

# Celiac disease: no difference in milk and dairy products consumption in comparison with controls

Fabiana Zingone,<sup>1</sup> Paola Iovino,<sup>2</sup> Cristina Bucci,<sup>2</sup> Carolina Ciacci <sup>2</sup>

<sup>1</sup>Department of Surgery, Oncology and Gastroenterology, University of Padua, Padua, Italy  
<sup>2</sup>Celiac Center, AOU San Giovanni di Dio e Ruggi di Aragona, University of Salerno, Department of Medicine, Surgery, and Dentistry Scuola Medica Salernitana, Salerno, Italy

## Correspondence to

Dr Carolina Ciacci, Università degli Studi di Salerno, Fisciano 84084, Italy; cciacci@unisa.it

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## ABSTRACT

**Background** Nutritional deficiencies are common in patients with celiac disease and they can cause osteopenia among other associated diseases. Reduced consumption of milk and dairy products may play a major role in determining low bone mass in patients with celiac disease.

**Aim** We aimed to investigate milk and dairy products consumption in patients with celiac disease compared with the general population.

**Methods** We examined the average consumption of milk and dairy products and the reasons for not consuming them. An online survey was sent by email to patients with celiac disease on a gluten-free diet and aged 18–75. Matched controls were selected among volunteers who responded to the survey posted on the public access sites. Differences in frequencies and means between the two groups were calculated using the  $\chi^2$  test and t-test, respectively. All tests were two-tailed with a significance level set at  $p < 0.05$ .

**Results** 176 patients with celiac disease and 528 controls participated in the study. We found that 22.2% of the patients with celiac disease and 19.9% of controls did not drink fluid milk on a regular basis; lactose-free milk was preferred by 20.4% of the patients with celiac disease and by 19% of controls ( $p = 0.69$ ). Only a minority of patients with celiac disease contacted a doctor before having lactose-free milk, despite this being led by the presence of gastrointestinal symptoms. More patients with celiac disease than the general population reported a breath test before avoiding milk and dairy products.

**Conclusions** There is no significant difference between patients with celiac disease and controls in regular milk consumption. Follow-up visits for patients with celiac disease could avoid unnecessary dietary restrictions.

## INTRODUCTION

Milk and dairy products contain lactose, a disaccharide made of galactose and glucose. The absorption of lactose by the intestine requires a brush border enzyme named lactase that carries out the hydrolyses of the disaccharide to its monosaccharides, which easily cross the small bowel mucosa. Lactase activity decays during childhood in the majority of human populations leading to adult-type hypolactasia.<sup>1</sup> Lactose intolerance related to primary or secondary lactase deficiency may cause

## What this paper adds

- ▶ The damaged intestinal mucosa in celiac disease may cause lactose intolerance.
- ▶ Patients on a gluten-free diet frequently claim lactose intolerance and therefore avoid milk and dairy products.
- ▶ We found that 22.2% of the patients with CeD and 19.9% controls do not drink fluid milk on a regular basis.
- ▶ Lactose-free milk is chosen by 20.4% of patients with CeD and 19% of the controls.
- ▶ In our study we describe that there is no significant difference between patients with celiac disease and controls in regular milk consumption. Follow-up visits for patients with celiac disease could avoid unnecessary dietary restrictions.

abdominal pain and distension, borborygmi, flatus and diarrhoea induced by bacterial metabolism of undigested lactose in dairy products.<sup>1</sup> In untreated celiac disease (CeD), the damaged intestinal mucosa may have reduced the lactase activity, causing lactose intolerance in those subjects. However, previous data suggest that also patients with CeD on a gluten-free diet frequently claim lactose intolerance and therefore avoid milk and dairy products.<sup>2</sup> Recently, it has been demonstrated that there is no association between the type of adult hypolactasia gene mutations and CeD.<sup>3</sup> Milk avoidance in patients with CeD may depend on the fact that lactose intolerance is determined not only by the expression of lactase gene but also by the dose of lactose, intestinal flora, gastrointestinal motility, small intestinal bacterial overgrowth and sensitivity of the gastrointestinal tract to the generation of gas and other fermentation products of lactose digestion<sup>4</sup> and other unidentified factors.

Milk avoidance and consequent reduction of the intake of calcium is claimed to be one of the possible causes of osteopenia frequently found in patients with CeD.<sup>5–7</sup> Recently, we showed that 22.2% (260/1173) of the population from Southern Italy avoid milk consumption and



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18.1% (213/1173) drink lactose-free milk, even though among this only 10.3% had undergone a breath test for lactose tolerance, with positive results in 5.5% of the population. The reasons for milk avoidance were mainly gastrointestinal symptoms and the belief in its somewhat toxic effect on health.<sup>8</sup>

The present study aimed to investigate, using the same survey of the previous study,<sup>8</sup> the milk and dairy products consumption in patients with CeD compared with the general population.

## METHODS

As previously reported,<sup>8</sup> we used an online survey investigating the average consumption of milk and dairy products and the reasons for not consuming them. The survey consisted of 16 questions, and we calculated an average time of 5 min to complete it. The small number of questions and short answering time were devised to provide the best adherence and results.

Subjects aged 18–75 years and living in Campania (South Italy) were invited to answer the questionnaire online. The

	<b>Patients with coeliac disease, N (%) 176</b>	<b>General population, N (%) 528</b>	<b>P value</b>
<b>Ethnicity</b>			
Caucasian	100 %	100%	–
Female	129 (73.3)	389 (73.7)	0.43
Age at test (mean±SD)	37.7±10.8	39.1±12.7	0.19
<b>Body mass index</b>			
≤18	5 (2.8)	16 (3.0)	0.1
18.1–25	137 (77.8)	382 (72.3)	
25.1–30	27 (15.4)	80 (15.2)	
>30	7 (4.0)	50 (9.5)	
<b>Job</b>			
Student	25 (14.2)	85 (16.1)	0.9
Housewife	13 (7.4)	28 (5.3)	
Low-class job	14 (8.0)	45 (8.5)	
Middle-class job	39 (22.1)	120 (22.7)	
High-class job	70 (39.8)	201 (38.1)	
Retired	5 (2.8)	18 (3.4)	
Unemployed	10 (5.7)	31 (5.9)	
<b>Physical activity</b>			
Walk 30 mins daily	26 (14.8)	97 (18.4)	0.51
Practice sport once a week	12 (6.8)	48 (9.1)	
Practice sport more than twice a week	43 (24.4)	131 (24.8)	
Physical demanding job	12 (6.8)	26 (4.9)	
No sport activities	83 (47.2)	226 (42.8)	

**Table 2** Consumption of fluid milk in our study population

	<b>Patients with coeliac disease, N (%)</b>	<b>General population, N (%)</b>	<b>P value</b>
Do not drink milk	39 (22.2)	105 (19.9)	0.69
Milk with lactose	101 (57.4)	322 (61.0)	
Lactose-free milk	36 (20.4)	101 (19.1)	

survey was sent by email to 317 patients with CeD on a gluten-free diet for at least 6 months. Consent was obtained as part of a study dealing with vitamin D levels, bone mass and nutrition in CeD funded by a grant from the advocacy group Fondazione Celiachia (Italy). Patients specifically accepted to participate in the related online studies.

We selected controls from the general population who responded to the survey that was posted on the public access sites as reported elsewhere<sup>8</sup> creating two groups matched by gender, age and type of job and selecting three controls for each patient with CeD.

Categorical variables were expressed as frequency, continuous variables as mean±SD. Differences in frequencies and means between the two groups were calculated using the  $\chi^2$  test and t-test, respectively. Covariates included sex, age (18–35, 35–49, 50–75), body mass index (BMI, kg/m<sup>2</sup>), classified as underweight (≤18.5), normal weight (>18.5–25), overweight (>25–30) and obese (>30), job type (classified as student, housewife, low-class, middle-class and high-class job based on average salary, retired and unemployed) and weekly physical activity. We chose the above covariates because they may be associated with dietary restrictions and gastrointestinal symptoms like irritable bowel syndrome.<sup>9–12</sup> All tests were two-tailed with a significance level set at p<0.05. The data were analysed with STATA V.12. A biomedical statistician performed the statistical review of the study. We have followed the Strengthening the Reporting of Observational Studies in EpidemiologySTROBE guidelines for this study.

## RESULTS

Forty-three of the 317 emails bounced back because of the incorrect email address or server problems; 176 out of 274 patients with CeD (64.2 %) responded to all questions of the survey and were included in the study; 528 matched

**Table 3** How much milk do you drink per day?

	<b>Patients with coeliac disease, N (%) total 137</b>	<b>General population, N (%) total 423</b>	<b>P value</b>
1 L	0	5 (1.2)	0.22
0.5 L	5 (3.6)	14 (3.3)	
250 mL (large cup)	68 (49.6)	230 (54.4)	
150 mL (medium cup)	49 (35.8)	123 (29.1)	
50 mL (small cup)	15 (11.0)	51 (12.0)	

**Table 4** Why do you drink lactose-free milk?

	Patients with coeliac disease, N (%) total 36	General population, N (%) total 101	P value
Doctor's advice	2 (5.5)	13 (12.9)	0.5
Friends	1 (2.8)	6 (5.9)	
My choice	18 (50)	47 (46.6)	
GI problems	15 (41.7)	35 (34.6)	

**Table 5** Lactose intolerance test

	Patients with coeliac disease, N (%)	General population, N (%)	P value
Never	145 (82.4)	474 (89.8)	0.002
Negative test	19 (10.8)	20 (3.8)	
Positive test	12 (6.8)	34 (6.4)	

controls were used for the analysis. Details on sex, age, BMI, job and physical activity of the two groups were reported in [table 1](#).

Our study shows that milk consumption is similar between patients with CeD and control ( $p=0.69$ ). We found that 22.2% of the patients with CeD and 19.9% controls do not drink fluid milk on a regular basis. Lactose-free milk is chosen by 20.4% of patients with CeD and 19% of the controls ([table 2](#)).

Among those who drink milk (regular or lactose free), 49.6% of patients with CeD and 54.4% controls drink a daily average of 250 mL of fluid milk ([table 3](#)). Most of the subjects start to consume lactose-free milk for personal choice (without any specific reason) or because of gastrointestinal problems. Only a minority of patients with CeD contacted a doctor before starting the use of lactose-free milk (5.5%), despite being driven to this change by gastrointestinal symptoms (41.7%) ([table 4](#)).

Although the high percentage of responders avoid regular milk, only a minority of them reported having

undergone a breath test for lactose tolerance with positive results ([table 5](#)). However, more patients with CeD than the general population reported a breath test before avoiding milk and dairy products.

When considering only dairy products consumption, no patient with CeD and only 6 (1.1%) controls state that they do not eat dairy products on a regular basis, with most of them eating these products at least once a week ([table 6](#)). Subjects who rarely drank dairy products mainly consumed lactose-free mozzarella, cheese, yoghurt or only parmesan cheese ([table 6](#)).

## DISCUSSION

Our study shows that there is no significant difference between the patients with CeD and matched controls in the regular milk consumption.

This is, to our best knowledge, the first study investigating the milk and dairy products in CeDs in comparison with controls. The results indicate that in our population, the reduced calcium intake is not the dominant player in determining the low bone mass frequently found in patients with CeD.

Both patients with CeD and controls chose to avoid milk consumption because of their choice or because of gastrointestinal symptoms, without undergoing a breath test for lactose intolerance or consult a doctor.

As previously reported,<sup>8</sup> the use of an online survey has both strengths and limitations. Our survey, to our best knowledge, is the first one conducted in a large Italian cohort whose results describe the milk habits of patients with CeD and controls from the general population. Online surveys are quite popular because they are convenient and easy to use. However, possible limitations are the recall bias, common in food questionnaires and the use of a non-standardised questionnaire. We discussed these limitations elsewhere.<sup>8</sup> Being the questionnaire anonymous, we do not have any information regarding, for example, the compliance to the gluten-free diet, the antitransglutaminase antibodies values or the time from the CeD diagnosis.

**Table 6** Consumption of dairy products in our study population

	Patients with coeliac disease, N (%)	General population, N (%)	P value
Do not eat dairy products	0	6 (1.1)	0.125
Every day	25 (14.2)	75 (14.2)	
3–5 times a week	73 (41.5)	238 (45.1)	
Once a week	48 (27.3)	140 (26.5)	
Sometimes lactose-free mozzarella, cheese and yoghurt	8 (4.5)	23 (4.4)	
Only lactose-free mozzarella and cheese and yoghurt	2 (1.1)	10 (1.9)	
As ingredients only	11 (6.3)	29 (5.5)	
Only parmesan cheese (lactose-free aged cheese)	9 (5.1)	7 (1.3)	

The present data confirmed our previous results, adding the information that patients with CeD on a gluten-free diet avoid milk in a percentage similar to that of the general population. The most frequent cause of avoiding milk in patients with CeD is the persistence of gastrointestinal symptoms despite the starting of a gluten-free diet. There are several reasons for the persistence of symptoms in CeD on a gluten-free diet,<sup>2</sup> such as dietary lapses and irritable bowel syndrome, and lactose intolerance is only one of them. Therefore, daily calcium absorption may be low in those who avoid dairy products and contributes, but not fully explains, to the frequent low bone mass observed in patients with CeD from the same country, both before and after the gluten-free diet.<sup>13</sup> However, studies reported that dairy food intake is associated with higher bone mineral density among adults, particularly those with sufficient vitamin D status.<sup>14 15</sup>

Another aspect to take into consideration when dealing with the choice of food is that patients with CeD tend already to have psychological problems caused by dietary restriction.<sup>16 17</sup> Therefore, our data suggest that doctors' and dietitians' advise during follow-up visits for patients with CeD on a gluten-free diet should focus on avoiding unnecessary restriction of milk and of dairy products which could further compromise their health and quality of life.

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**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** The study was approved by the by the Ethics Committee of the University of Salerno Campania Sud aut. No 25, 25.4.2015.

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**Data sharing statement** Data set is available from the last author at cciacci@unisa.it. Consent for data sharing was obtained. All the data were anonymised, and risk of identification is inconsistent.

**Author note** Core tip: we examined the average consumption of milk and dairy products and the reasons for not consuming them in patients with coeliac disease compared with controls. We found that there is no significant difference between patients with coeliac disease and controls in the regular milk consumption.

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#### ORCID iD

Carolina Ciacci <http://orcid.org/0000-0002-7426-1145>

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