CLINICAL PRESENTATION AND COURSE OF COVID-19 INFECTION IN PATIENTS WITH CELIAC DISEASE

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ABSTRACT

Objectives: *Celiac disease (CD) is an autoimmune disease in which immune dysregulation plays a major role in the etiopathogenesis. Similarly, immune dysregulation and intense inflammation due to excessive cytokine storm are blamed for the etiopathogenesis of COVID-19. The aim of this study is to investigate the clinical presentation and symptoms of COVID-19, as well as the course of the disease in people with CD.*

Methods: *Patients with CD who were diagnosed with COVID-19 by a PCR test were included in the study. COVID-19 symptoms, such as fever, cough, dyspnea, tachycardia, muscle aches, headache, loss of taste and smell, diarrhea and abdominal pain, were determined. The severity of the clinical course of the disease was classified as mild, moderate, moderate to severe and severe.*

Results: *Of the 57 patients included in the study,47 (82.5%) were female and 10 (17.5%) were male. The most common complaints were myalgia (82.5%, n:47), headache (64.9%, n:37), loss of taste and smell (63.2%, n:36), fever (43.9%, n: 25) and cough (36.8%, n:21). The level of infection of 82.5% (n:47) of the patients was mild with home isolation, moderate with hospitalization for 8.8% (n:5), moderate to severe for 7% (n:4) and severe with treatment in intensive care for 1.8% (n:1).*

Conclusions: *COVID-19 in patients with CD most frequently presented with myalgia, headache, and loss of taste and smell. The rate of loss of taste and smell in patients with CD was significantly higher than those reported in the normal population.The CD does not pose an extra risk to patients during the clinical course of COVID-19, and growing concerns about their increased likelihood of catching COVID-19 and that the disease will be severe are unfounded.*

Keywords: *Celiac disease, COVID-19, symptoms, clinical presentation, severity.*

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Introduction

Celiac disease (CD) is an autoimmune disease that causes damage to the small intestinal epithelium, triggered by gluten intake in those who are genetically susceptible to immune dysregulation[(1)]. Genetic predisposition-the presence of HLA-DQ2/DQ8-and environmental exposures-gluten ingestion-are the main factors in the etiopathogenesis of CD. However, these factors alone are not sufficient for the development of the disease. A critical step in the development of the disease is immune dysregulation involving both innate and adaptive immune systems[(2)]. Diseases with autoimmunity in their etiopathogenesis, such as Type-1 Diabetes Mellitus (DM) and Hashimoto's thyroiditis, commonly occur alongside CD. Similarly, the prevalence of CD is significantly higher in those with a family history of CD compared to the general population[(1)]. Coronavirus Disease 2019 (COVID-19) first appeared in December 2019 in Wuhan, China, with the identification of clinical presentations such as a high fever, cough and respiratory complaints. It is caused by the new type of coronavirus "SARS-CoV-2," which is understood to be from the same coronavirus family as infections

such as severe acute respiratory syndrome (SARS), which appeared in 2002 and Middle East respiratory syndrome (MERS), in 2012, rapidly causing serious clinical pictures and deaths[3]. Studies have shown that both immune dysregulation and intense inflammation due to excessive cytokine storm are blamed for the etiopathogenesis of the disease[4]. COVID-19 has a wide clinical course ranging from asymptomatic infection to severe respiratory failure. Gastrointestinal system symptoms, such as diarrhea, nausea, vomiting, and abdominal pain, are observed in approximately half of patients[5, 6, 7].

The limited studies examining the relationship between these two clinical entities, in which immune dysregulation plays a major role in their etiopathogeneses, have not yet provided a clear result. The aim of this study is to investigate the clinical symptoms of COVID-19 and the course of the disease in people with CD.

Methods

This study was conducted at the SBU (University of Health Sciences Turkey) Gülhane Training and Research Hospital between 1 April-15 December 2020. Patients with COVID-19 who were diagnosed with and treated for CD according to the ESPGHAN guidelines were included in the study (8). Patients whose PCR (Polymerase chain reaction) nasopharyngeal swab samples were not confirmed for COVID-19 were not included in the study.

The demographic data and clinical information of the patients included in the study were analyzed retrospectively and recorded in previously prepared data collection registration forms. The patients were examined in terms of how many years they had been diagnosed with CD, their symptoms of CD, the presence of another autoimmune disease, the presence of other chronic diseases aside from CD, and their compliance with a gluten-free diet.

Additionally, the patients were examined to evaluate the clinical presentation of COVID-19 in terms of its classic clinical complaints and symptoms, such as fever, cough, dyspnea, tachycardia, muscle aches, headache, and loss of taste and smell. They were also examined for GIS (gastrointestinal system) involvement, such as nausea, vomiting, abdominal pain and diarrhea. In order to determine the severity of the clinical course of COVID-19, the patients were divided into four categories: mild (outpatients who were quarantined in their home), moderate (those who were hospitalized but did not have pneumonia), moderate to severe (those who were hospitalized and those with pneumonia) and severe (those who were hospitalized in intensive care and those with pneumonia). The study was conducted after obtaining approval from the Turkish Ministry of Health and the Gülhane Ethics Committee (2020/405). The informed consent form was read to all participants, and their signatures were obtained. Their consent was obtained. IBM SPSS 22 was used for the statistical evaluation of the data obtained in the study. Continuous variables were given as a median, and the categorical data was given as numbers and percentages. The compliance of the variables to normal distribution was examined using visual methods-e.g., histogram-and the Kolmogorov-Smirnov test. Non-parametric results were compared using the Mann-Whitney U test. Pearson's chi-squared or Fisher's exact tests were used to compare rates for the qualitative variables. The $p<0.05$ value was taken as the statistical significance level.

Results

Of the 57 patients included in the study, 47 (82.5%) were female and 10 (17.5%) were male. Since the age distributions of the patients did not comply with the normal distribution, the median value was 40 (6-60). In terms of gender, the median age of the female patients was 40 (6-60), and male patients were 39.5 (8-52).

There was no statistical difference between the female and male gender in terms of median values (p:0.54). When the symptomatology of celiac patients with COVID-19 infection was examined, the most common complaints were myalgia (82.5%, n: 47), headache (64.9%, n: 37), loss of taste and smell (63.2%, n: 36), fever (43.9%, n: 25) and cough (36.8%, n: 21), followed by nausea and vomiting (29.8%, n: 17) shortness of breath (22.8%, n: 13), diarrhea (21.1%, n: 12) and abdominal pain (21.1%, n: 12). The level of infection of 82.5% (n: 47) of the patients was mild with home isolation, moderate with hospitalization for 8.8% (n: 5), moderate to severe for 7% (n: 4) and severe with treatment in intensive care for 1.8% (n: 1). The relationship between the clinical severity of the infection and the symptoms seen in celiac patients with COVID-19 is summarized in Table 1. Complaints of fever, shortness of breath, nausea and vomiting, and abdominal pain were found to be statistically significantly higher in the group with more severe COVID-19, independent of CD ($p<0,05$).

Symptoms	Mild		Moderate		Moderate/Severe		Severe		p
	Yes	No	Yes	No	Yes	No	Yes	No	
Fever	17(36.2%)	30(63.8%)	4(80%)	1(20%)	4(100%)	0(0%)	0(0%)	1(100%)	**0.008**
Cough	17(36.2%)	30(63.8%)	3(60%)	2(40%)	1(25%)	3(75%)	0(0%)	1(100%)	0.71
Shortness of breath	8(17%)	39(83%)	3(60%)	2(40%)	2(50%)	2(50%)	0(0%)	1(100%)	**0.05**
Myalgia	37(78.7%)	10(21.3%)	5(100%)	0(0%)	4(100%)	0(0%)	1(100%)	0(0%)	0.57
Headache	27(57.4%)	20(42.6%)	5(100%)	0(0%)	4(100%)	0(0%)	1(100%)	0(0%)	0.06
Loss of taste/smell	29(61.7%)	18(38.3%)	5(100%)	0(0%)	1(25%)	3(75%)	1(100%)	0(0%)	0.08
Diarrhea	11(23.4%)	36(76.6%)	0(0%)	5(100%)	0(0%)	4(100%)	1(100%)	0(0%)	0.18
Nausea/Vomiting	11(23.4%)	36(76.6%)	1(20%)	4(%80)	4(100%)	0(0%)	1(100%)	0(0%)	**0.004**
Abdominal pain	7(14.9%)	40(85.1%)	1(20%)	4(%80)	3(75%)	1(25%)	1(100%)	0(0%)	**0.01**

Table 1: Relationship between the clinical course of COVID-19disease and symptoms.

The patients included in the study were grouped into under 20, 20-29, 30-39, 40-49 and over 50 years. The 40-49 age group had the highest number of patients, with 22 (38.6%). The distribution of the symptoms seen in the patients by age groups is summarized in Table 2. It was observed that dyspnea was more common in older ages, statistically significant at p<0,05.In terms of the severity of COVID-19, when the relationship between the gender of the patients and the age groups of the patients was examined, no statistically significant data was found.

COVID-19 symptoms, it was found that the loss of taste and smell was statistically significantly higher in patients with a disease duration of less than ten years (p<0.05), while there was no statistically significant difference between COVID-19 infection severity. Of the 57 patients in the study, 14 (24.6%) had an additional autoimmune disease other than CD. The most common was Hashimoto's thyroiditis with 8 patients, followed by Type-1 DM with 3 patients. Comorbid diseases were seen in 16 (28.1%) of the patients, with hypertension and Type-2 DM being the most common. With regard to the

Symptoms	<20 years N=11		20-29 years N=10		30-39 years N=7		40-49 years N=22		>50 years N=7		p
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Fever	5 (45.5%)	6 (54.5%)	7(70%)	3 (30%)	3 (42.9%)	4 (57.1%)	6 (27.3%)	16 (72.7%)	4 (57.1%)	3 (42.9%)	0.22
Cough	2 (18.2%)	9 (81.8%)	6 (60%)	4 (40%)	0(0%)	7 (100%)	10 (45.5%)	12 (54.5%)	3 (42.9%)	4 (57.1%)	0.06
Shortness of breath	0(0%)	11 (100%)	4 (40%)	6 (60%)	0(0%)	7 (100%)	5 (22.7%)	17 (77.3%)	4 (57.1%)	3 (42.9%)	**0.01**
Myalgia	8 (72.7%)	3 (27.3%)	7(70%)	3 (30%)	5 (71.4%)	2 (28.6%)	20 (90.9%)	2 (9.1%)	7 (100%)	0(0%)	0.26
Headache	6 (54.5%)	5 (45.5%)	9 (90%)	1 (10%)	3 (42.9%)	4 (57.1%)	14 (63.6%)	8 (36.4%)	5 (71.4%)	2 (28.6%)	0.30
Loss of taste / smell	5 (45.5%)	6 (54.5%)	7(70%)	3 (30%)	4 (57.1%)	3 (42.9%)	14 (63.6%)	8 (36.4%)	6 (85.7%)	1 (14.3%)	0.53
Diarrhea	0(0%)	11 (100%)	2 (20%)	8 (80%)	2 (28.6%)	5 (71.4%)	6 (27.3%)	16(72.7%)	2 (28.6%)	5 (71.4%)	0.33
Nausea / Vomiting	2 (18.2%)	9 (81.8%)	3 (30%)	7(70%)	3 (42.9%)	4 (57.1%)	5 (22.7%)	17 (77.3%)	4 (57.1%)	3 (42.9%)	0.38
Abdominal pain	1(9.1%)	10 (90.9%)	1 (10%)	9 (90%)	2 (28.6%)	5 (71.4%)	4 (18.2%)	18 (81.8%)	4 (57.1%)	3 (42.9%)	0.14

Table 2: Distribution of COVID-19symptoms by age group.

The duration of the CD for 34 (59.6%) patients was less than ten years, while for 23 patients (40.4%), it was more than ten years.

The relationship with the symptoms seen in those who had COVID-19 is summarized in Table 3, and the relationship with the severity of COVID-19 is summarized in Table 4.With regard to the relationship between the duration of CD and symptoms observed during COVID-19 infection in celiac patients, the relationship between gluten-free diet compliance, the presence of other autoimmune diseases, and additional comorbid diseases (Table 5), there were no statistically significant findings.

With regard to the severity of COVID-19 infection in celiac patients, the relationship between patients' compliance with a gluten-free diet, the

presence of other autoimmune diseases, and additional comorbid diseases (Table 6), there were no statistically significant findings.

Symptoms	<10 years N=34		>10 years N=23		p
	Yes	No	Yes	No	
Fever	15 (44.1%)	19 (55.9%)	10 (43.5%)	13 (56.5%)	0.96
Cough	14 (41.2%)	20 (58.8%)	7 (30.4%)	16 (69.6%)	0.41
Shortness of breath	9 (26.5%)	25 (73.5%)	4 (17.4%)	19 (82.6%)	0.42
Myalgia	28 (82.4%)	6 (17.6%)	19 (82.6%)	4 (17.4%)	0.98
Headache	23 (67.6%)	11 (32.4%)	14 (60.9%)	9 (39.1%)	0.60
Loss of taste/smell	25 (73.5%)	9 (26.5%)	11 (47.8%)	12 (52.2%)	**0.05**
Diarrhea	6 (17.6%)	28 (82.4%)	6 (26.1%)	17 (73.9%)	0.44
Nausea/Vomiting	11 (32.4%)	23 (67.6%)	6 (26.1%)	17 (73.9%)	0.61
Abdominal pain	7 (20.6%)	27 (79.4%)	5 (21.7%)	18 (78.3%)	0.92

Table 3: The relationship between the presentation findings of COVID-19 disease and the duration of CD.

Severity of Disease	<10 years N=34	>10 years N=23	p
Mild	27 (79.4%)	20 (87%)	0.85
Moderate	4 (11.8%)	1 (4.3%)	
Moderate toSevere	2 (5.9%)	2 (8.7%)	
Severe	1 (2.9%)	0 (0%)	

Table 4: The relationship of the clinical course of COVID-19disease with the duration of CD.

Discussion

COVID-19 is usually clinically presented with a fever, cough, shortness of breath, loss of taste and smell, myalgia, nausea, vomiting, abdominal pain, and diarrhea. There have been some studies on the frequency of the manifestation of the disease[9, 10]. When the symptomatology of 370,000 confirmed COVID-19 cases reported to the Centers for Disease Control and Prevention in the U.S.A. was examined, cough in 50%, fever in 43%, myalgia in 36%, headache in 34%, shortness of breath in 29%, sore throat in 20%, diarrhea in 19%, nausea and vomiting in 12%, loss of taste and smell in 8% and abdominal pain in 7% were observed[9]. In Turkish population, Güner et al. reported that 58% of 222 COVID-19patients had a cough, 48% had a fever, 27% suffered from shortness of breath, 24% from weakness, 16% from muscle pain, 16% from a sore throat, 14% from a headache and 3.2% lost their sense of taste and smell[10]. Additionally, Medetalibeyoğlu et al. showed that in 362 COVID-19patients, 90% had muscle pain/weakness, 84% had a cough, 73% had a fever, 17% suffered from nausea

Symptoms		Gluten-free diet			Autoimmune diseases			Comorbid diseases		
		Yes N=52	No N=5	p	Yes N=14	No N=43	p	Yes N=16	No N=41	p
Fever	Yes	22(88%)	3(12%)	0.65	4(16%)	21(84%)	0.18	9(36%)	16(64%)	0.24
	No	30(93.8%)	2(6.3%)		10(31.3%)	22(68.8%)		7(21.9%)	25(78.1%)	
Cough	Yes	19(90.5%)	2(9.5%)	1.00	7(33.3%)	14(66.7%)	0.24	4(19%)	17(81%)	0.25
	No	33(91.7%)	3(8.3%)		7(19.4%)	29(80.6%)		12(33.3%)	24(66.7%)	
Shortness of breath	Yes	12(92.3%)	1(7.7%)	1.00	3(23.1%)	10(76.9%)	0.89	3(23.1%)	10(76.9%)	0.65
	No	40(90.9%)	4(9.1%)		11(25%)	33(75%)		13(29.5%)	31(70.5%)	
Myalgia	Yes	42(89.4)	5(10.6%)	0.57	12(25.5%)	35(74.5%)	0.71	14(29.8%)	33(70.2%)	0.53
	No	10(100%)	0(0%)		2(20%)	8(80%)		2(20%)	8(80%)	
Headache	Yes	35(94.6%)	2(5.4%)	0.33	7(18.9%)	30(81.1%)	0.18	11(29.7%)	26(70.3%)	0.70
	No	17(85%)	3(15%)		7(35%)	13(65%)		5(25%)	15(75%)	
Loss of taste / smell	Yes	34(94.4%)	2(5.6%)	0.35	10(27.8%)	26(72.2%)	0.46	9(%25)	27(75%)	0.50
	No	18(85.7%)	3(14.3%)		4(19%)	17(81%)		7(33.3%)	14(66.7%)	
Diarrhea	Yes	11(91.7%)	1(8.3%)	1.00	3(25%)	9(75%)	0.97	4(33.3%)	8(66.7%)	0.65
	No	41(91.1%)	4(8.9%)		11(24.4%)	34(75.6%)		12(26.7%)	33(73.3%)	
Nausea / Vomiting	Yes	17(100%)	0(0%)	0.31	4(23.5%)	13(76.5%)	0.91	5(29.4%)	12(70.6%)	0.88
	No	35(87.5%)	5(12.5%)		10(25%)	30(75%)		11(27.5%)	29(72.5%)	
Abdominal pain	Yes	12(100%)	0(0%)	0.57	4(33.3%)	8(66.7%)	0.43	5(41.7%)	7(58.3%)	0.24
	No	40(88.9%)	5(11.1%)		10(22.2%)	35(77.8%)		11(24.4%)	34(75.6%)	

Table 5: The relationship between the symptoms of COVID-19 and compliance with a gluten-free diet, autoimmune and comorbid diseases.

Severity of Disease	Gluten-free diet		p	Autoimmune diseases		p	Comorbid diseases		p
	Yes N=52	No N=5		Yes N=14	No N=43		Yes N=16	No N=41	
Mild	42(89.4%)	5(10.6%)	1.00	11(23.4%)	36(76.6%)	0.19	12(25.5%)	35(74.5%)	0.43
Moderate	5(100%)	0(0%)		2(40%)	3(60%)		2(40%)	3(60%)	
Moderateto Severe	4(100%)	0(0%)		0(0%)	4(100%)		1(25%)	3(75%)	
Severe	1(100%)	0(0%)		1(100%)	0(0%)		1(100%)	0(0%)	

Table 6: The relationship between the clinical course of COVID-19and compliance with gluten-free diet, autoimmune and comorbid diseases.

and vomiting, and 7% lost their sense of taste and smell[11].Furthermore, Salepci et al.'s study of 223 COVID-19patients found that 71% suffered from weakness, 54% had a cough, 50% from a fever, 50% suffered from muscle pain, 37% from shortness of breath, and 34% lost their sense of taste and smell[12].

Our results showed that COVID-19 infection in celiac patients most frequently presented with myalgia, headache, and loss of taste and smell (82.5%, 64.9%, and 63.2%, respectively). We observed that a loss of taste and smell, in less than 10% of patients in the general population, was observed in 63.2% of patients with CD. This rate was significantly higher compared to other studies conducted in our society. Both neurological and psychiatric interactions are common in CD and COVID-19[13]. This combination might be related to the high rates of loss of taste and smell in these patients. The incidence of fever, diarrhea, abdominal pain, nausea, and vomiting was similar to the general population[9]. However, it was noteworthy that a cough, which is the most common symptom in the normal population, was seen in only one-third of celiac patients during COVID-19. When the literature is examined, the most frequently observed symptoms in patients with Type 1 DM during the period of COVID-19 infection are nausea and vomiting (71.4%) and fever (57.1%). Meanwhile, a cough, sore throat, abdominal pain, and shortness of breath were reported to be less common, which is similar to the results of our study[14].

The course of COVID-19 infection varies across a wide clinical spectrum, ranging from asymptomatic to mortality from SARS. Many factors, such as the immune system, age, and the presence of comorbid diseases, are related to the clinical course of the disease[15-17]. Various studies examining the relationship between the symptoms and the severity of the disease have produced differing data. Oran et al. reported that 40-45% of the 45,000 COVID-19 patients they examined were asymptomatic[17]. Wu et al. reported that 81% of 44,500 confirmed COVID-19 patients reported to the Chinese anti-infection agency had a mild to moderate course, 14% had a serious course and 5% had a severe course[18]. In this study, we observed that 82.5% of the patients examined had a mild course, 8.8% moderate, 7% moderate/severe, and 1.8% severe. Our results in terms of clinical course were similar to general population studies reported in the literature. These results showed that CD does not pose an additional risk to patients during the clinical course of COVID-19 and reveal that in people with CD, growing concerns of the increased likelihood of catching COVID-19 and that the disease will be severe are unfounded[19]. The relationship between the symptoms of COVID-19 and the severity of the clinical course of the disease has been established. It has been reported that shortness of breath is more common in those hospitalized with COVID-19[20, 21]. Fever and respiratory symptoms can be seen in the progress of the disease in the elderly and those with comorbidities[22, 23]. In a study in which 1,099 inpatients were examined, it was reported only 44% of the patients presented a fever during hospitalization, while fever was found in 89% of the patients during the period after hospitalization. Symptoms related to the severity of the disease may occur during the course of the disease[24]. In our study, we found that fever, nausea and vomiting, and abdominal pain complaints were more common in the group with a more severe COVID-19 infection. It has been reported that the complaint of fever correlates with the severe course of the COVID-19 disease in the general population[22, 23]. Gastrointestinal system complaints in patients with CD appear to be associated with the severe clinical course of COVID-19.

It is known that the age of the patient is a determining factor in the course of COVID-19. It has been reported that 87% of cases in China are between the ages of 30-79[18]. Studies have revealed that advanced age is a strong risk factor for a severe form of the disease, the resulting complications, and death[24, 25]. Verity et al. reported that the highest rate of hospitalization occurs in those who are aged 80 and over, at 18%[26]. Our results show that COVID-19 also progresses with more severe clinical symptoms in advanced-age celiac patients.

It is well known that CD coexists with other autoimmune diseases, such as Type-1 DM, Hashimoto's thyroiditis and Sjögren's[27]. Studies show that those with an autoimmune disease are not at a higher risk of contracting COVID-19 than the general population[28]. Hayek et al. examined 32 patients with Type 1 DM who contracted COVID-19, detecting both additional thyroiditis and CD in 6 (18.8%) patients[29]. In our study, we found that 14 (24.6%) of celiac patients had an accompanying autoimmune disease. We also observed that the presence of another autoimmune disease had no effect on the symptoms and clinical course of COVID-19. It is known that the presence of comorbid diseases is associated with a severe clinical course and mortality in COVID-19 patients.

Cardiovascular diseases, DM, hypertension, chronic lung disease, and malignancies stand out among the comorbid diseases[18, 30]. In our study, we found that 28.1% of the patients had comorbid diseases, with hypertension and type-2 DM being the most common. Our results were similar to those reported in the literature. However, we did not find a statistically significant relationship between the presence of comorbid diseases, COVID-19 presentation, and the severity of its clinical course in patients with CD.

There has been no comprehensive study as yet on whether there is a relationship between compliance with gluten-free diet in celiac patients and the symptoms and clinical course of COVID-19. A survey conducted by Zhen et al. found no correlation between compliance with a gluten-free diet and contracting COVID-19. As a result of this study, it can be concluded that the likelihood of patients with CD contracting COVID-19 is similar to that of the general population. Therefore, there is no need for those with CD to take extra precautions in addition to those which have been recommended to society[31]. In our study, we did not find a significant relationship between compliance with a gluten-free diet, the symptoms of COVID-19, and the severity of its clinical course.

The limited number of studies in the literature have indicated that those with CD do not have an additional risk in terms of COVID-19 infection; however, additional clinical and epidemiological studies with large series are still required (32,33). From this point of view, this study is the largest in which only celiac patients were included.

Our results are summarized below:

• COVID-19 infection in celiac patients is most frequently presented with myalgia, headache, and loss of taste and smell.

• Loss of taste and smell in patients with CD was significantly higher than the rates reported in the normal population. This is thought to be related to the frequent neuropsychiatric effects of both CD and COVID-19.

• Cough and shortness of breath associated with the severe consequences of COVID-19 were found to be less common in celiac patients than in the general population. This reveals that having CD does not pose an additional risk to patients during the clinical course of COVID-19. Therefore, growing concerns that CD patients are more susceptible to contracting COVID-19 and that the disease will take a severe course are unfounded.

• In patients with CD, gastrointestinal tract complaints-nausea and vomiting, and abdominal pain-are more common during COVID-19 compared to the general population, which would appear to be related to the severity of the clinical course of the disease.

• The presence of another autoimmune disease in celiac patients does not seem to have an effect on the symptoms and clinical course of COVID-19.

• No statistically significant relationship was found between the presence of comorbid diseases, the presentation of COVID-19, and the severity of its clinical course in patients with CD.

• There was no significant relationship between compliance with a gluten-free diet in celiac patients, the symptoms of COVID-19 infection, and the severity of its clinical course.

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