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The Correlation between Biomarkers and Chest Computed Tomography Findings and the Severity of COVID-19 Patients

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ABSTRACT:
Purpose: This study aims to reveal the correlation between some biomarkers and chest computed tomography findings and the severity of patients with COVID-19.
Materials and Methods: COVID-19 patients admitted to the emergency department and hospitalized between 20 March 2020 and 31 May 2020 were included in the study. Blood tests taken in the emergency room and chest computed tomography findings were examined. The risk factors for the severity and mortality of the chest computed tomography findings and biomarkers in terms of intensive care needs of COVID-19 patients were assessed.
Results: Data from 113 COVID-19 patients were reviewed retrospectively. Of these patients, 40 did not have pulmonary involvement. The most common chest computed tomography finding was ground-glass opacity (n=47, 41.6%). In 16 patients with COVID-19 hospitalized in the intensive care unit and 7 patients with COVID-19 with the risk of mortality, it was found that severe pulmonary involvement and leukocyte, neutrophil, D-dimer, troponin I, urea, LDH, CRP, and procalcitonin values were significantly higher, and lymphocyte, thrombocyte, and albumin levels were significantly lower.
Conclusion: It was observed that the need for intensive care and the mortality risk increased when there was an increase in leukocyte, neutrophil, D-dimer, CRP, procalcitonin, urea, and troponin values, and severe computed tomography findings, and a decrease in lymphocyte, thrombocyte, and albumin values.
Keywords: *Biomarkers, Chest computed tomography, COVID-19, Mortality*

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INTRODUCTION

The novel coronavirus disease (COVID-19), first identified as a pneumonia agent of unknown etiology in Hubei province in China in December 2019, was declared a pandemic by the World Health Organization (WHO) on March 11, 2019, and caused difficulties in the health system worldwide (Calvi et al., 2021). Adversely affecting millions of people worldwide, common symptoms of this disease are fever, myalgia, and respiratory and gastrointestinal system complaints (Wong et al., 2020). While COVID-19 infections often recover without any treatment, serious problems such as metabolic acidosis, septic shock, and acute respiratory distress syndrome (ARDS) may occur, particularly in severe cases (Wong et al., 2020). In addition, it can lead to death in cases with advanced age comorbidity (Wang D. et al., 2020). Many hospitals offer investigational tests for cases identified with a preliminary diagnosis of COVID-19 and perform radiological imaging such as chest computed tomography, complete blood count, coagulation tests, acute phase reactant tests, D-dimer, and serum biochemistry tests (such as liver function tests, kidney function tests, troponin, albumin, electrolytes) These tests can provide vital information related to the prognosis of COVID-19.

According to China's latest Diagnosis and Treatment Protocol for COVID-19 (Version T., 2020), the real-time reverse transcription-polymerase chain reaction (rRT-PCR) test is necessary for COVID-19 diagnosis; however, a certain percentage of false-negative results have been reported. Therefore, a combination of repeated swab tests and computed tomography (CT) scan may be essential for individuals whose rRT-PCR test is negative but who are clinically at high risk for novel coronavirus infection (2019-nCoV) (Xie et al., 2020). It may not be suitable to carry out the test due to the limitations and relatively long test time of reverse transcription-polymerase chain reaction. Clinical experience suggests that an early chest computed tomography (CT) may be helpful in the differential diagnosis of suspected cases. Chest CT findings specific to COVID-19 help physicians for early detection and diagnosis of the disease (Chung et al., 2020). Blood routine tests and chest X-ray findings have been associated with prognosis (Wong et al., 2020). In practice, symptoms and physiological observations such as prolonged fever, increased respiratory rate, and oxygen requirements are defined as progressive diseases. Moreover, among hospitalized patients, specific blood biomarker profiles, such as lymphopenia, neutrophilia, and elevated inflammatory markers such as C-reactive protein (CRP), have been associated with poor outcomes (Wang D. et al., 2020). However, there is no definitive standard for which biomarkers are the best predictive of severity, therapeutic response, or prognosis. We aim to reveal whether some biochemical, hematological tests, and computed tomography images in hospitalized patients with COVID-19 are associated with the risk of critical illness (transferred to the intensive care unit or resulting in death) for COVID-19 cases.

MATERIALS AND METHODS

Purpose and Type of the Study

This study aims to reveal the correlation between some biomarkers and chest computed tomography findings and the severity of patients with COVID-19. COVID-19 patients admitted to the emergency department and hospitalized between 20 March 2020 and 31 May 2020 were included in the study.

Sampling and participant

The study population comprised 113 consecutively hospitalized COVID-19 patients. The patients with chronic lung disease, cancer that might affect laboratory values, pregnant women, the patients younger than 18 and whose data could not be accessed from the hospital automation system were excluded from this study.

Data Collection Tools

The data in this single-center retrospective study were collected from a tertiary hospital in Turkey. After the approval of the local ethics committee, the analysis of COVID-19 patients who were admitted to the emergency department between March 20, 2020, and May 31, 2020, confirmed by rRT-PCR test and hospitalized consecutively, was performed. The patients' gender, age, admission complaints, comorbidities, their need for intensive care, whether they are alive or not, laboratory results (complete blood count, basic biochemistry tests, procalcitonin, D-dimer, troponin I, CRP) and chest CT findings (normal pulmonary findings, ground-glass opacity, pulmonary consolidation, pulmonary atelectasis, pleural effusion, and the lobe findings according to pathological examinations) were obtained from the hospital's database, evaluated, and recorded for each participant. Chest CT findings of the patients were examined by a clinician who did not know their clinical features. Chest CT findings were examined, and the severity of involvement of each five lobes was evaluated separately. According to these findings, the pulmonary involvement was classified as no involvement (0%), minimal (1-25%), mild (26-50%), moderate (51-75%), or severe (76-100%). The pulmonary involvement severity was given points and evaluated as 0 for no involvement, 1 for minimal involvement, 2 for mild involvement, 3 for moderate involvement, and 4 for severe involvement. A scoring between 0 and 20 was made for the five lobes, with 0 indicating no abnormality and 20 indicating that the COVID-19 lesions are more than 75% in all lung lobes (Chung et al., 2020).

Statistical Analysis

The data were analyzed through SPSS for Windows version 22.0 software (Statistical Package for Social

Science, Chicago, II, USA). Means, standard deviations (SD), frequency, and percentages were used to describe the characteristics of the participants. Normal distribution was checked with the Kolmogorov-Smirnov test. Normally distributed variables were given as mean ± SD and compared using Student's t-test. The variables that did not have normal distribution were defined as the median and interquartile range (IQR) and analyzed with non-parametric tests. Receiver Operating Characteristics (ROC) analysis was performed to determine the predictive factors of death risk. ROC curves were created for different prognostic factors. Area Under the Curve (AUC) values were used to compare ROC areas. The significance level of this study was determined as $p<0.05$.

Ethical Approval

Ethics committee approval was obtained from Sivas Cumhuriyet University Non-Interventional Clinical Research Ethics Committee with the date of 23 June 2021 and the decision number 2021-06/31.

RESULTS

113 patients with confirmed COVID-19 disease and hospitalized were included in this study. The mean age of the patients was 49.2±15.4 years, and 60 (53.1%) patients were male. A total of 18 (15.9%) patients were asymptomatic. The most common complaints of patients with symptoms were cough, fever, shortness of breath, myalgia, and loss of smell and taste. 67 (59.3%) patients in our study did not have comorbidities. The most common comorbidities were hypertension, coronary artery disease, and diabetes mellitus. 16 (14.2%) patients needed the intensive care unit, and 7 (6.2%) patients died (Table 1).

Table 1. Characteristics of the study patients

Variables	N (%)
Gender	
Female	53 (46.9)
Male	60 (53.1)
Need for intensive care	
Yes	16 (14.2)
No	97 (85.8)
Comorbidity	
Hypertension	22 (19.5)
Coronary artery disease	13 (11.5)
Diabetes Mellitus	10 (8.8)
Stroke	1 (0.9)
No Comorbidity	67 (59.3)
Complaints	
Fever	23 (20.4)
Dyspnea	13 (11.5)
Cough	26 (23)
Diarrhea	3 (2.7)
Myalgia	11 (9.7)
Anosmia	10 (8.8)
Aguzi	9 (8.0)
Asymptomatic	18 (15.9)
Survived	
Yes	106 (93.8)
No	7 (6.2)
Age (year)	49.2±15.4
Body temperature (°C)	37.2±0.7
Total lung severity score (Range)	6.6±5.7 (0-20)

In chest CT, there were normal pulmonary (n=40, 35.4%), ground-glass opacity (n=47, 41.6%), pulmonary consolidation (n=20, 17.7%), pulmonary atelectasis (n=3, 2.7%) and pleural effusion (n=3, 2.7%) findings, and these were bilateral in 49 (43.4%) and peripheral in 60 (53.1%) patients. The involvement was least in the right upper lobe and the most in the left lower lobe. When the lung involvement of the number of patients was evaluated as a percentage according to chest CT findings, it was found that 40 (35.3%) had no involvement, 17 (15%) had 1-25% involvement, 23 (20.4%) had 26-50% involvement, 26 (23%) had 51-75% involvement, and 7 (6.2%) had 76-100% involvement. While there were 40 patients with no involvement, 7 patients had 75% or more involvement (Table 2). In addition, bilateral involvement was detected in 49 (67.1%) of 73 patients, and peripheral involvement was detected in 60 (82.1%) patients.

Table 2: Radiographic Findings at Computed thorax tomography

Computed thorax tomography	N (%)
Distribution characteristics	
Ordinary lung findings	40 (35.4)
Only right lung involvement	14 (12.4)
Only left lung involvement	10 (8.8)
Bilateral	49 (43.4)
Central	13 (11.5)
Peripheral	60 (53.1)
Right superior lobe	27 (23.9)
Right middle lobe	39 (34.5)
Right inferior lobe	37 (32.7)
Left superior lobe	35 (31.0)
Left inferior lobe	40 (35.4)
Pulmonary involvement	
%0	40 (35.4)
%1-25	17 (15.0)
%26-50	23 (20.4)
%51-75	26 (23.0)
%76-100	7 (6.2)
CT findings	
Ordinary lung findings	40 (35.4)
GGO	47 (41.6)
Consolidation	20 (17.7)
Pulmonary atelectasis	3 (2.7)
Pleural effusion	3 (2.7)

GGO; Ground glass opacity, CT; Computed tomography

The mean age of the patients who needed intensive care was statistically significantly higher ($p<0.01$). All the patients in the intensive care unit had comorbidities, and it was statistically significant ($p<0.01$). The total lung severity score was significantly higher in patients admitted to the intensive care unit than in other patients ($p<0.01$). According to the laboratory results, the patients who needed intensive care, compared to the patients in the service, it was found that leukocyte, neutrophil, D-dimer, troponin I, urea, creatine, LDH, CRP, and procalcitonin values were found significantly higher. In contrast, lymphocyte ($p=0.037$), thrombocyte, and albumin values were found to be significantly lower ($p<0.01$) (Table 3).

Table 3: Comparison between patients with or without need of intensive care.

Variables	Need for intensive care (n=16)	No Need for intensive care (n=97)	p
Age (year) mean±SD	68,6±12,0	46,0±13,4	0,001
Comorbidities N (%)	16 (100)	32 (32,9)	0,001
Hemoglobin (g/dL) [median (IQR)]	13,90 (1,4)	14,2 (1,0)	0,293
Leukocytes (µL) [median (IQR)]	11002,5 (3126,7)	5075,0 (3009,0)	0,001
Lymphocytes (µL) [median (IQR)]	1402,0 (519,0)	2654,0 (947,5)	0,037
Neutrophils (µL) [median (IQR)]	4836,0 (1576,0)	2597,0 (890,0)	0,001
Platelet (µL) [median (IQR)]	163 000 (52750)	284 000 (81 000)	0,001
D-dimer (ng/mL) [median (IQR)]	2306,0 (1137,2)	235,0 (327,0)	0,001
Troponin (ug/L) [median (IQR)]	60,5 (42,0)	1,0 (2,0)	0,001
Urea (mg/dL) [median (IQR)]	63,5 (10,0)	31,0 (10,0)	0,001
Creatinine (mg/dL) [median (IQR)]	1,3 (0,5)	0,8 (0,1)	0,001
AST (U/L) [median (IQR)]	27,0 (16,5)	29,0 (15,0)	0,747
ALT (U/L) [median (IQR)]	43,5 (29,0)	45,0 (28,0)	0,813
LDH (U/l) [median (IQR)]	613,0 (133,2)	267,0 (84,0)	0,001
Albumin (g/dl) [median (IQR)]	3,6 (0,2)	3,9 (0,5)	0,001
CRP (mg/l) [median (IQR)]	61,0 (29,0)	4,0 (8,5)	0,001
Procalcitonin (ng/ml) [median (IQR)]	3,1 (0,9)	0,8 (0,5)	0,001
Total lung severity score mean±SD (Range)	15,8±2,4 (12-20)	5,1±4,6 (0-14)	0,001

LDH: Lactate dehydrogenase, CRP: C-reactive protein, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, IQR: Interquartile Range

Table 4: Relationship between survived and no survived patients

Variables	Survived (n=106)	No survived (n=7)	P
Age (year) mean±SD	47,5±14,4	73,8±6,7	0,001
Comorbidities N (%)	39 (36.7)	7 (100)	0,001
Hemoglobin (g/dL) [median (IQR)]	14,2 (1,1)	13,7 (1,0)	0,313
Leukocytes (µL) [median (IQR)]	5075,0 (3293,0)	12380,0 (4294,0)	0,001
Lymphocytes (µL) [median (IQR)]	2356,0 (1011,5)	1864,0 (140,0)	0,032
Neutrophils (µL) [median (IQR)]	2597,0 (890,0)	5603,0 (1093,0)	0,001
Platelet (µL) [median (IQR)]	256 000 (86 000)	165 000 (115 000)	0,033
D-dimer (ng/mL) [median (IQR)]	266,5 (401,5)	2756,0 (1767,0)	0,001
Troponin (ug/L) [median (IQR)]	1,0 (5,2)	82,0 (58,0)	0,001
Urea (mg/dL) [median (IQR)]	32,0 (10,0)	57,0 (28,0)	0,001
Creatinine (mg/dL) [median (IQR)]	0,9 (0,1)	1,1 (0,5)	0,096
AST (U/L) [median (IQR)]	27,5 (18,0)	35,0 (40)	0,151
ALT (U/L) [median (IQR)]	43,5 (28,0)	46,0 (31,0)	0,764
LDH (U/l) [median (IQR)]	286,0 (122,5)	645,0 (177,0)	0,001
Albumin (g/dl) [median (IQR)]	3,9 (0,4)	3,6 (0,1)	0,027
CRP (mg/l) [median (IQR)]	5,0 (11,2)	76,0 (23,0)	0,001
Procalcitonin (ng/ml) [median (IQR)]	0,8 (1,0)	3,8 (0,9)	0,001
Total lung severity score mean±SD (Range)	5,9±5,1 (0-17)	17,71±1,7 (15-20)	0,001

LDH: Lactate dehydrogenase, CRP: C-reactive protein, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, IQR: Interquartile Range

The mean age was higher in patients at risk of mortality due to COVID-19 than in other patients (p<0.01). All the patients who died during their follow-up had comorbidities, and it was statistically significant (p<0.01). The total lung severity score was significantly higher in patients with mortality than in patients who were discharged (p<0.01).

The leukocyte, neutrophil, D-dimer, troponin I, urea, LDH, CRP, and procalcitonin values in patients with mortality were significantly higher than in other patients (p<0.01). In contrast, lymphocytes (p=0.032), thrombocyte (p=0.033), and albumin (p=0.027) values were significantly lower than the other patients (Table 4).

According to ROC analysis, age (p<0.001), leukocytes (p<0.001), neutrophils (p<0.001), D-dimer (p<0.001), troponin I (p<0.001), LDH (p<0.001), procalcitonin (p<0.001), total lung severity score (p<0.001) were significantly correlated in patients with COVID-19 and in those that resulted in death (Table 5).

Table 5: The ROC analysis of mortality

Risk factors	AUC (95 % CI)	Cut off	P-value	Sensitivity (%)	Specificity (%)
Age (year)	0,93 (0,89-0,98)	64	0,001	100	86,8
Leukocytes (µL))	0,95 (0,90-0,99)	9505	0,001	85,7	87,7
Neutrophils (µL)	0,98 (0,96-1,00)	4770	0,001	100	94,3
D-dimer (ng/mL)	0,97 (0,94-1,00)	1232,5	0,001	86,1	91,5
Troponin (ug/L)	0,97 (0,94-1,00)	27,5	0,001	85,7	90,6
LDH (U/l)	0,94 (0,90-0,99)	524	0,001	85,7	89,6
CRP (mg/l)	0,98 (0,96-1,00)	39	0,001	85,7	92,5
Procalcitonin (ng/ml)	0,98 (0,96-1,00)	3,11	0,001	100	97,2
Total lung severity score (Range)	0,99 (0,97-1,00)	14,5	0,001	100	96,2

LDH: Lactate dehydrogenase, CRP: C-reactive protein.

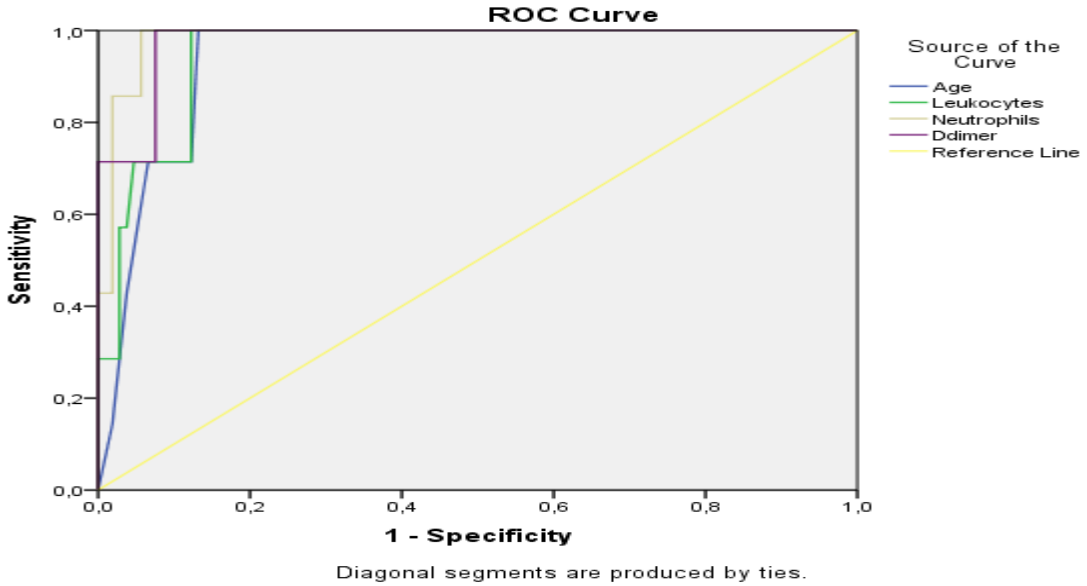

Figure 1. ROC curve analysis of some biochemical data in COVID-19 positive and fatal patients

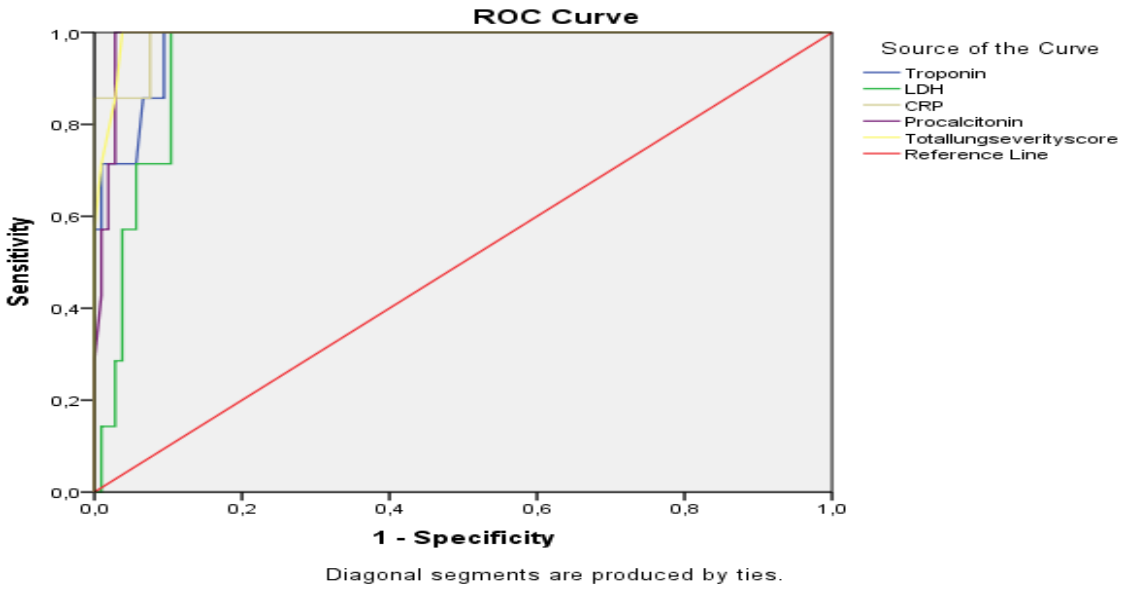

Figure 2. ROC curve analysis of some biochemical data and total lung involvement severity score in COVID-19 positive and fatal patients

DISCUSSION

Pandemics such as COVID-19 spread rapidly and increase the health burden worldwide. Due to the unstable course of this disease, from asymptomatic to severe acute respiratory failure, it is crucial to gather substantial evidence to determine the patient's condition on time and predict complications. Biomarkers are quantitative measurements that reflect the pathophysiology of diseases. The Chest CT scan is a vital element in the diagnosis, staging, disease progression, and follow-up of patients with COVID-19 (Li et al., 2021) Therefore, biomarkers and chest CT help clinicians identify the severity of medical diseases. They are also helpful in developing clinical care management algorithms that can be utilized to improve patient outcomes. These biomarkers and chest CT scans will help distinguish critical patients from others and ensure the appropriate allocation of healthcare resources accordingly. In addition, the use of biomarkers to identify COVID-19 may also help prevent viral-induced complications of acute inflammatory responses in patients, such as acute hypoxemic respiratory failure and multiple organ dysfunction, including acute cardiac, liver, and kidney injury.

113 consecutively hospitalized patients with COVID-19, who were admitted to the emergency department due to COVID-19 symptoms and confirmed with rRT-PCR, were included in this study. The majority of the hospitalized patients diagnosed with COVID-19 were men, with a rate of 53%. This result is in parallel with the studies in which 57% were male (Calvi et al., 2021) and 52% were male (Yurdaisik et al., 2021). The most common symptoms in COVID-19 patients are fever, cough, and shortness of breath, but some of them can have the disease asymptomatically (Huang et al., 2020). Similarly, our study found that the most common symptoms were fever, cough, and shortness of breath, but gastrointestinal symptoms, anosmia, and ageusia were less common.

There are several studies for the evaluation of the 2019 coronavirus disease (COVID-19). These evaluations are RT-PCR tests, chest radiographs, ultrasound scans, and computed tomography (CT) scans. However, the efficacy and suitability of these methods for the diagnosis of COVID-19 have not yet been entirely determined (Axiaq et al., 2021). The most common chest tomography findings of COVID-19 pneumonia are ground-glass opacity, pulmonary consolidation, and pleural effusion (Zhao et al., 2020; Shi et al., 2020). The data in this study were similar to the aforementioned studies, so the most common chest tomography findings were ground-glass opacity, pulmonary consolidation, and pleural

effusion. It is also worth noting that although some patients with COVID-19 may show normal findings on early chest CT scans in the first days of infection, they may develop pulmonary opacity in the later stages. Therefore, clinicians are recommended to monitor patients because normal chest CT cannot definitively diagnose patients with COVID-19 (Bernheim et al., 2020). In their study, Vafea et al. observed that 62% of the patients had lesions in the chest CT scans (Vafea et al., 2020). Our findings supported these results, and pathological lesions were observed in 64% of the patients.

When the findings of chest CT scans in the literature were evaluated in terms of localization, in their study, İleri et al. found that 87.9% of the patients had bilateral pulmonary infiltrates, and 12.1% had unilateral pulmonary involvement (Ileri et al., 2021). In their study, including more than 5340 participants and 84 articles, Li et al. determined that infiltrative chest CT findings in COVID-19 patients were bilateral (80.3%), peripheral (66.2%), and there was lower lobe involvement more than upper lobes (Li et al., 2021). Our findings were similar, and high rates of bilateral (n=49, 67.1%) and peripheral (n=60, 82.1%) localizations were found in patients with lung involvement (n=73, 100%). In addition, lower and middle lobe involvement was more common in our patients.

In some patients with COVID-19, the course of the disease may be more severe. While some patients are monitored in intensive care units, some cases may result in death. In studies carried out in China, mortality rates vary between 2.5% and 15%, while the rate of patients requiring intensive care varies between 8.3% and 32% (Wang D. et al., 2020; Huang et al., 2020; Guan et al., 2020a). In our study, the need for intensive care was 14.2%, and the mortality rate was 6.2%.

Chest CT imaging is an essential element in diagnosing, disease staging and progression, and monitoring patients with COVID-19 (Li et al., 2021). Pulmonary involvements in severe and critical types of COVID-19 usually involve more than one lobe of the lungs (Li et al., 2021). The qualitative visual assessment of pulmonary involvement is a notable measurement. Most hospitalized patients had more than 25% pulmonary involvement. Also, most patients who died due to it had more than 50% pulmonary involvement, indicating a worse prognosis depending on the size of the affected area (Calvi et al., 2021). Toussie et al. reported that patients with ground-glass opacity detected in at least two pulmonary areas were more likely to need hospitalization. In addition, they stated that patients with pulmonary involvement in three areas were more likely to need intubation; therefore, they emphasized that the larger the affected area was, the worse the prognosis would result (Toussie et al., 2020). Our study indicated that the total lung severity score was significantly higher in patients who needed intensive care and had a risk of death, which parallels other studies.

Lymphocytes play a crucial role in maintaining immune homeostasis and the inflammatory response to protect the body against viral infections (Wang F. et al., 2020). This study found that there was a decrease in the number of lymphocytes in people who needed intensive care and in those with COVID-19 infection, and this decrease was associated with the worsening of the disease. These findings are consistent with other studies (Malik et al., 2021; Huang and Pranata, 2020). Literature studies showed that low platelet counts in COVID-19 patients result in significantly worse outcomes (Malik et al., 2021; Guan et al., 2020b) his situation was similar in our study, and it was concluded that patients with low platelet count were in the intensive care unit or at risk of death. Albumin is an essential transport and drug-binding protein for various substances in plasma and maintains the osmotic pressure of the blood. In their study, Chen et al. found that the mortality rate of patients with hypoalbuminemia was significantly higher than that of patients with normal albumin (23.85% vs. 0.9%) and patients with normal pulmonary CT, normal CRP, and normal lymphocytes before discharge (Chen et al., 2021). Another study also suggested that COVID-19 patients with hypoalbuminemia had higher mortality rates and more extended hospital stays (Ileri et al., 2021). According to our findings, the patients with hypoalbuminemia had more severity and had higher mortality rates.

CRP is a non-specific acute phase reactant induced by IL-6 in the liver. Clinically, it is used as a biomarker

for several inflammatory and infectious conditions. High CRP levels are directly related to inflammation and disease severity. For this reason, it is an essential biomarker in the diagnosis and evaluation of the severity of infectious diseases. CRP levels in patients who died from COVID-19 were ten times higher than in those who survived (Lou et al., 2020). Studies investigating the clinical utility of CRP mainly reported a positive correlation between disease severity and baseline values (Bivona, Agnello and Ciaccio , 2021). The level of procalcitonin (PCT) is reported to increase in patients with severe COVID-19 compared to patients with a mild one, indicating bacterial superinfection. PCT levels do not get above the normal range in patients with uncomplicated COVID-19, so it is a candidate marker for severe disease progression (Bivona, Agnello and Ciaccio , 2021). Similar to our results, we found that CRP and procalcitonin values were significantly higher in patients with severe COVID-19, resulting in death.

According to the study results by Huang et al., D-dimer, leukocyte, neutrophil, and LDH values were significantly higher in patients with COVID-19 who were hospitalized in the intensive care unit and had more severe disease (Huang et al., 2020). Another study showed that COVID-19 progressed more severely or resulted in death in patients with advanced age and high blood neutrophil, LDH, D-dimer, leukocytes, and urea levels (Wu et al., 2020). Similar to these studies, our study findings indicated that blood leukocyte, neutrophil, LDH, D-dimer, and urea values were significantly higher in COVID-19 patients monitored in the intensive care unit and at the risk of death. Patients with comorbidities such as hypertension and coronary artery disease, with advanced age (65 and over), and patients with high troponin I level are at the risk of death (Du et al., 2020). According to Grasselli et al., mortality rates were high in patients 56 years and older with comorbidities such as diabetes mellitus, hypertension, and coronary artery disease (Grasselli et al., 2020). In their study, İleri et al. reported that the troponin values of people who were hospitalized in the intensive care unit and whose disease progressed significantly increased (İleri et al., 2021). Similarly, we found that comorbidities such as hypertension, coronary artery disease, and diabetes mellitus, and troponin I values were significantly higher in patients who had severe COVID-19 disease, needed an intensive care unit, and resulted in death.

CONCLUSION

To conclude, this study represents an investigation of laboratory biomarkers and chest CT findings in hospitalized patients with COVID-19. In the cases with advanced age, severe CT findings, especially those with comorbidities such as hypertension, coronary artery disease, and diabetes mellitus, increase in leukocyte, neutrophil, D-dimer, CRP, procalcitonin, urea and troponin values, and decrease in lymphocyte, thrombocyte, and albumin values, it was observed that the patient's need for intensive care unit increased, and the disease had a higher risk of mortality. These biomarkers and chest CT are crucial elements in the diagnosis, disease staging and progression, and monitoring of patients with COVID-19.

Conflict of Interest

The author declares no potential conflict of interest regarding the research, authorship and/or publication of this article.

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