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QUANTITATIVE AND QUALITATIVE NUTRITIONAL EVALUATION OF THE GENERAL ORAL DIET SERVED IN A UNIVERSITY HOSPITAL

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ABSTRACT | Introduction: The high prevalence of hospital protein-energy malnutrition is associated with several factors, including implemented dietary conducts. **Objective:** Analyze nutritional characteristics of the general hospital oral diet (GHOD). **Methods and materials:** A prospective and descriptive study, with a qualitative and semi-quantitative approach, concerning the GHOD menu, was developed from May 2012 to August 2013. GHOD menu was established for 28 days and consisted of five meals: breakfast, lunch, mid-afternoon snack, dinner and bedtime snack. Weighing of each food served in the meals (lunch/dinner) from the GHOD menu was performed. Composition tables were used to calculate the total energy value (TEV) and the energy distribution percentage of macronutrients of the foods, as well as to quantify the food portions from different food groups. **Results:** The average energy distribution to TEV (2409.4±152.6 kcal/day) was adequate for proteins (13.4%), carbohydrates (64.7%), and lipids (21.9%). Variable energy supply was identified at breakfast (15.6-20.6%), lunch (26.2-36.6%), dinner (22.2-31.1%), mid-afternoon and bedtime snacks (8.4-15.5%). The overnight fasting period was up to 13h. In the evaluation of nutritional quality of the GHOD meals in accordance with food groups was identified excessive offer for beans, meat/eggs, oils/fats/oilseeds and sugar/sweets, and deficient offer for fruit/juices, legumes/vegetables and milk/dairy. **Conclusions:** It is essential to perform quantitative and qualitative nutritional characterization of the GHOD served to inpatients. Reducing the duration of the overnight fast, as well as adjustments in the supply of food groups and in food fractionation, can contribute to better meeting the nutritional needs and prevention of nutritional deficiencies.

Keywords: Hospital oral diets; hospital menu; nutritional recommendations; food groups; hospital malnutrition.

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INTRODUCTION

High values for the prevalence of protein-energy malnutrition has been demonstrated among patients admitted to hospitals across Europe (18.2%)[1] the United States (51%)[2] and Latin America (48.1%)[3].

The harmful effect of hospitalization on the nutritional status of inpatients has been demonstrated by several investigators[3,4]. In one study developed by Waitzberg et al[3] the prevalence of malnutrition of 33.2%, identified among patients assessed within the first 48 hours of hospitalization (291 malnourished patients in a total of 878 patients), increased to 61.0% in patients with a length of hospital stay of 16 days or more (651 malnourished patients in a total of 1068 patients, $p < 0.05$). The increase in the frequency of protein-energy malnutrition among hospitalized patients is associated with numerous causal factors including, for example, inappropriate implemented dietary conducts[5].

Several investigators have reported that the majority of patients admitted to hospitals in China, United States, Cuba and Brazil[2,3] receive an oral diet as the only source of food and nutrition. In theory, the general hospital oral diet (GHOD) is indicated for well-nourished individuals, who present satisfactory conditions for food intake, chewing, swallowing and digestion. In addition, GHOD should be prescribed for patients with preserved capacity for absorption and metabolism of nutrients, as well as proper excretion of metabolites and/or feces[6]. However, in clinical practice, the choice to prescribe the GHOD may be related to the lower cost of the meal and its usual indication for patients with no restrictions in the consistency or in the centesimal composition of the diet[6].

During hospitalization, patients are exposed to numerous conditions that affect appetite and the supply/intake of food, as well as the metabolic rate and the metabolism of nutrients[7]. Thus, for preventing the onset and the worsening of the malnutrition disease and specific nutritional deficiencies, it is essential to know the nutritional characteristics of hospital oral diets[8]. In accordance with these considerations, the aim of this study was to investigate the nutritional characteristics of the GHOD menu established by the food and nutrition unit in a public university hospital. More specifically, the primary aim was to calculate the total energy value and to analyze the percentage distribution of energy and macronutrients of the GHOD meals. A secondary aim was to identify preparations and foods and quantify portions from specific food groups offered daily in meals of the GHOD menu.

METHODS

Study design and location

A prospective and descriptive study, with a qualitative and semi-quantitative approach was developed from May 2012 to August 2013. The study was developed in a public university hospital of high complexity with a 556-hospital bed capacity, after being approved by the University Research Ethics Committee (CAAE: 00615012.6.0000.5152).

The GHOD menu was established for 28 days, being repeated at the end of this period. A daily menu consisting of five distinct meals: breakfast, lunch, mid-afternoon snack, dinner and bedtime snack was administered.

Weighing of foods of the GHOD meals served for inpatients

GHOD meals served in disposable food containers at lunch time ($n = 3$) and at dinner ($n = 3$), in accordance with the daily menu, were provided by the food and nutrition unit of the hospital. All containers of evaluated food were withdrawn from the food service trolley, immediately before being offered to patients, at lunch time (10h45 to 11h30) and dinner (17h to 17h30). The closed disposable food containers were acquired, from the usual distribution schedules (about 340 units at lunch; about 210 units at dinner), during 28 consecutive days.

Regardless of the daily menu, each meal of the GHOD served to inpatients had the following preparations: rice, beans, meat (beef, or pork, or chicken, or fish), side dish, and a small container with vegetable salad (lettuce, arugula, cabbage, chard, chicory, cauliflower, beets, pods, carrots, and tomatoes). Immediately after the acquisition, foods from each food container were identified and separated using disposable materials. The weighing of each food was performed on a digital electronic scale (Plenna, Thinox Bel), with an accuracy of 1g. After registration of the weight, each food was properly disposed of.

Since disposable food containers without divisions were standardized in the hospital, in some meals the broth of certain foods (e.g. beans) was unintentionally weighed together with the rice. To minimize the error in food weighing, three additional disposable food containers were weighed during the process of preparation. In order to obtain the weight of each food, standard amounts of rice and beans were portioned sequentially by an official of the hospital food and nutrition unit. Using the tare function of the scale, the food containers were weighed first empty, then with rice only and finally with rice and beans together. Then these food containers were sent to the laboratory, where manual separation of the foods and the weighing of the rice with broth and the beans without broth were performed. Initially, the difference between the weight of the portion of rice with bean broth and the weight of the portion of rice of the respective food container was identified. Following this, the difference between the weight of the portion of beans and the weight of the portion of the beans without broth of each respective food container, was also registered. This procedure provided an adequate estimate of the weight of the bean broth present in the portion of rice. The percentage corresponding to the average of the differences was used to correct the weight of the portions of rice and beans of all food containers analyzed in this study (n = 168). More specifically, for each of the food containers, the estimated average weight of the bean broth (which was weighed along with rice) was added to the weight of the bean seeds. In addition, the estimated average weight of the bean broth was subtracted from the weight of the portion of rice.

Quantities of energy and macronutrients associated with the foods of the GHOD meals

The amount of energy and macronutrients associated with each food constituent for the meals (lunch and dinner) on the GHOD menu were calculated using the Brazilian table of food composition (BTFC)[9]. In situations where some component / ingredient in food preparations was not identified in the BTFC, the table of food composition: support for nutritional decisions, proposed by Philippi[10] was used. In situations where the component / ingredient remained unidentified, the table for evaluation of food consumption, proposed by Pinheiro et al.[11] was used. In most calculations, cooked foods were used as a reference for the identification of the quantities of energy and macronutrients of the food containers.

For preparations with the main ingredient, the amount of energy and macronutrients were calculated by using the average value of the food weight in the food containers (n = 3). For preparations with more than one main ingredient, the amount of energy and macronutrients was calculated considering the average weight of each main ingredient. For preparations where it was not possible to perform the manual separation of ingredients, the calculation was performed according to the recipe of the preparation of the service itself, as proposed by Philippi[11]. Only the seasonings that could be separated and weighed were considered for the calculation.

The amount of oil in each preparation was obtained according to the information from the dietitian responsible for the general kitchen of the hospital. The per capita of oil was identified by dividing the full volume of oil used over all meal preparation in a single day (sautéed, not immersed in oil), by the total number of hospital meals produced.

Quantities of energy and macronutrients of food served in the GHOD snacks

The food contained in snacks served at breakfast, mid-afternoon and bedtime, was not weighed. This conduct was due to all these foods being offered in standardized and known portions. Tea, milk, coffee, bread with margarine, sweet and salted biscuits are

offered in these meals. At specific times the patient must choose between tea (180 ml cup) or coffee with milk (90 ml and 180 ml cups, respectively), both with or without sugar. In addition, a patient choice is made between sweet biscuits (6 units) or salted biscuits (6 units), or French bread with margarine (1 unit). Fresh fruit juice (orange) or industrialized juices (other flavors), as well as a portion of fruit are offered exclusively at breakfast.

For the calculation of the quantities of energy and macronutrients of food served at breakfast, mid-afternoon and bedtime snacks, the tables of food composition proposed by NEPA[9], Philippi[10] or Pinheiro et al.[11] were sequentially used. Since the patient must make a choice of some foods in the same meal, energy and macronutrients calculations were performed for the combinations of available foods, corresponding to the minimum, average and maximum food combinations.

Total daily supply of energy and macronutrients in the meals of the GHOD

The total supply of energy and macronutrients for each GHOD menu day was identified by the sum of the mean values for each food served to patients. More specifically, the component foods from the food containers served at lunch and dinner, and the foods available in the meals of breakfast, mid-afternoon and bedtime snacks corresponding to the minimum, average or maximum values were considered.

Due to failure in the identification of specific recommendations for hospitalized patients in the literature, the GHOD menu analysis of the amount of energy and macronutrients distribution offered per day, was performed according to the recommendations for healthy people in the Brazilian food guide[12] and by the World Health Organization (WHO)[13].

The energy distribution of meals (minimum, average and maximum supplies) served during one day to inpatients was compared with the energy distribution proposed by Fausto[14]. The intervals between all the meals offered to patients, as well as the overnight fasting period, were properly registered.

Portions from specific food groups served daily in GHOD meals.

To identify the nutritional quality of the GHOD meals, the number of food portions offered from different food groups was analyzed. Due to failure in the identification of specific recommendations for hospitalized patients, the analysis of the nutritional quality of the GHOD was performed according to the recommendations of the number of portions for specific food groups, proposed for healthy people by the Brazilian food guide[12].

The number of food portions that should be consumed per day for each food group was established according to the energy value of the reference diet (2000 kcal), proposed by the Brazilian food guide[12].

Due to the possibility of the patient making dietary choices in some meals, minimum and maximum values for the supply of some food groups were identified. The number of portions for each food group was determined by comparing the weight of each food or food preparation provided to patients on the GHOD with the weight of the food or preparations corresponding to one food portion, as established by the Brazilian food guide[12]. For preparations with more than one food group, recipes were assessed and the amounts of each component were classified according to the corresponding food group.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences - SPSS version 17 and SISVAR version 5.3 software. Initially, a descriptive statistical analysis of data was performed to estimate the average, standard deviation and percentages. To examine whether there was a significant difference between the supplies of energy and macronutrients of the GHOD (minimum, average and maximum supplies), the statistical inference was used to estimate confidence intervals (95%) for the average of analyzed variables, and confidence intervals (95%) for differences between means.

RESULTS

Energy value of meals in relation to food supply

The energy value corresponding to the minimum, average and maximum supplies of energy from of the GHOD meals served to inpatients was equal to or higher than the recommendations for healthy people by the Brazilian food guide[12] (Table 1).

The difference between the means of the minimum, average and maximum supplies of energy for patients showed statistical differences (Table 2).

Table 1. Variation of the energy supply and percentage distribution of macronutrients of the general hospital oral diet.

	Mean	Standard Deviation	CI (95%) LL – UL	Reference Value[12,13] (%)
Minimum Supply[a]				
Energy (kcal)	2054.3	152.6	1971.5 – 2089.8	2000[12]
Protein				
Grams	70.4	10.3	66.3 – 74.3	--
TEV (%)	13.7	1.6	13.2 – 14.5	10 – 15
Carbohydrate				
Grams	336.6	26.2	326.4 – 346.8	--
TEV (%)	65.5	3.1	65.1 – 67.6	55 – 75
Lipid				
Grams	47.4	7.0	44.7 – 50.1	--
TEV (%)	20.8	2.4	20.1 – 21.9	15 – 30
Average Supply[a]				
Energy (kcal)	2409.4	152.6	2337.4 – 2455.7	2000[12]
Protein				
grams	80.8	10.3	76.8 – 84.8	--
TEV (%)	13.4	1.4	12.9 – 14.0	10 – 15
Carbohydrate				
grams	389.7	26.2	379.5 – 399.9	--
TEV (%)	64.7	2.6	64.1 – 66.1	55 – 75
Lipid				
grams	58.6	7.0	55.9 – 61.3	--
TEV (%)	21.9	2.0	21.2 – 22.8	15 – 30
Maximum Supply[a]				
Energy (kcal)	2841.1	152.6	2776.7 – 2895.0	2000[12]
Protein				
grams	93.4	10.3	89.3 – 97.3	--
TEV (%)	13.2	1.2	12.7 – 13.6	10 – 15
Carbohydrate				
grams	447.6	26.2	437.4 – 457.8	--
TEV (%)	63.0	2.2	62.3 – 64.0	55 – 75
Lipid				
grams	75.2	7.0	72.5 – 78.0	--
TEV (%)	23.8	1.7	23.2 – 24.5	15 – 30

CI: Confidence Interval; LL: Lower Limit; UL: Upper Limit; TEV: Total Energy Value. [a]Due to the possibility of the patient choosing some foods for breakfast, mid-afternoon and bedtime snacks, three values of supply (minimum, average and maximum) were presented.

Table 2. Comparisons between minimum, average and maximum values of the difference of the means of energy supplies and of macronutrients of the general hospital oral diet[a]

Variable	Comparisons among supplies	CI of 95%	
		LL	UL
Energy	Minimum vs. Average	-447.7	-284.2
	Minimum vs. Maximum	-887.0	-723.5
	Average vs. Maximum	-521.1	-357.6
Protein	Minimum vs. Average	-15.9	-4.9
	Minimum vs. Maximum	-28.5	-17.5
	Average vs. Maximum	-18.1	-7.1
Carbohydrate	Minimum vs. Average	-67.2	-39.1
	Minimum vs. Maximum	-125.1	-97.0
	Average vs. Maximum	-72.0	-43.9
Lipid	Minimum vs. Average	-15.0	-7.5
	Minimum vs. Maximum	-31.6	-24.1
	Average vs. Maximum	-20.4	-12.9

CI: Confidence Interval; LL: Lower Limit; UL: Upper Limit; vs.: versus.
[a]From the decision rules involving CI for difference between two means, it was identified that the extremes of CI were negative, which indicates that the averages present significant differences between them. In addition, the first average of each situation studied showed a value lower than the second average.

Energy distribution and amounts of macronutrients in relation to the food supply

The energy distribution and the amounts of macronutrients, corresponding to the minimum, average and maximum energy supplies in the analyzed GHOD meals, met the recommendations for healthy people by the Brazilian food guide[12] and WHO[13] (Figure 1 and Table 1). Values slightly above the maximum recommendation for healthy people were occasionally identified only for the protein menu.

Average daily energy distribution per meal in the GHOD

Meals were offered at intervals of about three hours, at the following times: breakfast – 7h40 to 8h30; lunch – 10h45 to 11h30; mid-afternoon snack – 14h to 14h30; dinner – 17h to 17h30; bedtime snack – 19h30 to 20h (Figure 2). The overnight fasting period ranged around 11h40 to 13h.

In the comparison between the average daily energy distribution per meal of the GHOD served to our inpatients and the GHOD recommended by other researchers[14] similar values for breakfast, lunch and dinner were identified, regardless of the minimum, average or maximum total daily caloric supply (Figure 2). The main differences to the energy distribution of meals, between the GHOD served in our hospital and the recommendations from the literature[14] were identified for the mid-afternoon and bedtime snacks (higher energy value in our hospital) and morning snack (not served in our hospital) (Figure 2).

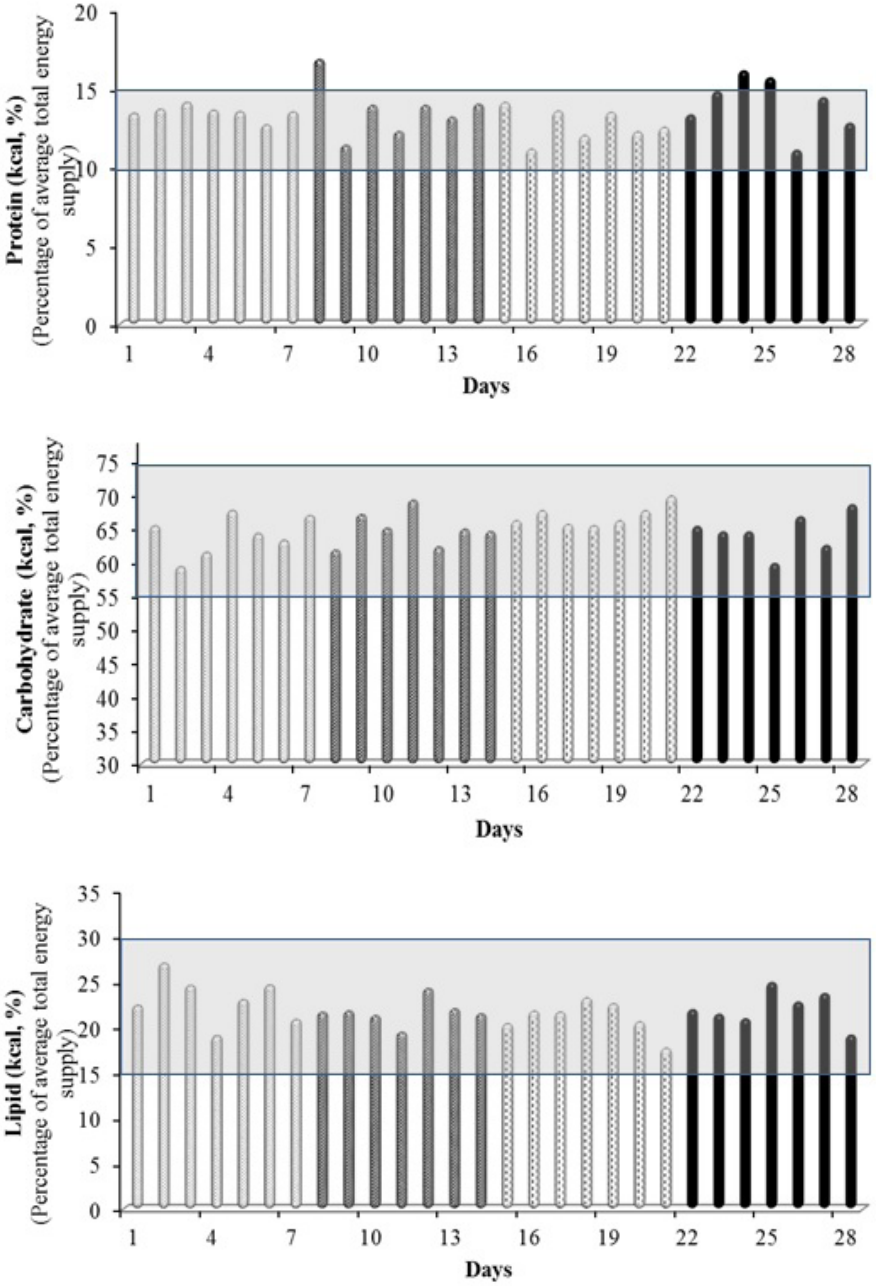

Figure 1. Energy distribution of macronutrients (protein, carbohydrate, lipid) of the meals on the four menus of the general hospital oral diet. The presented results correspond to the average total energy value offered by the general oral diet, implemented by the food and nutrition unit. Menu: 1rst week, 2nd week, 3rd week and 4th week. The band corresponds to the recommendations of macronutrients (%) made by the food guide[12] and WHO[13]

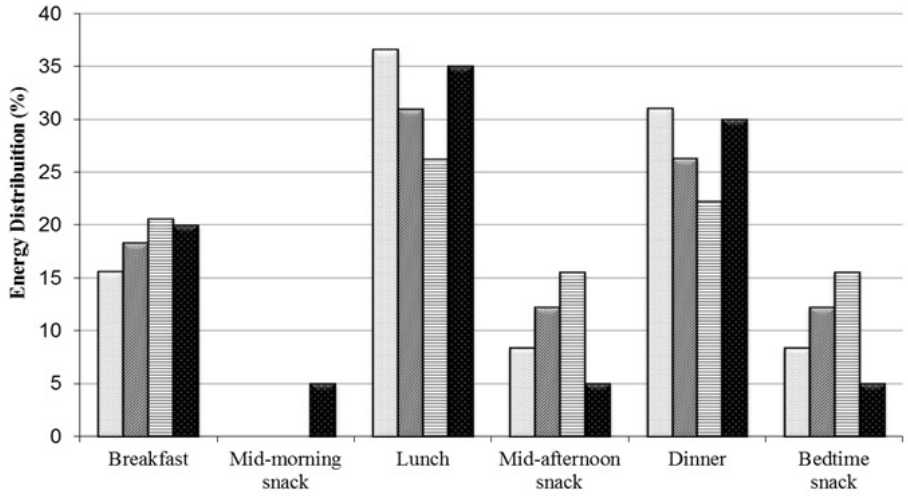

Figure 2. Comparison of the energy distribution by meal of the general hospital oral diet served to patients at our hospital and recommended by Fausto[14]. Minimum ; average and maximum energy supply. Energy supply proposed by Fausto[14] . Meals of the general oral diet in our hospital were served at the following times: breakfast – 7h40 to 8h30; lunch – 10h45 to 11h30; mid-afternoon snack – 14h to 14h30; dinner – 17h to 17h30; bedtime snack – 19h30 to 20h.

Food portions of different food groups, served in a day for the GHOD

In the analysis of food portions of the different food groups served in a day on the GHOD menu, values in accordance with the recommendation for the group of cereals, tubers, roots and derivatives were identified. Food portions above the recommendation were identified for the food groups of beans; meat and eggs; oils, fats and oilseeds; and sugars and sweets (average corresponding to 116.4%, 112.1%, 364.3%, 268.6% of the maximum recommendation, respectively). Food portions below the recommendation were identified for the food groups corresponding to fruits and natural fruit juices (average corresponding to 62.3% of the minimum recommendation); natural vegetables (average value corresponding to 78.0% of the minimum recommendation); and milk and derivatives (minimum value of supply corresponding to 4.7% of the minimum recommendation) (Table 3).

Table 3. Food portions from different food groups served per day on the menu implemented for general oral diet in our hospital.

Food Groups[a]	Food portions served in a day				Total	Reference Values[12]
	1rst week menu	2nd week menu	3rd week menu	4th week menu		
Cereals, tubers, roots and derivatives[b]	6.9 – 7.3	7.4 – 7.8	7.6 – 8.1	6.9 – 7.3	7.2 – 7.6	6.0 – 8.4
Beans	1.9	1.5	1.6	1.6	1.6	1.0 – 1.4
Fruits and natural fruit juices	1.9	1.9	1.9	1.9	1.9	3.0 – 4.2
Vegetables	2.5	2.2	2.4	2.3	2.3	3.0 – 4.2
Milk and derivatives[b]	0.1 – 3.1	0.2 – 3.2	0.1 – 3.1	0.1 – 3.1	0.1 – 3.1	3.0 – 4.2
Meat and eggs	1.7	1.6	1.3	1.7	1.6	1.0 – 1.4
Oils, fats and oilseeds[b]	2.3 – 5.2	2.1 – 5.0	2.2 – 5.1	2.1 – 5.1	2.2 – 5.1	1.0 – 1.4
Sugars and sweets[b]	1.6 – 3.8	1.6 – 3.8	1.6 – 3.8	1.6 – 3.8	1.6 – 3.8	1.0 – 1.4

[a]Food offered at breakfast, lunch, mid-afternoon snack, dinner and bedtime snack were analyzed. [b]For each food group the minimum and maximum values of the portions are presented, which can be achieved depending on the chosen food by the patient at breakfast, mid-afternoon and bedtime snacks.

DISCUSSION

The GHOD meals served to our inpatients presented equal energy value (minimum supply) or greater (average and maximum supplies) than the reference values established for healthy persons in the Brazilian food guide[12]. In addition, the GHOD meals served to our inpatients were appropriate in relation to the energy distribution of macronutrients, when compared with the recommendations for healthy individuals proposed by the food guide[12] and WHO[13].

Despite the great importance of the demonstration of these results in relation to planning menus for the food nutrition unit, some additional considerations are necessary. It is well established in the literature that individuals exposed to situations of disease present an increase in the resting metabolic rate due to the state of metabolic stress[15]. Thus, it is expected that energy supply and the macronutrient percentage distribution of the GHOD meet the nutritional needs of the inpatient for that clinical time. Therefore, the supply of GHOD with nutritional characteristics proposed for healthy individuals characterize a dietary conduct that can in fact induce a patient to hospital malnutrition[16].

To the best of our knowledge, there is no consensus in the literature regarding the recommendations of energy and macronutrients of the GHOD. However, due to the influence of the commitment of the nutritional status in the clinical evolution of individuals exposed to disease[4,16,17] some investigators have reported the supply of energy and protein in quantities greater than those calculated nutritional needs. In studies carried out by several investigators[7,18-20] the general and specialized oral diets presented energy supply around 1.900 to 2.700 kcal/day, i.e., higher values than the calculated energy for patients included in these studies (1.400 to 2.200 kcal/day). Similar conduct was adopted for protein supply, i.e., about 80g protein/day was offered, although the recommendation was about 70g protein/day[7,18-20]. By comparison, the average amounts of energy (2.653±120 kcal/day[18] and 2.438±161 kcal/day[20]) and protein (83±22 g/day[7] and 78±21 g/day[19]) offered to the investigated patients in these studies were similar to the values of the average energy supply (2.409.4±152.6 kcal/day) and the average protein supply (80.8±10.3 g/day) demonstrated in the present study.

On the GHOD menu, meals were offered throughout the day. Considering the minimum, average and maximum supplies of food, energy distribution ranged around 26-37% at lunch and 22-31% at dinner and between 16-21% at breakfast and 8-16% at mid-afternoon and bedtime snacks. Although, to the best of our knowledge, there is not a determination of the energy distribution of meals offered to hospitalized individuals, the food fractionation into three main meals (breakfast, lunch and dinner), intercalated by small snacks is recommended by the food guide for healthy Brazilian population[12], Fausto[14] and the Resolution ResAP[21]. Specifically, in relation to general and specialized oral diets served to hospitalized people, it has been demonstrated that the supply of snacks between main meals contributes to an adequate food intake[5,22].

In the present study an interval of overnight fasting of up to 13h (bedtime snack: 19h30 to 20h, and breakfast: 07h40 to 08h30) was identified. Since in a previous study developed in our hospital it was demonstrated that 33.2% of patients that were evaluated within the first 48 hours of admission presented protein-energy malnutrition[4] the identification of such a prolonged overnight fasting period is highly worrying. In accordance with these considerations, in a study developed by Söderström et al.[23] analyzing elderly hospitalized individuals (n = 1771) it was demonstrated that inadequate dietary habits including prolonged overnight fasting (> 11h) increased the risk of malnutrition[23].

In the analysis of the meals of the GHOD menu implemented in our hospital with respect to the number of portions of different food groups, portion values were given in accordance with the recommendations[12] exclusively for the group of cereals, tubers, roots and derivatives. Portions above the recommendation for healthy people were identified in the food groups of beans; meat and eggs; oils, fats and oilseeds; and sugars and sweets. For the corresponding food groups of fruits and natural fruit juices; vegetables; and milk and derivatives, food portions below the recommendation were identified. Through a combined analysis of these results, it becomes evident that although the

meals of the GHOD menu provide appropriate amounts of energy and protein, the nutritional deficiencies concerning vitamins, minerals and fiber could be induced or aggravated.

In a study developed by Moreira et al.[24] it was demonstrated that the amounts of iron, copper, manganese and selenium of the hospital oral diets (general, bland and pasty) were inadequate in relation to the recommended daily allowance for all trace elements investigated. The demonstration of insufficient amounts of specific micronutrients in hospital oral diets is alarming, since in association with the commitment in the supply of nutrients, hospitalized patients may also present inadequacies in dietary intake. In accordance with these considerations, from another study conducted by the same group[25] it was demonstrated that consumption of the oral diets by cancer patients was less than 80% of supply. In clinical practice, it has been observed that patients with deficiencies of specific nutrients present, among other pathophysiological alterations, impaired wound healing and immunodeficiency, with a predisposition of increased morbidity and mortality[4].

Despite the high frequency of prescription of the GHOD for patients, as well as the close relationship between food choices, nutritional status, and clinical evolution of hospitalized patients, few researchers have analyzed this dietary practice. In the present study the need for the establishment of recommendations for hospitalized patients relating to the energy value and the amount of protein to be offered daily; the distribution of energy and nutrients per meal and per day; the total number of meals and food portions for the different food groups; and the maximum period of overnight fasting was identified. In addition, the need for periodic analysis and possible reformulation of the menu to improve the adequacy of the food offered from different food groups, and the current recommendations of specific nutrients was also identified.

This study presents as a limitation the use of nutritional composition tables for the analysis of the supply of food of the GHOD. This methodology is often reported in other studies, but the analytical laboratory methods used for the demonstration of the nutritional composition of foods present greater sensitivity and reproducibility.

CONCLUSION

The establishment of recommendations for the GHOD is essential for a proper dietary practice among hospitalized patients. In addition, the quantitative and qualitative characterization of oral diets should be performed and known by members of the professional staff responsible for patient care. Special attention should be directed towards the reduction of the overnight fasting period, the amounts and frequency of food, and the proper supply of food from different food groups. In summary, the establishment of dietary recommendations and carrying out adjustments to menus are needed to better meet the nutritional needs of hospitalized individuals and prevent disabilities associated with the GHOD.

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AUTHOR CONTRIBUTIONS

FGM participated in the conception and design of the study, carried out the study, acquisition of data, participated in the statistical analyzes, interpreted the results and elaborated the manuscript. DADS participated in the conception and design of the study, carried out the study, participated in the statistical analyzes, interpreted the results and elaborated the manuscript. CAC participated in the conception and design of the study and helped in drafting the initial version of the manuscript. JMP participated in the conception and design of the study, performed the statistical analysis, interpreted the results and helped in drafting the initial version of the manuscript. LPSK helped in data collection, interpreted the results and contributed in drafting the initial version of the manuscript. FPOM helped in data collection and collaborated in drafting the initial version of the manuscript. All authors have read and approved the final version of the manuscript.

COMPETING INTERESTS

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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