

# The Risk of Contracting COVID-19 Is Not Increased in Patients With Celiac Disease

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The World Health Organization declared coronavirus disease-2019 (COVID-19) a global pandemic in March 2020. Since then, there are more than 34 million cases of COVID-19 leading to more than 1 million deaths worldwide. Numerous studies suggest that celiac disease (CeD), a chronic immune-mediated gastrointestinal condition triggered by gluten, is associated with an increased risk of respiratory infections.<sup>1-3</sup> However, how it relates to the risk of COVID-19 is unknown. To address this gap, we conducted a cross-sectional study to evaluate whether patients with self-reported CeD are at an increased risk of contracting COVID-19.

## Methods

This study was conducted between March and June 2020. Participants of all ages with a self-reported CeD diagnosis and those without CeD from different countries including Argentina, Australia, Canada, Italy, Mexico, New Zealand, Spain, Uruguay, and the United States were recruited through local CeD associations, electronic newsletters, and social media. Participants completed a web-based survey consisting of 41 items, which was translated into Spanish and Italian using the approach proposed by Mallinckrodt and Wang.<sup>4</sup> Data on demographics, gluten-free diet (GFD), symptomatology, and COVID-19 testing were collected using RedCap.

Statistical analyses were carried-out using SPSS version 25 (IBM, Armonk, NY). Continuous and categorical variables were compared using the Mann-Whitney *U* test and chi-square test. Logistic regression was performed to assess the impact of different factors on the likelihood of reporting a positive COVID-19 test (dependent variable). Independent variables included

CeD diagnosis, age, gender, comorbidities, GFD adherence, extra precautions, and previous COVID-19 exposure. The unadjusted and adjusted odds ratios were reported with their 95% confidence intervals.

## Results

A total of 18,022 participants completed the survey. From them, 10,737 had self-reported CeD; they were older (mean, 32 vs 41 years;  $P < .01$ ) and had a higher proportion of females when compared with the control group (85% vs 80%;  $P < .001$ ).

CeD was confirmed by duodenal biopsy in 7506 patients (69.9%). Thirty-two percent of patients with CeD had persistent symptoms. A strict GFD was reported by 65.7% and 3.9% of patients with CeD and control subjects, respectively. A greater proportion of patients with CeD had comorbidities including respiratory (6.6% vs 3.7%;  $P < .001$ ), cardiac (3.5% vs 1.9%;  $P < .001$ ), and diabetes (3.8% vs 2.5%;  $P < .001$ ) compared with control subjects.

Patients with CeD were significantly less likely to have been tested for COVID-19 (4.5% vs 6.6%;  $P < .001$ ) and to have been exposed to COVID-19 (1.6% vs 4%;  $P < .001$ ) compared with control subjects. Out of 940 participants tested for COVID-19, 8.7% reported a positive test. There was no difference in the odds of having a positive test for COVID-19 in CeD compared with control subjects (9.4% vs 8.1%; odds ratio, 1.18; 95% confidence interval, 0.75–1.84).

**Table 1.** Likelihood of Positive COVID-19 Test in CeD and Non-CeD Populations

|                                  | Likelihood of positive COVID-19 tes |                   |                         |                   |
|----------------------------------|-------------------------------------|-------------------|-------------------------|-------------------|
|                                  | Unadjusted<br>OR (95% CI)           | <i>P</i><br>value | Adjusted<br>OR (95% CI) | <i>P</i><br>value |
| CeD                              | 1.3 (0.8–2)                         | .3                | 1.4 (0.5–3.5)           | .5                |
| Female gender                    | 1.7 (1–2.9)                         | .07               | 2.4 (0.9–6.5)           | .08               |
| Age                              | 1 (0.97–1)                          | .3                | 1 (0.9–1)               | .5                |
| Gluten-free diet <sup>a</sup>    | 1.1 (0.7–1.8)                       | .6                | 0.9 (0.4–2.5)           | .9                |
| Comorbidities <sup>b</sup>       | 0.9 (0.5–1.6)                       | .7                | 1.2 (0.5–2.7)           | .7                |
| Extra precautions <sup>c</sup>   | 0.6 (0.4–1.1)                       | .1                | 1.4 (0.8–2.7)           | .3                |
| Previous exposure<br>to COVID-19 | 15.3 (8–29)                         | < .001            | 16.7 (7.7–36)           | < .001            |

CeD, celiac disease; CI, confidence interval; OR, odds ratio.

<sup>a</sup>Dichotomized strict versus not-strict gluten-free diet.

<sup>b</sup>Cardiovascular, respiratory, diabetes, autoimmune diseases.

<sup>c</sup>Extensive personal protect equipment use and social isolation.

Subgroup analyses within the CeD group showed no difference in the odds of contracting COVID-19 in patients with and without biopsy confirmation of CeD (9% vs 10%;  $P = .65$ ), symptomatic versus not-symptomatic CeD (11% vs 7%;  $P = .13$ ), or those adopting a strict-GFD versus not-strict-GFD (9% vs 10%;  $P = .74$ ).

Twenty-eight percent of CeD reported taking extra safety precautions for COVID-19; however, this did not change the likelihood of a positive COVID-19 test. Exposure to a COVID-19 contact was the only factor increasing the odds of a positive test (Table 1).

## Discussion

To our knowledge, this is the first large-scale study to examine risk of COVID-19 in CeD compared with non-celiac population. We found that patients with CeD had a similar odds of contracting COVID-19 when compared with the control subjects. The presence of comorbidities, which was identified as an important predictor of morbidity and mortality associated with COVID-19,<sup>5</sup> was more frequent in CeD than control subjects. However, this did not result in higher odds of a positive COVID-19 test in CeD. We hypothesized that adopting a strict-GFD and having fewer symptoms<sup>6</sup> would decrease the odds of contracting COVID-19 in CeD; however, this was not confirmed in our analyses. It is of common knowledge<sup>7</sup> that previous exposure to someone with COVID-19 increases the risk of contracting COVID-19,<sup>8</sup> and this was confirmed in our study. However, patients with CeD were less exposed to COVID-19 than control subjects, which may have influenced the results.

We acknowledge the presence of limitations related to the design of our study, which used a web-based survey for data collection, and therefore, the source of

information provided by participants cannot be confirmed. The study was not designed to assess differences in COVID-19-related severity outcomes, and it is our hope that the ongoing international SECURE-Celiac registry ([www.covidceliac.org](http://www.covidceliac.org)) will further address this.

In conclusion, patients with CeD have similar odds of contracting COVID-19 and may not need to take additional precautions to prevent exposure aside from that recommended to the general public. Longitudinal studies using repeated measurements will contribute to a better understanding on whether the risk of contracting COVID-19 in CeD changes over time.

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## Reprint requests

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## Acknowledgments

The authors thank all the individuals who kindly participated in this study. They also acknowledge the following individuals and associations for their major contributions to the recruitment of participants: Canadian Celiac Association, Melissa Secord (CEO) and Professional Advisory Committee; Beyond Celiac, Alice Bast and Kate Avery; Celiac Disease Foundation, Marilyn Geller; Coeliac Australia; Coeliac New Zealand; Aglutenedos, Carolina Rocha; Federación de Asociaciones de Celiacos de España; Asociación de Enfermos Celiacos y Sensibles al Gluten de la Comunidad de Madrid; Asociación de Celiacos de Cataluña; Asociación Celiaca Argentina; Asistencia al Celiaco de Argentina; Grupo Promotor de la Ley Celiaca; Canadian Association of Gastroenterology, Mayur Tailor; Sociedad de Gastroenterología de Santiago del Estero, Argentina, Dr J. Pinto Bruchmann; M. Guadalupe, M. del Pilar, Magdalena Pinto-Sanchez for their contribution with the social media distribution; president of ACELA Santiago del Estero Mrs. Reina Palavecino; Sociedad Argentina de Gastroenterología; Federación Argentina de Gastroenterología; and Mrs. Julia Molina, director of Market Dixit Graphic Design and Digital marketing for in-kind support of promotion materials.

## Conflicts of interest

These authors disclose the following: Maria Ines Pinto-Sanchez received in-

kind support for the Modulen formula from Nestle Canada; and honoraria from Baxter and Fresenius Kabi unrelated to this manuscript. Andrew Day has received honoraria from Janseen, AbbVie, Nestle, and Sanofi unrelated to this manuscript. The other authors disclose no conflicts.

**Funding**

Caroline Seiler received an Ontario Graduate Scholarship. Jason Tye-Din is

supported by an NHMRC Investigator Grant and the University of Melbourne Centenary Fellowship. Elena Verdu is funded by CCC GIA and CIHRPJT-168840 and holds CRC award. Benjamin Lebwohl is supported by The Louis and Gloria Flanzer Philanthropic Trust. Maria Ines Pinto-Sanchez received an Innovation Grant from CCC, Medicine Internal Career Research Award, Division of Gastroenterology AFP grant, and Farncombe Family Digestive Health Research Institute Award.