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# Komorbiditesi Olan COVID-19 Hastalarının Laboratuvar Bulguları, Hastanede Yatış ve Ölüm Oranlarının İncelenmesi

## Investigation of Laboratory Findings, Hospitalization Day and Ex Rates of COVID-19 Patients with Comorbidity

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## ÖZ

***Amaç:*** Bu çalışmada, COVID-19 hastalarının hastanede kalış süreleri ve ölüm oranları dikkate alınarak laboratuvar bulguları komorbidite yönünden incelenmesi amaçlandı.
***Yöntem:*** Yoğun bakım ünitesinde yatan 44 COVID-19 hastası ve serviste yatan 71 hasta çalışmaya dahil edildi. Hastaların Tam kan parametreleri, C-Reaktif Protein (CRP), Prokalsitonin, Ferritin, Eritrosit Sedimantasyon Hızı (ESR), Troponin-I, Kreatin, Protrombin zamanı (PT), Aktive parsiyel tromboplastin zamanı (aPTT) Uluslararası normalleştirilmiş oran (INR) ve D-Dimer sonuçları ile hastanede yatış günü ve ölüm oranı arasında korelasyon analizi yapıldı. Ayrıca bu parametrelerin komorbidite hastalıklarının etkileri değerlendirildi.
***Bulgular:*** Hastaların PT, INR, CRP, Ferritin, Prokalsitonin, ESR, D-Dimer, Troponin-I, Beyaz kan hücresi, Nötrofil, Monosit Lenfosit Oranı, Nötrofil Lenfosit Oranı düzeyleri, hastanede yatış günü ve ölüm oranı ile pozitif korelasyon gösterirken Lenfosit düzeyleri, negatif korelasyon göstermiştir. Ayrıca ölüm oranı ile Monosit, Kreatin ve Platelet düzeyleriyle de pozitif korelasyon göstermiştir.
***Sonuç:*** Kardiyovasküler Hastalığı, Kronik Obstrüktif Akciğer Hastalığı ve Pnomöni komorbiditesi olan hastaların hastanede yatış günü ve yoğun bakıma yatma oranları komorbiditesi olmayan hastalara göre daha yüksek olduğu saptanmıştır. Ayrıca Diyabet, Kanser ve Kronik Böbrek yetmezliği olan hastaların yoğun bakıma yatma oranları komorbiditesi olmayan hastalara göre daha yüksek olduğu saptanmıştır.

***Anahtar Kelimeler:*** COVID-19, Komorbidite, Ölüm oranı.

## ABSTRACT

***Objective:*** The purpose of the present study was to investigate the laboratory findings in terms of comorbidity, taking into account the length of hospital stay and death rates of COVID-19 patients.
***Method:*** Forty-four patients with COVID-19 hospitalized in intensive care unit and 71 patients hospitalized in the ward were included in this study. Whole blood parameters, C-Reactive Protein (CRP), Procalcitonin, Ferritin, Erythrocyte Sedimentation Rate (ESR), Troponin-I, Creatine, Prothrombin time (PT), Activated partial thromboplastin time (aPTT) International normalized ratio (INR) and D-Dimer results of the patients between hospitalization day and death rate correlation analysis was performed. In addition, the effects of these parameters on comorbid diseases were evaluated.
***Results:*** PT, INR, CRP, Ferritin, Procalcitonin, ESR, D-Dimer, Troponin-I, White blood cell, Neutrophil, Monocyte Lymphocyte Ratio, Neutrophil Lymphocyte Ratio levels of the patients were positively correlated with hospitalization day and death rate, while Lymphocyte levels showed a negative correlation. It also showed a positive correlation with ex rate and Monocyte, Creatine and Platelet levels.
***Conclusion:*** It was determined that patients with Chronic Obstructive Pulmonary Disease, Pneumonia comorbidities and Cardiovascular Disease had higher hospitalization days and intensive care unit admission rates than patients without

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comorbidity. In addition, patients with Diabetes, Cancer and Chronic Kidney Failure were found to have higher rates of intensive care admission compared to patients without comorbidity.

***Key words:*** COVID-19, Comorbidity, Ex rate.

## 1. INTRODUCTION

At the end of 2019, a brand new coronavirus, named SARS-CoV-2, caused a chain of pneumonia cases have been detected in Wuhan, China. Although manipulate and quarantine measures had been taken to save international spread, the contamination steadily gradually elevated and led to a pandemic (1).

While a total of 80 million COVID-19 cases were seen in the world, approximately 2 million fatal cases have been reported as of 30 December 2020. Epidemiological studies conducted on three coronavirus associated with epidemics (SARS, MERS, COVID-19) have shown that numerous studies define patients with other comorbid diseases including diabetes, hypertension, cardiovascular and cerebrovascular sicknesses as danger factors for excessive or deadly infections (2,3). Data published since the beginning of the pandemic have shown that COVID-19 causes respiratory morbidity and mortality (4). Age, male gender, ethnicity, and current health problems are additional risk factors for hospitalized patients, in particular with inside the intensive care unit due to Covid-19, and the most important of these has been determined as age (5,6). Patients with comorbidities are much more likely to have a greater excessive course of an illness (7). SARS-CoV-2 contaminates people of all age groups, but the patients over the age of 60 and those with comorbidities improving chronic respiratory, cardiovascular disease and diabetes are better danger of growing infections with those virus (6). In the examinations carried out considering all COVID-19 cases, it has been shown that high serum ferritin, lactate dehydrogenase, C-reactive protein (CRP), procalcitonin, erythrocyte sedimentation rate (ESR), cardiac troponin I and D-dimer levels, and the presence of lymphopenia have been related to a excessive course of disease (8,9).

In this study, the documents of suffers with COVID-19 (+) who have been accompanied with service and intensive care unit were retrospectively scanned, and their comorbid disease status was examined. This study aimed to compare with some biochemical and hematological parameters in terms of the mortality rates, taking into account the length of stay in the hospital of Covid 19 patients with comorbid and non-comorbid.

## 2. METHOD

This study was approved by the ethics board of Samsun Training and Research Hospital (Date 09.09.2020) with 2020/13 session numbered, GOKA/ 2020/13/6 decision numbered. The files of patients who were followed up in COVID-19 service and intensive care units with suspected COVID-19 in June-July-August 2020 were retrospectively reviewed, and comorbidity information was reviewed with the authorization given from the Hbys system. Whole blood parameters (white blood cell (WBC), Lymphocyte (Lym), Neutrophil (Ntr), Monocyte (Mon), platelet (PLT), Neutrophil/Lymphocyte (NLR), Monocyte/Lymphocyte (MLR), and C-Reactive Protein (CRP), Procalcitonin (PCT), Ferritin, Erythrocyte Sedimentation Rate (ESR) and D-Dimer values, which are important biomarkers for the prognosis of the disease in the inflammatory process, were analyzed retrospectively. Whole blood parameters were studied in DXH800 (BeckmanCoulter (California, USA)) device,

Ferritin and Procalcitonin in Cobas E411 (Roche (Basel, Switzerland)) device, D-Dimer test in Ca-7000 (Siemens (Munich, Germany)) device, and CRP in AU5800 (BeckmanCoulter (California, USA)) device using a turbidimetric method using appropriate kits and materials. The rRT-PCR results obtained from the throat and nasal swabs from patients followed up in the service and intensive care units were compared with the stated laboratory results, and it was evaluated whether there was a significant relationship between the groups.

### Data Analysis

SPSS 22.0 statistical software programme turned into used for statistical analysis. The study's biochemical results were given as mean±Standard deviation (X±SD), and a p-value $P<0.05$ indicates statistical significance. Patients participating in the study were grouped as patients, intensive care in patients, and all patients. Averages of each group's parameters were performed with Spearman correlation analysis to see the relationship between hospitalization days and mortality. Additionally, patients with comorbidities were grouped according to their diseases. The averages of parameters obtained from the groups were compared with the averages of parameters obtained from patients without comorbidity using the Mann-Whitney U test.

## 3. RESULTS

### Descriptive Information of the Study

In this study, a total of 44 COVID-19 (+) patients hospitalized in the intensive care unit with a mean age of 71.22±11.22, 17 female and 27 male, and a total of 71 COVID-19 (+) patients hospitalized in the service with a mean age of 57.96±16.66, 34 female and 37 male were included. Of these patients, 28 were Exitus and 16 were discharged from the intensive care unit. All of the patients hospitalized in the service were discharged. The mean±standard deviations of the analyzed parameters are given in Table 1.

**Table 1.** Biochemical and Hematological Parameters of COVID-19 (+) Patients.

| Parameter | Service | Intensive Care | All Patients |
|---|---|---|---|
| **Pt (sn)** | 12.78±2.73 | 14.11±4.42 | 13.29±3.51 |
| **Aptt (sn)** | 25.67±9.60 | 24.92±8.26 | 25.38±9.08 |
| **INR** | 1.12±0.25 | 1.25±0.41 | 1.17±0.33 |
| **CRP (mg/L)** | 57.94±60.57 | 122.09±103.20 | 82.48±85.15 |
| **Ferritin(ng/mL)** | 306.06±344.58 | 948.96±635,83 | 552.04±569.11 |
| **PCT (ng/mL)** | 0.14±0.27 | 1.19±2.67 | 0.54±1.73 |
| **ESR (mm/h)** | 36.27±26.98 | 56.57±27.06 | 44.03±28.66 |
| **D-Dimer** | 1.24±2.47 | 5.08±7.13 | 2.71±5.14 |
| **WBC (*$10^9$/L)** | 6.91±3.37 | 14.53±9.83 | 9.82±7.57 |
| **HGB** | 12.41±2.13 | 11.24±1.94 | 11.96±2.13 |
| **Lymphocyte (*$10^9$/L)** | 1.31±0.74 | 0.89±0.68 | 1.15±0.74 |
| **Monocyte (*$10^9$/L)** | 0.49±0.26 | 0.57±0.42 | 0.52±0.33 |
| **Neutrophil (*$10^9$/L)** | 5.12±3.18 | 11.27±8.50 | 7.48±6.52 |
| **MLR** | 0.42±0.23 | 0.93±0.90 | 0.61±0.63 |
| **NLR** | 5.42±6.03 | 27.50±39.34 | 13.87±26.88 |
| **PLT (*$10^9$/L)** | 247.41±91.58 | 207.45±107.95 | 232.12±99.63 |
| **Troponin-I(ng/mL)** | 0.08±0.01 | 0.96±1.96 | 0.42±1.28 |
| **Creatine (mg/dL)** | 0.90±0.24 | 1.58±1.42 | 1.16±0.95 |

### Correlation of Biochemical and Hematological Parameters With Hospitalization Day and Ex Rate

When looking at the correlation of biochemical and hematological parameters of hospitalized sufferers with COVID-19 (+) at the day of hospitalization; it was positively associated with CRP ($p<0.01$), NLR ($p<0.05$) parameters of the day of hospitalization, while it was negatively associated with HGB ($p<0.01$) and lymphocyte ($p<0.01$) parameters as shown in Table 2.

**Table 2**. Correlation of Biochemical and Hematological Parameters of Hospitalized Patients in Service with COVID-19 (+) on the Day of Hospitalization.

| | | PT | APTT | INR | CRP | FERRITIN | PCT |
|---|---|---|---|---|---|---|---|
| **Hospitalization Day** | **cc** | 0.152 | -0.036 | 0.136 | 0.350 | 0.142 | 0.208 |
| | **p** | >0.05 | >0.05 | >0.05 | **<0.01** | >0.05 | >0.05 |
| | | **ESR** | **D-DIMER** | **TRP-I** | **WBC** | **HGB** | **LYM** |
| **Hospitalization Day** | **cc** | 0.225 | 0.136 | -0.042 | -0.019 | -0.335 | -0.315 |
| | **p** | >0.05 | >0.05 | >0.05 | >0.05 | **<0.01** | **<0.01** |
| | | **MONOSITE** | **NEUTROPHIL** | **MLR** | **NLR** | **PLT** | **CREA** |
| **Hospitalization Day** | **cc** | -0.229 | 0.074 | 0.053 | 0.237 | -0.133 | 0.117 |
| | **p** | >0.05 | >0.05 | >0.05 | **<0.05** | >0.05 | >0.05 |

Cc : Correlation coefficient, LYM: Lymphocyte, CREA: Creatine

When looking at the biochemical and hematological parameters of hospitalized sufferers in the intensive care unit with COVID-19(+), it was positively associated with the troponin ($p<0.01$) parameter of the day of hospitalization. In contrast, it was negatively associated with the HGB ($p<0.05$) parameter. Additionally, Ex/discharge status was negatively associated with Lymphocyte ($p<0.05$), PLT ($p<0.01$) parameters, while it was positively correlated with PCT ($p<0.01$), WBC ($p<0.01$), Neutrophil ($p<0.01$), MLR ($p<0.01$), NLR ($p<0.01$), troponin ($p<0.01$) and creatine ($p<0.01$) parameters as shown in Table 3.

**Table 3.** Correlation of Biochemical and Hematological Parameters of Hospitalized Patients in Intensive Care Unit with COVID-19 (+).

| | | PT | APTT | INR | CRP | FERRITIN | PCT |
|---|---|---|---|---|---|---|---|
| **Hospitalization Day** | **cc** | 0.218 | 0.267 | 0.223 | 0.027 | -0.225 | 0.065 |
| | **p** | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 |
| **Ex-Discharge** | **cc** | 0.067 | 0.093 | 0.069 | 0.281 | 0.067 | 0.420 |
| | **p** | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 | **<0.01** |
| | | **ESR** | **D-DIMER** | **TROPONIN** | **WBC** | **HGB** | **LYM** |
| **Hospitalization Day** | **cc** | -0.067 | -0.164 | 0.031 | -0.117 | -0.317 | 0.007 |
| | **p** | >0.05 | >0.05 | >0.05 | >0.05 | **<0.05** | >0.05 |
| **Ex-Discharge** | **cc** | 0.127 | 0.089 | 0.420 | 0.469 | 0.108 | -0.353 |
| | **p** | >0.05 | >0.05 | **<0.01** | **<0.01** | >0.05 | **<0.05** |
| | | **MONOSITE** | **NEUTROPHIL** | **MLR** | **NLR** | **PLT** | **CREA** |
| **Hospitalization Day** | **cc** | -0.081 | 0.096 | -0.113 | -0.020 | -0.200 | -0.248 |
| | **p** | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 |
| **Ex-Discharge** | **cc** | 0.186 | 0.448 | 0.423 | 0.465 | 0.387 | 0.201 |
| | **p** | >0.05 | **<0.01** | **<0.01** | **<0.01** | **<0.01** | >0.05 |

Cc : Correlation coefficient, LYM: Lymphocyte, CREA: Creatine

When looking at the correlation of biochemical and hematological parameters of all COVID-19 (+) patients hospitalized in both the service and the intensive care unit with the day of hospitalization; it was positively associated with PT, INR, CRP, FERRITINE, PCT, ESR, D-DIMER, WBC, NEUTROPHIL, MLR, and NLR parameters of the day of hospitalization,

while it was negatively associated with HGB and LYMPHOCYTE parameters (p<0.01). In addition, Ex/discharge status was negatively correlated with LNF (p<0.01), PLT (p<0.01) parameters, while it was positively correlated with PT (p<0.05), INR (p<0.05), CRP (p<0.01), Ferritin (p<0.01), PCT (p<0.01), ESR (p<0.01), D-Dimer (p<0.01), WBC (p<0.01), NTR (p<0.01), MLR (p<0.01), NLR (p<0.01) and Troponin-I (p<0.01) parameters as shown in Table 4.

**Table 4.** Correlation of all Patients with COVID-19 (+) with Biochemical and Hematological Parameters.

| | | PT | APTT | INR | CRP | FERRITINE | PCT |
|---|---|---|---|---|---|---|---|
| **Hospitalization Day** | **cc** | 0.272 | -0.079 | 0.281 | 0.396 | 0.400 | 0.465 |
| | **P** | **<0.01** | >0.05 | **<0.01** | **<0.01** | **<0.01** | **<0.01** |
| **Ex-Discharge** | **cc** | 0.215 | -0.034 | 0.226 | 0.395 | 0.432 | 0.557 |
| | **P** | **<0.05** | >0.05 | **<0.05** | **<0.01** | **<0.01** | **<0.01** |
| | | **ESR** | **D-DIMER** | **TRP-I** | **WBC** | **HGB** | **LYM** |
| **Hospitalization Day** | **cc** | 0.314 | 0.432 | 0.417 | 0.297 | -0.392 | -0.376 |
| | **P** | **<0.01** | **<0.01** | **<0.01** | **<0.01** | **<0.01** | **<0.01** |
| **Ex-Discharge** | **cc** | 0.318 | 0.447 | 0.636 | 0.538 | -0.162 | -0.381 |
| | **P** | **<0.01** | **<0.01** | **<0.01** | **<0.01** | >0.05 | **<0.01** |
| | | **MONOSITE** | **NEUTROPHIL** | **MLR** | **NLR** | **PLT** | **CREA** |
| **Hospitalization Day** | **cc** | -0.065 | 0.348 | 0.297 | 0.457 | -0.133 | 0.132 |
| | **P** | >0.05 | **<0.01** | **<0.01** | **<0.01** | >0.05 | >0.05 |
| **Ex-Discharge** | **cc** | 0.143 | 0.544 | 0.484 | 0.553 | 0.319 | 0.254 |
| | **P** | **<0.01** | **<0.01** | **<0.01** | **<0.01** | **<0.01** | **<0.01** |

### Descriptive Information of the Study About Comorbid Diseases

Also, out of 115 COVID-19 (+) patients participating in this study, 91 comorbid diseases were detected, while 24 of them did not. This comorbid disease was detected in 22 patients with DM (24.18%), 21 with hypertension (23.08%), 11 with CVD (12.09%), 9 with CRF (9.89%), 6 in COPD (6.59%), 15 of them had pneumonia (16.48%), and 7 had cancer (7.69%). Besides, out of 115 COVID-19 (+) patients participating in this study, all 28 patients who died were found to have comorbid diseases. It was determined that DMD in 5 (17.86%), hypertension in 4 (14.29%), CVD in 6 (21.43%), CRF in 3 (10.71%), COPD in 2 (%7.14), Pneumonia in 4 (14.29%), cancer in 4 (14.29%) patients with Exitus.

### Comparison of Biochemical and Hematological Parameters of Patients With Comorbidities

Biochemical and hematological parameters of 91 patients with comorbid diseases on the day of hospitalization and the number of patients in intensive care were compared with 24 COVID-19 (+) patients without any comorbid disease using the Mann-Whitney U test as shown in Table 5. Considering the statistical analysis performed in terms of hospitalization days; among the diseases that we considered as comorbid, CVD (p<0.05), COPD (p<0.01), and pneumonia (p<0.01) had been determined to be significantly higher than COVID-19 (+) patients without the comorbid disease as shown in Table 5.

Considering the statistical analysis performed in terms of the number of in patients in the intensive care unit; the number of patients with DM (p<0.05), CVD (p<0.01), CRF (p<0.05), COPD (p<0.05), pneumonia (p<0.01) and cancer (p<0.01) diseases that we considered as comorbid were found to be significantly higher than COVID-19 (+) patients without the comorbid disease. The detailed consequences are shown in shown in Table 5.

CRP ($p<0.05$), ESR ($p<0.05$), LNF ($p<0.01$) and NLR ($p<0.05$) levels of COVID-19 (+) patients with DM as a comorbid disease were different from COVID-19 (+) patients without comorbid disease. The detailed results are shown in Table 5. PCT ($p<0.05$), LNF ($p<0.05$), Neutrophil ($p<0.05$) and NLR ($p<0.01$) levels of COVID-19 (+) patients with HT as a comorbid disease were different from COVID-19 (+) patients without comorbid disease. The detailed results are shown in Table 5. CRP ($p<0.01$), PCT ($p<0.05$), Neutrophil ($p<0.05$), NLR ($p<0.01$) and Troponin ($p<0.05$) levels of patients with CVD as a comorbid disease were different from COVID-19 (+) patients without comorbid disease. The detailed results are shown in Table 5. Troponin ($p<0.05$) levels of COVID-19 (+) patients with CRF as a comorbid disease were different from COVID-19 (+) patients without the comorbid disease. The detailed results are shown in Table 5. Ferritin ($p<0.05$), D-Dimer ($p<0.05$), LNF ($p<0.05$), and Troponin ($p<0.01$) levels of COVID-19 (+) patients with COPD as a comorbid disease were different from Covid-19(+) patients without comorbid disease. The detailed results are shown in Table 5. The CRP ($p<0.01$), PCT ($p<0.01$), and D-Dimer ($p<0.05$) levels of COVID-19 (+) patients with pneumonia as a comorbid disease were different from COVID-19 (+) patients without the comorbid disease as shown in Table 5. CRP ($p<0.01$), ferritin ($p<0.01$), PCT ($p<0.01$), ESR ($p<0.01$), D-Dimer ($p<0.05$), LNF($p<0.01$), Neutrophil ($p<0.05$), MLR ($p<0.01$) and NLR ($p<0.01$) levels of COVID-19 (+) patients with cancer as a comorbid disease were different from COVID-19 (+)parents without comorbid disease as shown in Table 5.

**Table 5.** Comparison of COVID-19 (+) Patients with the Comorbid Disease and COVID-19 (+) Patients without Comorbid Disease on Hospitalization Days, Number of Patients in the Intensive Care Unit(ICU) and Biochemical and Hematological Parameters

| | **CMY (n:24)** | **DM (n:22)** | **HT (n:21)** | **CVD (n:11)** | **CRF (n:9)** | **COPD (n:6)** | **PNO (n:15)** | **CA (n:7)** |
|---|---|---|---|---|---|---|---|---|
| **HD** | 9,83 | 15,72 | 12,48 | 20,45* | 11,11 | 18,00** | 20.00** | 19,86 |
| **ICU (n)** | 3 | 7* | 6 | 7** | 4* | 3* | 9** | 5** |
| **Pt (sn)** | 13.16 | 13.10 | 14.44 | 13.61 | 12.50 | 12.80 | 12.60 | 13.34 |
| **Aptt (sn)** | 27.77 | 23.45 | 25.06 | 30.05 | 25.18 | 24.08 | 23.19 | 23.00 |
| **INR** | 1.17 | 1.15 | 1.27 | 1.20 | 1.08 | 1.13 | 1.11 | 1.18 |
| **CRP (mg/L)** | 53.96 | 78.49* | 63.60 | 96.29** | 91.71 | 109.73 | 92.47** | 171.16** |
| **Ferritin(ng/mL)** | 331.82 | 504.93 | 459.49 | 581.18 | 684.84 | 837.33* | 575.51 | 1221.43** |
| **PCT(ng/mL)** | 0.12 | 0.37 | 0.28* | 1.10* | 0.70 | 0.51 | 1.24** | 0.79** |
| **ESR(mm/h)** | 32.67 | 48.95* | 41.38 | 49.45 | 30.33 | 38.17 | 46.20 | 85.00** |
| **D-Dimer (µg/ml)** | 1.87 | 2.15 | 3.31 | 1.42 | 2.77 | 5.56* | 2.95* | 4.57* |
| **WBC (*$10^9$/L)** | 7.83 | 9.29 | 10,35 | 14.20 | 8.18 | 8.60 | 9,82 | 13.01 |
| **HGB (gr/dL)** | 12.47 | 11.37 | 11.61 | 11.86 | 12.87 | 12.72 | 12.20 | 11.03 |
| **LNF (*$10^9$/L)** | 1.62 | 0.98** | 0.99* | 1.25 | 1.19 | 0.92* | 1.19 | 0.50** |
| **Mon (*$10^9$/L)** | 0.57 | 0.44 | 0.49 | 0.54 | 0.54 | 0.43 | 0.65 | 0.43 |
| **Ntrf (*$10^9$/L)** | 5.62 | 5.95 | 9.32* | 12.02* | 5.98 | 7.22 | 6.32 | 0.57* |
| **MLR** | 0.40 | 0.56 | 0.53 | 0.83 | 0.98 | 0.54 | 0.55 | 1.10** |
| **NLR** | 4.64 | 9.44* | 19.64** | 25.33** | 16.88 | 14.41 | 6.81 | 34.92** |
| **Plt (*$10^9$/L)** | 268.79 | 224.41 | 246.10 | 199.64 | 239.33 | 214.67 | 214.20 | 183.86 |
| **Troponin-I(ng/mL)** | 0.09 | 0.28 | 0.10 | 1.81* | 0.51* | 1.74** | 0.10 | 0.17 |
| **Creatin (mg/dL)** | 0.96 | 1.00 | 1.08 | 1.55 | 2.79 | 0.82 | 0.85 | 0.80 |

CMY: Covid 19+ patients without comorbid disease, DM: Diabetes Mellitus, HT: Hypertension, CVD: Cardiovascular Diseases, CRF: Chronic renal failure, COPD: Chronic Obstructive Pulmonary Disease, PNO: Pneumonia, CA: Cancer ICU: Intensive care, Hospitalization Day: HD * $p<0.05$, **$p<0.01$

## 4. DISCUSSION

Several studies have been conducted to determine which diseases have suffered from this disease before, and the danger factors for the infection and serious consequences of this disease, and to under stand the molecular mechanisms underlying them since the beginning of the COVID-19 outbreak. In a meta-analysis involving 1527 Chinese patients with COVID-19, it was stated that the prevalence of hypertension (17.1%), diabetes (9.7%), cardiac and cerebrovascular disease (16.4%) (10). Comorbidity burden has been correlated with the severity of COVID-19 contamination and the need for ICU admission (10). Despite the general case mortality of 2.3 % amongst 44,672 showed COVID-19 cases from Wuhan, better rates had been found in sufferers with pre-existing cardiovascular disease (10.5%), diabetes (7.3%), hypertension (6%) (8). Diabetes has been cited as one of the most important risk factors for the mortal consequences of COVID-19 (10). SARS-CoV-2 infection can stimulate stress conditions and enhanced the secretion of hyperglycemic hormones such as glucocorticoids and catecholamines. As a result, it can lead to high blood sugar, abnormal glucose instability, diabetic complications. A previous large observational study determined that sufferers with intense disease (16.3%) had a better prevalence of diabetes than those with non-intense disease (6.9%) (11). A retrospective study conducted in Wuhan found a significantly higher prevalence of type 2 diabetes (15.6-31%) among non-survivors than survivors (7.8-14%) (12,13). Lately, a large data set of Chinese patients with COVID-19 have shown that their diabetes condition increased the risk of mortality from COVID-19. (2.7% versus 7.8%) (19). In our study, DM was detected in 22 (24.18%) of the patients with comorbid diseases. CRP ($p<0.05$), ESR ($p<0.05$), LNF ($p<0.01$) and NLR ($p<0.05$) levels of COVID-19 (+) patients with DM as a comorbid disease were different from COVID-19 (+) patients without comorbid diseases shown in Table 5. In addition, out of 115 COVID-19 (+) patients participating in this study, all 28 patients who died were found to have comorbid diseases. DM (17.86%) was detected in 5 of the patients with this death.

It has been stated that COVID-19 disease caused hypoxemia in 15-20% of patients who needed ventilator support under adverse conditions (14). COPD and other chronic disorders had been additionally correlated with SARS (1.4%) and MERS (13%) infections (15). COPD, which was observed in 50-52.3% of COVID-19 cases admitted to the total ICU, leads to high mortality among these patients with increased mucosal production and airway obstruction (15). Our study found that 6 of the patients with comorbid diseases had COPD (6.59%), and 15 had pneumonia (16.48%). COPD was detected in 2 (7.14%) and Pneumonia in 4 (14.29%) of 28 patients with Exitus. Considering the statistical analysis performed in terms of hospitalization days; among the diseases that we considered as comorbid, the hospitalization days of COPD ($p<0.01$) and pneumonia ($p<0.01$) were higher than those of COVID-19 (+) patients without comorbid disease as shown in Table 5.

Considering the statistical analysis performed in terms of the number of inpatients in the intensive care unit; It was significantly found to be the number of patients with COPD ($p<0.05$) and pneumonia ($p<0.01$) was higher than the patients with COVID-19 (+) without comorbid diseases as shown in Table 5. Ferritin ($p<0.05$), D-Dimer ($p<0.05$), LNF ($p<0.05$), and Troponin ($p<0.01$) levels of COVID-19 (+) patients with COPD as a comorbid disease were different from Covid-19(+) patients without comorbid diseases shown in Table 5. The CRP ($p<0.01$), PCT ($p<0.01$), and D-Dimer ($p<0.05$) levels of COVID-19 (+) patients with

pneumonia as a comorbid disease were different from COVID-19 (+) patients without comorbid disease as shown in Table 5.

CVD has been found to have a powerful association with previous SARS (8%) and MERS (30%) [2,16]. İncreased incidence of CVD has been similarly found in COVID-19 patients, mainly amongst people with excessive signs and symptoms. A study conducted in Wuhan found that 6.8% of 191 COVID-19 patients who did not survive had CVD, while another study observed that 17% of COVID-19 patients who did not survive had CVD (8,17). Patients with CVD have a better risk of occurring acute coronary syndrome in acute infections. Hypertension is a characteristical health problem whose prevalence increases significantly with advancing age, and it was a major risk factor of comorbidity that aggravates much other COVID-19 severity, including atherosclerotic cardiovascular, congestive heart failure, and chronic kidney disease. For all these reasons, it makes it difficult to assess how much hypertension alone affects COVID-19-related morbidity and mortality. COVID-19 sufferers can be at excessive danger of venous thromboembolism (VTE). In addition to extended immobilization, endothelial harm and vascular inflammation leading to the occurrence of a hypercoagulable. In a study, it was stated that high D-dimer level (>1 g/L) was an independent predictor of in hospital death (18). Levels of D-dimer and fibrin degradation products were found to be significantly higher in non-survivors, and extensive intravascular coagulation was reported in 71.4% of sufferers who finally died (18). In our study, hypertension was detected in 21 (23.08%), and CVD (12.09%) was detected in 11 patients with comorbid diseases. In addition, out of 115 COVID-19 (+) patients participating in this study, hypertension (14.29%) was detected in 4 of 28 patients who were dead, and CVD (21.43%) was detected in 6 of them. Considering the statistical analysis performed in terms of hospitalization days; Among the diseases that we consider as comorbid, the hospitalization day in CVD was significantly higher than COVID-19 (+) patients without the comorbid disease, as shown in Table 5 ($p<0.01$). Considering the statistical analysis performed in terms of the number of patients in the intensive care unit, CVD patients' number as a comorbid disease was significantly higher than the COVID-19 (+) patients without the comorbid disease.PCT ($p<0.05$), LNF ($p<0.05$), Neutrophil ($p<0.05$) and NLR ($p<0.01$) levels of COVID-19 (+) patients with HT as a comorbid disease was different from COVID-19 (+) patients without comorbid disease a shown in Table 5. CRP ($p<0.01$), PCT ($p<0.05$), Neutrophil ($p<0.05$), NLR ($p<0.01$) and Troponin ($p<0.05$) levels of patients with CVD as a comorbid disease.

COVID-19 (+) were different from COVID-19 (+) patients without the comorbid disease, as shown in Table 5. In addition to the virus's direct effect, disruption of oxygenation due to disease and low oxygen pressure can also damage kidney cells.

The cardiopulmonary syndrome may be observed due to systemic hypoxia. Cytokine storms may also damage organs, including the kidney. Another situation is the formation of thrombus in the kidneys due to coagulation caused by SARS-CoV-2. SARS-CoV-2 directly impacts the kidneys through cellular damage or sepsis, leading to cytokine storms. Acute kidney injury (AKI) was observed in 3-9% of COVID-19 cases, while it has been reported with a 60% -90% mortality rate in patients with previous SARS (5%) and MERS (15%) who had AKI (19,20). In a comprehensive study including 1099 patients, the mortality rate of these patients was reported as 1.4%, and the rate of patients with chronic renal failure among comorbid factors was reported to be 0.7% (n = 8) (21). In another study in which 323 patients were followed, and

their risk factors were evaluated, the mortality rate was reported as 10.8% (n = 35) the rate of those with chronic renal failure at the beginning was 2.2% (n = 7) among these patients, and none of them were critical. However, acute kidney damage was observed during the disease in 3.4% of the patients with a intense path of COVID-19 disease and 38.5% of the critically ill patients during the illness (22). Our study determined that 9 of the patients with 91 comorbid diseases had CRF (9.89%). Also, it was determined that 3 of the patients had CRF (10.71%) with the dead. Considering the statistical analysis performed in terms of the number of patients in the intensive care unit; among the diseases that we consider as comorbid, the number of patients with CRF ($p<0.05$) was significantly higher than COVID-19 (+) patients without comorbid disease as shown in Table 5. Troponin ($p<0.05$) levels of COVID-19 (+) patients with CRF as a comorbid disease were different from COVID-19 (+) patients without comorbid disease as shown in Table 5.

Patients stricken by any malignancy are at a better danger of COVID-19 contamination because of a poor immune response. SARS-CoV-2 provides an effective replication environment for initiating infection in these patients. Cancer patients are more vulnerable to infections during the viral epidemic due to immunosuppression. Immune suppressive states are caused by the malignancy itself and anti-cancer treatments. In a report from China, according to 2015 cancer epidemiology statistics, 18 of 1590 COVID-19 cases (1.13%) had a history of cancer, and it was found to be higher than the cancer incidence (0.29%) in the General Chinese population. Lung cancer (5/18, 28%) is the most common cancer among patients with a history of malignant tumors (23,24). A study reported that 58.3% of COVID-19 patients had lung carcinoma, and 41.7% received immunotherapy, chemotherapy, radiotherapy, and none of these patients needed ICU care during their hospitalization (25). A total mortality rate of 2% has been observed in COVID-19 cases with current malignancy (26). Our study found that 7 of the patients with 91 comorbid diseases (7.69%) had cancer. In addition, 4 of 28 patients who died were found to have cancer (14.29%). Considering the statistical analysis performed in terms of the number of patients in intensive care; the number of patients with DM ($p<0.05$), CVD ($p<0.01$), CRF ($p<0.05$), COPD ($p<0.05$), pneumonia ($p<0.01$) and cancer ($p<0.01$) diseases that we considered as comorbid as was significantly higher than COVID-19 (+) patients without comorbid disease as shown in Table 5. CRP ($p<0.01$), ferritin ($p<0.01$), PCT ($p<0.01$), ESR ($p<0.01$), D-Dimer ($p<0.05$), LNF($p<0.01$), Neutrophil ($p<0.05$), MLR ($p<0.01$) and NLR ($p<0.01$) of patients with cancer as a comorbid disease level were different from COVID-19 (+) patients without Comorbid disease as shown in Table 5.

In the examinations performed considering all COVID-19 cases, it has been demonstrated that high serum ferritin, lactate dehydrogenase, CRP, procalcitonin, ESR, cardiac troponin I and D-dimer levels, and the presence of lymphopenia are correlated with a intense course of the disease. Considering the correlation of biochemical and hematological parameters of all patients with COVID-19 (+) hospitalized in both the ward and the intensive care unit with the day of hospitalization; has been shown a positive correlation with PT, INR, CRP, FERRITINE, PCT, ESR, D-DIMER, WBC, NTRF, MLR and NLR parameters of the day of hospitalization, while it has been shown a negative correlation with HGB and lymphocyte parameters ($p<0.01$). In addition, Ex / discharge status was negatively associated with LNF ($p<0.01$), PLT ($p<0.01$) parameters, while it was positively correlated with PT ($p<0.05$), INR ($p<0.05$), CRP ($p<0.01$), Ferritin ($p<0.01$), PCT ($p<0.01$), ESR ($p<0.01$), D-Dimer ($p<0.01$),

WBC ($p<0.01$), NTR ($p<0.01$), MLR ($p<0.01$), NLR ($p<0.01$) and Troponin-I ($p<0.01$) parameters as shown in Table 4.

## 5. CONCLUSION

As a result; comorbidities are more important in the COVID-19 treatment. Most aged sufferers have evidence of underlying diseases along with liver, kidney or malignant tumors disease. These sufferers typically die in their original comorbidities. Therefore, we need to assess all unique comorbidities of patients with COVID-19 accurately. Especially in elderly patients with severe comorbid conditions, treatment of the patients unique comorbidities is of importance during the treatment of pneumonia. COVID-19 is causing pneumonia and damage organ systems including blood and immune system, as well as other organs such as the heart, liver, and kidneys. Patients eventually die of more than one organ failure, shock, acute breathing misery syndrome, coronary heart, arrhythmias, and kidney failure. Therefore, potential multi-organ injuries, their protection and prevention are of significance in the treatment of COVID-19.

### Ethical Consideration of the Study

This study was approved by the ethics board of Samsun Training and Research Hospital (Date 09.09.2020) with 2020/13 session numbered, GOKA/ 2020/13/6 decision numbered.

### Conflict of Interest Statement

All authors declare no conflict of interest.

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