

Evaluation of patients admitted to our hospital with a possible diagnosis of COVID-19

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Abstract

We aimed to evaluate the clinical characteristics, laboratory and imaging findings, and outcomes associated with the severity of illness of patients admitted to our hospital with possible COVID-19 diagnosis. The patients admitted to our hospital with a possible diagnosis of COVID-19 between March 25 and December 3, 2020, were evaluated retrospectively. In terms of their clinical, laboratory, imaging findings, and mortality were compared between patients discharged and hospitalized with died and survivors. 12470 patients admitted to our hospital with a possible diagnosis of COVID-19 tested by SARS-CoV-2 RT-PCR. Of those tested, 3116 (24.9%) were positive. Of the patients, 2529 (81.2%) were discharged, 587 (18.8%) hospitalized, and 92 (3%) were died. In the comparison of discharged, and hospitalized groups, a significant difference was found in age, symptoms, comorbid diseases, chest CT, laboratory findings, and mortality ($p < 0.05$). In the comparison of survivor, and dead, the risk of mortality analysis showed similar characteristics. Older age, male gender, comorbidities, lymphopenia, thrombocytopenia, increased levels of CRP, NLR, D-dimer, ferritin, and chest CT findings were significant risk factors. Of the patients who died, 23 (25%) were female and 69 (75%) were male. The outbreak of COVID-19 is a significantly health problem. We were experienced with high numbers of COVID-19 cases and found that age, symptoms, comorbid diseases, chest CT, laboratory findings of inflammation are significant predictors for admission to hospital. Therefore, these risk factors should consider routinely for patients with a high risk of developing severe and critical diseases by clinicians.

Keywords: COVID-19, prognosis, diagnosis.

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Introduction

COVID-19 pandemic has affected millions of people around the world in recent years. Firstly, in December 2019, the pneumonia cases occurred in Wuhan, a city of China. The disease quickly spread to the other parts of the world. In February 2020, it was named COVID-19 by the World Health Organization (WHO) [1].

COVID-19 has a different clinical presentation ranging from asymptomatic infection to severe pneumonia. The symptoms initially present with mild but later may develop severe clinical manifestations. Therefore, identifying risk factors that estimate the prognosis of COVID-19 can reduce the mortality rates. Most of the studies have been published on hospitalised patients, but the acute symptoms of the disease in outpatients

Table 1. The characteristic data of overall 3116 patients

Characteristics	%	(n)
Male	45.8	1427
Female	54.2	1689
Exposure history	28.3	881
Symptoms at admission		
Fatigue	47	1464
Cough	44.2	1377
Sore Throat	25.6	799
Muscle Pain	25.4	792
Headache	21.2	660
Fever	17.7	550
Dyspnea	11.7	366
Loss of Taste	8.9	276
Loss of Smell	8.5	266
Diarrhea	6.5	204
Nausea and Vomiting	5.3	165
Abdominal Pain	2.6	82
Anorexia	2.1	66
Conjunctivitis	0.2	5
Comorbid Diseases		
Hypertension	12.1	377
Diabetes	8.7	270
Cardiovascular Disease	5.1	159
Chronic Obstructive Pulmonary Disease	4.3	133
Malignancy	2	63
Chronic Nephropathy	1.2	38
Pregnancy	1.2	38
Others	1.3	37
Chest CT		
COVID-19	19.4	606
Mortalite	3	92
Outcomes		
Discharge	81.2	2529
Hospitalization	18.8	587
Death	3	92

was restricted [2]. This study aimed to evaluate the clinical features, laboratory and imaging findings and results of associated with severity of illness patients admitted to our hospital with possible COVID-19 diagnosis.

Materials and Methods

The patients admitted to our hospital with a possible COVID-19 diagnosis between March 25 and December 3, 2020, were evaluated, retrospectively. The patients over 18 years and older were included in our study. Testing was conducted on patients admitted to the pandemic department who were any symptom or sign consistent with COVID-19, including fever, cough, and shortness of breath, fatigue, gastrointestinal problems, syncope, and exposure to a positive patient for COVID-19.

Case definitions were made according to the COVID-19 guidelines of the Republic of Türkiye Ministry of Health. Cases among the patients admitted to our hospital with a possible COVID-19 diagnosis that were found to have SARS-CoV-2 by molecular methods were included in the study. A definitive diagnosis was made detecting the SARS-CoV-2 virus in oropharyngeal and nasopharyngeal swabs by SARS-CoV-2 virus real-time polymerase chain reaction (RT-PCR). Demographic, clinical, laboratory, chest CT findings and clinical outcomes of these patients were obtained from the hospital database and patient records. The data of patients, including age, gender, underlying disease (comorbidities), duration of days with symptoms on admission and exposure to a positive patient for COVID-19 were recorded. Hemogram, neutrophil-to-lymphocyte ratio [NLR], kidney and liver function tests, lactate dehydrogenase [LDH], troponin, D-dimer, ferritin, C-reactive protein (CRP) were examined

on the first day of hospitalization in the patients. Age, symptoms, comorbid diseases, chest CT and laboratory findings were compared between patients discharged, and hospitalized. Approval for the study was provided from the Clinical Research Ethics Committee of Afyonkarahisar Health Sciences University, Türkiye(2021/199).

Statistical analysis

All of the patient data were recorded with Statistical Package for Social Sciences (SPSS) 20.0 (SPSS Inc., Chicago, IL, USA) Descriptive data were given as mean, standard deviation, numbers and percentages. Chi-square and Fisher's exact tests were used for group comparisons, and Student's t-test was used for comparisons of normally distributed continuous variables. The Mann-Whitney U test, one of the nonparametric tests, was used to compare continuous variables that did not conform to the normal distribution. Results with a p-value of less than 0.05 were considered statistically significant.

Table2 .The comparison data of the patients between hospitalized and discharged group

	Discharged (n= 2527)	Hospitalized(n=589)	p
Age			
Median (minimum-maximum)	42.1 (18-93)	60.3 (19-92)	<0.005
Symptoms			
Fever	16.9% (426)	%21.1 (104)	0.016
Cough	40.8% (1032)	%58.6 (345)	<0.005
Dyspnea	5.2% (131)	%39.9 (235)	<0.005
Nausea and Vomiting	4.2% (106)	%10 (59)	<0.005
Anorexia	1.5% (37)	%4.9 (29)	<0.005
Comorbid Diseases			
Hypertension	7.3% (184)	%32.8 (193)	<0.005
Diabetes	5.2% (132)	%23.4 (138)	<0.005
Cardiovascular Disease	2.9% (74)	%14.4 (85)	<0.005
Chronic Obstructive Pulmonary Disease	2.4% (61)	%12.2 (72)	<0.005
Malignancy	1.1% (29)	%5.8 (34)	<0.005
Chronic Nephropathy	0.6% (15)	%3.9 (23)	<0.005
Pregnancy	0.7% (19)	%3 (18)	<0.005
Chest CT			
Compatible with COVID-19	56.1% (169)	%85.9 (437)	<0.005
Mortality	0.2% (5)	%14.8 (87)	<0.005
Laboratory			
Lymphopenia	29.6% (55)	%70.4 (131)	<0.005
PNL/Lymphocyte	29.9% (19)	%70.1 (289)	<0.005
Thrombocytopenia	29.2% (15)	%70.8 (46)	<0.005
CRP	15.5% (18)	%84.5 (98)	<0.005
D-Dimer	26.2% (37)	%83.6 (104)	<0.005
Ferritin	16.4% (26)	%49.4 (133)	<0.005

Results

During the study period, 12470 patients admitted to our hospital with a possible COVID-19 diagnosis tested by SARS-CoV-2 RT-PCR. Of those tested, 3116 (24.9%) were positive and included in the study. The mean age of the patients was 45.5±16.9 years. Of the patients, 168 (54.2%) were female. Among patients admitted to hospital, the median duration of days with symptoms on admission was 3.15±2.45 days. The number of patients who known exposure was 881(28.3). The most common complaints were fatigue (47%), cough (44.2%), and headache (21.2%). The most common chronic diseases were hypertension (12.1%), diabetes mellitus (8.7%), cardiovascular disease (5.1%) and chronic obstructive pulmonary disease (4.3%). Of the patients, 92 (3%) were died. The characteristic data of patients are given in Table 1. Of the patients, 2529 (81.2%) were discharged, and 587 (18.8%) hospitalized. Among the 587 patients 523 (16.8) were treated in the clinic and 66 (2.1) were treated in the intensive care unit. Age, symptoms, comorbid diseases, chest

CT, laboratory findings and mortality were compared patients discharged, and hospitalized. In the comparison of discharged, and hospitalized groups, a significant difference was found age, symptoms, comorbid diseases, chest CT, laboratory findings and mortality ($p<0.05$). The mean age of group hospitalized were significantly higher than discharged group. The symptoms such as cough, dyspnea, nausea and vomiting were significantly higher in patients hospitalized than discharged group ($p<0.05$). The comorbidities in patients hospitalized were significantly higher than discharged group. A significant correlation was found between hospitalized and diabetes mellitus (DM), coronary artery disease (CAD), hypertension (HT), chronic obstructive pulmonary (COPD), chronic renal failure (CRF), malignancy ($p<0.05$). Lymphopenia, thrombocytopenia, elevated NLR levels, elevated D-dimer levels, elevated Ferritin levels, and elevated C-reactive protein (CRP) levels were significantly higher in the patients with hospitalized groups than discharged group ($p<0.05$). Of the hospitalized patients 437 (85.9%)

Table3.The comparison data of the groups between the survivor, and died

	Survivor (n=3024)	Died (n=92)	p
Age			
Median (minimum-maximum)	44.7 (20-87)	72.1 (18-93)	<0.005
Symptoms			
Dyspnea	10.2% (309)	%62 (57)	<0.005
Nausea and Vomiting	5.1% (155)	%10.9 (10)	<0.005
Anorexia	5.4% (5)	%2 (61)	<0.005
Hospitalization	16.6% (502)	%92.4 (85)	<0.005
Comorbid Diseases			
Hypertension	11.3% (340)	%40.2 (37)	<0.005
Diabetes	8% (243)	%29.3 (27)	<0.005
Cardiovascular Disease	4.3%(131)	%30.4 (28)	<0.005
Chronic Obstructive Pulmonary Disease	4% (120)	%14.1 (13)	<0.005
Malignancy	1.7% (52)	%12 (11)	<0.005
Chronic Nephropathy	0.9% (29)	%9.8 (9)	<0.005
Pregnancy	1% (32)	%4 (5)	<0.005
Chest-CT			
Compatible with COVID-19	73% (533)	%91.2 (73)	<0.005
Laboratory			
Lymphopenia	16.1% (140)	%51.7 (46)	<0.005
PNL/Lymphocyte	39.2% (341)	%79.8 (71)	<0.005
Thrombocytopenia	5.7% (50)	%16.9 (15)	<0.005
CRP	8.8% (76)	%44.9 (40)	<0.005
D-Dimer	15.6% (111)	%39 (30)	<0.005
Ferritin	13.8% (116)	%49.4 (43)	<0.005

had thorax CT findings of COVID-19 infection and mortality rate 87 (14.8%) was founded higher than discharge group ($p < 0.05$). The comparison data of the patients between the hospitalized and discharged group are given in Table 2.

Of the patients who died, 23 (25%) were female, and 69 (75%) male. In the comparison of survivor, and died, a significant difference was found age, symptoms, comorbid diseases, chest CT, and laboratory findings ($p < 0.05$). The mean age of group died were significantly higher than survivors. The symptoms such as dyspnea, nausea-vomiting were notably higher in patients died than survivor ($p < 0.05$). The comorbidities such as diabetes mellitus (DM), coronary artery disease (CAD), hypertension (HT), chronic obstructive pulmonary (COPD), chronic renal failure (CRF), malignancy in patients died were significantly higher than survivor ($p < 0.05$). Lymphopenia, thrombocytopenia, elevated NLR levels, elevated D-dimer levels, elevated Ferritin levels, and elevated C-reactive protein (CRP) levels were significantly higher in the patients with died groups than survivor ($p < 0.05$). 73 (91.2%) of died had thorax CT findings consistent with COVID-19 infection. The comparison data of the groups between died and survivor are given in Table 3.

Discussion

In the COVID-19 pandemic, our study investigated the factors associated with severity of COVID-19. Identifying the risk factors can indicate the prognosis of the disease, and help to hospitalize patients in the high-risk group earlier. According to our study, demographic, clinical, laboratory, chest CT findings and clinical outcomes of COVID-19 patients were similar to previous studies [3-5].

Compared with younger age, the patients an older age (>65 years) are more likely mortality. In our study, the mean age of group died were over 65 years old. Elderly patients have reduced in immune function. The anti-inflammatory mechanisms after infection are not adequately controlled in elderly persons, potentially causing to mortality [6]. In the studies, it was found that male patients are the more susceptible to the

COVID-19 infection [7,8]. In our study, 54.2% of the patients admitted to our hospital with a possible COVID-19 diagnosis were female and 45.8% were male.

In the studies, the incubation period of SARS-CoV-2 ranges from 2.1 to 11.1 days [9]. The median incubation period was found 3.15 ± 2.45 days in our study. The studies have reported that the COVID-19 infections may be impacted by geographical climatic factors such as temperature and seasonality. Nineteen studies in China reported peak time of infections varied from late January to late March [10]. Findings from our study showed that peak time of infections from late June to late November.

SARS-CoV-2 can be transmitted effectively human-to-human by droplets or direct contact. [11]. In a study, the rate of SARS-CoV-2 transmission was founded 41% in the hospital [12]. In our study, the transmission rate of SARS-CoV-2 was founded 28.3%. The development and facility of global travel could also increase its worldwide spread transmission of SARS-CoV-2 [13].

The most common symptoms of COVID-19 infection are fever, cough, dyspnea, fatigue, which were reported in the previous literature [13,14]. In our study, the signs and symptoms of COVID-19 were similar with these previous publications. On admission, fatigue (47%), cough (44.2%), and headache (21.2%) were the most common symptoms. The clinical course in COVID-19 may vary according to the comorbidities. Comorbidities increase the risk of hospitalization and mortality in COVID-19 pandemic [16,17]. Huang et al. reported that 32% of 41 patients had an underlying disease; reported that they found diabetes mellitus in 20%, hypertension in 15%, and cardiovascular disease in 15% of these patients [2]. In another study by Lai et al., it was found the common underlying diseases in patients were hypertension, cardiovascular disease and diabetes mellitus [15]. In our study, hypertension (12.1%) we found to be the most common comorbidity, followed by diabetes (8.7%), and cardiovascular disease (5.1%).

The most widely used test method all over the world in the diagnosis of COVID-19 is RT-PCR. The positivity rate of the RT-PCR test was reported as 39.5% by Li et al., and as 36.6% by Sümer et al. [18,19]. In our study, the RT-PCR test positivity rate was found to be 24.9% at the time of admission. Thorax CT is used as an important diagnostic method in cases of COVID-19 pneumonia [20]. Guan et al reported that CT no abnormality was found in 1099 patients (17.9%) [7]. In our study, thoracic CT was requested in 805 (25.8%) of the patients. Among 805 patients characteristic thoracic CT findings were detected in 606 (75.2%) patients. The mortality rates reported in the literature ranged from 1% to 32.5% [1]. In this study, the mortality rate of patients included was 3%.

COVID-19 may progress more severely in hospitalized patients; therefore, it should be identified the risk factors for mortality [21,22]. In a study, it is reported that advanced age cause severe COVID-19 disease [23]. In general, comorbidities such as DM, CAD, HT, COPD, CRF and malignancy have leading to worse outcomes in COVID-19 patients [24-26]. The most common laboratory findings in COVID-19 patients that include lymphopenia, thrombocytopenia, and increased levels of CRP, NLR, D-dimer, and ferritin reported in several studies. These laboratory findings are significantly higher in hospitalized patients and can be used to predict COVID-19 severity [27,28]. When the outcomes of patients who were hospitalized was compared with the discharged group, we found particularly association of among age, symptoms, comorbid diseases, chest CT, laboratory findings and mortality as in previous studies. In the comparison of survivor, and died, the risk mortality analysis showed similar characteristics with previous studies. The mean age of group died were over 65 years old. Of the patients who died, 23 (25%) were female, and 69 (75%) male. The mortality was found higher in the males. Other significant factors included symptoms, comorbid diseases, and chest CT, and laboratory findings.

Conclusion

Finally, the outbreak of COVID-19 is a significantly health problem. We were experienced with high numbers of COVID-19 cases and found that age, symptoms, comorbid diseases, chest CT, laboratory findings of inflammation are significant predictors for admission to hospital. Determining risk factors for COVID-19 severity and mortality are critical for prognosis too. Therefore, these risk factors should consider routinely for patients with a high risk of developing severe and critical diseases by clinicians.

Our study has some notable limitations. It was designed as a retrospective study. Some cases had incomplete documentation for exposure history and laboratory testing in the electronic databases.

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Conflict of interest

The authors of this manuscript report no conflict of interest. All co-authors have seen and agreed with the contents of the manuscript.

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