ORIGINAL ARTICLE

Anthropometric profile of patients with celiac disease tended at the Pediatric Gastroenterology Clinic of UFMG, Belo Horizonte, MG – Brasil

Perfil antropométrico de pacientes com doença celíaca atendidos pelo Ambulatório de Gastroenterologia Pediátrica da UFMG, Belo Horizonte, MG – Brasil

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ABSTRACT

Objective: Celiac disease is characterized by being autoimmune, triggered by the presence of wheat gliadin and barley and rye proteins in the diet of susceptible people. The non-adherence to proper diet can lead to nutritional deficiency and alteration in body composition. This study evaluated the anthropometric profile and body composition of children, adolescents, and young adults with celiac disease. **Methods:** 31 patients with celiac disease and 31 control persons, within the age range from 3 to 23 years, were evaluated. Weight, height, waist and hip circumference were compared and body mass index was calculated. The percentage of body fat, muscle mass, and total water was obtained by electrical bioimpedance. Food frequency and food record questionnaires were applied to evaluate its relationship with body composition. The Fisher, Student's t, and Wilcoxon tests were used for comparison of groups. **Results:** The anthropometric and body composition analyses did not show significant differences ($p < 0.05$) between the two groups. The proportions of individuals with bodily parameters above, below, or at the healthy appropriate level were similar. **Conclusion:** The patient with celiac disease following a gluten-free diet has normal body composition. In this study, the gluten-free diet has not been proved detrimental to the body composition of these individuals.

Key words: Anthropometry; Body Composition; Celiac Disease.

RESUMO

Objetivo: *A doença celíaca caracteriza-se por ser autoimune, desencadeada pela presença da gliadina do trigo e de proteínas da cevada e do centeio, na dieta de pessoas suscetíveis. A não adesão à dieta apropriada pode levar a deficiência nutricional e alteração na composição corporal. Este estudo avaliou o perfil antropométrico e a composição corporal de crianças, adolescentes e jovens adultos com a doença celíaca.* ***Métodos:*** *Foram avaliados 31 pacientes com doença celíaca e 31 pessoas-controle, na faixa etária de três a 23 anos. Foram comparados peso, altura, circunferência abdominal e do quadril e calculado o índice de massa corporal. O percentual de gordura corporal, massa muscular e água total foi obtido pela bioimpedância elétrica. Foram realizados questionário de frequência alimentar e registro alimentar para avaliar sua relação com a composição corporal. Utilizaram-se os testes de Fisher, t de Student e de Wilcoxon para comparação dos grupos.* ***Resultados:*** *A análise antropométrica e a composição corporal não apresentaram diferenças significativas ($p<0,05$) entre os dois grupos. As proporções de indivíduos com parâmetros corporais acima, abaixo ou adequado de saúde foram semelhantes.* ***Conclusão:*** *O paciente com doença celíaca que segue a dieta isenta de glúten tem composição corporal normal. A dieta isenta de glúten não se provou prejudicial, neste estudo, à composição corporal desses indivíduos.*

Palavras-chave: *Antropometria; Composição Corporal; Doença Celíaca.*

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INTRODUCTION

Celiac disease (CD) is an autoimmune disease triggered by wheat gliadin, and proteins similar to those in barley and rye, in the diet of susceptible people. It is mainly characterized by intestinal malabsorption due to intestinal villus atrophy.[1] Its characteristic symptoms usually arise in the first years of life, after the introduction of cereals in the individual's diet. However, an increase in diagnosis is currently observed in adulthood, even resulting from non-specific complaints.[2]

The multidisciplinary treatment of CD involves a dietary approach and nutritional follow-up to ensure that the diet is complete, nutritious, and gluten-free. The non-adherence to the diet can lead to nutrients' deficiency, obesity, and high incidence of neoplasias.[3-6] An early start in gluten-free diets shows the best results in body composition recovery in patients with CD. Children under two years of age who begin receiving gluten-free diets may have less impact on body composition than those diagnosed in the teenage years or adulthood.[7] Teenagers who are diagnosed before the growth spurt of this age group can still significantly recover part of body composition, however, not as much as children.[8] CD can result in short stature, reduced lean body mass and bone mass, even without symptoms related to the digestive tract. The identification of individuals with short stature and changes in body composition can lead to a suspicion of CD because many may develop the disease without the classic symptoms.[9-11]

The diet is detrimental to the patient in the qualitative and quantitative point of view in relation to energy and nutrients. Children and adolescents with CD may exhibit disorders of body composition due to inappropriate eating habits and lack of guidance. These habits, especially in teenagers, consist of a higher consumption of lipids and proteins because foods that are sources of carbohydrates contain mostly gluten.[12] The maintenance of these eating habits can cause changes in body composition in these individuals. The increase in the percentage of total body fat and decrease in total lean mass are recognized as likely risk to human health.[13]

There are few studies in Brazil that discuss the nutritional aspects of patients with CD and their bodily changes.[6, 7, 14-16] This study was motivated by the need to assess the nutritional status, anthropometric profile, and body composition of children, adolescents, and young adults with CD.

METHOD

This was a cross-sectional, observational, and descriptive study. Data collections were carried out in the Outpatient Pediatric Gastroenterology Clinic of the HC-UFMG in dates coordinated with the study participants. The subjects were divided into two groups: the study group, consisting of patients with CD, confirmed through intestinal biopsy, tended in the Outpatient Pediatric Gastroenterology Clinic of the HC-UFMG, and between three and 23 years of age; the control group, consisting of healthy volunteers within the same age range, of both genders and belonging to any ethnicity and social status.

The individuals in the study group had a CD diagnosis confirmed by intestinal biopsy and ages between three and 25 years. In both groups (study and control), participants could not present other diseases of intestinal manifestations or Down syndrome, Turner syndrome, IgA and growth hormone deficiency, diabetes mellitus, herpetiform dermatitis, or make use of diuretics (protocol for the performance of electrical bioimpedance). A sample of convenience was designed according to the flow of patients in the Outpatient Pediatric Gastroenterology Clinic of the HC and the Celiac Association of Minas Gerais in Brazil (ACELBRA-MG). The sample was comprised of 31 children and adolescents with CD and 31 healthy volunteers, matched by age and sex. The project was approved by the Ethics and Research Committee from the UFMG in 2010, under Opinion number ETIC 0112.0.203.000-10.

Data collection was carried out between September of 2011 and June of 2012. Participants were recruited for participation by telephone calls made by the researchers or after consultation in the Outpatient Pediatric Gastroenterology Clinic of the HC-UFMG. The information collected included body composition and anthropometry (height, weight, body mass index, waist circumference, hip circumference, and body composition through the electrical bioimpedance tetrapolar place vertical equipment, InBody520), current dietary intake (24 h eating recall record and two food records), and socio-economic data (from a socioeconomic questionnaire).

Several sources of references found in the literature were used for data analysis. The body mass index (BMI), weight, height and BMI/age index were directly compared with the tables proposed by the World Health Organization (WHO) and evaluated according to the cut-off points proposed for the stud-

ied age groups.[13] The abdominal and hip circumferences were evaluated according to the cut-off points proposed by the WHO for both genders.[17]The results revealed by the electric bioimpedance (BIA) were compared with the cut-off points for total body fat percentage (% GC), total muscle mass (MM), and total body water (TBW).[18,19]The 24 h eating recall data (R24) and food registry were computed and analyzed in the software dietWin. Information about the average daily intake of calories, protein, carbohydrates, and lipids were obtained.

Statistical treatment

Descriptive analyses were performed for all variables. The level of confidence was established at 95% for the statistical tests (α= 0.05). The t-test was applied to all the normal variables with similar variance to evaluate the average difference between the two groups. The Wilcoxon test was adopted for the continuous non-normal variables. Because the two groups showed different age groups, different reference values were determined for body measurements and anthropometric variables categorized according to the classification of bodily parameters as normal, high, or deficient. The Fisher's test was used for these variables to evaluate the difference in proportions between the two groups. This test was also used for the analysis of proportions revealed by the socio-economic questionnaire. The Pearson test was applied to continuous variables of interest to evaluate the correlation between samples. The tests were executed through the programs Microsoft Excel, R, and IBM SPSS Statistics.

RESULTS

Socio-economic evaluation

A total of 62 people were evaluated, distributed in two groups of 31 each. Table 1 shows the distribution of participants according to gender, skin color, social class, nutritional follow-up, and practice of physical activities. No statistical difference was found in these parameters, only in social class (p = 0.00), which may indicate a difference in purchasing power between the two groups. Table 2 shows the descriptive analysis of age in the two groups with similar average according to the t-test (p = 0.39).

Table 1 - Distribution of study and control groups according to information in the socio-economic questionnaire

	Study Group		Control Group		P
	n	%	n	%	
Gender					
Male	23	74.19	21	67.74	0.78
Female	8	25.81	10	32.26	
Skin color					
White	21	67.74	18	58.06	0.19
Brown	8	25.81	13	41.94	
Black	2	6.45	0.00	0.00	
Other	0	0.00	0.00	0.00	
Social Class					
A1 (R$11480.00)	1	3.23	5	16.13	0.00
A2 (R$8295.00)	3	9.68	16	51.61	
B1 (4754.00)	7	22.58	5	16.13	
B2 (R$2.656.00)	13	41.94	1	3.23	
C1 (R$1459.00)	4	12.90	4	12.90	
C2 (R$962.00)	3	9.68	0	0.00	
Nutritional follow-up					
Yes	12	38.71	5	16.13	0.08
No	19	61.29	26	83.87	
Practice of physical activity					
Yes	15	48.39	21	67.74	0.19
No	16	51.61	10	32.26	

Table 2 - Descriptive analysis of age for the study and control groups

Statistics	Age		P
	Study Group	Control Group	
Median	14	14	0.39
Average	13.00	13.42	
SD*	5.79	5.70	
CV +	0.45	0.42	

Legend: (*)Standard Deviation, (+) Coefficient of Variance.

The study group responded to a portion of the questionnaire related only to CD and its symptoms. The CD diagnosis was performed in 100% of patients through intestinal biopsy and at least one serological test. In the same group, 77.42% of the patients admitted to following a completely gluten-free diet.

As for pre-diagnose symptoms of the disease, 74.19% of patients admitted some form of gastrointestinal manifestation, mostly diarrhea (51.61%), fol-

lowed by vomiting (19.35%), weight loss (16.13%), and abdominal discomfort (16.13%).

Caloric intake

Table 3 shows the average caloric intake in the two groups. This average is greater than the average total energy expenditure. The calorie consumption was significantly higher in the study group than in the control group regardless of the lack of significant difference in average values of total energy expenditure between these groups ($p > 0.05$).

Table 3 - Descriptive analyses of daily values found for total caloric value (ICI) of diets and the total energy expenditure (TEE) in the study and control groups according to the 24 h eating recall record

Variable	VCTR24		P	TEE (Kcal)		P
	Study	Control		Study	Control	
Median	2619.77	2017.10	0.00	1872.83	1832.70	0.25
Average	2602.05	2001.40		1831.09	1949.37	
SD*	703.89	619.17		598.01	549.42	
CV +	0.27	0.31		0.33	0.28	

Legend: (*)Standard Deviation, (+) Coefficient of Variance.

Evaluation of body composition and anthropometry

Measurements of weight, height, AC, and HC were collected, BMI was calculated, and total body water, body fat percentage and muscle mass were analyzed in all participants for the anthropometric profile and body composition analysis. The t test was applied for the comparison of the following normal variables averages: weight, BMI, CA, and %GC; the Wilcoxon test was used for the non-normal variables of height, CQ, TBW, and MM in the comparison of medians. No significant difference was found in all continuous variables of body composition and anthropometric values between the two groups ($p > 0.05$).

Participants in the two groups were classified according to the z-score for the BMI/age.[13] Table 4 shows the absolute values and the distribution of the two groups according to this index. According to the Fisher's test, used for the comparison of proportions, there is no statistical difference between the two groups.

The body composition analysis by means of electrical bioimpedance showed no statistical difference between the proportions of individuals with percentage of body fat, total water, and high, low, or normal muscle mass according to the Fisher's test. The classification of abdominal circumference identified nine (29.03%) individuals in the study group above the ideal measure, compared to three individuals (9.68%) in the control group. The Fisher's test showed no statistical difference between the two groups.

Table 4 - Classification of participants in the control and study groups according to the BMI/age percentile

Classification	BMI/age				P
	Study		Control		
	n	%	n	%	
Eutrophy	25	80.65	26	83.87	0.89
Thin/Underweight	3	9.68	0	0.00	
Overweight	3	9.68	5	16.13	

Table 5 shows the absolute values and percentages representative for each group in relation to the categorized variables of % GC, MM, TBW, and CA.

There was no positive correlation between the increase in caloric intake (ICI) and the increase in bodily parameters such as weight, CC, BMI, %GC, or MM in the two groups.

Table 5 - Classification of participants in the study and control groups according to % GC. MM. CA. and TBW

	Study		Control		P
	n	%	n	%	
% GC					
Normal	12	38.71	11	35.48	1
Low	10	32.26	10	32.26	
High	9	29.03	10	32.26	
CA					
High	9	29.03	3	9.68	0.1
Low	22	70.97	28	90.32	
TBW					
Normal	24	77.42	25	80.65	0.74
Low	7	22.58	5	16.13	
High	0	0.00	1	3.23	
MM					
Normal	20	64.52	22	70.97	0.58
Low	11	35.48	8	25.81	
High	0	0.00	1	3.23	

DISCUSSION

The nutritional profile of a CD patient was described as low weight, short stature, loss of muscle, bone, and fat mass; and other nutritional deficiencies such as loss of vitamins and minerals until the beginning of the 21st century.[7, 8, 20-23] The recovery of body composition and nutritional status only occurred after following a gluten-free diet. The profile of the individual with CD after beginning a dietary treatment shows an increase in weight and fat mass, and obesity.[24,25] In this study, no patient with CD who claimed to sporadically consume gluten had decreased BMI, weight, height, %GC, or MM. No significant differences were observed in weight, height, BMI, %GC, MM, CA, and CQ in the studied groups ($p > 0.05$).

In this study, all CD patients followed a fully gluten restrictive diet for at least one year. The adhesion to a gluten-free diet was assessed by collecting information from the R24 and food records. Only some participants admitted to consuming gluten sporadically. However, it was not possible to affirm with certainty that these transgressions, especially in teenagers, were occasional. Similarly, Rea et al.[26] in 1996, did not observe differences in body composition of children aged one to 12 years old who followed a gluten-free diet when compared with healthy children. This indicates that following a gluten-free diet after a CD diagnosis allowed a recovery in body composition. In the study presented here, the duration following the diet can be one of the reasons for maintenance in body composition in this group compared to the control group.

De Lorenzo et al.[23] in 1999 evaluated 43 teenagers with CD, aged between 10 and 18 years old, and compared the results with those in the control group of same age teenagers. The CD teenagers showed reduced lean body mass, weight, height, and bone mass, even after one year of dieting. The only body parameter without significant difference between the two groups was total body fat mass. Carbone et al.[8] in 2003 stressed that children and adolescents recovered weight, BMI, and %GC after four years of gluten-free diet compared with the control group, however, still showed a deficit in height and fat-free mass. In this study, although there is no significant difference in the bodily parameters between the two groups, the control group showed higher average weight, height, BMI, %GC, CA, and MM than the study group, suggesting a discreet tendency to reduction in bodily parameters in CD patients related to gluten-free diet time and adherence.

Reilly et al.[27] in 2011 observed 12.6% of overweight prevalence in 142 children and adolescents aged between one and 19 years old. The obese patients were 6% of the total study sample. In this study, only 9.68% of participants in the study group were overweight according to BMI, which is different from the profile found in other studies with patients of the same age group. The low purchasing power of individuals with CD in this study may justify the low overweight prevalence in this group because industrialized foods without gluten, which are, in large part, the cause of increase in lipid consumption in these patients, are more expensive than non-gluten free foods, and therefore, less consumed by them. Another important factor is the participation of those individuals in celiac patients associations such as the ACELBRA-MG, which assists in the adaptation to the diet with the exchange of experiences and recipes among members. These recipes commonly use fresh foods and avoid processed foods, reducing the caloric intake per meal.

By analyzing the percentage of body fat, the study group showed a higher percentage of patients classified with normal %GC than in the control group. According to the %GC, 32.26% of patients in the study group presented fatty mass above the ideal value according to Lohman, Roche, and Martorell[18], however, these authors used only BMI and did not use %GC for classifying obesity.

The Fisher's test applied to individuals in accordance with the WHO,[13] Lohman, Roche, and Martorell,[18] and Chumlea et al.[19] references for BMI, %GC, MM, BTW, CQ, and CC did not show significant difference between the proportions of the two groups, suggesting that the nutritional profile of children and adolescents evaluated in this study was similar, regardless of the CD or gluten-free diet.

The nutritional profile of children and adolescents has changed with the development of the food industry and decline in the practice of physical activity.[28] The nutritional transition in Brazil, observed in the 70, 80, and 90 decades by Baptist Filho and Rissin[30], was marked by the reduction of malnutrition and tripled obesity values. In this study, the practice of physical activities was lower in the study group (48.39%) than in the control group (67.74%), however without a statistical difference ($p = 0.19$). The average caloric consumption was elevated in both groups but significantly higher in the study group (Table 5).

In the most recent Research of Family Budgets (POF), carried out by IBGE between 2008 and 2009[29],

14.3% of children between five and nine years old were obese, and 33.5% were overweight. In adolescents from 10 to 19 years of age, 4.9% of participants were classified as obese, and 20.5% as overweight. In young adults, from 20 to 24 years of age, 5.6% were classified as obese and 27.3% as overweight.[29] In the present study, the prevalence of individuals with CD classified as overweight according to the BMI/age index was low[13]. Only 9.68% of individuals in the study group were classified as overweight according to this method. This value was higher in the control group in which 16.13% of the individuals were classified as overweight according to BMI/age index. The evaluation of %GC showed that the percentage of individuals with body fat above the ideal value was 29.03% in the study group, and 32.25% in the control group. These values were lower than the Brazilian profile values reported on the POF 2008-2009 when only BMI was analyzed. The use of %GC, in turn, facilitates the classification of the individual according to his real body composition because the BMI can mask the excess body fat by assessing only the total weight. The participants in this study, when ranked according to %GC, showed values similar to those reported as overweight in the POF 2008-2009. It is important to highlight that because we evaluated a heterogeneous group with respect to age, there was a difference in the classification of bodily parameters among children, adolescents, and young adults resulting from different types of body composition.

CONCLUSION

In the present study, the analysis of anthropometric values in a group of CD patients compared with the same variables in the control group of same age range shows that there are no significant differences in weight, height, muscle mass, %GC, total water, and waist and hip circumference. The gluten-free diet, adopted by the patients in this study, was not harmful to body composition in these individuals, although it leads to an increased total caloric intake. The increased caloric intake in both groups seems to be related to the age food profile and not only to the adoption of a gluten-free diet. Because this study evaluated a small number of participants, the elaboration of additional studies is necessary to evaluate body composition and dietary intake in patients over time, and related to the real influence of following a long-term gluten-free diet on their nutritional status. After that, it will be possible to evaluate whether increased calories and lipids consumption in these individuals could lead to increased weight, BMI, and fat mass overtime.

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