to the scarcity of studies evaluating the consumption of minerals by the sick. The majority of dietetic consumption surveys are restricted to energy and protein analyses,[14] a lacuna still exists with respect to micronutrients consumption, including minerals and vitamins, supporting the need for more approaches such as the one presented in the present study.

Studies concerning the consumption of minerals by hospital oncology patients are necessary, to establish a relationship between intake values and organic levels, including the checking of the specific nutritional requirements, dealing not only with those on enteral and parenteral diets, but also those on oral hospital diets, who represent the great majority of hospital patients.

5. Conclusions

The percent consumption of regular and soft oral diets was influenced by the joint offer of an OFC. For the three diets, lunch and dinner resulted in the greatest percentages of leftovers and the highest acceptance scores were awarded by the patients who receive an OFC, independent of the type of oral diet. The consumption of an OFC only resulted in an improvement in the ingestion adequacy of Ca. The consumption of oral hospital diets, isolated or associated with an OFC, was shown to be inadequate, indicating the need to exclude the OFC currently in use and include a daily oral mineral supplement not containing P or Na, with the objective of making ingestion by the patients adequate with respect to the nutritional recommendations.

Statement of authors contributions

All authors participated in data collection and analysis; DCFM, KDQ, MAM participated in data interpretation and manuscript writing. All authors read and approved the final manuscript.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.clnu.2013.09.005.

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