Quantitative nutritional analysis of a protein diet aimed at all audiences

Análise nutricional quantitativa de uma dieta da proteína destinada a todos os públicos

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Abstract

Fad diets can be defined as unusual, popular and temporary eating behavior patterns adopted by followers, enthusiastically promoting quick and attractive results, but without any scientific basis. Among them, protein diets can be mentioned. Thus, this study aimed to carry out a quantitative nutritional analysis of a weekly menu of a protein diet published in a printed book and also available in digital media, aimed at all audiences. For the accomplishment of this study, a female and a male overweight model were constructed, both being potential users of the diet. The book's assessed menus used in this study were constructed from the same orientations and refer to the induction phase of the protein diet. Quantitative analyses of energy and of the following macronutrients and micronutrients were performed: carbohydrates, proteins, lipids, fiber, cholesterol, calcium, iron and vitamin C. This study found inadequate food planning for the overweight models constructed. The results show a hyperproteic, hyperlipidic, hypoglycemic and hypercaloric diet, in addition to values above that recommended for the nutrient cholesterol, and below that recommended for nutrients such as calcium and fiber. It was concluded that the protein diet cannot be considered healthy and balanced, since it does not take into account individual nutritional needs. Therefore, it is of utmost importance that nutrition education campaigns are made available to the general population, clarifying the ills that an unbalanced diet and the absence of nutritional monitoring can generate to the nutritional status.

Keywords: Fad Diets. Weight loss. Overweight. Food Planning.

Resumo

As dietas da moda podem ser definidas como padrões de comportamento alimentar não usuais e temporários, adotados por seguidores de forma entusiástica, promovendo resultados rápidos e atraentes, mas sem possuir nenhum fundamento científico. Entre elas, podem-se citar as dietas da proteína. O presente estudo teve como objetivo realizar análise nutricional quantitativa de um cardápio semanal de uma dieta da proteína publicada em um livro impresso e também disponibilizada em mídia digital, destinada a todos os públicos. Para a realização deste estudo, foi construído um modelo feminino e um masculino em sobrepeso, ambos com possibilidade de serem eventuais utilizadores da dieta. Os cardápios avaliados do livro referem-se à fase de indução da dieta da proteína. Foram realizadas análises quantitativas de energia e dos nutrientes: carboidratos, proteínas, lipídeos, fibras, colesterol, cálcio, ferro e vitamina C. Os resultados do estudo indicaram um planejamento alimentar inadequado para os modelos em sobrepeso construídos, apresentando uma dieta hiperproteica, hiperlipídica, hipoglicídica e hipercalórica, além de valores acima do recomendado para o nutriente colesterol e abaixo do recomendado para os nutrientes cálcio e fibras. Concluiu-se que a dieta da proteína não pode ser considerada saudável e equilibrada, não atendendo às necessidades nutricionais individuais, sendo importante a realização de campanhas de educação nutricional para a população, esclarecendo os malefícios que uma dieta desbalanceada e sem acompanhamento nutricional pode gerar ao estado nutricional.

Palavras-chave: Dietas da moda. Emagrecimento. Sobrepeso. Planejamento Alimentar.

Introduction

Nowadays, food is defined by the modern lifestyle, marked by the lack of time to prepare and consume food, leading to the emergence of *fast food* preparations.[1] As a consequence of this type of diet, there is an increase in the consumption of saturated fatty acids, sugars, soft drinks, alcohol, processed products with excess trans fatty acids and, at the same time, a considerable reduction in the consumption of complex carbohydrates, fruits and vegetables.[2]

This fact generates a picture of caloric excess due to the high intake of macronutrients and deficiency of micronutrients, besides the fibers[2] that, combined with the reduction of physical

activity, is associated with the high prevalence of Chronic Noncommunicable Diseases (NCDs), such as obesity, and the decrease in the quality of life of the population.[3]

With the increase in the prevalence of obesity in Brazil and due to all the problems caused by the disease, together with the current imposition of the society, which considers normal the lean body and / or muscular body, the population starts to understand the lean biotype as a sign of health, beauty and quality of life and, in this way, people seek ways to have a slim body, which has never been as evident as in our times.[4]

Thus, the so-called "fad diets" are regularly launched, printed or online, inducing the population to illusions of fast weight loss and without sacrifice that, besides not stimulating the change of eating habits and the necessity of the practice of physical activity, do not provide healthy habits and are inadequate from the nutritional point of view, which in the long run can compromise health in many aspects.[4]

Digital and printed media have contributed greatly to the emergence of misconceptions about health in the pursuit of an "ideal body", conveying various "fad diets", as well as tips, sympathies, personal testimonials, calorie tables and other non-scientific information for the purpose of weight loss.[4,5]

In this study, it was sought to quantitatively evaluate a "fad diet" called "protein diet" published in print and digital media, intended for all audiences and, based on the results found, to guide the population and health professionals on the possible risks of using this diet.

Methodology

The study is descriptive and for its accomplishment a specific book on "protein diet" was acquired,[6] published by a publishing company, and also available in digital media.

Based on the information in the book, a weekly menu was analyzed through Virtual Nutri Plus® *software*, database version.[7] When some food or preparations were not present in the *software* database, information on the nutritional composition was acquired by means of food labels or similar preparations.

Quantitative analyzes of energy and of the following nutrients were carried out: carbohydrates, proteins, lipids, fibers, cholesterol, calcium, iron and vitamin C of the menus present in the book. The average of the results was obtained with the help of Microsoft Office Excel® *software* version 2010.[8]

The percentage distribution of macronutrients found in the study was compared to the recommendations of the *Food and Agriculture Organization*, which guides: carbohydrates, 55% to 75%; protein, 10% to 15% and lipids, 15% to 30%.[9]

Yet, the values of the fibers and the micronutrients such as calcium, iron, cholesterol and vitamin C were compared to the *Dietary Reference Intakes* (DRIs).[10,11] Initially, the *Recommended Dietary Allowances* (RDA) were used. However, when these values were not available in DRIs, the comparison was performed with *Adequate Intake* (AI).[12] The occurrence of excessive indication of the consumption of some micronutrients in the studied diet was verified with the aid of *Tolerable Upper Intake Level* (UL).[12]

To verify the appropriateness of the weekly menu evaluated regarding the nutritional recommendations and nutrient distribution percentages, it was necessary to construct overweight female and male models, possible users of the "protein diet" (Chart 1).

Chart 1. Characterization of models 1 and 2.

Features of the models	Model 1	Model 2
Gender	Female	Male
Age	43 years old	57 years old
Weight (kg)	84	109
Height (m)	1.65	1.75
BMI (kg/m^2)	30.85	35.59
Activity Factor	Light	Light

For the characterization of the female and male models in overweight, the Body Mass Index (BMI) was used which, although it has limitations in its use, is highly applied in clinical practice. In order to calculate the Total Energy Expenditure (TEE) of the two models, it was used the formula that determines the Basal Metabolic Rate (BMR) and activity factors (AF) related to an individual with mild activity.[13]

Based on the information from model 1, the BMI obtained was 30.86 kg/m^2, being classified as overweight II; and for model 2, the BMI obtained was 35.59 kg/m^2, being also classified as overweight II.

The recommended method for weight loss involves correct dietary planning that promotes a light calorie restriction, and the rate of weight loss should not exceed 1 kilo per week.[14] Considering that the proposed weight loss of both models in one month will be 2 kilos (0.5 kilo per week), the diet was estimated at a value of 1,919.96 kcal/day for model 1 and 2,808.94 kcal/day for model 2.

The recommendations of fiber and micronutrients such as calcium, cholesterol, iron and vitamin C used for the comparison of the values found in the evaluation of the protein diet with the need of models 1 and 2 are listed in Table 1 and follow the values recommended by the *Dietary Reference Intakes* (DRI)[10,11] (Table 1).

Table 1. Recommended daily intake of nutrients: calcium, cholesterol, iron, fiber and vitamin C, Brazil, 2016.

	Model 1		Model 2	
Micronutrients	RDA OR AI	UL	RDA OR AI	UL
Calcium (mg)	1000**	2500	1200**	2500
Cholesterol (mg)	< 200	-	< 200	-
Iron (mg)	18*	45	8*	45
Fibers (g)	25**	-	30**	-
Vitamin C (mg)	75*	2000	90*	2000

* RDA Values[12]; **AI Values[12].

Results and Discussion

Table 2 shows the weekly energetic averages of macronutrients such as carbohydrate, protein and lipid, calculated from the analysis of the menus produced based on the guidelines of the "protein diet" and the adequacy of the average values found in relation to the nutritional needs of models 1 and 2.

Table 2. Weekly energy means of the induction diet phase and comparison with the nutritional needs of the models 1 and 2, Brazil, 2016.

	Energy (kcal)	Carbohydrate (g)	Protein (g)	Lipid (g)
Weekly average of the menus	2531.93	20	136.44	168.40
% Macronutrients	-	4.16	28.43	78.94
Nutritional needs of model 1	1919.96	55 – 75%*	10 – 15%*	15 – 30%*
Adequacy (%)	**131.87**	**6.93**	**189.53**	**315.76**
	Energy (kcal)	Carbohydrate (g)	Protein (g)	Lipid (g)
Weekly average of the menus	3958.75	20	211.56	262.85
% Macronutrients	-	2.85	30.13	84.22
Nutritional needs of model 2	2808.94	55 – 75%*	10 – 15%*	15 – 30%*
Adequacy (%)	140.9	4.8	200.9	**336.9**

Source: *9.

In relation to the results found in the evaluation of the energy values and the distribution of the macronutrients, hypercaloric, hyperproteic, hyperlipidic and hypoglycemic planning were observed when compared to the nutritional needs of the two models created.

The initial weight loss, which occurs with the great majority of patients submitted to protein diets, with these characteristics mentioned in the previous paragraph, occurs due to the emptying of glycogen and water reserves. As a consequence, weight loss could be, predominantly, a loss of fluids, leading to patient dehydration.[15] In addition to this factor, the reduction of insulin secretion, due to the nullity of carbohydrates in meals, promotes the mobilization of fatty acids and ketone bodies, further increasing protein catabolism. The patient loses weight because of the loss of lean mass.[16] At the end of 12 months of diet, researchers observed that patients submitted to the protein diet had the same or lower results than patients submitted to adequate dietary plans, with correct

distribution of nutrients, because the regulation of satiety occurred in the protein diet, has its effect limited by the action of two hormones - insulin and leptin - which have a stimulating effect on food intake, consequently increasing adiposity. Fats are also less efficient than proteins and carbohydrates in sending the signs of satiety, causing the patient on protein diet to eat more and in larger amounts.[17]

Another negative factor in the use of the protein diet is related to the metabolic changes that occurred with increased insulin resistance and, therefore, glucose and hyperinsulinemia intolerance, which are similar to those perceived in hypothalamic or genetic obesity, and is considered the first clinical manifestation of type 2 diabetes mellitus.[18] In addition, a hyperlipidic diet is also one of the main factors that help increase the levels of blood lipids and, in this way, the origin of cardiovascular accidents. The incidence of cardiovascular diseases and other vascular diseases are associated to the disorders that occur in lipid metabolism, resulting in dyslipidemias, with high serum cholesterol and triglyceride concentrations.[17]

Studies also suggest precaution with hyperproteic diets in individuals with evidence of renal disease, diabetics and with a history of nephrolithiasis, because this diet is associated with a greater urinary excretion of calcium in healthy individuals, and hypercalciuria, being a consequence of increased synthesis of acid during the oxidation of sulfur amino acids found especially in proteins of animal origin.[19] In these hyperproteic and hypoglycemic diets, due to the limitation of carbohydrates, weight loss also occurs due to the loss of fluids, resulting in dehydration.[20] Although proteins are vital nutrients for tissue maintenance and metabolism, excess can cause health problems, such as: atherosclerosis, cancer, kidney disease, and osteoporosis. These factors interfere in the renal release of uric acid and, consequently, raise the serum levels of this acid, which can lead to the appearance of Gout.[4]

Likewise, fad diets considered to be of low energy value will promote the reduction of basal metabolism by the loss of muscle mass, used to supply energy to the body, which may make the process of weight loss and its maintenance even more difficult in the long term. Studies indicate that hypotherapeutic diets, regardless of the type of proposal, are not effective for long-term weight loss. In addition, about 80% of patients regain weight lost after one month of finishing the diet, and dropout is approximately 50%.[20] For the correct energy intake, individual BMR should be considered as the minimum value of caloric intake, and there should be no food planning based on diets below this rate in order to avoid health risks.[4,21]

Very restrictive, hypocaloric or hypercaloric diets that are inadequate in relation to the macronutrient distribution, characterized by the low variety of foods allowed, such as the diet evaluated in this study, can lead to specific nutritional deficiencies.

Table 3 shows the weekly averages of nutrients, such as calcium, cholesterol, iron and vitamin C, in addition to the fibers, also calculated from the analysis of the "protein diet" menus, and the adequacy of the average values found in relation to the nutritional needs of the models 1 and 2 (Table 3).

Table 3. Weekly nutrient means of the induction diet phase and comparison with the nutritional needs of the models 1 and 2, Brazil, 2016.

	Calcium (mg)		Cholesterol (mg)	Iron (mg)		Fibers (g)	Vitamin C (mg)	
Weekly average of the menus	925.4		1687.3	18.2		6.3	111.6	
Nutritional needs of model 1	RDA or AI	UL	RDA or AI	RDA or AI	UL	RDA or AI	RDA or AI	UL
	1000**	2500**	<200**	18**	45**	25**	75**	2000**
Adequacy (%)	92.5		**843.7**	101.1		25.3	148.8	
	Calcium (mg)		Cholesterol (mg)	Iron (mg)		Fibers (g)	Vitamin C (mg)	
Weekly average of the menus	1037.8		2561.9	23.5		6.4	131.5	
Nutritional needs of model 2	RDA or AI	UL	RDA or AI	RDA or AI	UL	RDA or AI	RDA or AI	UL
	1200**	2500**	<200**	8**	45**	30**	90**	2000**
Adequacy (%)	**86.48**		**1280.9**	293.75		**21.3**	146.1	

Source: *9; **12.

In relation to the consumption of micronutrients, such as calcium, iron and vitamin C, as well as fibers, they are essential and indispensable for an adequate development and maintenance of homeostasis in the body, and therefore they must be present in food planning, in correct quantities.[22-26] In the study in question, iron and vitamin C were present in adequate average amounts on the menu produced for one week of care, unlike nutrients such as calcium, cholesterol and fiber.

Iron is involved in various reactions of the body, such as oxygen transport in the blood, oxygen storage in muscle tissue, DNA synthesis and energy metabolism, besides participating in the defense of the organism. Its deficiency causes serious consequences, being anemia the most frequent pathology, causing implications like weakness, fatigue, loss of concentration, palpitation, headache, discouragement, pallor, drowsiness, diminution of the respiratory capacity, being able to lead to death.[22] Excess iron can also cause damage to the body due to its toxic effects, which can be reflected in abdominal pain, weight loss, memory loss, hair loss, testicular atrophy, liver cirrhosis and even diabetes.[22]

Vitamin C is a water soluble and thermolabile vitamin. Humans and other primates are the only mammals unable to synthesize it. It is of paramount importance for various factors of the organism, such as the prevention of scurvy, defense of the body against infections, formation of collagen fibers in virtually all tissues of the human body, such as dermis, cartilage and bones, and it is fundamental in the integrity of walls of blood vessels. Its daily recommendation is high in situations such as infections, pregnancy and breastfeeding, and for smokers. Vitamin C deficient diet can trigger scurvy, a disease characterized by hemorrhagic manifestations (petechiae, ecchymosis, bleeding gums), joint edema, fatigue, dizziness, anorexia, skin changes, infections and death.[24]

Although the two nutrients were present in average amounts adequate for the nutritional needs of the two models constructed, it cannot be said that this will happen in all constructions of menus made by diet users, since there are no substitution lists guiding the patient. Likewise, it is not an individualized planning, which can lead to low or high intake of nutrients, depending on the nutritional needs of those who will follow this diet. Only a diet that is individualized and accompanied by a qualified professional can affirm a correct dietary intake of all macronutrients and micronutrients.

Regarding calcium, it was presented with a low supply in relation to the nutritional needs of model 2. Its adequate amount is of fundamental importance for health maintenance. This micronutrient participates in biological functions, such as muscle contraction, mitosis, blood coagulation, transmission of the nerve or synaptic impulse, and structural support of the skeleton. Studies have shown a consumption of calcium below that recommended by the Brazilian population and the association between low calcium consumption and the development of NCDs, such as osteoporosis, colon cancer, arterial hypertension and obesity.[23] In hypoglycemic diets, the calcium absorption is decreased, since the carbohydrate seems to increase the absorption of this micronutrient, mainly lactose.[25]

In relation to the hyperlipidic diets, Buzinaro et al.[25] have shown that the addition of fat can promote malabsorption, or steatorrhea, thereby decreasing the absorption of calcium. This is usually the result of the precipitation of calcium with fatty acids due to the presence of insoluble soaps in the lumen of the intestine. The volume of soaps produced, in parallel, is significant for ionizing the fatty acids, at the same time as the calcium concentration decreases. In hyperproteic diets, these same authors advocate a combination between increased protein intake and worsening of calcium metabolism, and such interaction refers to the increase in calcium excretion in the urine.[25]

The fibers are inadequate in both models. These are polysaccharides and polymers of phenols (lignin) present in foods such as cereals, grains, roots and leaves. Although resistant to the action of human digestive enzymes, they may be partially digested by colon bacteria or eliminated unaltered in the faeces. They are also considered as functional foods which help improving vital activities, providing a good performance of the gastrointestinal tract, and its adequate consumption is related to lower prevalence of coronary artery disease (CAD), stroke and peripheral arterial disease. Dietary fiber deficiency favors the increase of gastrointestinal disorders and diseases, such as irritable bowel syndrome, appendicitis, diverticulitis, Crohn's disease, hemorrhoids and intestinal constipation.[26,27] The insufficient consumption of fiber in the hyperproteic and hyperlipidic diets of both models is possibly explained by the low consumption of fruits, vegetables and whole grains, due to the carbohydrate restriction, which is characteristic of such a diet.[27]

A troubling result also found in this study was the supply of dietary cholesterol. It is found in eight times greater quantity in the case of model 1, and approximately 13 times greater in relation to model 2, according to the maximum quantity recommended for both models. In any case, this result was expected, since these diets have as main characteristic the high consumption of proteins and lipids, and the freely allowed foods on it are those of animal origin, main sources of cholesterol. Cholesterol is found only in animal fats, almost entirely in free form. Its main food sources are egg yolk, milk and dairy products, beef, poultry skin and chicken giblets. Its balance is the result of the balance between ingestion, absorption / excretion and synthesis.[28,29]

According to Lottenberg,[28] since the 1950s, it has been known that dietary fat increases cardiovascular risk and that fat consumption of more than 30% of calories is associated with a higher incidence of atherosclerosis. At the same time, the strong relationship between obesity, diabetes and inflammation was determined, showing later that metabolism and immunity are interdependent circumstances and that excess food intake and food sources of fat and cholesterol induce a higher risk for NCDs.

Studies have shown that correct dietary interventions can significantly attenuate or prevent the onset of various NCDs, since high-cholesterol and low-fiber diets raise cholesterol, lead to early atherosclerosis, high blood pressure, diabetes, and obesity. In addition, elevated LDL concentrations increase cardiovascular risk,[29,30] which is evidenced in the diet evaluated in the present study.

The use of inadequate diets, without the correct accompaniment of qualified professionals, helps in the establishment of common elements, such as obesity, diabetes and cardiovascular diseases that accompany the process of Nutrition Transition and Epidemiological Transition, around which other aggregate disorders oscillate, such as osteoarticular diseases, dyslipidemias, elevated blood levels of uric acid and other degenerative manifestations. These are the predominant elements in populations with a longer life expectancy, with a diet rich in lipids (particularly those of animal origin), sugars and refined foods, as well as a reduced intake of complex carbohydrates and fibers, which is often referred to as "Western diet".[31] At the same time, there are also changes in body composition promoted both by the predominance of this diet and the fact that it is related to the progressive decline of physical activity of the individuals, both providing an increase in the prevalence of NCDs and worsening of the quality of life of the population.[32]

Conclusion

This study found inadequate food planning for the constructed models and for the possible users of the "protein diet" on digital and print media. The results present a hyperproteic, hyperlipidic, hypoglycemic and hypercaloric diet, in addition to values above the recommended for nutrient such as cholesterol and below recommended for nutrients such as calcium and fiber, which may compromise the health of diet users in the short, medium and long term.

Therefore, it is concluded that the protein diet cannot be considered healthy and balanced, since it does not consider the nutritional needs of healthy individuals or nutritionally vulnerable individuals, such as those predisposed to cardiovascular diseases, since such diet is not performed individually.

The ideal composition of a diet is one that promotes greater satiety with adequate energy intake at each stage of life. For both healthy and obese individuals, macronutrients and micronutrients should be in balanced proportions in relation to the Total Energy Expenditure (TEE). It is also important that the diet be composed of a variety of foods, appropriate to the habits or eating patterns of the individual.

Therefore, it is extremely important that nutritional education campaigns be carried out for the general population, clarifying the ills that an unbalanced diet and that without nutritional monitoring can generate to the nutritional status, and the importance of patient care and follow-up by qualified professionals, the nutritionists.

Collaborators

Faria, LN and Souza AA participated in the conception, study design, writing, analysis, interpretation and review of the article.

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