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Physicochemical and nutricional characteristics of handmade enteral diets

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Abstract

Introduction: **There is an increasing use of enteral therapy at home, which reduces costs and improves patients' quality of life. Homemade food diets are being commonly used in the households of undeveloped countries, but those diets vary in composition and characteristics depending on the ingredients and preparation procedures adopted in its preparation, which influences the quality of the diet to satisfy the nutritional needs of patients.**

Objective: **This study aimed to formulate and determine the quality of homemade enteral diets.**

Methods: **An enteral diet plan was prepared by using conventional food, consisting of 6 meals, totalizing 2 liters per day, and it was adopted a proportion of 25% of solid food. The diets were analyzed for stability, viscosity, flow, pH, chemical and nutritional composition.**

Results and discussion: **The enteral diet plan was adequate in its physical-chemical aspects, however, it presented low percentages of adequacy, 20-53%, between the estimated and real content of macronutrients in the soup, formula used for lunch and dinner, which impaired the nutritional quality of the enteral diet plan.**

Conclusions: **The results showed the difficulty of establishing the nutritional content of these diets, especially when made of meat and vegetables. Therefore, it is suggested a mixed enteral therapy by using commercial diets to achieve part of the nutritional needs of the patient together with enteral diets of homemade food to supplement it and also to redeem the psychosocial values of the feeding process.**

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Keywords: *Enteral nutrition. Enteral formula. Food quality. Food analysis.*

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CARACTERÍSTICAS FÍSICO-QUÍMICAS Y NUTRICIONALES DE LAS DIETAS ENTERALES CASERAS

Resumen

Introducción: **Existe un creciente uso de la terapia enteral domiciliaria, lo que reduce los costes y mejora la calidad de vida para los pacientes. Las dietas elaboradas con alimentos caseros están siendo usadas comúnmente en los domicilios de los países subdesarrollados, pero estos varían en composición y características dependiendo de los ingredientes y procedimientos adoptados en su preparación, lo que influye la calidad de estas dietas para satisfacer las necesidades nutricionales de los pacientes.**

Objetivo: **Desarrollar y determinar la calidad de las dietas enterales caseras.**

Métodos: **Se elaboró un plan de dieta enteral casera, con alimentos naturales, consistente en 6 comidas, con un total de 2 litros por día, utilizando una proporción de 25% de sólidos. Las dietas se analizaron para determinar la estabilidad de su composición, viscosidad, flujo, pH, composición química y nutricional.**

Resultados y discusión: **Las dietas eran adecuadas en sus aspectos físico-químicos, sin embargo, presentaron bajos porcentajes de adecuación, 20 a 53%, entre el contenido estimado y real de macronutrientes en la sopa, fórmula usada en el almuerzo y la cena, que afectó a la calidad nutricional del plan de dieta enteral.**

Conclusiones: **Los resultados muestran las dificultades de establecer el contenido nutricional de estas dietas, sobre todo cuando son a base de carne y verduras. Por lo tanto, se sugiere una mezcla de terapia enteral casera e industrial, mediante el uso de dietas comerciales para lograr parte de las necesidades nutricionales del paciente, junto con dietas caseras para complementar y compensar también los valores psicosociales del proceso de alimentación.**

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Palabras clave: *Nutrición enteral. Fórmula enteral. Calidad de los alimentos. Análisis de los alimentos.*

Introduction

The enteral nutritional therapy aims to maintain or restore the nutritional status of individuals who fail to maintain a sufficient oral intake, although having a gastrointestinal tract fully or partially functioning. Its administration is related to the reduction of infectious complications and maintenance of the integrity of intestinal flora.[1,2] Lesions of jaw and central nervous system, anorexia, cancer, and hypermetabolic conditions such as burns and severe infections are examples for nutrition enteral indication.[1,3]

As feeding is not exclusively related to the physiological aspects, but also to psychosocial needs, enteral nutrition, likewise, is surrounded by symbolisms. For patients on enteral feeding, food may lose its social aspect, as family integration and expression of affection, which is intensified in hospitalization.[4] The practice of home enteral therapy, which is increasing in several countries,[2,5,1] tends to rescue the psychosocial values of food, making possible a family life for the patient, in addition to prevent contamination and reduce hospital costs for the health system in general.[3,4,5]

There are several industrialized enteral diets in the market, chemically defined in labels, safely storage during reasonable time.[6,7,8] Such diets also have the advantage of reduced need for handling, which helps to preserve a higher hygienic quality, due to its process of production and packaging, as well as reduces the risk of complications from diet contamination itself.[3,9] However, the industrialized formulas are expensive, so their continued use is basically impractical for low-income families and even by health institutions with reduced budget.[3,9] This leads to the use of enteral food made formulas, also known as non-industrial or handmade diet prepared with food, mixed or not with industrial products and nutrient modules.[10,11]

In North America and Europe the prevalence use of industrialized enteral diets is common.[1,5,12] But in underdeveloped or developing countries, like Brazil, there has been a considerable prevalence on handmade diets in home therapy, and even in hospitals located in the poorest regions such as the Valle Jequitinhonha.[3,9,13] The quality aspects that influence the effectiveness of treatment, such as pH, fluidity, stability and nutritional composition of handmade diets may vary depending on the ingredients that are used and the procedures which are adopted in its preparation and storage process.[8,11,14] Another factor that limitates the quality of these diets is the indirect estimation of its nutritional composition, based on food composition tables, which also show great variability and scarcity of data.[11,15] Besides, there is still little knowledge about the actual loss of nutrients during the preparation of handmade enteral diets, which also turns its nutritional quality questionable.[13,14]

The Human Rights to Adequate Food is recognized in various international standards, such as in article 25 of the Universal Declaration of Human Rights and article 11 of the International Covenant on Economic, Social and Cultural Rights.[16,17] Since 2003 there have been many achievements towards the institutionalization of this right by Latin America countries, the Caribbean, including Argentina, Brazil, Guatemala, Ecuador and Venezuela, which has already established Food Safety Laws, based in the Human Rights to Adequate Food warranty.[16,17] Nevertheless, individuals in enteral therapy with low purchasing power still have not guaranteed any access, availability or adequacy in this diet.[8,9] For the use of enteral diets made of food is necessary to monitor their nutritional content, as well as their physical and chemical characteristics because of the direct influence they have on its fluidity, which is a determining factor for a correct passage through the catheter.[11,18,19] Several studies have shown that handmade diets have reached ideals physicochemical parameters, however, most of the time, its nutritional quality was based only on the estimated calculation from food composition tables.[3,7,20,21,22]

To provide subsidies that assist the prescriptions for handmade enteral formulas, in order to ensure food and nutritional safety for patients on enteral therapy, the present study aimed to formulate and determine the characteristics of physicochemical and nutritional quality of homemade enteral diets.

Methods

Raw material

To elaborate these enteral diets low-cost food was chosen: beef (lean meat with no fat or aponeurosis), carrot, soybean oil (Liza®), iodized salt (Swan®), maltodextrin (Lowçucar®), whole milk (Lider®), Mucilon Rice (Nestle®), banana (in stage 7 of ripening, yellow with brown areas), mango and orange (in stage C5 of maturation).[23] The ingredients were selected based on their nutritional value, according to food composition tables,[24] industrialized product labels, also osmolality and solubility characteristics previously tested by other authors.[25,26]

Food plan

The diet plan was based on the nutritional needs of an adult[27] and had the purpose of adding the psychosocial aspects of food to the home nutritional enteral therapy, divided into 6 meals a day, whose preparation process were similar to the standard fare. The concepts of the meals were: fruit shakes for breakfast and afternoon snack; natural fruit juice for morning snack, soup for lunch and dinner; milk with Mucilon® for supper (table I). The proportion of solids consisted of 25% solute (w/v) established according to the osmolality parameters already tested in other studies.[11]

The enteral feeding plan was characterized as normocaloric and normoproteic, according to the esti-

Table I
Enteral diet plan

Meals and volume	*Diets*	*Formulation of the diets*		
		Ingredients	*Weight/volume*	*Homemade measure*
Breakfast 350 mL	Banana Shake	Whole milk	200 mL	1 tea cup
		Banana	60 g	1 small unit
		Maltodextrin	27 g	3 tablespoons
		Water	–	Until complete volume
Morning snack 250 mL	Juice	Orange juice	250 mL	1 cup
Lunch and dinner 350 mL/each	Soup	Beef	75 g	4 tablespoons
		Carrot	24 g	2 tablespoons
		Whole milk	200 mL	1 tea cup
		Maltodextrin	36 g	4 tablespoons
		Soybean oil	8 mL	1 tablespoons
		Broth cooking	–	Until complete volume
		Iodized salt	2 g	1 coffee spoon
Afternoon snack 350 mL	Mango Shake	Whole milk	200 mL	1 tea cup
		Mango	60 g	Half unit
		Maltodextrin	27 g	3 tablespoons
		Water	–	Until complete volume
Supper 350 mL	Milk with Mucilon®	Whole milk	200 mL	1 tea cup
		Mucilon®	21 g	3 tablespoons
		Maltodextrin	27 g	3 tablespoons
		Water	–	Until complete volume

mated nutrients[24] in a volume of 2 liters per day. The percentage of caloric distribution among the macronutrients was established as: proteins, up to 20%, lipids 30-35%, 50-60% carbohydrates.[11,19]

Formulas preparation process

The diets were developed in laboratory under similar conditions to home. For the soup preparation, carrots, previously cleaned, together with meat were cooked in small pieces, for 40 minutes in a pressure cooker (12psi, ch. 4.5 L, Colck®, Brazil) with 800 mL water. After cooking, the ingredients were liquefied (Britania®, Diamente, São Paulo, Brazil) with whole milk, iodized salt and maltodextrin. The contents were then sieved on nylon mesh with openings of 1 mm in diameter, until undissolved solids were retained. After sieving, soybean oil was added together with the broth left up to complete 350 ml and then homogenized for 2 minutes. For each feeding formula another one was identically performed without adding soybean oil in order to determinate the pH.

To prepare the shakes, the fruits were previously cleaned, peeled and cut into pieces, and then liquefied (Britania®, Diamente, São Paulo, Brazil) for 5 minutes with whole milk and maltodextrin. The formula was then screened following the procedure used for the soup, and added water up to reach 350 ml. The fruits were sanitized beforehand and the juice extracted with the aid of a manual orange juicer (Plasvale®, Brazil). The suspension obtained was sieved on nylon mesh with opening of 1 mm in diameter. For supper, milk and Mucilon® were liquefied (Britania®, Diamente, São Paulo, Brazil) for 4 minutes and then also screened. The preparations were placed in sterile glass containers, sealed and left to stand for 3 hours at room temperature, approximately 22 ± 2° C for further analysis.

Physical chemistry quality analysis

To test the stability of the diets they were subjected to a visual inspection of phases separation process, after being homogenized and tightly packed, then rested for 3 hours.[3] The viscosity of the formulas was considered adequate if it did not cause obstruction when administered through a 10-French catheter (1 French = 0.33 mm), by the gravitational method.[28] Fluidity evaluation was carried out by means of drip test, gravitational method, using 200 mL of the diet in plastic bottles (Darrow®) connected to the equip (B. Braun Laboratory®) to check the number of drops by minute.[20] To determine the pH we used 12 mL of non oil diets at room temperature by means of pH meter (Analyser®, São Paulo, Brazil), according to Menezes and Araújo protocol.[20]

Nutritional quality analysis

The nutritional value of the enteral food plan was previously estimated by food composition tables[24]

Table II
Nutritional quality and physical chemistry of the homemade enteral diets

Nutrients	*Banana Shake*	*Juice*	*Soup*	*Mango Shake*	*Milk with Mucilon®*
Solids (g/%)	18.79 ± 0.02	9.08 ± 0.01	11.59 ± 0.01	16.64 ± 0.02	17.91 ± 0.01
Ashes (g/%)	0.50 ± 0.01	0.03 ± 0.02	0.17 ± 0.01	0.40 ± 0.03	0.40 ± 0.01
Protein (g/%)	2.02 ± 0.13	0.60 ± 0.01	1.42 ± 0.01	2.03 ± 0.15	2.16 ± 0.23
Lipids (g/%)	1.90 ± 0.07	0.11 ± 0.06	3.06 ± 0.10	1.68 ± 0.38	1.83 ± 0.01
Carbohydrate*	14.36	8.33	6.93	12.53	14.41
Real caloric density†	0.83 kcal/mL	0.37 kcal/mL	0.61 kcal/mL	0.73 kcal/mL	0.83 kcal/mL
Estimated caloric density‡	0.82 kcal/mL	0.27 kcal/mL	1.32 kcal/mL	0.77 kcal/mL	0.87 kcal/mL
Drops per minute	97 a 103	118 a 120	95 a 102	95 a 103	75 a 80
pH	6.04 ± 0.0	5.5 ± 0.0	6.15 ± 0.0	6.32 ± 0.0	6.9 ± 0.0

*Calculated by difference: Carbohydrate = 100 - (protein + lipids + ashes).
†Values obtained by chemical analyzes.
‡Values estimated by food composition tables.
± Standard deviation.

and information on the labels of processed products. Sequentially, it was also analyzed the real nutritional content in the formulas.

Moisture was determined by drying process in hothouse,[29] ashes by incineration in a muffle furnace at 550° C[29] and total lipid content according to Blight and Dyer method.[28] Protein content was quantified through the determination of total nitrogen by Kjeldah method[29] using the 6.25 factor for total conversion of nitrogen in crude protein. Total carbohydrates were estimated by difference and the results were expressed in g/100 mL diet on a wet basis. Those analyzes were conducted in triplicates, the results presented in arithmetic mean and standard deviation. For the metabolizable energy calculation the Atwater Factors were applied, which determines 4 kcal per gram of carbohydrate and protein, and 9 kcal per gram of lipids.[30]

To obtain the nutritional quality of the diets, the percentage of match between the nutritional content of estimated macronutrients and the results of chemical analyzes of composition was calculated. According to the 360 Resolution of December 23th of 2003,[31] a difference up to 20% for more or for less is tolerated in the nutritional content information presented on feeding products. Based on this Reference,[31] a range of at least 80% of match between the results obtained in laboratory tests and nutritional contents estimated was adopted as a quality parameter.

Results

On subjective analysis, all diets showed beige color, appearance and smell just fine. The stability test did not show phase separation after 3 hours after preparation when at rest and at room temperature. None of the formulas caused obstruction when administrated trough a 10-Frech catheter, by gravity method, which indicates the adequacy of their viscosity.[28] It was also expected, since the formulas were sieved on a 1 mm nylon mesh, before been administrated trough the catheter.

In the aspect of fluidity, the formulations passed through the 10-French catheter without clogging, with dripping from 78 to 120 drops/minute (table II), not depending on the opening of the equip for retarding or accelerating its passage, which indicates that it is possible its administration by gravity method. The orange juice had a pH of 5.5 and the milk with Mucilon® diet recorded the highest pH-value of 6.9. The other diets ranged between 6.04 and 6.32 (table II) which suggests that they showed good physicochemical quality.

The results of the chemical analyzes, of the diets composition, as well as the estimated energy value by food composition tables[24] are shown in table II. The comparison between real and estimated nutritional content of the diets showed low percentages of adequacy for soup (table III). With the exception of the soup, the percentage of adequacy for the other preparations were adequate, 86-122%, however, the presence of the soup in both main meals (lunch and dinner) has limited the eating plan to achieve good nutritional quality, with low percentages of suitability for proteins and lipids (table III).

The chemical analyzes showed that the diet plan resulted in a low-fat diet, with a considerable decrease in the proportion of protein and total energy intake compared to estimated values for the distribution of macronutrients and total energy intake (fig. 1).

Discussion

As for physical and chemical characteristics, the results were similar to those found by other authors,[11,20,26] who demonstrated that a concentration of 25% solids allows proper drainage through the equip. The registered times were similar to those at 120 drops/minute in pre-pyloric position and 60 to 120 drops per minute

Table III
Percentage adequacy of macronutrient diets

Diets	Protein (g)			Carbohydrate (g)			Lipids (g)		
	Real* (g)	Estimated† (g)	%‡	Real (g)	Estimated (g)	%	Real (g)	Estimated (g)	%
Banana Shake 350 mL	7.07	7.22	98	50.26	48.75	103	6.66	6.93	96
Juice 250 mL	1.21	1.40	86	16.66	15.20	109	0.22	0.20	110
Soup 350 mL	4.99	22.76	22**	24.25	45.51	53**	10.71	21.20	50**
Mango Shake 350 mL	7.08	6.91	102	43.84	44.92	122	5.90	6.77	88
Milk with Mucilon® 350 mL	7.55	7.99	94	50.45	52.99	95	6.41	6.77	95
Enteral diet plan 2,000 mL	32.88	69.04	44**	185.4	252.88	82	40.62	63.07	60**

*Values obtained by chemical analyzes.
†Values estimated by food composition tables.
‡Percentage of matching the real nutritional content and the estimated one.
**Values below the parameterized nutritional quality.

post-pyloric, as suggested by Baxter.[32] Smaller calibers provide greater comfort to the patient, but they increase the chances of catheter obstruction.[28] For administration by gravity, which is generally used in households, it is recommended to use catheters with an internal diameter of 10-French or more.[28] Formulas with high viscosity can cause obstruction when administrated trough small catheters, but none of the formulas of this study caused obstruction in 10-French calibers.[28]

Most diets made by food showed slightly acidic or neutral pH, which favors the growth of microorganisms, so that the person responsible for its preparation must be instructed about the proper hygiene practices to be followed in the handling, preparation, storage and administration of the diet.[3,13,26] On the other hand, the pH found in the formulations promotes the gastric motility; since this can be reduced by using solutions with pH lower than 3.5. As well as in formulas with pH less than 4.6 this can cause obstruction in the catheters.[3,19,25] All diets in this study had pH values greater than 4.6.

Regarding nutritional quality, unlike other formulations, the soup had adequacy percentages below 80% considering the soil nutrients found by chemical analyzes and those calculated by food composition tables.[24] The protein content showed the greatest discrepancy among these values, with only 22% in correlation to the soup, which led to an adequacy percentage of 44% of the total protein content of the diet plan. The soup was the only preparation with flesh meat content. During its screening an accumulation of meat fibers was observed on the sieves, which were discarded by the inability to pass through the catheter. Low percentage of match between the levels of real and estimated nutrients, especially protein content, were also found in other studies[8,9,11,13,18,33] being justified by the significant amount of waste disposed in sifting.

Felicio et al.[13] has also found a low percentage of suitability, about 40% to the total caloric value of the food plan, consisting of 4 handmade enteral diets used in a hospital in Valle Jequitinhonha-MG, when comparing the their chemical analyzes results with nutritional values estimated by the food composition tables.[13]

According to these authors,[13] in order to be able to flow through the catheter it is necessary to perform a hiperdiluition on non-industrialized diets, which difficult to reach the desired caloric density for the diet.

Mitne et al.[33] have analyzed the nutritional quality of non-industrial enteral diets in three Brazilian hospitals, and they found significant differences between the real and the estimated content in food composition tables. In a study conducted in a public hospital in João Pessoa city-Estate of Paraíba, values chemical analyzes were performed on four different non-industrialized enteral diets and they found that none of them reached the macronutrient and total energy estimated in the food composition tables.[8,11]

Santos and Moraes[9] also found similar results when they analyzed the adequacy percentage of macronutrients and total energy for non-industrial enteral formulas of soup type and milk-based preparations. In this

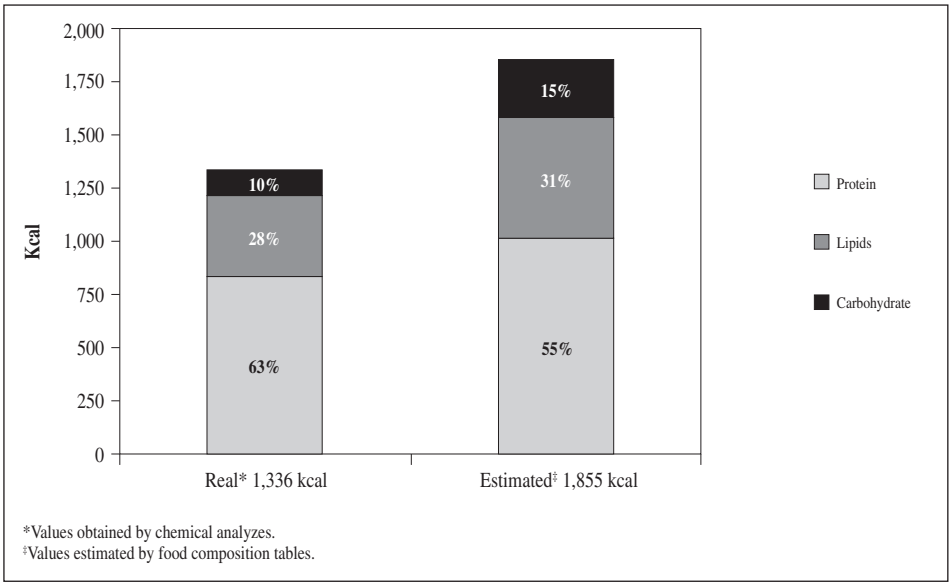

Fig. 1.—Real and estimated distribution of macronutrients of enteral diet plan.

study,[9] the preparations on milk basis obtained about 70% of adequacy between macronutrient content and total energy, compared to the estimated values, and the soups reached percentage below than 50% for proteins, lipids and total energy. Of the macronutrients analyzed in food plan, the carbohydrates obtained the highest suitability content estimated, 82%, which can be explained by the high solubility of the maltodextrin, main source used in the diets.

The utilization of nutrients is also conditioned upon a proper distribution of macronutrients in the diet.[8] The low correlation between the estimated and the real macronutrients in the soup impaired the nutritional balance of the diet plan, as shown in figure 1. The administration of a diet that does not reach the estimated energy value, as well as balance in the proportion of its macronutrients, may result in loss of lean body mass and adipose tissue, hindering the maintenance and/or recovery of the individual nutritional status, which directly reflects in the control of health-disease process.[8,34]

The preparation of enteral diets with food of high physical, chemistry and nutritional qualities has as limiting factors: physical and chemistry instability of formulations, the difficulty of achieving an adequate flow in the catheter, the risk of contamination during handling and preparation processes, the inaccuracy of previous estimates for nutritional content and the relative loss of nutrients during the whole process of preparation, which also can lead to imbalance in the distribution of macronutrients in the diet.[9,11,26]

Due to these obstacles, the exclusive use of enteral diets madden by food may hinder the achievement of the goal of enteral nutrition. Thus, a mixed enteral therapy that provides part of the patient's nutritional needs by handmade enteral diets, based on juices and fruit shakes, and complemented with industrialized enteral diets seems to be indicated as best alternative to avoid damages to the health of individuals in enteral nutrition. The use of diets made with food, besides contributing to the nutritional support, tends to recover psychosocial values of feeding process, since the meals can be prepared by the family using conventional food.

Despite the higher cost of mixed enteral therapy due to the use of industrial diets, the Human Right to Adequate Food predicts the responsibility of the State to guarantee to all citizens permanent access to adequate food in quantity, health and nutrition quality, according to the special needs of each one.[16] And thus, individuals who have this right violated, as in case of necessity and lack of access to industrialized enteral formulations, may require their provision to the State, in other words, they may seek for the enforceability of this right by public power.[17] In this context, health professionals should have their actions aimed at ensuring rights of health and nutrition to the population, going beyond compliance and nutritional prescription, but promoting empowerment and awareness, guiding their patients about their guarantees of access to especial formulas.[17,35]

The knowledge of the nutritional composition of enteral diets is critical to the effectiveness of enteral therapy.[3] However, there is still a paucity of data regarding health and nutritional quality, based on chemical analysis, of handmade enteral diets. Thus, more studies are needed that seek to establish quality standards for nutritional analyzes in these diets, besides seeking for food formulas that meet those parameters.

Conclusions

The handmade enteral diets have good physicochemical quality. Regarding nutritional quality, the fruit shakes, fruit juices and milk mixtures with Mucilon® have good adequacy in its contents of estimated and analyzed macronutrients, reaching the expected quality. However, the soup presents significant losses in nutritional composi-

tion, possibly occurring during the screening, which leads to low percentages of adequacy, which is determining for a nutritional quality expected from the food plan.

Given to the difficulty of determining the nutritional composition in handmade enteral diets, especially the ones that have meats and vegetables, a mixed enteral therapy, using industrialized and handmade diets, is suggested to meet the nutritional needs of the patients and to add the psychosocial values to the treatment.

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References

1. Hebuterne X, Bozetti F, Villares JM, Pertkiewicz M, Shaffer J, Staun M, et al. Home enteral nutrition in adults: a European multicentre survey. *Clin Nutr* 2003; 22: 261-2.
2. Nozaki VT, Peralta, RM. Adequação do suporte nutricional na terapia nutricional enteral: comparação em dois hospitais. *Rev Nutr* 2009; 22 (3): 341-50.
3. Atzigen MCBC, Ribalta M, Santinho MAR, Fontes R, Castro M, Silva MEMP. Características físico-químicas de dietas enterais artesanais com hidrolisado proteico de carne. *Aliment Nutr* 2007; 18 (2): 183-9.
4. Barbosa JAG, Freitas MIF. Representações sociais sobre a alimentação por sonda obtidas de pacientes adultos hospitalizados. *Rev Latino-am Enfermagem* 2005; 13 (2): 235-42.
5. Pérez LML, Chicharro ML, Cuerda PP, García Luna A, Rabassa Soler A, Romero JA et al. Registro de nutrición enteral domiciliaria en España en el año 2007. *Nutr Hosp* 2009; 24 (6): 655-60.
6. Cunha SFC, Ferreira CR, Braga CBM. Fórmulas enterais no mercado brasileiro: classificação e descrição da composição nutricional. *Intern J of Nutrology* 2011; 4 (3): 71-86.
7. Atzigen MCBC, Silva, MEMP. Desenvolvimento e análise de custo de dietas enterais artesanais à base de hidrolisado proteico de carne. *Rev Bras Nutr Clín* 2007; 22 (3): 210-3.
8. Carvalho Filho EV, Aquino JS, Donato, NR, Sousa, PPR, Silva JA. Monitoramento físico-químico e microbiológico de dietas enterais em unidade hospitalar pública da região nordeste do brasil. *Aliment Nutr* 2008; 19 (2): 145-51.
9. Santos VFN, Morais TB. Nutritional Quality and osmolality of home-made enteral diets, and follow-up of growth of severely disabled children receiving home enteral nutrition therapy. *J Trop Pediatr* 2010; 2 (56): 127-8.
10. Riboldi BP, Rockett FC, Oliveira VR, Alves BC, Becker J, Perry IDS. Nutrição enteral artesanal, semi-artesanal e industrializada em unidades hospitalares do Rio Grande do Sul: inquérito telefônico. *Rev HCPA* 2001; 31 (3): 281-9.
11. Menegassi B, Santana LS, Martins OA, Pinto JPAN, Costa TMB, Navarro AM. Características físico-químicas e qualidade nutricional de dietas enterais não industrializadas. *Aliment Nutr* 2007; 12 (2): 127-32.
12. Atzigen MCBC, Garbelotti ML, Araújo RFC, Soares RM, Silva MEMP. Composição centesimal e teor de minerais de dietas enterais artesanais. *Rev Bras de Tecnol Agroind* 2007; 1 (2): 37-47.
13. Felício BA, Pinto ROM, Pinto NAVD, Silva DF. Food and nutritional safety of hospitalized patients under treatment with enteral nutrition therapy in the Jequitinhonha Valley, Brazil. *Nutr Hosp* 2012; 27 (6): 2122-9.
14. Santos VFN, Bottoni A, Morais TB. Qualidade nutricional e microbiológica de dietas enterais artesanais padronizadas preparadas nas residências de pacientes em terapia nutricional domiciliar. *Rev Nutr Campinas* 2013; 26 (2): 205-14.
15. Araújo EM, Menezes HC. Composição centesimal, lisina disponível e digestibilidade in vitro de proteínas de fórmulas para nutrição oral ou enteral. *Cienc Tecnol Aliment* 2005; 4 (25): 768-71.
16. Ação Brasileira pela Nutrição e Direitos Humanos (ABRANDH). Relatório Final Seminário "A exigibilidade do Direito Humano à Alimentação Adequada e o Sistema Nacional de Segurança Alimentar e Nutricional". Brasilia; 2010.
17. Ação Brasileira pela Nutrição e Direitos Humanos (ABRANDH). Direito humano à alimentação adequada no contexto da segurança alimentar e nutricional. Brasília; 2010.
18. Cirqueira AN, Caramico D, Poltronieri F, Frangella VS. Estudo bromatológico de fórmulas artesanais e proposta de protocolo ambulatorial de assistência nutricional enteral. *O Mundo da Saúde* 2009; 33 (4): 467-79.
19. Mitne C. Preparações não-industrializadas para nutrição enteral. In: Waitzberg, D. L. Nutrição oral, enteral e parenteral na prática clínica. 3ª ed. São Paulo: Atheneu; 2006, pp. 629-40.
20. Araújo EM, Menezes HC. Formulações com alimentos convencionais para nutrição enteral ou oral. *Cienc Tecnol Aliment* 2006; 3 (6): 533-8.
21. Souza MLR. Elaboração de uma dieta enteral artesanal padronizada para alta de pacientes em um hospital público de Belo horizonte. Pós em Rev [online] 2011 [cited 2011 Nov]; 4 (31): [13 p.]. Available in: http://revista.newtonpaiva.br/seer_3/index.php/RevistaPos/article/view/228 Accessed: June 2013.
22. Araújo EM, Menezes HC. Estudo de fibras alimentares em frutas e hortaliças para uso em nutrição enteral ou oral. *Ciênc Tecnol de Aliment* 2010; 30 (1): 42-7.
23. Federação da Agricultura do Estado do Paraná ± FAEP. Available in: http://www.sistemafaep.org.br/Faep/Comissoes/comissao-de-hortifruticu.aspx Accessed: June 2013.
24. Brasil. Ministério da Saúde. Núcleo de Estudos e Pesquisa em Alimentação ± NEPA. Tabela Brasileira de Composição de Alimentos ± TACO. 2 ed. Campinas: NEPA; 2006.
25. Ferreira, RS. Elaboração de fórmulas enterais artesanais de baixo custo adequadas em fluidez e osmolalidade [dissertation]. Programa de Pós-Graduação em Ciência da Nutrição: Universidade Federal de Viçosa, 2009.
26. Henriques GS, Rosado GP. Formulação de dietas enterais artesanais e determinação da osmolalidade pelo método crioscópico. *Rev Nutr* 1999; 12 (3): 225-32.
27. IOM (Institute of Medicine). Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington: National Academies Press; 2005.
28. Candela CG, Blanco AI de C, Rosado I. Fibra y nutrición enteral. *Nutr Hosp* 2002; 17 (2): 30-40.
29. Instituto Adolfo Lutz. Métodos Físico-Químicos para Análise de Alimentos. 4ª ed. São Paulo: IAL; 2008.
30. Giuntini EB, Lajolo FM, Menezes EW. Composição de alimentos: um pouco de história. *ALAN* 2006; 56 (3): 295-303.
31. Brasil. Agência Nacional de Vigilância Sanitária. Regulamento técnico sobre rotulagem nutricional de alimentos embalados. RDC 360, de 23 de dezembro de 2003 [dez 2003]. Available in: http://www.anvisa.gov.br/legis/. Accessed: June 2013.
32. Baxter YC, Waitzberg DL, Rodrigues JJG, Pinotti HW. Critérios de decisão na seleção de dietas enterais. In: Waitzberg DL, editor. Nutrição oral, enteral e parenteral na prática clínica. 3ª ed. São Paulo, Atheneu; 2006, pp. 659-76.
33. Mitne C, Simões AMG, Wakamoto D, Liori GP, Sullivan M, Comer GM. Análise das dietas enterais artesanais. *Rev Bras Nutr Clín* 2001; 16 (3): 100-9.
34. Waitzberg DL, Fadul RA, Aanholt DPJV, Plopper C, Terra RM. Indicações e técnicas de ministração em nutrição enteral. In: Waitzberg DL, editor. Nutrição enteral e parenteral na prática clínica. 3ª ed. São Paulo: Atheneu; 2006, pp. 561-71.
35. Pereira CC, Gessele C. A desnutrição infantil como consequência dos distúrbios nutricionais e a atuação do assistente social na garantia do direito a alimentação adequada. *Saúde Pública Santa Cat* 2010; 3 (1): 6-20.