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Current Threat in COVID-19; Asymptomatic Carriers

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ABSTRACT

BACKGROUND/AIM: Asymptomatic infections are not low in their inability to spread the virus and have no special clinical signs. Consequently, the detection of asymptomatic infections is the central issue for early prevention and control of the coronavirus disease-2019 (COVID-19) around the world. This study aimed to assess the demographic, clinical, and laboratory findings of symptomatic and asymptomatic patients with a diagnosis of COVID-19.

MATERIALS AND METHODS: In this retrospective single-center study, 165 laboratory-confirmed COVID-19 patients who were asymptomatic or symptomatic and followed up at home or in the hospital between March 15, 2020, and May 23, 2020, were included.

RESULTS: Among all 165 patients, 21 (12.7%) were asymptomatic and 144 (87.2%) were symptomatic. The median age of the symptomatic patients was higher than the asymptomatic patients, and there were no asymptomatic patients over 65 years older. Twenty-one patients were asymptomatic at admission, but four of them (19%) developed symptoms in the follow-up. Although the white blood cell (WBC) and lymphocyte counts were within the normal range for all patients, the asymptomatic

patients had a significantly higher WBC and lymphocyte count than the symptomatic patients. The symptomatic patients had higher median C-reactive protein levels than the asymptomatic patients. For the typical CT findings for COVID-19, there were fewer in the asymptomatic infections (12 cases, 57.1%) than those in the symptomatic infections (103 cases, 71.5%). There were 17 (10%) patients in need of intensive care and the mortality rate was 6.1%.

CONCLUSION: Asymptomatic infections spread silently in COVID-19. More importance should be given to the identification and quarantine of asymptomatic patients to eliminate COVID-19 transmission and to allow for the early diagnosis of pre-symptomatic patients.

Keywords: COVID-19, SARS-CoV-2, pre-symptomatic, asymptomatic, control

INTRODUCTION

In late December 2019, a series of unexplained pneumonia cases were identified in Wuhan, China, which attracted the attention of health officials. As a result of studies, a new coronavirus (2019-nCoV) was identified by Chinese scientists on January 7, 2020. At the same time, the International Committee on Taxonomy of Viruses (ICTV) declared that the new coronavirus to be severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). The World Health Organization announced "COVID-19" as the name of this new disease on February 11, 2020.[1] Globally so far, nearly 145 million people have been infected with COVID-19, and more than 3 million people have died.[2] Drug and vaccination studies on this subject are ongoing. In the absence of effective treatment, the key points to control COVID-19 rests on the

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early recognition and containment of an infected person, and the interruption of transmission.[1]

COVID-19 is a complicated illness with a broad spectrum of clinical patterns. Although approximately 20% of patients progress with moderate or severe disease, some remain asymptomatic.[3] Asymptomatic infections have no certain incubation period owing to the absence of clinical signs.[4] Knowing the frequency of asymptomatic infections will allow for a comprehension of the epidemiological capability of COVID-19 transmission and the genuine universality of the illness.

As reported in the literature, the incidence of asymptomatic carriers ranges from 1.6% to 51.7%.[1]

Asymptomatic patients with SARS-CoV-2 infection may become symptomatic during follow-up.[5] Asymptomatic patients are not low in their capacity to spread the infection and these patients are likely to give rise to new rounds of outbreaks. Thus, the detection of asymptomatic infections is the central issue for the early prevention and control of COVID-19 around the world.[6,7]

This study aimed to assess the demographic, clinical and laboratory findings of symptomatic and asymptomatic patients admitted to our university hospital with a diagnosis of COVID-19.

MATERIALS AND METHODS

Study Design and Patients

The study was conducted retrospectively in the Faculty of Medicine of Erciyes University. Patients who were asymptomatic or symptomatic and followed up at home or in the hospital between March 15, 2020 and May 23, 2020 were included in this study. Case definitions were made according to the Republic of Turkey Ministry of Health guidelines.[8]

Data Collection

Epidemiological, demographic, clinical, laboratory, treatment, and outcome data were obtained from the hospital's electronic records. In addition, chest computed tomography (CT) findings of the patients before treatment were recorded.

Definitions

Asymptomatic infection: Patient samples were positive for SARS-CoV-2 by reverse transcriptase polymerase chain reaction test (RT-PCR), and the absence of typical clinical symptoms or signs.

People who were close contacts of those patients diagnosed with COVID-19 in our hospital were screened by performing a COVID-19 PCR test and thus, asymptomatic patients were found.

Symptomatic infection: Patient samples were positive for SARS-CoV-2 by RT-PCR in conjunction with the typical clinical symptoms and signs.

Pre-symptomatic infection: Asymptomatic infection at admission and development of typical clinical symptoms and signs during follow-up.

Typical findings in chest CT:

- Peripheral, bilateral (multilobar) ground glass areas
- Multifocal ground glass areas (consolidation, crazy paving pattern can also be seen)

Atypical findings in chest CT

- Round or non-peripheral multifocal, diffuse, perihilar or unilateral ground glass areas
- Lobar or segmental consolidation or tree in bud view without areas of ground glass
- Cavitation
- Pleural effusion with interlobular septal thickening

Normal chest CT: No finding of pneumonia.[8]

Laboratory Procedures

Laboratory data include complete blood cell count, renal and liver function, creatine kinase, lactate dehydrogenase, electrolytes, coagulation profile (prothrombin time, active thromboplastin time,

INR, D-dimer and fibrinogen), myocardial enzymes, serum ferritin, CRP, procalcitonin and these were monitored periodically. Combined throat/nasal swab samples were tested for SARS-CoV-2 RNA.

Trained personnel collected the nasopharyngeal/oropharyngeal swabs and transferred the samples onto viral transport media. The SARS-CoV-2 RNA from these samples was determined using the Biospeedy COVID-19 RT-PCR kit (Bioeksen R&D Technologies Ltd., Republic of Turkey Ministry of Health, Istanbul, Turkey) according to the manufacturer's protocols. All tests were carried out with the Roto-Gene platform (Qiagen, Hilden, Germany).

From those whom combined nose and throat swab samples were taken:

- Patients who were possible cases and were admitted to our hospital.[8]
- Patients whose first COVID-19 PCR result was negative, but clinically, laboratory or
- Radiologically were likely to be considered COVID-19 (with 24-hour intervals) and those
- Patients with positive COVID-19 PCR results included in this study.
- A control COVID-19 PCR sample was taken from patients with stable vital signs for 72 hours during treatment.
- For patients with a positive PCR results and whose treatment was completed, a PCR scan was
- Performed every 48 hours until a negative result was obtained.
- Patients whose positive PCR test turned negative were discharged.

In each case, symptoms such as fever, cough, nasal congestion, dizziness, fatigue, shortness of breath, arthralgia, etc. that occurred during their hospitalization were recorded.

Statistical Analysis

Histogram, q-q plots and Shapiro–Wilk's test were examined to assess the data normality. The Levene test was used to test variance homogeneity. To compare the differences between the symptomatic and non-symptomatic groups, either independent two samples t-test or Mann–Whitney U tests were applied for continuous

variables, Pearson chi-square analysis or Fisher's exact test were applied for categorical variables. Kaplan–Meier plots were generated to compare the survival probabilities between the patient groups. Additionally, univariate and multiple Cox proportional hazards regression analysis were conducted to identify the risk factors of survival time. Significant variables at $p<0.05$ were included into a multiple model and forward elimination was performed using Wald statistic.

The proportional hazards assumption was assessed using Schoenfeld residuals. Hazard ratios were calculated with 95% confidence intervals. The Hosmer–Lemeshow test was used to assess the goodness of fit of the built model. To check for multiple testing, all p-values were adjusted using the Benjamini–Hochberg procedure. Adjusted p-values less than 5% were considered to be statistically significant. All analyses were conducted using R 3.5.1 (www.r-project.org) and TURCOSA (Turcosa Analytics Ltd. Co., Turkey, www.turcosa.com.tr) software.

Ethical Consideration

The study was approved by the Research Ethics Commission of University of Erciyes, Turkey (2020/357-2020.07.08).

RESULTS

Demographic Characteristics

In the planned study interval, 1157 patients admitted to our hospital were possible cases and 165 of them were determined as definite cases and were incorporated into this study. The flow diagram of the patients enrolled in this study is shown in Figure 1. Of these patients, 21 (12.7%) were asymptomatic and 144 (87.2%) were symptomatic. The demographic data of these two groups are shown in Table 1. The median age of the patients was 46 years and a preponderance of them was male (53%).

Asymptomatic patients had a lower median age than symptomatic patients, and there was no asymptomatic patient over 65 years. According to age, there was no significant differences between the groups ($p=0.114$). Twenty-seven (12.7%) patients were healthcare workers [5 (23.8%) of the asymptomatic patients and 16 (11.1%) of symptomatic patients]. There were 10 (6.1%) patients with a travel history abroad in the prior 14 days and all of them were symptomatic. From all of the patients, 41.8% had a history of exposure with cases diagnosed with COVID-19 in their family or at work and this rate was significantly higher in the symptomatic patients (71.4%) ($p<0.05$). There were 52 (31.5%) patients with a minimum of one comorbidity. The most frequent comorbidities were hypertension (18.2%), diabetes mellitus (DM) (12.7%) and coronary artery disease (CAD) (9.7%).

Distribution of Symptoms in COVID-19 Patients

The symptom distribution of those patients who were symptomatic at the time of admission is shown in Figure 2. Among the 144 symptomatic patients, the most common symptom was coughing (63.2%).

Other symptoms were fever (55,6%), dyspnoea (31.3%), myalgia (30.6%), sore throat (29.9%) and headache (17.4%). Twenty-one patients were asymptomatic at admission, but four of them developed symptoms in the follow-up. The demographic, clinical and laboratory findings of pre-symptomatic patients are shown in Table 2. Among them, 75% of these patients were 50 years or older and were male. Two patients had at least one comorbidity and one patient who became symptomatic had a history of malignancy. No significant difference was found when laboratory findings (lymphocyte count, CRP, D-dimer) were observed at the time of admission. Only the patient with malignancy had a high level of CRP (70 mg/L). Three pre-symptomatic patients were found to have abnormal chest CT findings. Invasive mechanical ventilation was needed for just one patient who had malignancy but it was not fatal.

Laboratory and Radiologic findings

A comparison of first admission laboratory and radiological findings between the symptomatic and asymptomatic groups is shown in Table 3. Whereas the white blood cell (WBC) and lymphocyte counts were within the normal range for all patients, the asymptomatic patients had a significantly higher WBC and lymphocyte count than the symptomatic patients. The symptomatic patients had higher median CRP levels than the asymptomatic patients and there was statistically significant difference between the two groups ($p<0.05$). When the radiological findings of all the patients were evaluated, 115 (69.7%) were typical for COVID-19, 26 (15.8%) were normal and 18 (10.9%) were atypical. For the typical CT findings for COVID-19, there were fewer in the asymptomatic infections (12 cases, 57.1%) than those in the symptomatic infections (103 cases, 71.5%). Among the 21 asymptomatic patients, 13 (61.9%) had abnormal radiological findings and 8 (38.1%) patients had no signs of pneumonia on chest CT. There was no significant difference between the symptomatic and asymptomatic patient groups in terms of age, gender, comorbidity, laboratory findings (except CRP levels) or prognosis.

Treatment and Prognosis

A comparison of the treatment and prognosis between the symptomatic and asymptomatic groups is shown in Table 4. Almost all of the patients (98.8%) received hydroxychloroquine treatment. Favipiravir treatment rates were higher in the symptomatic patients ($p<0.05$). There was no significant difference for other antiviral or antibacterial treatment rates in these groups. The median duration of hospitalization was 7 days and it was higher in the symptomatic patients ($p<0.05$). There were 17 (10%) patients in need of intensive care and the mortality rate was 6.1%. Invasive mechanical ventilation was needed for just one asymptomatic patient, but it was not fatal. No significant difference in terms of the

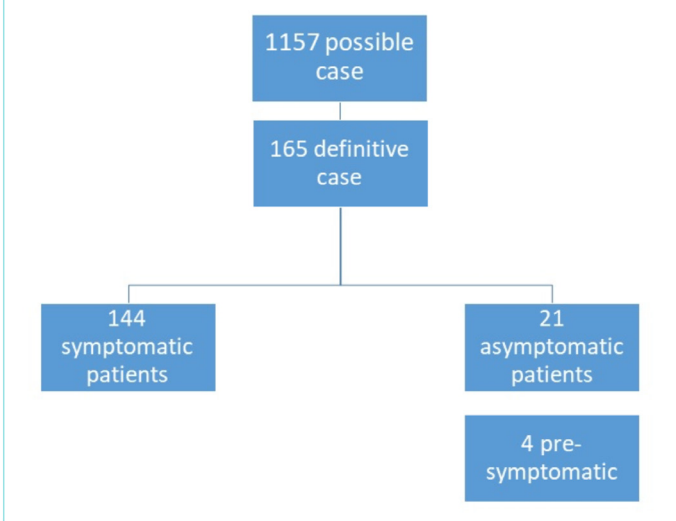

Figure 1. Flow diagram of patients enrolled in this study.

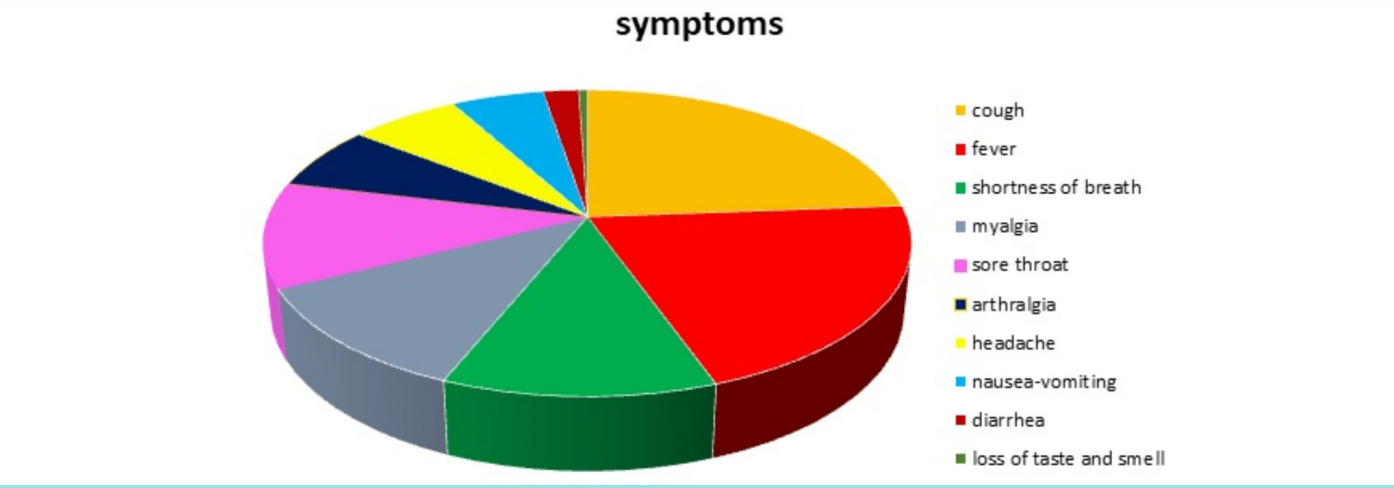

Figure 2. Symptom distribution of patients diagnosed with COVID-19.
COVID-19: coronavirus disease-2019

presence of nosocomial infection, invasive mechanical ventilation, and mortality between these two groups was found.

DISCUSSION

Asymptomatic carriers have a significant role in the spread of COVID-19 disease.[9]

Asymptomatic patients are a silent source of infection, who can unknowingly place others at risk of infection as they have fewer admissions to hospital. Therefore, they can lead to a global increase in morbidity and mortality with the expansion of the pandemic.[1,10] Identifying asymptomatic patients is one of the most important strategies in disease control. This study included 165 COVID-19 patients and 21 (12.7%) of them were asymptomatic at admission. In a study conducted in 72,314 patients in China, 1.6% were found to be asymptomatic, whereas another study found that the incidence of asymptomatic infection was 30.8% in 565 Japanese people who were evacuated from Wuhan. The incidence of asymptomatic patients on the "Diamond Princess" ship, which was quarantined in early February, 2020 due to COVID-19 disease, was found to be 51.7%. In these last two studies, it has been suggested that the reason for the higher incidence is close contact in a certain closed area.[1]

In this study, the median age of the symptomatic patients was higher than the asymptomatic patients, but there was no significant difference between these groups. Also, there were no asymptomatic patients over 65 years of age. In previous studies comparing the demographic data of asymptomatic and symptomatic patients with COVID-19, asymptomatic patients were younger than the symptomatic ones.[11,12] In the literature, people with comorbidity or the elderly are more vulnerable to serious diseases.[13,14] There were 52 (31.5%) patients with a minimum of one comorbidity in this study. The most frequent comorbidities were hypertension (18.2%), DM (12.7%) and CAD (9.7%). There was no significant difference in terms of comorbidities between our groups.

Among the 165 patients with COVID-19, cough was the most common symptom (63.2%) and the second was fever with a rate of 55.6%. More than 370,000 patients diagnosed with COVID-19 in the United States

Table 1. Comparison of patient characteristics between symptomatic and asymptomatic groups

Variables	Asymptomatic (n=21)	Symptomatic (n=144)	Total (n=165)	p-value	adj.p
Age (years)	42.38±11.33	47.01±16.99	46.42±16.42	0.114	0.277
Over 50 years old	6 (28.6)	61 (42.4)	67 (40.6)	0.229	0.360
Over 65 years old	0 (0.0)	25 (17.4)	25 (15.2)	**0.046**	0.253
Male (gender)	13 (61.9)	75 (52.1)	88 (53.3)	0.399	0.488
Healthcare worker	5 (23.8)	16 (11.1)	21 (12.7)	0.151	0.277
Imported cases	0 (0.0)	10 (6.9)	10 (6.1)	0.364	0.488
Exposure history	15 (71.4)	54 (37.5)	69 (41.8)	**0.003**	0.033
Comorbidity	3 (14.3)	49 (34.0)	52 (31.5)	0.069	0.253
Hypertension	1 (4.8)	29 (20.1)	30 (18.2)	0.128	0.277
Diabetes mellitus	1 (4.8)	20 (13.9)	21 (12.7)	0.480	0.528
Coronary heath diseases	1 (4.8)	15 (10.4)	16 (9.7)	0.696	0.696

Values are expressed as n (%) or mean ± SD, significant p-values are shown in bold.
SD: standard deviation, n: number.

Table 2. Characteristics of pre-symptomatic patients

Variables	Patient 1	Patient 2	Patient 3	Patient 4
Age (years)	50	39	56	57
Gender	Male	Male	Male	Female
Days of hospitalization	5	6	60	18
Exposure history	Yes	Yes	No	No
Any pre-existing comorbidity	Yes	No	Yes	Yes
Comorbidities	HT, CAD	No	Malignancy	DM
The median duration of PCR negativization	20	5	20	10
Symptom	Cough-weakness	Myalgia	Fever-dyspnoea	Fever
Thorax CT finding	No	Typical	Typical	Typical
WBC (x10³/µL)	3950	6450	2220	6330
Lymphocyte count (x10³/µL)	1080	1880	1580	1280
Lactate dehydrogenase (u/L)	223	190	243	150
D-dimer (µg/L)	290	420	420	250
CRP (mg/L)	2,30	5,32	70,16	24,43
Treatment	Hydroxychloroquine + Azithromycin	Hydroxychloroquine + Azithromycin +Oseltamivir	Hydroxychloroquine + Azithromycin +Favipiravir+ Oseltamivir	Hydroxychloroquine + Azithromycin +Oseltamivir
Nosocomial infection	No	No	Yes	No
Intubation	No	No	Yes	No
Intensive care unit	No	No	Yes	No
Outcome	Discharge	Discharge	Discharge	Discharge

HT: hypertension, CAD: coronary artery diseases, DM: diabetes mellitus, PCR: polymerase chain reaction,WBC: white blood cell, CT: computed tomography, CRP: C-reactive protein.

reported to the Centers for Disease Control and Prevention (CDC) and the most common symptoms were cough (50%), fever (43%), myalgia (36%), headache (34%), and dyspnea (29%).[15] Similar frequencies of clinical findings were found in other studies.[13,16] Of our patients, twenty-one were asymptomatic at admission, but four of them (19%) developed symptoms during follow-up. These symptoms were similar to those of the symptomatic patients. In a skilled nursing facility, 27 (56%) of 48 confirmed COVID-19 cases were classified as asymptomatic at the time of diagnosis. However, 24 of them developed symptoms within 7 days of their follow-up.[5]

A study conducted in a nursing home in the United States showed that 23 novel coronary pneumonia virus RT-PCR tests were positive, 10 were symptomatic and 13 were asymptomatic.

Among them, 10 patients were reported to have developed symptoms within 7 days of testing and three of them with positive test results continued to be asymptomatic, suggesting that hidden infections account for approximately 13% (3/23) of the total number of infections.[17] As a result of these studies, it can be stated that, the earlier that testing is performed, the higher the rate of detected asymptomatic infections will be. In China, a total of 81,802 COVID-19 cases were reported as of April 7, 2020 and 1,190 of them were asymptomatic and 1095 of these asymptomatic patients were under follow-up. In the light of these results, the frequency of "true" asymptomatic infection was found to be between 1.5 % and 2.8%. On the other hand, the authors emphasized that this is unlikely to show the true prevalence of asymptomatic infection. The rate of asymptomatic case detection was found to be high due to the careful follow-up of close contacts.[9] Therefore, it is essential to follow asymptomatic patients, as they may not be true asymptomatic cases.

When the laboratory findings of all the patients were compared, WBC and lymphocyte values were within the normal range and the asymptomatic patients had a significantly higher WBC and lymphocyte counts than the symptomatic patients. Similarly, another study reported that WBC and lymphocyte count levels were significantly higher in asymptomatic infections than in symptomatic patients which confirmed that the lymphocyte count was important in clearing the virus.[11,12] Previous studies showed that CRP levels may be considered as a determinant of disease severity.[7,18] Considering our data, the CRP levels were found to be significantly higher in the symptomatic patients.

In our study, approximately 70% of the patients had typical radiological findings for COVID-19.

The proportion of asymptomatic patients with typical CT findings for COVID-19 was close to

the symptomatic patients (57.1%, 71.5% respectively). As a result, there was also a significant presence of tomography findings in those patients without clinical symptoms and they should be tested for COVID-19. Recent studies support this inference. In one study that included 24 asymptomatic patients, 50% had findings of ground-glass or patchy shadows in the lungs and 20% had atypical imaging abnormalities.[6] In a similar study of 55 patients with asymptomatic infection, 67% were found to have pneumonia on admission; only two patients developed hypoxia, and all were discharged.[7] The close follow-up of asymptomatic patients with radiological findings on chest tomography at admission is recommended for progression.

Table 3. Comparison of admission laboratory and radiological findings between symptomatic and asymptomatic groups

Variables	Asymptomati (n=21)	Symptomatic (n=144)	Total (n=165)	p-value	adj.p
WBC (x10³/µL)	6130 (4690–7300)	5745 (4735-7218)	5810(4740-7215)	0.870	0.979
Lymphocyte count (x10³/µL)	1640 (1285–2425)	1490 (1100-1927.5)	1520(1105-1960)	0.145	0.447
Neutrophil count (x10³/µL)	3540 (2525–4980)	3580 (2833-4653)	3580(2710-4645)	0.694	0.807
Hemoglobin (g/L)	14.15±1.81	13.94±1.74	13.97±1.74	0.602	0.807
Platelet count	247,000 (193,000–320,000)	230,000 (187,250–296,750)	230,000 (189,000–299,500)	0.303	0.671
Aspartate aminotransferase (u/L)	22.0 (17.5-27.5)	22.0 (17.0–32.0)	22.0 (17.0–31.0)	0.736	0.807
Alanine aminotransferase (u/L)	22.0 (15.5–36.7)	21.0 (14.9–29.0)	21.0 (15.0–30.0)	0.373	0.671
Lactate dehydrogenase (u/L)	210 (167–236)	203 (174–244)	203 (172–242)	0.637	0.807
Troponin (ng/mL)	0.004 (0.003–0.006)	0.005 (0.003–0.007)	0.0045 (0.003–0.007)	0.369	0.671
Creatine kinase (U/L)	83.0 (57.8–95.8)	84.0 (52.5–111.0)	84.0 (54.0–110.0)	0.979	0.979
Fibrinogen (mg/dL)	368.0 (312.0–418.5)	347.0 (270.5–473.8)	353.0 (278.0–455.0)	0.728	0.807
D-dimer (µg/L)	370 (235–420)	410 (250–610)	385 (250–590)	0.149	0.447
Ferritin (ng/mL)	192.0 (89.0–343.5)	219.5 (130.8–457.3)	210.0 (124.5–432.5)	0.573	0.807
CRP (mg/ L)	4.25 (1.47–7.49)	10.10 (3.13–37.15)	8.82 (2.77–31.45)	**0.006**	0.108
Procalcitonin (ng/mL)	0.030 (0.020–0.045)	0.050 (0.030–0.090)	0.040 (0.030–0.083)	0.057	0.266
Blood urea nitrogen (mg/dL)	12.0 (11.0–15.5)	12.0 (9.5–16.2)	12.0 (9.7–16.0)	0.762	0.807
Creatinine (mg/dL)	0.80 (0.67–1.00)	0.84 (0.70–1.04)	0.83 (0.70–1.03)	0.333	0.671
Triglyceride (mg/dL)	173.0 (138.5–206.5)	128.5 (92.3–173.5)	136.0 (94.0–178.0)	0.059	0.266
Torax CT finding					
No CT	0 (0.0)	6 (4.2)	6 (3.6)		
Normal	8 (38.1)	18 (12.5)	26 (15.8)		
Atypical	1 (4.8)	17 (11.8)	18 (10.9)	**0.020**	0.180
Typical	12 (57.1)	103 (71.5)	115 (69.7)		
Asymptomatic patientwith typical CT finding	13 (61.9)	-	-	-	

Values are expressed as n (%), mean ± SD or median (1st–3rd quartiles), significant p-values are shown in bold.
SD: standard deviation, WBC: white blood cell, CT: computed tomography, n: number.

Table 4. Comparison of treatment and prognosis related variables between symptomatic and asymptomatic groups

Variables	Asymptomatic (n=21)	Symptomatic (n=144)	Total (n=165)	p-value	adj.p
Hydroxychloroquine	21 (100.0)	142 (98.6)	163 (98.8)	0.999	0.999
Azithromycin	11 (52.4)	91 (63.2)	102 (61.8)	0.341	0.686
Favipiravir	1 (4.8)	36 (25.0)	37 (22.4)	**0.047**	0.259
Oseltamivir	7 (33.3)	67 (46.5)	74 (44.8)	0.256	0.686
The median duration of PCR negativization	6 (5-16.5)	6 (5-8)	6 (5-8.8)	0.168	0.581
Days of hospitalization	6 (3.5-7)	8 (6-11)	7 (5-11)	**0.004**	0.044
Nosocomial infection	2 (11.1)	10 (7.5)	12 (7.9)	0.636	0.999
Prone position	1 (5.20)	20 (17.5)	21 (15.9)	0.304	0.686
Intensive care unit	1 (4.8)	16 (11.1)	17 (10.3)	0.700	0.999
Intubation	1 (4.8)	11 (7.6)	12 (7.3)	0.999	0.999
Mortality	0 (0.0)	10 (6.9)	10 (6.1)	0.364	0.686

Values are expressed as n (%) or median (1st–3rd quartiles), significant p-values are shown in bold.
PCR: polymerase chain reaction, n: number.

CONCLUSION

In summary, we compared the demographic, clinical and laboratory findings of symptomatic and asymptomatic patients confirmed with COVID-19 in our university. In the light of this information, those with an absence of lymphopenia and low CRP levels are more likely to have the disease asymptomatically. Due to the high risk of the silent spread of the disease by asymptomatic people, testing programs should include those without symptoms. More importance should be given to the identification and quarantine of asymptomatic patients in order to eliminate COVID-19 transmission and to allow for the early diagnosis of pre-symptomatic patients. Transmission can be greatly reduced if both asymptomatic and symptomatic patients can be appropriately quarantined.

MAIN POINTS

- The detection of asymptomatic infections is the central issue for the early prevention and control of COVID-19 around the world.
- Asymptomatic patients at admission may develop symptoms in follow-up. When earlier tests are performed for possible cases, the rate of asymptomatic infections will be seen to increase.
- Those of younger age, with an absence of lymphopenia, low CRP levels, and no signs of pneumonia on chest CT are more likely to have the disease asymptomatically.

ETHICS

Ethics Committee Approval: The study was approved by the Research Ethics Commission of the University of Erciyes, Turkey (2020/357-2020.07.08).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: F.İ., Z.T., Design: F.İ., Z.T., B.B.K., Supervision: G.Z., B.A., O.Y., Data Collection and/or Processing: F.İ., Z.T., G.K.Ü., B.B.K., Analysis and/or Interpretation: F.İ., Z.T., G.K.Ü., Literature Search: F.İ., Z.T., B.A., O.Y., Writing: F.İ., Z.T., G.Z., Critical Review: B.A., O.Y.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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