ORIGINAL ARTICLE

AG-2020-220
doi.org/10.1590/S0004-2803.202100000-50

How is the diet quality of patients with Crohn's disease in clinical remission using infliximab?

Melissa Mercadante Santana **CRUZ**, Pâmela Dias **FONTANA**, Odery **RAMOS-JUNIOR** and Estela Iraci **RABITO**

Received: 13 October 2020
Accepted: 12 February 2021

ABSTRACT – **Background** – A healthy diet is recommended for patients with Crohn's disease (CD) in remission. **Objective** – To evaluate the diet quality of patients with CD. **Methods** – Cross-sectional study with patients with CD and clinical remission using the biological agent infliximab. The diet quality was assessed using the Diet Quality Index-Revised (DQI-R). DQI-R was calculated based on 24-hour dietary recalls (24HR), being classified as "inadequate diet" (≤40 points), "diet requiring modifications" (41 to 64 points) and "healthy diet" (≥65 points). Weight, height and waist circumference (WC) of patients were assessed. For comparison between groups, Student's t-test or Mann-Whitney was used. For correlation between continuous variables, Pearson or Spearman coefficient was used. Values of $P<0.05$ indicated statistical significance. **Results** – A total of 43 patients participated in the study. The final DQI-R score was 49.1 points – "diet requiring modifications". No patient received the classification of "healthy diet" (maximum score =59.7), 55.8% presented "diet requiring modifications" and 44.2% "inadequate diet". When comparing the "inadequate diet" and "diet requiring modifications" groups, a lower mean age was observed in the "inadequate diet" group (37.6±14.8 versus 47.4±10.5 y, $P=0.02$). It was found that 44.2% of the patients were overweight (body mass index [BMI] ≥25 kg/m²) and had increased WC (women: WC ≥80 cm and men: WC ≥94 cm). A positive correlation was found between the final DQI-R score and BMI ($P=0.046$; r=0.346). **Conclusion** – Patients with CD in clinical remission using infliximab are not adopting a diet considered healthy, which points to the need for an individualized nutritional approach.

Keywords – Inflammatory bowel diseases; Crohn disease; food; quality; diet; nutritional status; tumor necrosis factor-alpha; infliximab.

INTRODUCTION

Inflammatory bowel disease (IBD) is a chronic condition of intestinal inflammation, mainly represented by Crohn's disease (CD) and ulcerative colitis (UC). CD is characterized by lesions and transmural inflammation that can affect the entire gastrointestinal tract, from the mouth to the anus[1].

Although CD is historically associated with malnutrition, evidence indicates the occurrence of a nutritional transition process with an increase in overweight and obesity in these individuals[2]. The mechanisms are still unclear[3], however, it is suggested that the introduction of biologic agents may be one of the causative factors[4,5].

Biological therapies, such as infliximab (IFX), an anti-TNF-monoclonal antibody, induce and maintain remission of the disease for a prolonged period, reducing symptoms and catabolism associated with inflammation[4,5]. Thus, patients with CD on this therapy show weight gain and changes in their eating habits[6,7].

Although the European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the adoption of a healthy diet during IBD remission[8], it is common for patients to adopt a diet with high intake of animal protein, carbohydrates and total fats and low intake of unsaturated fats and fibers. The imbalance in the diet composition may be associated with an increase in obesity and disease recurrences[6,7].

There is a lack of studies defining the profile of consumption and food choices in patients with CD undergoing biologic therapy. Therefore, this research aims to evaluate the diet quality of patients with CD in clinical remission using IFX. The hypothesis is that these individuals have low-quality diet.

METHODS

Sample

This is a cross-sectional study with patients with CD patients in clinical remission using IFX. The study was conducted at the IBD outpatient clinic at *Hospital de Clínicas*, *Universidade Federal do Paraná*, a reference center for the diagnosis and treatment of IBD patients in the state of Paraná. The study took place from August 2018 to July 2019.

Inclusion criteria were patients with CD: in clinical remission using IFX, of both sexes, aged between 18 and 65 y. The clinical remission of the disease was defined by Harvey-Bradshaw's index (score ≤4) and/or the clinical diagnosis of remission recorded in the medical record by the gastroenterologist.

Those who agreed to participate in the research signed the informed consent term (ICF), as approved by the Research Ethics Committee under number 63801717.0.0000.0096 on June 22, 2017. The study was developed according to the ethical criteria of Resolution 466/2012 of the National Health Council of the Ministry of Health (Brazil).

Declared conflict of interest of all authors: none
Disclosure of funding: no funding received
Universidade Federal do Paraná, Complexo Hospital de Clínicas, Ambulatório de Doença Inflamatória Intestinal, Programa de Pós-graduação em Alimentação e Nutrição, Curitiba, PR, Brasil.
Corresponding author: Melissa Mercadante Santana Cruz. E-mail: melissa.mercadante@outlook.com

Exclusion criteria were patients with CD: in clinical activity; who underwent recent surgery on the gastrointestinal tract (≤3 months); in IFX induction protocol; kidney or hepatis disease, cancer and other inflammatory diseases.

To assess the clinical characteristics of CD, the following information was collected from the medical record: CD time (years), CD location and behavior, bowel resection surgery, Harvey-Bradshaw's Index score and IFX treatment time (years).

For the sample calculation, the G power Windows 3.1.9.2 program was used[9]. The multiple linear regression statistical test was considered: fixed model, R^2 deviation from zero, effect size of 0.35 (wide), α error of 0.05, sampling power (1- β) of 0.8, five of which predictors, totaling 43 patients.

Assessing diet quality

To assess the quality of the diet, the Diet Quality Index-Revised (DQI-R) was considered. DQI-R consists of a qualitative assessment tool for diet developed based on the recommendations of the Dietary Guideline for Brazilian Population 2006, World Health Organization, Institute of Medicine, Healthy Eating Index 2005 and the Brazilian Society of Cardiology[10].

DQI-R has twelve components adjusted per 1000 kcal, with nine food groups, two nutrients and one component referring to the sum of the energy value from the intake of solid fat, alcohol and added sugar (empty calories) (TABLE 1).

Components 1 to 9 assess suitability and components 10 to 12, moderation, that is, increased consumption reflects positively on the scores of groups 1 to 9 and negatively on groups 10 to 12. Maximum total score of 100 points is assigned, being 5, 10 or 20 points for components with ideal consumption; 0 for non-consumption or inadequate consumption and intermediate values in proportion to the amount consumed[10].

To calculate DQI-R, two 24-hour dietary recalls (24HR) were applied on different days of the week, with an interval of 1 to 2 months between them. 24HR was applied by researchers trained according to the "multiple pass" technique to minimize possible reporting errors[11]. For patients who entered the disease activity in the interval between collections of food consumption, only the first 24HR was considered.

Quantitative analysis of food intake was performed using the diet analysis software Erica®. The *Tabela de Composição Nutricional dos Alimentos (TACO)* of *Instituto Brasileiro de Geografia e Estatística (IBGE)* was selected as a data source[12]. In order to minimize the effects of diet variability, food consumption data were adjusted using the "Multiple Source Method" (MSM) statistical modeling method[13].

The allocation of food in food groups and the steps for calculating DQI-R were based on the script of the *Grupo de Pesquisa de Avaliação de Consumo Alimentar* at the *Universidade de São Paulo* (GAC-USP)[14].

After scores for each component, the DQI-R was classified according to the total scores (0 to 100 points) and categorized into: "inadequate diet" (≤40 points), "diet requiring modifications" (41 to 64 points) and "healthy diet" (≥65 points)[15].

Anthropometric evaluation

For anthropometric evaluation, weight, height and waist circumference (WC) were measured. Weight was measured on an anthropometric scale with a maximum capacity of 150 kg and variation of 100 g (Welmy®) and height was measured on a mobile stadiometer coupled to the scale with millimeter precision. BMI was calculated by dividing weight in kilograms by height squared in meters. Cut-off points established by the World Health Organization (WHO) were adopted[16].

WC was measured using a flexible anthropometric tape with an accuracy of 0.1 cm (Cescorf®). The measurement was made at the midpoint between the iliac crest and the last rib. Cut-off points established by the WHO were adopted, considered increased WC when ≥80 cm in women and ≥94 cm in men[16].

Food exclusion or restriction

In order to investigate the exclusion or restriction of foods or food groups related to the worsening of the disease symptoms, the participants were asked the following: "Do you exclude or restrict

TABLE 1. Score and portions distribution of the Revised Diet Quality Index (DQI-R) components[10].

Components	Score (points)				
	0	5	8	10	20
1. Total fruits[a]	0	1.0 portion/1000 kcal			
2. Whole fruits[b]	0	0.5 portion/1000 kcal			
3. Total vegetables[c]	0	1.0 portion/1000 kcal			
4. Dark green and orange vegetables and legumes[d]	0	0.5 portion/1000 kcal			
5. Total cereals[e]	0	2.0 portions/1000 kcal			
6. Whole grains	0	1.0 portion/1000 kcal			
7. Milk and dairy[f]	0			1.5 portion/1000 kcal	
8. Meat, eggs and legumes	0			1.0 portion/1000 kcal	
9. Oils[g]	0			0.5 portion/1000 kcal	
10. Saturated fat	≥15		10	≤7% of TEV	
11. Sodium	≥2		1	≤0.75 g/1000 kcal	
12. Empty calories	≥35				≤10 % of TEV

Empty calories: energy from solid fat, alcohol and added sugar; TEV: total energy value; kcal: kilocalories; g: grams.

a. Includes fruits and natural fruit juices. b. Excludes fruit juice. c. Includes legumes only after the maximum score for meat, eggs and legumes has been reached. d. Only after the maximum score for meat, eggs and legumes is reached. e. Total cereals = represents the group of cereals, roots and tubers. f. Includes milk and soy beverages. g. Includes monounsaturated and polyunsaturated fats, oils from fish and nuts.

food for associating with worsening of the symptoms?". Participants were asked to answer "yes" or "no". In case of exclusion or restriction, the following foods were questioned: milk and dairy products, meats, processed meat, seasoning/spicy foods, citrus fruits, coffee/tea, flatulent vegetables (cabbage, spring greens, radish, peppers etc.), soft drinks, sweets/sugar, legume and fatty/fried foods, based on the results of previous studies conducted with patients with IBD[6,17,18]. If the patient reported exclusion or restriction of other foods/food groups that were not among the options mentioned, these were recorded. In the evaluation of all responses, those foods/groups that were repeated among study participants were identified.

Statistical analysis

Statistical analyzes were performed using SPSS version 22.0. To assess the condition of normality of continuous quantitative variables, the Shapiro-Wilk test was used, being considered normal distribution, *P* value >0.05. Variables with normal distribution were described as mean and standard deviation, and for non-normal distribution, the median or confidence interval, minimum and maximum values were presented. For comparison between two groups, Student's *t*-test for independent samples or the non-parametric Mann-Whitney test was used.

Categorical variables were analyzed by calculating frequency. To verify association between category variables, the chi-square test of independence was used. The correlation between continuous variables was analyzed using Pearson's or Spearman's coefficient.

For the multiple linear regression model, the final DQI-R score and independent variables were used as the dependent variable: BMI, age, stricturing behavior, bowel resection surgery and the report of food exclusion/restriction. Values of $P<0.05$ indicated statistical significance.

The preparation of the article followed the STROBE system (Strengthening the Reporting of Observational studies in Epidemiology) for cross-sectional study.

RESULTS

For the study, 63 patients were invited; however, 20 patients were excluded – 11 for not meeting the inclusion criteria and 9 for not accepting to participate in the research. Thus, the study population was composed of 43 patients.

As for sociodemographic characteristics, 53.5% (n=23) were female and 46.5% (n=20) male. The mean age was 43.1±13.5 y and education level was 10.5±2.7 y, with no significant difference between genders (*P*=0.069 and *P*=0.959, respectively). The participants had an average of 14.1±8.0 y with CD and 5.6 y (0.3–21.7) using IFX, the age at diagnosis being 26.0 y (2.0–54.0). The other clinical characteristics are described in TABLE 2.

As for the analysis of the diet quality, participants had a final mean score of 49.1 points, classified as "diet requiring modifications". Regarding the classification in tertiles of the diet quality, no patient received the classification of "healthy diet" (maximum score =59.7), 55.8% (n=24) presented "diet requiring modifications" and 44.2 % (n=19) "inadequate diet".

Components of DQI-R with the highest percentages in relation to the maximum score were, respectively: "oils", "whole fruits" and "meats, eggs and legumes", while components with the lowest percentages in relation to the maximum score were: "whole grains", "Empty calories" and "milk and dairy products", as shown in TABLE 3.

TABLE 2. Clinical Characteristics of patients with Crohn's disease in remission using Infliximab.

Variables	Total (n=43) % (n)
Age at diagnosis (years)	
≤16 y	16.3 (7)
17–40 y	65.1 (28)
≥40 y	18.6 (8)
Disease location	
Ileal	16.3 (7)
Colonic	32.6 (14)
Ileocolonic	46.5 (20)
Ileocolonic + upper GIT	4.7 (2)
Crohn's disease behavior	
Non-stricturing, non-penetrating	11.6 (5)
Stricturing	27.9 (12)
Stricturing + "p"	2.3 (1)
Penetrating	2.3 (1)
Penetrating + "p"	20.9 (9)
Stricturing and penetrating	14.0 (6)
Stricturing and penetrating + "p"	20.9 (9)
Bowel resection	41.9 (18)
Large intestine	61.1 (11)
Small + large intestine	38.9 (7)
Harvey-Bradshaw's Index *	0.69±1.1

GIT: gastrointestinal tract; y: years; "p": perineal. * Four patients were not included in the calculation of the Harvey-Bradshaw's Index. Variables with normal distribution are described as mean and standard deviation and variables with non-normal distribution are described as median and minimum and maximum median.

TABLE 3. Revised Diet Quality Index (DQI-R) score.

Variables	Maximum score	Mean score CI 95% (min. – max.)	Percentage in relation to the maximum score (%)
Food components			
Total fruits	5	3.3 (2.6–3.9)	66.0
Whole fruits	5	3.6 (2.9–4.3)	72.0
Total vegetables	5	3.1 (2.5–3.8)	62.0
DGOVL	5	2.6 (1.9–3.4)	52.0
Total cereals	5	2.7 (2.4–3.0)	54.0
Whole grains	5	0.1 (0.0–0.2)	2.0
Milk and dairy	10	3.2 (2.3–4.1)	32.0
Meats, eggs, legumes	10	6.7 (5.9–7.5)	67.0
Oils	10	8.7 (7.8–9.6)	87.0
Saturated fat	10	4.4 (3.3–5.5)	44.0
Sodium	10	4.0 (3.3–4.6)	40.0
Empty calories	20	6.7 (5.1–8.3)	33.5
DQI-R – Total score	**100**	49.1 (45.4–53.2)	100

DGOVL: dark green and orange vegetables and legumes; empty calories: energy from solid fat, alcohol and added sugar; DQI-R: Revised Quality Index; CI: confidence interval; min: minimum; max: maximum.

After classifying the diet quality in tertiles, a comparison was made between the "inadequate diet" and "diet requiring modifications" groups. A lower mean age was found in the "inadequate diet" group (37.6±14.8 versus 47.4±10.5 y, *P*=0.02) (TABLE 4).

As for the anthropometric evaluation, it was observed that 44.2% (n=19) of the patients were overweight (BMI ≥25 kg/m^2) and had increased WC (women: WC ≥80 cm and men: WC ≥94 cm). The evaluation by sex is described in TABLE 5.

It was found that the longer the time using IFX, the higher the BMI (*P*=0.043; r=0.310) and WC (*P*=0.018; r=0.359). No association was found between CD time and IFX time with the final DQI-R score (*P*=0.248 and *P*=0.185, respectively).

Most patients (79.1%, n=34) reported exclusion or restriction of at least one food or food group because it was associated with worsening symptoms. The items "milk and dairy products", "seasoned and spicy foods" and "fatty and fried foods" presented a higher frequency of reporting, while the items: "sweets and sugar", "coffee and tea" and "fruits in general" presented lower frequencies as described in TABLE 6.

TABLE 4. Comparison according Revised Diet Quality Index classification.

Variables	"Inadequate diet" (n=19)	"Diet requiring modifications" (n=24)	*P*
Age (years)	37.6±14.8	47.4±10.5	0.02**
Education level (years)	11 (8.0–15.0)	10.2 (4–16)	0.30
CD time (years)	11 (2–35)	12.5 (7–39)	0.47
IFX time (years)	4.9 (0.3–11.8)	6.4 (0.3–21.7)	0.37
Harvey-Bradshaw's Index*	0.59±1.1	0.77±1.2	0.63
BMI (kg/m²)	23.5±4.2	25.2±3.2	0.15
Waist circumference (cm)	82.0±11.3	85.7±10.1	0.26
Sex male / female % (n)	47.4% (9) / 52.6% (10)	45.8% (11) / 54.2% (13)	0.92

* Four patients were not included in the calculation of the Harvey-Bradshaw's Index. Variables with normal distribution are described as mean and standard deviation and variables with non-normal distribution are described as median a minimum and maximum median. Student's *t*-test or Mann-Whitney test were used to compare continuous variables between groups. To verify association between category variables, the chi-square test of independence was used. ** Indicates significant difference (*P*<0.05).

TABLE 5. Anthropometric characteristics of patients with Crohn's disease in remission using infliximab.

Variables	Total (n=43)	Female (n=23)	Male (n=20)	*P*
Weight (kg)	65.4±11.9	60.9±10.6	70.7±11.3	0.00**
Height (m)	1.63±0.1	1.57±0.76	1.72±0.7	0.00**
BMI (kg/m²)	24.4±3.7	24.8±3.6	24.0±3.9	0.45
% (n) BMI (≥25.0 kg/m²)	44.2 (19)	43.5 (10)	45.0 (9)	0.90
WC (cm)	84.1±10.7	82.5±10.4	86.0±11.0	0.29
% (n) increased WC*	44.2 (19)	62.5 (15)	20.0 (4)	0.00**

BMI: body mass index; WC: waist circumference; cm: centimeters; kg: kilos; m: meters. * Increased WC: women: WC ≥80 cm and men: WC ≥94 cm. For comparison between groups, Student's *t*-test or Mann-Whitney was used. To verify association between category variables, the chi-square test of independence was used. ** Indicates significant difference (*P*<0.05). Variables with normal distribution are described as mean and standard deviation and variables with non-normal distribution are described as median and minimum and maximum median.

TABLE 6. Frequency of exclusion or restriction of food and food groups reported by patients.

Food and food groups	Frequency (n=43) exclusion ou restriction % (n)
Milk and dairy	53.5 (23)
Seasoning / spicy food	46.5 (20)
Fatty / fried foods	44.2 (19)
Legumes	37.2 (16)
Flatulent vegetables	32.6 (14)
Processed meat	25.6 (11)
Citrus fruits	20.9 (9)
Soft drinks	18.8 (8)
Meats	14.0 (6)
Vegetables and legumes (in general)	11.6 (5)
Fruits (in general)	7.0 (3)
Coffee and tea	7.0 (3)
Sweets and sugar	2.3 (1)

There was no significant difference between the DQI-R score between those who reported exclusion or restriction of foods or food groups and those who did not (*P*=0.305).

In the analysis of the multiple linear regression model, an association was found between the dependent variable final DQI-R score and the independent variables: BMI, age and stricturing behavior (adjusted R^2=0.157, *P*=0.022). BMI and age are directly correlated with the final DQI-R score (respectively, *P*=0.046; r=0.346 and *P*=0.006; r=0.414).

DISCUSSION

Diet quality and food exclusion / restriction

Results show that 44.2% of the patients had inadequate diet and were overweight. This is the first study to assess diet quality in patients with CD in clinical remission using IFX.

The mean of the final DQI-R score was 49.1 points, classified as "diet requiring modifications". Pires et al. (2020) found an average of 72.6 points in DQI-R among 14,849 healthy participants in the "Longitudinal Study of Adult Health – *ELSA BRASIL*", being higher than the final score found in this study[19]. Although healthy eating recommended during CD remission[8], patients often report symptoms compatible with irritable bowel syndrome (IBS), with food restriction being common[20]. Therefore, a lower score on the DQI-R was expected when compared to the study by Pires et al., 2020, conducted with the healthy population[19].

The exclusion or restriction of at least one food/food group was reported by 79.1% of the participants. Although no significant difference was found in the final DQI-R score between those who reported food exclusion/restriction and those who did not, this behavior can interfere with the individual score of the evaluated components. An example is the "milk and dairy products" com-

ponent, which had one of the lowest percentages of adequacy in relation to the maximum DQI-R score (32%) justified by the higher frequency of reported food exclusion/restriction (53.5%).

The practice of exclusion/restriction of milk and dairy products seems common among patients with IBD in remission[4,20]. In the study by Lopes et al. (2014), 52.3% of patients claimed some change in the consumption of dairy products after the diagnosis of IBD, the main reasons being: exacerbation or onset of symptoms (45.5%), followed by guidance from the health professional (36.4%)[21].

The low percentage in relation to the maximum DQI-R score for the component "whole grains" (2%) also stands out. Although the lower consumption of cereals, fruits and/or vegetables is involved with the etiology of IBD, it is possible that this practice is in response to the disease and not to an etiological factor. Patients can adopt a low-fiber diet in order to minimize symptoms such as diarrhea[7].

In the evaluated patients, the component "whole fruits" presented one of the highest percentages in relation to the maximum score of DQI-R (72%), which could be justified by the low frequency of food exclusion/restriction report (7%), unlike the common practice adopted by patients with CD[22].

Fiber consumption has a protective effect against the disease's activity. Brotherton et al. (2016) when evaluating 1,619 patients with IBD in remission, 1,130 with CD and 489 with UC, found that patients who did not avoid fiber consumption were approximately 40% less likely to exacerbate the disease when compared to those who avoid food that is rich in fiber[23].

Other food components that stood out with a higher percentage in relation to the maximum DQI-R score were "oils" and "meat, eggs and legumes". Despite contributing with a higher score, DQI-R does not consider excessive consumption for these components of adequacy, as observed in food records.

Higher scores in "oils" component can be negative from the point of view of the diet quality when including fried foods. Although the intake of polyunsaturated fats from vegetable oils can be beneficial to health due to the anti-inflammatory nature, when oxidized and decomposing, as in the case of fried foods, they are sources of inflammation in patients with IBD[24].

As for the component "meat, eggs and legumes", we observed in the dietary recalls the low consumption of legumes, but high consumption of meat, which may have compensated in the final score of the component and contributed with a lower score in the moderation component "saturated fats".

Low consumption of legumes may be associated with the presence of fermentable oligosaccharides, poorly tolerated by individuals with IBD[26]. Since 37.2% of the patients reported the exclusion/restriction of this food group for being associated with symptoms. In addition, bean consumption has been losing ground among Brazilians with a 52% reduction between *Pesquisa de Orçamento Familiar (POF)* from 2002 – 2003 to 2017 – 2018[25].

High meat intake by patients with IBD has also been observed in other studies[6,7,27]. According to Opstelten et al. (2019), this practice occurs even before the diagnosis of IBD, which may suggest that general food choices of IBD patients persist after diagnosis[6].

Such an argument could justify the low score for the "empty calories" component, since the high consumption of foods rich in solid fat and added sugar, present in processed and ultra-processed foods, are common in the dietary pattern of the general population[28]. Consumption of added sugar may be even higher in patients with IBD in remission when compared to the control group of healthy individuals[6,7].

As observed in this and other studies, patients with CD in remission, regardless of drug treatment, are adopting a diet with characteristics similar to the Western diet pattern, so an increase in excess weight has been common.

Anthropometric evaluation

In this study, an association was found between the final DQI-R score and BMI, age and stricturing behavior, when inserted in the multiple linear regression model. BMI showed a positive association with DQI-R, which could be explained by the instrument being a qualitative method of assessing consumption and not a quantitative one. Thus, patients with a higher BMI may have a higher energy intake and, therefore, reflect a higher score on the adequacy components of DQI-R.

Patients in the "diet requiring modifications" group had a mean age significantly higher than the patients in the "inadequate diet" group (37.6±14.8 versus 47.4±10.5 y, P=0.02). The better quality of the diet with increasing age may be associated with motivation to follow a healthy diet. As individuals age, they become more aware of the need to improve their diet to treat or prevent chronic illnesses[29].

In this study, the longer the time using IFX, the higher the BMI (P=0.043; r=0.310) and WC (P=0.018; r=0.359), however the correlations found were weak. Despite the beneficial effect on the recovery of the nutritional status that has been observed since the beginning of the IFX induction protocol until maintenance[30], Santos et al. (2017) found a significant increase in weight gain and WC after 6 months of treatment with the drug[5].

Since dietary inadequacies and increased overweight are common characteristics in patients with CD in remission and since nutritional status can influence the loss of response to biological therapy[31], individualized nutritional monitoring is essential.

This study presents limitations due to the small sample size and the loss of patients who refused to participate (14.3%). However, strict criteria for the selection of participants were adopted to ensure the homogeneity of the clinical characteristics of the sample. The absence of a control group in the study was justified by the limitation of comparing patients with CD with healthy individuals or with other diseases, since the samples would be heterogeneous due to the different types of treatments, stages and clinical manifestations of the disease.

Although the dietary intake assessment has limitations, we sought to minimize possible sources of bias by adjusting the variability of the diet using the MSM statistical modeling method; using the "multiple pass" technique by researchers trained to complete the 24HR and adoption of a specific food composition table for Brazilians.

The identification of the dietary profile in patients with CD in remission using IFX stands out as a strong point of the study. The adoption of a low-quality diet and being overweight points to the need for differentiated nutritional care. To approach low scores in DQI-R, it is necessary to make an assessment as to the adequacy of energy consumption, as well as a study of the individual scores of food components[32].

Although the amounts of energies and nutrients have been calculated and are important in dietary assessment, this work sought to know the foods or food groups that make up the patients' dietary pattern. The evaluation of the group of foods within a dietary pattern facilitates the orientation for the patient in terms of food and not just isolated nutrients[32].

For future studies, it is necessary to investigate the socioeco-

nomic profile on the quality diet of these patients. The identification of food choices can support studies for intervention and food and nutrition education approaches aimed at these patients.

CONCLUSION

CD patients in clinical remission using IFX are not adopting a considered healthy diet. This profile may have been influenced by exclusions and dietary restrictions that are maintained by the patients, even in disease remission. Therefore, the need for an individualized nutritional approach is emphasized.

ACKNOWLEDGEMENT

We thank the Coordenação de *Aperfeiçoamento de Pessoal de Nível Superior* (CAPES) and *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CNPq) for funding the scholarship of the authors (Cruz MMS and Fontana PD).

Authors' contribution

Cruz MMS: data collection, statistical analysis and text writing. Fontana PD: data collection and text review. Ramos Junior O, Rabito EI: orientation and text review.

Orcid

Melissa Mercadante Santana Cruz: 0000-0003-1853-0336.
Pâmela Dias Fontana: 0000-0003-3031-6367.
Odery Ramos Junior: 0000-0002-9730-6860.
Estela Iraci Rabito: 0000-0002-3857-9746.

Cruz MMS, Fontana PD, Ramos Junior O, Rabito EI. Como está a qualidade da dieta de pacientes com doença de Crohn em remissão clínica e em uso de infliximabe? Arq Gastroenterol. 2021;58(3):289-95.

RESUMO – **Contexto** – É recomendado alimentação saudável para pacientes com doença de Crohn (DC) em remissão. **Objetivo** – Avaliar a qualidade da dieta de pacientes com DC. **Métodos** – Estudo transversal com pacientes com DC em remissão clínica e em uso do imunobiológico infliximabe. A qualidade da dieta foi avaliada pelo índice de qualidade da dieta revisado (IQD-R). O IQD-R foi calculado a partir do recordatório 24 horas, sendo classificado em "dieta inadequada" (≤40 pontos), "dieta que requer modificações" (41 a 64 pontos) e "dieta saudável" (≥65 pontos). Os pacientes foram avaliados quanto ao peso, altura e circunferência da cintura (CC). Para comparação entre grupos foi utilizado o test-*t* de Student ou Mann-Whitney. Para correlação entre variáveis contínuas foi utilizado o coeficiente de Pearson ou Spearman. Valores de $P<0,05$ indicaram significância estatística. **Resultados** – Participaram do estudo 43 pacientes. A pontuação final do IQD-R foi de 49,1 pontos – "dieta que requer modificações". Nenhum paciente recebeu a classificação de "dieta saudável" (pontuação máxima =59,7), 55,8% apresentaram "dieta que requer modificações" e 44,2% "dieta inadequada". Ao comparar os grupos "dieta inadequada" e "dieta que requer modificações", foi observado menor média de idade no grupo "dieta inadequada" (37,6±14,8 versus 47,4±10,5 anos, $P=0,02$). Verificou-se que 44,2% dos pacientes estavam acima do peso (índice de massa corporal (IMC) ≥25 kg/m²) e possuíam CC aumentada (mulheres: CC ≥80 cm e homens: CC ≥94 cm). Foi encontrada correlação positiva entre a pontuação final do IQD-R e o IMC ($P=0,046$; r=0,346). **Conclusão** – Os pacientes com DC em remissão clínica e em uso de infliximabe não estão adotando dieta com qualidade considerada saudável o que aponta a necessidade de abordagem nutricional individualizada.

Palavras-chave – Doenças inflamatórias intestinais; doença de Crohn; alimento; qualidade; dieta; estado nutricional; fator de necrose tumoral alfa; infliximabe.

REFERENCES

1. Bernstein CN, Eliakim A, Fedail S, Fried M, Gearry R, Goh KL, et al. World Gastroenterology Organisation Global Guidelines Inflammatory Bowel Disease: Update August 2015. J Clin Gastroenterol. 2016;50:803-18.
2. Bischoff SC, Escher J, Hébuterne X, Kłęk S, Krznaric Z, Schneider S, et al. ESPEN practical guideline: Clinical Nutrition in inflammatory bowel disease. Clin Nutr. 2020;39:632-53.
3. Singh S, Dulai PS, Zarrinpar A, Ramamoorthy S, Sandborn WJ. Obesity in IBD: Epidemiology, pathogenesis, disease course and treatment outcomes. Nat Rev Gastroenterol Hepatol. 2017;14:110-21.
4. Vidarsdottir JB, Johannsdottir SE, Thorsdottir I, Bjornsson E, Ramel A. A cross-sectional study on nutrient intake and -status in inflammatory bowel disease patients. Nutr J. 2016;15:1-6.
5. Dos Santos JC, Malaguti C, De Azevedo LF, Cabalzar AL, Da Rocha Ribeiro TC, Gaburri PD, et al. Impact of biological therapy on body composition of patients with Chron's disease. Rev Assoc Med Bras. 2017;63:407-13.
6. Opstelten JL, de Vries JHM, Wools A, Siersema PD, Oldenburg B, Witteman BJM. Dietary intake of patients with inflammatory bowel disease: A comparison with individuals from a general population and associations with relapse. Clin Nutr. 2019;38:1892-8.
7. Pieczyńska J, Prescha A, Zabłocka-Słowińska K, Neubauer K, Smereka A, Grajeta H, et al. Occurrence of dietary risk factors in inflammatory bowel disease: Influence on the nutritional status of patients in clinical remission. Adv Clin Exp Med. 2019;28:587-92.
8. Forbes A, Escher J, Hébuterne X, Kłęk S, Krznaric Z, Schneider S, et al. ESPEN guideline: Clinical nutrition in inflammatory bowel disease. Clin Nutr. 2017;36:321-47.
9. Heinrich-Heine-Universität Düsseldorf (HHU). G Power, version 3.1.9.2. Düsseldorf, 2014.
10. Previdelli AN, Andrade SC, Pires MM, Ferreira SRG, Fisberg RM, Marchioni DM. A revised version of the Healthy Eating Index for the Brazilian population. Rev Saude Publica. 2011;45:794-8.
11. Moshfegh AJ, Rhodes DG, Baer DJ, Murayi T, Clemens JC, Rumpler WV., et al. The US Department of Agriculture Automated Multiple-Pass Method reduces bias in the collection of energy intakes. Am J Clin Nutr. 2008;88:324-32.
12. Instituto Brasileiro de Geografia e Estatística (IBGE), Coordenação de Trabalho e Rendimento. Pesquisa de Orçamentos Familiares: 2008-2009. Análise do Consumo Alimentar Pessoal no Brasil. Biblioteca do Ministério do Planejamento, Orçamento e Gestão. 2011. 150 p.
13. Multiple Source Method Program. Department of Epidemiology of the German Institute of Human Nutrition Potsdam-Rehbrücke. Version 1.0.1. [Internet]. [cited 2020 April 7]. Available from: www.msm.dife.de
14. Grupo de Pesquisa de Avaliação de Consumo Alimentar (GAC). Universidade de São Paulo. Roteiro explicativo para o cálculo do IQD-R e Cálculo do IQD-R e seus componentes. [Internet]. [cited 2020 April 7]. Available from: www.gac-usp.com.br/orientações.php

15. Fisberg RM, Slater B, Barros RR, Lima FD de, Cesar CLG, Carandina L, et al. Índice de Qualidade da Dieta: avaliação da adaptação e aplicabilidade. Rev Nutr. 2004;17:301-18.
16. World Health Organization (WHO). Obesity: preventing and managing the global epidemic: Report of a WHO consultation on obesity. (WHO Technical Report Series n. 894). Geneva, Switzerland: WHO, 2000.
17. Vagianos K, Clara I, Carr R, Graff LA, Walker JR, Targownik LE, et al. What are adults with inflammatory bowel disease (IBD) eating? A closer look at the dietary habits of a population-based Canadian IBD cohort. J Parenter Enter Nutr. 2016;40:405-11.
18. Lim HS, Kim SK, Hong SJ. Food Elimination Diet and Nutritional Deficiency in Patients with Inflammatory Bowel Disease. Clin Nutr Res. 2018;7:48.
19. Pires RK, Luft VC, Araújo MC, Bandoni D, Molina MDC, Chor D, et al. Critical analysis of the revised diet quality index for the brazilian population (Dqi-r): Its application in elsa-brasil. Cienc e Saude Coletiva. 2020;25:703-13.
20. Marsh A, Kinneally J, Robertson T, Lord A, Young A, Radford-Smith G. Food avoidance in outpatients with Inflammatory Bowel Disease – Who, what and why. Clin Nutr ESPEN. 2019;31:10-6.
21. Lopes MB, Rocha R, Lyra AC, Oliveira VR, Coqueiro FG, Almeida NS, et al. Restricción de productos lácteos; una realidad en pacientes con enfermedad inflamatoria intestinal. Nutr Hosp. 2014;29:575-81.
22. DeClercq V, Langille MG, Van Limbergen J. Differences in adiposity and diet quality among individuals with inflammatory bowel disease in Eastern Canada. PloS one. 2018;13:e0200580.
23. Brotherton CS, Martin CA, Long MD, Kappelman MD, Sandler RS. Avoidance of Fiber Is Associated With Greater Risk of Crohn's Disease Flare in a 6-Month Period. Clin Gastroenterol Hepatol. 2016;14:1130-6.
24. Bhaskar N, Narasimhulu CA, Keewan E, Rohr M, Parthasarathy S. Proinflammatory Properties of Peroxidized Fat May Contribute to the Etiology of Crohn's Disease. J Med Food. 2019;22:162-9.
25. Instituto Brasileiro de Geografia e Estatística (IBGE), Coordenação de Trabalho e Rendimento. Pesquisa de Orçamentos Familiares: 2017-2018. Análise do Consumo Alimentar Pessoal no Brasil. Biblioteca do Ministério do Planejamento, Orçamento e Gestão. 2020. 61 p.
26. Zhan Yl, Zhan YA, Dai SX. Is a low FODMAP diet beneficial for patients with inflammatory bowel disease? A meta-analysis and systematic review. Clin Nutr. 2018; 37:123-9.
27. Taylor L, Almutairdi A, Shommu N, Fedorak R, Ghosh S, Reimer RA, et al. Cross-sectional analysis of overall dietary intake and mediterranean dietary pattern in patients with crohn's disease. Nutrients. 2018;10:1761.
28. Louzada ML da C, Martins APB, Canella DS, Baraldi LG, Levy RB, Claro RM, et al. Impact of ultra-processed foods on micronutrient content in the Brazilian diet. Rev Saude Publica. 2015;49:45.
29. Hiza HAB, Casavale KO, Guenther PM, Davis CA. Diet Quality of Americans Differs by Age, Sex, Race/Ethnicity, Income, and Education Level. J Acad Nutr Diet. 2013;113:297-306.
30. Emerenziani S, Biancone L, Guarino MPL, Balestrieri P, Stasi E, Ribolsi M, et al. Nutritional status and bioelectrical phase angle assessment in adult Crohn disease patients receiving anti-TNFα therapy. Dig Liver Dis. 2017;49:495-9.
31. Dai ZhH, Xu XT, Ran ZH. Associations Between Obesity and the Effectiveness of Anti–Tumor Necrosis Factor-α Agents in Inflammatory Bowel Disease Patients: A Literature Review and Meta-analysis. Ann Pharmacother. 2020;1-13.
32. Krebs-Smith SM, Pannucci TE, Subar AF, et al. Update of the Healthy Eating Index: HEI-2015. J Acad Nutr Diet. 2018;118:1591-602.

(cc) BY-NC