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Food intake profile of celiac disease pacients in the gastropediatric clinic of Universidade Federal de Minas Gerais, Brazil

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Abstract

Introduction: Celiac disease is an autoimmune disease triggered by the presence of wheat gliadin and similar proteins in barley and rye in the diet of susceptible individuals. Since the treatment of this disease is following a gluten-free diet it is very important to keep nutritional monitoring of these individuals. Non-adherence to the diet can lead to nutritional deficiency. There are few studies in Brazil addressing the nutritional aspects of celiac disease patients. *Objective*: To assess the dietary intake of patients with celiac disease. *Methods*: We evaluated 31 patients with celiac disease and 31 healthy individuals from three to 23 years; a convenience sample was used. For analysis of food intake we carried food frequency questionnaire, dietary records and 24-hour dietary recall. *Results*: Food intake, calorie and lipids consumption was higher in the study group. Carbohydrate intake was higher in the control group. Despite the difference in the amount ingested, the proportion of individuals, in both groups, who achieved the daily requirement for vitamins and minerals in accordance with the selected IDRs showed no statistical difference. *Conclusion*: The gluten-free diet was not harmful to the eating habits of the study participants. Diet composition of patients with celiac disease was similar to the diet of the control group. No statistical differences were found between the proportion of subjects with ideal, below or above intake for vitamins and minerals in both groups.

Keywords: Celiac Disease. Nutrition Assessment. Food Consumption.

Introduction

Celiac disease (CD) is an autoimmune disease, triggered by the presence of wheat gliadin and similar barley and rye protein in the diet of people susceptible to this disease. It is characterized mainly by intestinal malabsorption due to the atrophy of intestinal villi. Its most common symptoms usually appear in the early stages of life, after the introduction of these cereals in the diet.[1]

Wheat grain is source of thiamine, niacin, riboflavin and folic acid, and minerals, such as magnesium, potassium, iron and selenium. The restriction of this food on a diet can limit the variety of foods available for consumption, especially for its importance in the Western diet, along with the reduced line of gluten-free products in the market.[2-4]

Celiac Disease multi-professional treatment involves a dietary approach; thus, it is very important to have a nutritional monitoring of these individuals so that their diet is complete, nutritious and gluten-free. If patients are not given a proper diet, they can have nutritional deficiency, obesity and increased incidence of neoplasia.[5-7]

In the Pediatric Gastroenterology Clinic of the University Hospital of Universidade Federal de Minas Gerais (UFMG), clinical monitoring is conducted on all patients diagnosed with CD. Cases suspected of nutritional disorders are referred for guidance through celiac associations, where they are also registered for control.

Children and adolescents with CD may have body composition disorders due to poor eating habits and lack of guidance. These habits, especially in adolescents, consist of greater consumption of lipids and proteins, since foods that are a source of carbohydrate contain mostly gluten.[8] There are very few studies in Brazil that address the nutritional aspects of CD patients.[7,9] The need to monitor the nutritional status of patients with CD and provide information on this population group has motivated the development of this project.

The objective of this study was to assess the profile of the food intake of CD patients treated at the Pediatric Gastroenterology Clinic of the University Hospital of Universidade Federal de Minas Gerais (HC-UFMG) and compare with same-age healthy individuals.

Method

This is a descriptive observational cross-sectional study. It was held at the Pediatric Gastroenterology Clinic of HC-UFMG, on appointments made with individuals participating in the research. The population group consisted of patients diagnosed with CD by intestinal biopsy, with no other associated pathologies, submitted to the Pediatric Gastroenterology Clinic of HC-UFMG, and volunteers from the Celiac Association of Brazil in Minas Gerais (ACELBRA-MG), aged from three to 23 years. Patients of both genders were selected, regardless of race and social status. Healthy subjects also participated, within the same age range of the studied subjects, who volunteered after the disclosure of the project at UFMG and at schools in the city of Belo Horizonte.

The study group consisted of patients diagnosed with CD after intestinal biopsy, aged between three and 23 years. The control group consisted of healthy volunteers, aged between three and 23 years.

The selection criteria were: diagnosis of CD confirmed by intestinal biopsy; and age between three and 23 years. Exclusion criteria were: patients with intestinal manifestations other than CD; patients with Down syndrome, Turner syndrome, IgA deficiency and deficiency of growth hormone, diabetes mellitus, dermatitis herpetiformis; and patients using diuretics, due to the protocol for use of bioimpedance. Individuals who participated in the control group met the same exclusion criteria as that for the study group.

Sample calculation

The sample was formed by convenience, according to the flow of patients who volunteered to participate in the study during their stay at the Pediatric Gastroenterology Clinic of the HC, or through ACELBRA-MG. The final sample of CD volunteers was formed by 31 children and adolescents. In the second stage, 31 same-age healthy volunteers were selected for the control group.

Ethical aspects

The project was approved by the Research Ethics Committee of UFMG in 2010, opinion No. ETIC 0112.0.203.000-10. All participants of this research have signed the Informed Consent (IC) form.

Data collection

Data collection was conducted from September 2011 to June 2012. Participants were invited to participate through phone calls made by researchers or after being assisted at the Pediatric Gastroenterology Clinic of the UFMG School of Medicine. Participation entailed their presence in a place scheduled for interview, questionnaire completion and anthropometry.

Collected data

Calculation of Basal Metabolic Rate (BMR), through formulas proposed by the WHO.[10] Total Energy Expenditure Calculation (TEE), through references proposed by the Brazilian Society of Parenteral and Enteral Nutrition, Brazilian Association of Pediatric Surgery, Brazilian Society of Internal Medicine and the Brazilian Association of Nutrition, created by Coppini, Sampaio & Marco.[11] Calculated after measuring participant weight and height.

Twenty-four hour recall (R24) conducted by the researcher, interviewing individuals, with the aid of tables and photo album to standardize portion sizes. This interview also served to enable patients or caregivers to record dietary data at home. Held at the day of the interview.

Two dietary records made at home by the patient, one on a weekday and one on the weekend. The records were delivered on the day of the interview to be filled by a participant or caregiver. After filling, records were sent to the main researcher, via mail or email.

Food frequency questionnaire (FFQ), performed after the R24, on the day of the interview. Such analysis was both quantitative and qualitative, and the questionnaire was filled only once.

Data analysis

Data from the R24 and dietary records were computed and analyzed with the DietWin software. Information on the average daily intake of calories, proteins, carbohydrates and lipids was provided. The FFQ data were evaluated in spreadsheet prepared with food information, provided by tables of food composition, such as the Brazilian Table of Food Composition (TACO), and a Table of Equivalents, Portion Sizes and Chemical Composition of Food.[12] This analysis provided information on cholesterol intake, dietary fiber, trans fat, saturated fat, vitamins and minerals of individuals. The values found were compared with the daily intake reference (DIR) tables 1998-2005 prepared by the Food and Nutrition Board[13-17] from the National Academies Press and by Ross et al.[18]

The following DIRs were used for analyzed nutrients: Vitamin A, folate, B1, B2, B6, zinc, phosphorus, magnesium, iron, iodine (3 to 23): recommended dietary allowance (RDA); and vitamin C, D, calcium, potassium, sodium (3-23 years): adequate intake (AI).

The FFQ was transferred for analysis to the Excel 2010 spreadsheet program. To organize study population in study by social class, we used the Economic Classification Criterion Brazil (CCEB), prepared by the Brazilian Association of Research Companies (ABEP) in 2011.[19]

Statistical treatment

Descriptive analyzes were performed for all variables. Confidence level of 95% was established for the statistical tests ($\alpha = 0.05$). To evaluate the difference of the average between the two groups was performed t test for all normal variables with similar variance. For non-normal continuous variables, Wilcoxon test was performed. As they are different age groups, which implies different reference values for intake of vitamins and minerals, food intake variables they were categorized according to the classification of American DIRs to satisfactory intake, high or poor. For these variables, Fisher's test was performed in order to evaluate the difference between proportions between the two groups. This test was also used for the proportions given by the socioeconomic questionnaire. Pearson's test was applied in continuous variables of interest in order to assess the correlation among samples. The tests were performed using the Microsoft Excel, R and IBM SPSS Statistics programs.

Results

Socioeconomic Assessment

Sixty-two participants were evaluated during the study period, divided into two groups of 31 subjects each. It is possible to see in Table 1, the information on the distribution of participants in the two groups in terms of gender, ethnicity, social class, nutritional counseling and physical activity. There was no statistical difference in these parameters, only in social classification ($p = 0.00$), which may indicate purchasing power differences between the two groups. Figures 1 and 2 shows the distribution of groups according to age. The average percent of the study group (13 years ± 5.79) and control group (13.42 years ± 5.70) are similar, according to the t-test ($p = 0.39$).

Table 1. Distribution of study and control groups according to information from the socio-economic questionnaire - Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

	Study Group		Control Group		P
Gender	n	%	n	%	
Male	23	74.19	21	67.74	0.78
Female	8	25.81	10	32.26	
Skin color	n	%	n	%	
White	21	67.74	18	58.06	
Mulatto	8	25.81	13	41.94	0.19
Black	2	6.45	0.00	0.00	
Other	0	0.00	0.00	0.00	
Social class	n	%	n	%	
A1 (R$ 11 480 00)	1	3.23	5	16.13	
A2 (R$ 8 295 00)	3	9.68	16	51.61	
B1 (R$ 4 754 00)	7	22.58	5	16.13	0.00
B2 (R$ 2 656 00)	13	41.94	1	3.23	
C1 (R$ 1 459 00)	4	12.90	4	12.90	
C2 (R$ 962 00)	3	9.68	0	0.00	
Nutritional Follow-up	n	%	n	%	
Yes	12	38.71	5	16.13	0.08
No	19	61.29	26	83.87	
Physical exercise	n	%	n	%	
Yes	15	48.39	21	67.74	0.19
No	16	51.61	10	32.26	

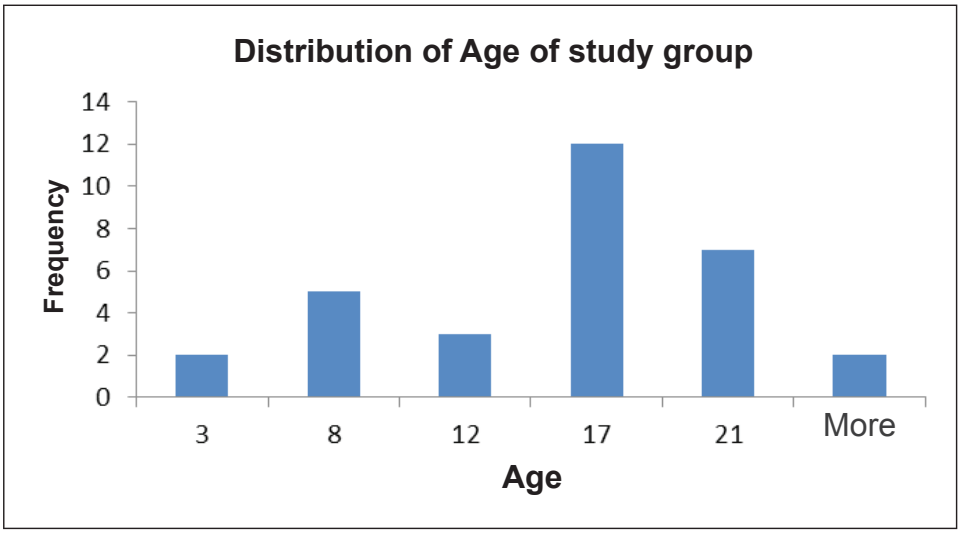

Figure 1. Distribution of participants from the study and control groups according to age - Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

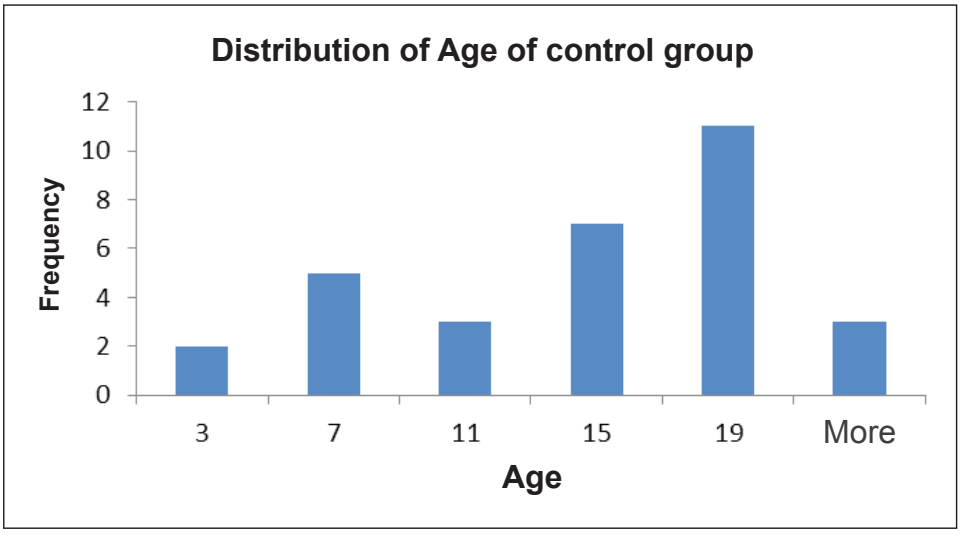

Figure 2. Distribution of participants from the study and control groups according to age. Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

The study group answered part of a questionnaire solely on CD and its symptoms. One hundred percent of participants had intestinal biopsy as the main diagnosis for CD and had made at least one serological test for CD. In this same group, 77.42% of patients admitted following a full gluten-free diet.

Above pre-diagnostic symptoms of the disease, 74.19% of the participants reported having some type of gastrointestinal manifestation, mostly diarrhea (51.61%), followed by vomiting (19.35%), weight loss (16 , 13%), and abdominal discomfort (16.13%).

Macronutrient intake

According to the information presented in Figure 1, the daily consumption of rice and beans, which are common foods in the Brazilian diet, was higher among participants in the study group (30 and 29 individuals from 28 and 22 respectively in the control group) The control group had lower daily meat consumption (18 individuals from 24), processed foods (23 versus 16) and embedded (7 vs 2). The group called "Cheese breads and flour cookie" was chosen because of the large consumption of these foods by individuals with CD, precisely because they are gluten-free. These data have been disclosed for illustrative purposes, with no statistical tests, because they are not the focus of this work.

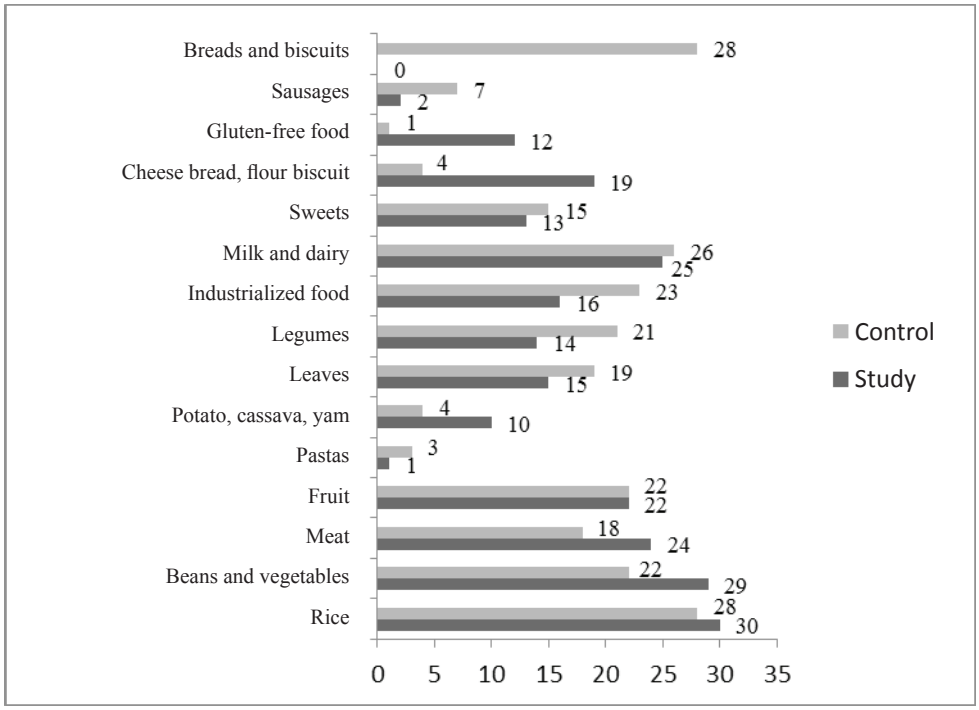

Figure 3. Daily food intake of participants in the study according to the Food Frequency Questionnaire. Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

Once performed the separation of foods in the food groups according to the food pyramid proposed by Welsh, Davis & Shaw,[20] in 1992 in the United States, it was found that daily consumption of cereals, tubers and roots, which are the base of the pyramid is similar between the study group and the control group. Difference was found for the consumption of meat and eggs, which is lower in the study group, and legumes, which is lower in the control group. Fisher's test showed no statistical difference between the two groups regarding the intake of food groups, according to the food pyramid.

According to Table 2, the average daily caloric intake of individuals in the study group is statistically higher than the control group. It was also observed that the average total energy expenditure of the two groups is similar (p> 0.05). It is also possible to note that the number of patients with caloric intake above the daily TEE calculated for each individual is greater in the study group (29 individuals in the study group versus 22 in the control group). Since such information is considered complementary, it is not presented in tables, and there were no statistical tests.

Table 2. Descriptive analyzes of the daily values for the total caloric value (TCV) of diets, according to 24 hour recall, and total energy expenditure (TEE) of the study and control groups. Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

Variable	TCV R24		P	TEE (Kcal)		P
	Study	Control		Study	Control	
Median	2,619.77	2,017.10	0.00	1,872.83	1,832.70	0.25
Mean	2,602.05	2,001.40		1,831.09	1,949.37	
SD*	703.89	619.17		598.01	549.42	
CV †	0.27	0.31		0.33	0.28	

‡Legend: (*) Standard Deviation (†) Coefficient of Variance

According to Table 3, the average consumption in grams of carbohydrates and lipids, is significantly higher in the study group. The average protein intake is higher in the control group, but with no statistical significance.

Table 3. Descriptive analyzes of intake in grams of CHO, LIP and PTN of the study and control groups according to the 24h recall. Belo Horizonte-MG, 2012.

Statistics	CHO (g)		p	PTN (g)		p	LIP (g)		P
	Study	Control		Study	Control		Study	Control	
Median	369.82	248.75	0.00	98.99	78.98	0.41	76.01	61.21	0.00
Mean	371.02	266.07		93.45	94.20		78.73	61.02	
SD*	127.09	97.96		33.62	57.14		24.59	21.60	
CV †	0.34	0.37		0.36	0.61		0.31	0.35	

‡Legend: (*) Standard Deviation (†) Coefficient of Variance

Vitamin and mineral intake

Once Fischer's test was applied for variables of categorized vitamins, as shown in Table 4, no difference was observed in proportion of participants with optimal intake of vitamins, below or above recommended, between the two groups. Likewise, as the application of Fischer test for intake of minerals and dietary fiber categorized according to the DIRs, it was observed that there was no statistically significant difference for the optimal intake ratios above or below the recommended level for the two groups. These similarities, however, do not claim that the intake of food profile found in both groups is ideal, according to international benchmarks.

Table 4. Percentage of individuals of the study and control groups that have achieved or not, DIRs for vitamins, minerals and dietary fiber according to the FFQ. Pediatric Gastroenterology Clinic at UFMG Belo Horizonte-MG, June 2012.

Nutrient	Groups				
	Study		Control		p
	n	%	n	%	
Vitamin A					
Lower	10	32.26	10	32.26	1
Adequate	21	67.74	21	67.74	
Higher	0	0	0	0	
Vitamin D					
Lower	21	67.74	17	54.84	0.43
Adequate	10	32.26	14	45.16	
Higher	0	0	0	0	
Vitamin E					
Lower	3	9.68	2	6.45	1
Adequate	28	90.32	29	93.55	
Higher	0	0	0	0	

Nutrient	Groups				
	Study		Control		p
	n	%	n	%	
Vitamin B1					
Lower	0	0	1	3.23	1
Adequate	31	100	30	96.77	
Higher	0	0	0	0	
Vitamin B2					
Lower	9	29.03	4	12.9	1
Adequate	22	70.97	27	87.1	
Higher	0	0	0	0	
Vitamin B6					
Lower	2	6.45	2	6.45	1
Adequate	29	93.55	29	93.55	
Higher	0	0	0	0	
Folate					
Lower	26	83.87	16	51.61	0.45
Adequate	5	16.13	15	48.39	
Higher	0	0	0	0	
Vitamin B12					
Lower	5	16.13	6	19.35	1
Adequate	26	83.87	25	80.65	
Higher	0	0	0	0	
Vitamin C					
Lower	5	16.13	2	6.45	1
Adequate	26	83.87	29	93.55	
Higher	0	0	0	0	

Nutrient	Groups				
	Study		Control		p
	n	%	n	%	
Calcium					
Lower	13	41.94	20	64.52	0.12
Adequate	18	58.06	11	35.48	
Higher	0	0	0	0	
Iron					
Lower	6	19.35	12	38.71	0.16
Adequate	25	80.65	19	61.29	
Higher	0	0	0	0	
Sodium					
Lower	0	0	0	0	0.17
Adequate	7	22.58	13	41.94	
Higher	24	77.42	18	58.06	
Potassium					
Lower	24	77.42	26	83.87	0.74
Adequate	7	22.58	5	16.13	
Higher	0	0	0	0	
Zinc					
Lower	8	25.81	13	41.94	0.28
Adequate	23	74.19	18	58.06	
Higher	0	0	0	0	
Phosphorus					
Lower	7	22.58	13	41.94	0.17
Adequate	24	77.42	18	58.06	
Higher	0	0	0	0	

Nutrient	Groups				
	Study		Control		p
	n	%	n	%	
Magnesium					
Lower	22	70.97	24	77.42	
Adequate	9	29.03	7	22.58	0.77
Higher	0	0	0	0	
Iodine					
Lower	23	74.19	20	64.52	
Adequate	8	25.81	11	35.48	0.58
Higher	0	0	0	0	
Total fiber					
Lower	21	67.74	24	77.42	
Adequate	10	32.26	7	22.58	0.57
Higher	0	0	0	0	

Discussion

According to the results found in this study, participants in the study and control groups, when investigating the intake of macro and micronutrients profile, can be considered similar. Some differences in eating habits were found, but did not reflect in special supply of nutrients in final balance. The food intake of these children and adolescents is deficient in many ways, but in this study, this fact is not related to celiac disease.

Some authors, such as Mariani et al.,[8] have reported that the child and, more often, the teenager, usually find it more difficult to follow healthy eating patterns, whether or not they have any disease. Fonseca, Sichieri & Veiga[21] strengthen the idea that adolescent eating habits consists mainly in the

consumption of caloric preparations, skipping meals such as breakfast, and making quick meals. These habits, associated with low physical activity, increase the prevalence of overweight and obesity in this age group.[21] Carvalho, Oliveira & Santos[22] have found low intake of fruit, legume, milk and vegetables, and high consumption of candy, chewing gum, fried foods, chips and soda in children at a public school in Belo Horizonte. The authors associate this profile of food intake with the Brazilian nutritional transition in the past three decades.[22]

These descriptions of the food profile, found for this age group, reinforce that nutritional deficiencies can not be related to the presence of celiac disease. This present study showed a large consumption of sugary products such as soft drinks, sweets and biscuits, in both groups, through the analysis of dietary records and FFQ results. However, this type of consumption was higher among patients in the control group. Individuals free of CD also consumed the highest amount of sausages and processed foods.

Dall'Asta et al.[23] found greater intake of sweets and soft drinks for celiac patients compared with control group, but the patients studied were adults, which could explain the difference in dietary profile when compared to the group assessed in this study: young patients are more influenced by parents to follow a nutritionally adequate diet, especially if they already have some type of nutritional disability.[7,24]

The individuals in the study group had lower daily intake of protein, vegetables and fruits, but higher consumption of rice, beans, potatoes and other roots and tubers. The fact that the study group participants had lower monthly family income than the control group, and consequently lower spending on food, could be associated with a reduction in the consumption of meats, vegetables, fruits and processed products, which are more expensive.

It was observed that individuals with CD mostly ingested larger amount of calories than their total energy expenditure (TEE). The number of individuals with higher calorie intake than TEE in the study group (29) was greater than in the control group (22). However, there was no statistical difference for the mean of total energy expenditure and basal metabolic rate between the two groups.

The highest total daily caloric intake, found in the study group compared to their control group, may be a feature of the diet of these patients. In a study of patients in adulthood, Thompson et al.[25] found mean daily caloric intake on a high with CD, agreeing with the profile found in this study, despite the age difference. Cheng et al.,[26] Valleta et al.,[27] Reilly et al.[28] and Dickey & Kearney[6]

argue, in their work, the possibility of increased caloric expenditure after the start of DIG since, in all three studies, they found increased weight and BMI after the withdrawal of gluten from the diet. Increased caloric intake happens regardless of sex or age group.

Despite this evidence, the participants in the study and control groups in this study were similar in terms of composition of diet, with regard to the consumption of nutrients. The average percentage of consumption of carbohydrates and lipids of both groups is similar, and only the average percentage of protein consumption is lower in the study group. Some works, such as by Mariani et al.,[8] found that the diet of celiac patients was hyperlipidic and hyperproteic, associated with low intake of carbohydrates. Polito et al.[29] also found high intake of proteins and lipids in children following DIG. A variable that may be important in the different profiles found in celiac children and adolescents in our study is low family income, which would not allow high frequent consumption of protein and fatty foods, as discussed previously.

According to Fisher's test, conducted to assess the differences between the proportions of patients with optimal intake of vitamins or below the recommended, there was no statistical difference between the two groups with regard to the consumption of these nutrients. Malandrino et al.[30] state that such deficiencies are found only upon transgression of the diet, and that the presence of gluten damages the intestinal mucosa, hindering the absorption of vitamins and mineirals. In this study, the transgression rate of diet in patients with CD, was low and casual. Malandrino at al.[30] also mention that the gluten-free diet is not nutritionally inadequate despite decreased intake of dietary fiber because of the restriction of integrated products.

The intake of dietary fiber is low in both groups. Despite the low availability of fiber in DIG, also due to the use of refined flours with few nutrients, and carbohydrate reduction for the production of gluten-free food, fiber intake is reduced in young Brazilians. According to the Household Budget Survey held by IBGE[31] in 2008 and 2009, 82% of females and 78% of males, 10-13 years old, are not able to reach the target set by the Brazilian Ministry of Health for intake of dietary fiber. These values remain in the age group 14-18 years in which 77% of male subjects and 86% of women have inadequate intake of dietary fiber.

Conclusion

In this study, after the assessment of food intake, no difference was found in the proportion of individuals classified with optimal intake, below or above recommended by the American DIRs.

The composition of the diet of patients with CD was similar, and some items were more adequate than those of the control group. Although they complain about the difficulty of following the gluten-free diet, CD patients have good participation on this treatment because they are registered in an association of celiac patients. Dietary adjustments made by these individuals were not found to be the cause of nutritional deficiency when evaluating the intake of some vitamins or minerals.

The profile of the food intake of the study group is associated with the age range of participants who have greater caloric intake and low adherence to natural products, and not with the clinical status of patients with CD and compliance to gluten-free diet.

Income differences between the two groups presented in this study may play a role in differed variables evaluated in both groups, as well as physical activity and protein intake. However, these factors are not associated with differences in the nutritional profile of subjects assessed here.

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References

1. Kagnoff MF. Overview and pathogenesis of celiac disease. Gastroenterology. 2005; 128(4 Suppl 1):S10-8.
2. Thompson T. Thiamin, riboflavin, and niacin contents of the gluten-free diet: is there cause for concern? J. Am. Diet Assoc. 1999; 99(7):858-62.
3. Lee A, Newman JM. Celiac diet: its impact on quality of life. J. Am. Diet Assoc. 2003; 103(11):1533-5.
4. Carneiro H. Comida e sociedade. Rio de Janeiro: Campus; 2003.

5. Butterworth JR, Banfield LM, Iqbal TH, Cooper BT. Factors relating to compliance with a gluten-free diet in patients with coeliac disease: comparison of white Caucasian and South Asian patients. Clin. Nutr. 2004; 23(5):1127-34.

6. Dickey W, Kearney N. Overweight in celiac disease: prevalence, clinical characteristics, and effect of a gluten-free diet. Am. J. Gastroenterol. 2006; 101(10):2356-9.

7. Sdepanian VL, Morais MB, Fagundes-Neto U. Celiac disease: evaluation of compliance to gluten-free diet and knowledge of disease in patients registered at the Brazilian Celiac Association (ACA). Arq. Gastroenterol. 2001; 38(4):232-9.

8. Mariani P, Viti MG, Montuori M, La Vecchia A, Cipolletta E, Calvani L, et al. The gluten-free diet: a nutritional risk factor for adolescents with celiac disease? J. Pediatr. Gastroenterol. Nutr. 1998; 27(5):519-23.

9. Araújo HMC. Impacto da doença celíaca na saúde, práticas alimentares e na qualidade de vida de celíacos [Dissertação]. Brasília: Universidade de Brasília; 2008.

10. World Health Organization. Energy and protein requirements. Report of a joint FAO/WHO/UNU expert consultation. Geneva: World Health Organization; 1985. World Health Organization Technical Report Series 724.

11. Coppini LZ, Sampaio H, Marco D. Recomendações nutricionais para crianças em terapia nutricional enteral e parenteral. In: Jatene FB, Bernardo WM. Projeto diretrizes: Associação Médica Brasileira e Conselho Federal de Medicina. v. 9. Brasília: Conselho Federal de Medicina; 2011. p. 35-50.

12. Pacheco M. Tabela de equivalentes, medidas caseiras e composição química dos alimentos. São Paulo: Rúbio; 2011.

13. Food and Nutrition Board. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids. Washington, D.C.: The National Academies Press; 2005. 1357 p.

14. Food and Nutrition Board. Dietary reference intakes for thiamin, riboflavin, niacin, vitamin b6, folate, vitamin b12, pantothenic acid, biotin and choline. Washington, D.C.: The National Academies Press; 1998. 592 p.

15. Food and Nutrition Board. Dietary reference intakes for vitamin a, vitamin k, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenium, nickel, silicon, vanadium and zinc. Washington, D.C.: The National Academies Press; 2001. 800 p.

16. Food and Nutrition Board. Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium and Carotenoids. The National Academies Press; 2000. 529p.

17. Food and Nutrition Board. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride and Sulfate. The National Academies Press; 2005. 640p.

18. Ross CA, Taylor CL, Yaktine AL, Valle HB. Dietary Reference Intakes for Calcium and Vitamin D. Washington: The National Academies Press; 2011.

19. Associação Brasileira de Empresas de Pesquisa. Critério de classificação econômica Brasil [Internet]. São Paulo: ABEP. [acesso em dez. 2011]. Disponível em: http://www.abep.org/new/criterioBrasil.aspx

20. Welsh S, Davis C, Shaw A. Development of the food guide pyramid. Nutr. Today 1992; 27(6):12-23.

21. Fonseca VM, Sichieri R, Veiga GV. Factors associated with obesity among adolescents. Rev. Saude Publica. 1998; 32(6):541-9.

22. Carvalho AP, Oliveira VB, Santos LC. Hábitos alimentares e práticas de educação nutricional: atenção a crianças de uma escola municipal de Belo Horizonte, Minas Gerais. Pediatria (São Paulo). 2010; 32(1):20-7.

23. Dall'Asta C, Scarlato AP, Galaverna G, Brighenti F, Pellegrini N. Dietary exposure to fumonisins and evaluation of nutrient intake in a group of adult celiac patients on a gluten-free diet. Mol. Nutr. Food Res. 2012; 56(4):632-40.

24. Greco L, Mayer M, Ciccarelli G, Troncone R, Auricchio S. Compliance to a gluten-free diet in adolescents, or "what do 300 coeliac adolescents eat every day?". Ital. J. Gastroenterol. Hepatol. 1997; 29(4):305-10.

25. Thompson T, Dennis M, Higgins LA, Lee AR, Sharrett MK. Gluten-free diet survey: are Americans with coeliac disease consuming recommended amounts of fibre, iron, calcium and grain foods? J. Hum. Nutr. Diet. 2005; 18(3):163-9.

26. Cheng J, Brar PS, Lee AR, Green PH. Body mass index in celiac disease: beneficial effect of a gluten-free diet. J. Clin. Gastroenterol. 2010; 44(4):267-71.

27. Valletta E, Fornaro M, Cipolli M, Conte S, Bissolo F, Danchielli C. Celiac disease and obesity: need for nutritional follow-up after diagnosis. Eur. J. Clin. Nutr. 2010; 64(11):1371-2.

28. Reilly NR, Aguilar K, Hassid BG, Cheng J, Defelice AR, Kazlow P, et al. Celiac disease in normal-weight and overweight children: clinical features and growth outcomes following a gluten-free diet. J. Pediatr. Gastroenterol. Nutr. 2011; 53(5):528-31.

29. Polito C, Olivieri AC, Marchese L, Desiderio G, Pullano F, Rea F. Weight overgrowth of coeliac children on gluten-free diet. Nutr. Res. 1992; 12(3):353-8.

30. Malandrino N, Capristo E, Farnetti S, Leggio L, Abenavoli L, Addolorato G, *et al.* Metabolic and nutritional features in adult celiac patients. Dig Dis. 2008; 26(2):128-33.

31. Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009: análise do consumo alimentar pessoal no Brasil. Rio de Janeiro: IBGE; 2011. 150 p.

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