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Adherence to a Gluten-Free Diet in Mexican Subjects with Gluten-Related Disorders: A High Prevalence of Inadvertent Gluten Intake

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ABSTRACT

Background: The rate of compliance with a gluten-free diet in patients with gluten-related disorders is unknown in most Latin American countries. **Objective:** To study the adherence to a gluten-free diet of Mexican individuals with celiac disease and non-celiac gluten sensitivity at the time of their first medical and nutritional consultation at a tertiary referral center. **Methods:** A cross-sectional study was performed. A specific questionnaire was used to gather information on demographics, clinical condition, and self-reported adherence to a gluten-free diet, and to determine strict compliance and intentional or inadvertent gluten consumption. All questionnaires were applied by a nutritionist with expertise in gluten-related disorders. **Results:** Fifty-six patients with celiac disease and 24 with non-celiac gluten sensitivity were included. Overall, 46 (57.5%) subjects perceived themselves as strictly adherent; however, inadvertent gluten intake was frequent in both celiac disease and non-celiac gluten sensitivity patients (39.2 vs. 33.3%; p = 0.2). Intentional consumption was more prevalent in subjects with celiac disease (48.8 vs. 29.1%; p = 0.048) and individuals with non-celiac gluten sensitivity showed better adherence (37.5 vs. 12.5%; p = 0.035). **Conclusions:** The importance of a gluten-free diet is underestimated by Mexican patients with celiac disease. The role of a team with expertise in gluten-related disorders is essential to identify inadvertent gluten intake. (REV INVES CLIN. 2016;68:229-34)

Key words: Celiac disease. Gluten-free diet. Gluten-related disorders. Non-celiac gluten sensitivity.

INTRODUCTION

A gluten-free diet (GFD) is only recommended for patients with gluten-related disorders (GRD); among them, the most studied condition is celiac disease (CD), an autoimmune enteropathy triggered by the ingestion of gluten that affects individuals with genetic susceptibility, in which the benefits of a GFD have been highly proven[1,2]. In non-celiac gluten sensitivity (NCGS), another GRD occurring in subjects who do not fulfill

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the criteria for CD but who present gastrointestinal and extra-intestinal symptoms related to the ingestion of wheat and similar cereals, the improvement of symptoms after a GFD is significant[3,4].

Adherence to a GFD has been shown to be a difficult task, attained by 44-90% of patients with CD[5]. Some of the factors related with the lack of compliance and inadvertent gluten intake are associated with a high prevalence of cross-contamination of foods and nutritional labeling difficulties[6-8]. In CD, a strict life-long GFD is aimed at avoiding metabolic, nutritional, and neoplastic complications, and although these have not been demonstrated in subjects with NCGS, their well-being improves, as in those patients with CD, when they follow a GFD[3,9,10]. Among the management strategies that seek to improve adherence to a GFD, nutritional assessment by supportive teams with expertise in GRD shows better outcomes[11]; however, there is a lack of information regarding these management strategies in most Latin American countries.

Celiac disease has been considered rare among native Mexicans, but a recent study indicates a prevalence of 0.7%, which is similar to that reported worldwide[12]. The prevalence of NCGS remains unknown in Mexico, although a self-reported questionnaire found that 7.8% of the studied population presents recurrent adverse reactions to gluten ingestion, which suggests that its prevalence could be as high as that published abroad[13]. Compliance with a GFD has not been studied in Mexican subjects with GRD; therefore, our aim was to investigate the adherence to a GFD in a group of patients with CD and NCGS seen at a tertiary referral center in Mexico City.

MATERIALS AND METHODS

A cross-sectional analysis was performed in 80 adult subjects with GRD who attended the Celiac Disease Unit at the Department of Gastroenterology at Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, a tertiary referral medical center in Mexico City.

Patients were divided in two groups: (i) subjects with CD, and (ii) subjects with NCGS. A diagnosis of CD was established in 56 symptomatic subjects based on the following criteria: (i) compatible clinical data; (ii) positive serological markers: anti-endomysium (EmA IgA/IgG), anti-transglutaminase (anti-tTG IgA), and/or anti-deamidated gliadin peptide (AGA-DGP IgA/IgG) antibodies; and (iii) villous atrophy typed according to Marsh-Oberhuber classification (3B-3C). Twenty-four individuals were considered as having NCGS due to: (i) gastrointestinal symptoms associated with wheat ingestion; (ii) negative serological markers; (iii) no/mild histological changes in duodenal biopsies; and (iv) symptom improvement while on a GFD.

Prior to this study, the patients with CD and NCGS were diagnosed by a gastroenterologist or a primary care physician and advised to follow a GFD during a similar estimated median time (72 vs. 43 months; p = 0.38). Before this evaluation, none of the patients had been followed up by a team with expertise in GRD.

During their first consultation at our unit, a nutritionist with expertise in GRD administered a specific questionnaire, which was divided into three sections. The first section collected the patients' demographic characteristics and evaluated their self-perception of current compliance with the GFD, classifying them into self-perceived as strictly adherent or non-adherent. The second section contained information regarding the time since diagnosis, time on a GFD, symptoms at onset, and symptomatic response to a GFD. In the third section, patients were given a list of 35 gluten-containing foods to select the products they considered as gluten-free and those ingested over the previous four weeks. If at least one of the products was consumed with the awareness of its gluten composition, it was classified as intentional non-adherence to the GFD. Otherwise, if the consumption was done unconsciously, it was considered inadvertent non-compliance. Strict compliance was defined when neither intentional nor inadvertent non-adherence occurred. The foods from the list were selected based on processed dairy products and gluten cross-contaminated grains popular in our country.

Statistical analysis

Categorical variables were presented as absolute and relative frequencies, whereas the continuous variables were summarized as means ± SD. The overall prevalence was reported as relative frequencies with the

Table 1. Subject characteristics

	CD (n = 56)		NCGS (n = 24)		p value
Gender					
Male	11	(19.6%)	7	(29.1%)	
Female	45	(80.4%)	17	(70.2%)	0.38
Age, years	59.4 ± 14.7		52.1 ± 11.9		0.03
Educational level, years	12.5 ± 3.9		14.04 ± 4.5		0.15
Duration of symptoms before diagnosis, months	12 (3-360)		30 (3-288)		0.12
	n	%	n	%	
Symptoms at onset					
Diarrhea	53	(96.4)	24	(100)	0.33
Steatorrhea	25	(44.6)	7	(29.2)	0.14
Abdominal distension	24	(42.9)	9	(37.5)	0.42
Lientery	22	(39.3)	10	(41.7)	0.51
Bloating	20	(35.7)	9	(37.5)	0.53
Abdominal pain	17	(30.4)	10	(41.7)	0.23
Flatulence	16	(28.5)	5	(20.8)	0.33
Tenesmus	6	(10.7)	7	(29.2)	0.04
Vomiting	13	(23.2)	1	(4.2)	0.03
Nausea	8	(14.3)	3	(12.5)	0.57
Time on GFD, months	72	(3-648)	43	(4-168)	0.38
Self-perceived as strictly adherent	29	(51.7%)	17	(70.8%)	0.00
Inadvertently non-adherent	22	(39.2%)	8	(33.3%)	0.29
Intentionally non-adherent	27	(48.2%)	7	(29.1%)	0.04
Strictly adherent	7	(12.5%)	9	(37.5%)	0.03
Mean gluten-containing foods consumed	2	(0-11)	1	(0-7)	0.00

CD: celiac disease; GFD: gluten-free diet; NCGS: non-celiac gluten sensitivity.

corresponding 95% confidence intervals (according to binomial distribution). Student's *t*-test and Mann-Whitney *U* test were used for evaluating normally and not normally distributed continuous data. Chi-square and Fisher's exact tests were used for the categorical data. Associations between demographics, symptoms at onset, time on a GFD and type of compliance were analyzed using binary logistic regression. Statistical significance was set up at p value < 0.05. The statistical package SPSS v20 software was used for data analysis.

The Ethics and Research Committees and the Institutional Review Board at the Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico, approved this study. All participants signed statements of informed consent as voluntary participants in the study. Patient's information was collected and saved according to the database standards of our public hospital and we followed the standards of practice and privacy from our institution.

RESULTS

From the 80 subjects included (mean age 58 ±14 years), 64 were female. Overall, 46 (57.5%) individuals perceived themselves as strictly adherent; however, when this cross-sectional study was concluded, it was found that 30 subjects (37.5%) had inadvertent gluten ingestion and 34 (42.5%) consumed gluten intentionally.

Demographic characteristics were similar between groups (Table 1). At the time of this study their clinical condition was stable; the most prevalent symptoms were diarrhea and abdominal distension, with frequencies of 75 and 36%, respectively. After following a GFD, almost all gastrointestinal symptoms disappeared in similar proportions in patients with CD and NCGS (67 vs. 75%; p = 0.7). Binary logistic regression model did not show a predictable association between groups' characteristics and adherence to a GFD. The specific questionnaire we used in this study is shown in table 2.

Table 2. Questionnaire

Section 1

a) Name _____ b) Age _____ c) Gender: ☐ Male ☐ Female d) Nationality _____
e) Occupation _____ f) Number of years of education completed _____
g) Marital status: ☐ single ☐ married ☐ divorced other _____

Questions	Answer	
1. Have you been diagnosed with a disorder related with gluten ingestion?	☐ Yes	☐ No
2. Which disorder have you been diagnosed with?	☐ CD	☐ NCGS
3. Do you follow a gluten-free diet (GFD)?	☐ Yes	☐ No
4. Do you consider that you follow a strict GFD?	☐ Yes	☐ No
5. Do you ingest gluten-containing foods intentionally?	☐ Yes	☐ No

Section 2

6. Who diagnosed your disorder?
☐ Gastroenterologist
☐ Primary care physician
☐ Other _____

7. How long have you been diagnosed with CD/NCGS? _____ Months
(Date of initial diagnosis _____)

8. How long have you followed a GFD? _____ Months

9. Please indicate which of the following symptoms you had at the time of diagnosis and which of them you still have at the present time.

Symptoms you presented at the time of diagnosis		Symptoms you present now	
☐ Diarrhea	☐ Steatorrhea	☐ Diarrhea	☐ Steatorrhea
☐ Abdominal Pain	☐ Lientery	☐ Abdominal Pain	☐ Lientery
☐ Bloating	☐ Incomplete emptying (tenesmus)	☐ Bloating	☐ Incomplete emptying (tenesmus)
☐ Abdominal distension	☐ Nausea	☐ Abdominal distension	☐ Nausea
☐ Flatulence	☐ Vomiting	☐ Flatulence	☐ Vomiting

Section 3 (Patients' marks)

10. Please mark (✓) the products that you consider are gluten-free.

☐ Achiote (Annato)	☐ Canned beans	☐ Gravy	☐ Processed rice
☐ Atole (cornflour beverage)	☐ Canned soup	☐ Ham	☐ Processed sauces
☐ Beer	☐ Champurrado	☐ Hamburger beef	☐ Sacramental bread
☐ Bread	☐ Chicken powder	☐ Ice cream	☐ Sausage
☐ Breaded food	☐ Chocolate candies	☐ Marshmallow	☐ Scotch
☐ Breakfast cereal	☐ Churros (fritters)	☐ Mexican traditional candies	☐ Snacks
☐ Bulk amaranth seeds	☐ Cookies	☐ Oat cookies	☐ Tamales
☐ Bulk rice	☐ Custards	☐ Pasta	☐ White tortillas
☐ Cake	☐ Flavored yoghurt	☐ Processed corn	

11. Please mark (✓) the products you have consumed, at least once, over the previous 4 weeks.

☐ Achiote	☐ Canned beans	☐ Gravy	☐ Processed rice
☐ Atole	☐ Canned soup	☐ Ham	☐ Processed sauces
☐ Beer	☐ Champurrado	☐ Hamburger beef	☐ Sacramental bread
☐ Bread	☐ Chicken powder	☐ Ice cream	☐ Sausage
☐ Breaded food	☐ Chocolate candies	☐ Marshmallow	☐ Scotch
☐ Breakfast cereal	☐ Churros	☐ Mexican traditional candies	☐ Snacks
☐ Bulk amaranth seeds	☐ Cookies	☐ Oat cookies	☐ Tamales
☐ Bulk rice	☐ Custards	☐ Pasta	☐ White tortillas
☐ Cake	☐ Flavored yoghurt	☐ Processed corn	

Table 3. Gluten-containing foods consumed (n = 80)

Inadvertently		Intentionally	
Product	**%**		**%**
Powdered chicken broth	27.2	Bread	57.6
Flavored yoghurt	21.7	Cookies	26.9
Sacramental bread	21.7	Processed sauce	26.9
Breakfast cereal	16.6	Powdered chicken broth	23.0
Traditional candies	16.6	Breaded food	23.0
Custards	14.8	Traditional candies	23.0
Processed sauces	11.1	Breakfast cereal	19.2

When compliance with the diet was compared between groups, subjects with NCGS were shown to be more adherent to the GFD than celiac individuals (37.5 vs. 12.5%; p = 0.035). Inadvertent gluten intake was not statistically different between groups (39.2 vs. 33.3%; p = 0.2); however, intentional disruptions were more frequent in subjects with CD (48.8 vs. 29.1%; p = 0.048). Individuals with inadvertent and intentional non-adherence consumed a median of two gluten-containing foods over the previous four weeks. The number of products inadvertently ingested by a single individual varied from one to seven. Foods consumed intentionally and by mistake are shown in table 3.

DISCUSSION

The recent Celiac Dietary Adherence Test (CDAT) seems to be a useful tool to assess GFD adherence, although it has not been validated in a Mexican population[14]. Biagi, et al. developed a score that verifies adherence to a GFD based on four questions that evaluate voluntary gluten intake, self-care when dining out, avoidance of gluten consumption by reading food labels, and eating products guaranteed by a celiac association. However, the reproducibility of this score in countries like ours is uncertain[15]. In Mexico, as in other Latin American countries, food labeling regulations do not require giving information on gluten content in all packaged products, so different strategies must be developed when evaluating adherence to a GFD. Until now, one of the most reliable strategies is patient monitoring by medical teams with expertise in GRD capable of identifying dietary habits and factors related with non-compliance[11]. This study shows, for the first time in our country, the rates of compliance with a GFD of Mexican patients with GRD who had not received proper nutritional advice. A specific questionnaire was performed by a nutritionist with expertise in CD, and the low rates of strict adherence that we found highlight the importance of improving the strategies to follow-up patients with CD and NCGS in Mexico.

In our study, a high proportion of individuals with CD and NCGS who attended their first medical and nutritional consultation at a CD unit, considered themselves to be adherent; however, a considerable amount of products prepared or contaminated with gluten were consumed accidentally. A recent systematic review demonstrated that the median of self-reported strict adherence to a GFD in subjects with CD is around 70% (range 42-91%)[5]; in our study, 57.5% (46) of the patients with a GRD believed themselves to be strictly adherent; however, inadvertent gluten intake was frequent (n = 30; 37.5%) and a low rate of strict compliance was found (20%). Gluten consumption was voluntary in 34 (42.5%) individuals of our group; bread and cookies were the products most frequently consumed intentionally, and the number of gluten-containing products eaten by a single individual varied from one to 11. Similar results were found by Hall, et al., who reported that 40.1% of 287 celiac subjects who responded to a self-completion questionnaire had intentional gluten consumption[8].

Compliance with dietary recommendations has been widely studied among subjects with CD and is poorly described in NCGS, so it is unclear whether this behavior is similar in both conditions. Interestingly, in

our study when groups were compared, subjects with NCGS showed to be more compliant with the GFD than celiac individuals (37.5 vs. 12.5%; p = 0.035). These surprising results suggest that NCGS patients could be more cautious while on a GFD, and that a high proportion of patients with CD ignore or underestimate the importance of this diet.

Interestingly, in our group the adherence to a GFD was not associated with a symptomatic response: gastrointestinal symptoms disappeared similarly in both CD and NCGS patients after a GFD (67 vs. 75%; p = 0.7). Although it is possible that the amounts of gluten ingested, or the time of exposure to gluten, could have been insufficient to cause symptoms in subjects who perceived themselves as strictly adherent, it supports the notion that compliance with the diet could be independent of the symptomatic condition, as has been previously described[16-18].

Our work was a cross-sectional evaluation that relied on patients' responses to study the adherence to a GFD. It was based on a simple questionnaire with a list of gluten-containing foods, whose results become of a high interest, not only for Mexicans, but also for other Latin American populations. It indicates that a high proportion of patients could be consuming gluten inadvertently. Furthermore, this is the first study performed in individuals with GRD in our country that suggests that the awareness of subjects with NCGS could be better than the celiac patients' when a GFD is followed. The low rates of strict adherence found in individuals without special nutritional advice underscores the importance of implementing new strategies to follow-up Mexican patients with GRD.

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