Clinical Research

FIRAT TIP DERGISI

Relationship between Hospitalization, Admission Symptoms, and Chronic Disease in COVID-19 at an Emergency Clinic

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ABSTRACT

Objective: This study aimed to investigate the association between hospitalization and admission symptoms, demographic information, laboratory results, and pre-existing chronic diseases in patients who sought care at the emergency outpatient clinic of a research hospital and were diagnosed with coronavirus disease of 2019 (COVID-19).

Material and Method: This retrospective cross-sectional study included 220 randomly selected patients who presented to the emergency outpatient clinic of a training and research hospital and were diagnosed with COVID-19. The patients were categorized into two groups, hospitalized and non-hospitalized, and an investigation was conducted to determine whether there were differences between the two groups regarding symptoms, chronic diseases, demographics, and laboratory data.

Results: Among the COVID-19 patients in the study, 50.9% had hypertension, 31.8% had diabetes, and 18.6% had chronic diseases, such as coronary artery disease. Thoracic computerized tomography (CT) scans of 83% of COVID-19 patients were consistent with COVID-19/viral pneumonia, and 92% were hospitalized. Regression analysis revealed that C-reactive protein levels and chest CT findings compatible with COVID-19/viral pneumonia, asthma positively and age, hemoglobine, myalgia-back/joint pain negatively predicted hospitalization.

Conclusion: The concordance of chest CT scans with COVID-19/viral pneumonia increased the likelihood of hospitalization by 32.43 times, while patients with asthma or chronic obstructive pulmonary disease had an 5.28 times higher risk. Contrary to expectations, hospitalization increased as age decreased. These parameters should be considered when making hospitalization decisions for individuals with suspected COVID-19.

Keywords: COVID-19, Comorbidity, Symptom, Virus.

ÖZ

Acil Servis COVID-19 Hastalarının Hastaneye Yatışlarının, Başvuru Semptomları ve Kronik Hastalıkları ile İlişkisi

Amaç: Bu çalışmada, araştırma hastanesinin acil polikliniğine başvuran ve korono virüs hastalığı- 2019 (COVİD-19) tanısı alan hastalarda hastaneye yatış ve başvuru semptomları, laboratuvar sonuçları ve önceden var olan kronik hastalıklar arasındaki ilişkinin araştırılması amaçlanmıştır.

Gereç ve Yöntem: Çalışma, COVID-19 tanısı konan eğitim ve araştırma hastanesinin acil polikliniğine başvuran ve rastgele seçilen 220 hastayı içeren retrospektif bir kesitsel çalışmadır. Hastalar, yatarak tedavi edilenler ve ayaktan tedavi edilenler olmak üzere iki gruba ayrılmıştır ve her iki grup arasında semptomlar, kronik hastalıklar, demografik bilgiler ve laboratuvar verileri açısından farklılık olup olmadığını belirlemek için bir inceleme yapılmıştır.

Bulgular: Çalışmadaki COVID-19 hastalarının %50.9' unun hipertansiyon, %31.8' inin diyabet, ve %18.6'sının koroner arter hastalığı gibi kronik hastalıkları vardı. COVID-19 hastalarının %83'ünün toraks bilgisayarlı tomografi taramaları COVID-19/viral pnömoni ile uyumlu idi ve bu hastaların %92'si hastaneye yatırıldı. Regresyon analizi sonucunda, C-reaktif protein seviyelerinin, COVID-19/viral pnömoni ile uyumlu göğüs bilgisayar tomografi (BT) bulgularının ve astımın hastaneye yatışı pozitif yönde, yaşın, hemoglobin ve miyalji-sırt/eklem ağrısının ise negatif yönde yordadığı belirlenmiştir.

Sonuç: Toraks BT taramalarının COVID-19/viral pnömoni ile uyumluluğu hastaneye yatış olasılığını 32.43 kat artırırken, astım veya kronik obstrüktif akciğer hastalarının riski 5.28 kat daha yüksektir. Yaygın inanışın aksine yaş azaldıkça hastaneye yatışlar artmıştır. COVID-19 şüphesi olan bireylerin hastaneye yatış kararlarını verirken bu parametreler dikkate alınmalıdır.

Anahtar Sözcükler: COVID-19, Komorbidite, Semptom, Virüs.

Coronavirus disease of 2019 (COVID-19) is a rapidly spreading infectious disease. Although studies have revealed the symptoms and risk factors that may occur in COVID-19 patients, the presence of uncommon or unknown symptoms can delay the diagnosis and, consequently, the treatment of COVID-19 (1).

Common symptoms of this infection, which can also occur asymptomatically, include fever, cough, and shortness of breath. In addition, symptoms such as headache, sore throat, runny nose, muscle and joint pain, weakness, loss of sense of smell and taste, and diarrhea can also be observed. In some severe cases,

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pneumonia, severe acute respiratory tract infection, kidney failure, and even death may develop (2).

Hospitalized adults and children and adults aged >60 years are less likely to show typical symptoms. Fever, cough, and shortness of breath were more common in men, while confusion, nausea and vomiting, diarrhea, chest pain, headache, and abdominal pain were more common in women. Confusion is frequently observed in patients > 60 years of age. Symptoms such as nausea and vomiting, headache, abdominal pain, and sore throat are more common in patients under the age of 30 years, and the frequency of these symptoms decreases with age (3, 4).

Jain at al. suggested that shortness of breath is the only symptom sufficient for hospitalization in the intensive care unit (5).

In this study, we investigated whether there was a relationship between hospitalization and admission symptoms, demographic data, laboratory findings, and chronic diseases in patients who visited the emergency COVID-19 outpatient clinic of the training and research hospital and were diagnosed with COVID-19.

MATERIAL AND METHOD

Patients and sample size

This retrospective cross-sectional study included 2,000 patients who attended the Training and Research Hospital COVID-19 outpatient clinic between November 1, 2020, and December 31, 2020. These patients were designated as the study population. Based on the criteria entered into our statistical model, we determined that the minimum sample size required for the study was 219 patients. We subsequently selected 220 patients through a simple random sampling method, ensuring that their data were accessible for inclusion in the study.

Inclusion and exclusion criteria

Patients included in the study were 18 years or older, tested positive for COVID-19 via PCR, presented with symptoms, and had a thoracic computed tomography (CT) evaluated for COVID-19 imaging. Complete data required for inclusion consisted of age, sex, blood urea nitrogen (BUN), creatinine, alanine aminotransferase (ALT), aspartate aminotransferase (AST), C-reactive protein (CRP), white blood cell (WBC) count, neutrophil count, lymphocyte count, hemoglobin, and platelet count (PLT).

Patients younger than 18 years of age, with negative COVID-19 PCR test results, pregnant and lactating patients, and patients with incomplete thoracic CT and laboratory values were not included in the study.

Study design

Patient symptoms at diagnosis, demographic data such as age and sex, chronic diseases diabetes mellitus (DM), coronary artery disease (CAD), hypertension (HT), asthma/chronic obstructive pulmonary disease (COPD), chronic renal failure (CRF), congestive heart failure (CHF), other chronic diseases, hospitalization decisions, laboratory findings, and imaging results were recorded.

The patients were divided into two groups: those who were hospitalized and those who were not. We investigated whether there was a difference in terms of symptoms, comorbidity, and demographic and laboratory data in these patients.

In addition, to determine the factors predicting hospitalization, a model was created by evaluating findings such as age, AST, CRP, hemoglobin level, thoracic CT findings, myalgia-back/joint pain, CAD, HT, asthma-COPD, CRF, and weakness.

Ethical approval

The study was approved by the Ministry of Health and Clinical Research Ethics Committee of the Training and Research Hospital (decision number 2021/180 dated 21.06.2021). This study was conducted in accordance with the Declaration of Helsinki.

Statistical analyses

All data were analyzed in a computer environment using the SPSS 25.0package program. Categorical data were compared using the chi-squared test and Fisher's exact test. The conformity of continuous data to a normal distribution was evaluated graphically using the Kolmogorov-Smirnov, skewness, and kurtosis tests. Variables other than hemoglobin were not normally distributed. An independent t-test was used to analyze data that met normality conditions, and the Mann-Whitney U test was used to analyze data that did not meet normality. Binary logistic regression analysis was used to estimate the hospitalization status of patients. The significance level for all analysis results was set at $p < 0.05$.

RESULTS

The median age of the patients included in the study was 62 (22-93) years, of which 46.4% were female (n =102) . A total of 76.8% (n =169) of patients were hospitalized. Of the thoracic CT results, 182 (82.7%) were compatible with COVID-19 pneumonia, 9 (4.2%) were suspected to be COVID-19 pneumonia, and 29 (13.1%) were negative for COVID-19 pneumonia.

Cough, shortness of breath, weakness symptoms, and chronic diseases such as HT, DM, and CAD are frequently observed in COVID-19 patients. The most common complaint was cough (43.6%, n =96) and the most common chronic disease was hypertension (50.9%, n =112).

Thoracic CT of 83% of COVID-19 patients was compatible with COVID-19/viral pneumonia, and this rate was 93.5% in hospitalized patients. There was a significant difference ($p < 0.001$) between thoracic CT findings compatible with COVID-19 pneumonia and hospitalization status. In other words, the rate of hospitalization was higher in those whose thoracic CT fin-

dings were compatible with those of COVID-19 pneumonia.

Although the median age, lymphocyte count, and mean hemoglobin values of the hospitalized patients were significantly lower (respectively p <0.001, p <0.001,

p :0.013) than those of the non-hospitalized patients, their CRP and AST levels were higher (p <0.001).

No statistically significant difference was found in the hospitalization of patients according to sex (p >0.05). The laboratory data according to hospitalization status are shown in table 1.

Table 1. *Comparison of laboratory data according to hospitalization status.*

n :220	Hospitalization Status		
	Yes (Median, min-max)	No (Median, min-max)	p
Age (year)	59 (22-93)	75 (28-91)	**<0.001***
WBC (/mcL)	6110 (1910-18090)	5940 (2730-11000)	0.948*
Lymphocyte (/mcL)	1120 (210-3730)	1530 (600-3350)	**<0.001***
Neutrophil (/mcL)	4330 (980-16590)	3840 (770-8940)	0.057*
Hemoglobin (g/dl)	$12.41 \pm 1.97^{\#}$	$13.17 \pm 1.54^{\#}$	**0.013****
PLT (/mcL)	$205\ 10^3 (22\ 10^3\text{-}552\ 10^3)$	$205\ 10^3 (103\ 10^3\text{-}395\ 10^3)$	0.842*
CRP (mg/L)	7.1 (0.2-22.9)	1.4 (0.2-13.1)	**<0.001***
BUN (mg/dL)	17 (6-102)	18 (6-57)	0.319*
Creatinine (mg/dL)	$0.90 (0.48\text{-}7.84)^{\#}$	$0.94 (0.57\text{-}2.39)^{\#}$	0.246*
ALT (IU/L)	$24 (7\text{-}594)^{\#}$	$22 (9\text{-}65)^{\#}$	0.087*
AST (IU/L)	$27 (11\text{-}384)^{\#}$	$22 (12\text{-}98)^{\#}$	**<0.001***

*MannWhitney U Test, **Independent T Test, #Mean ± Standart deviation. **Abbreviations:** Min: Minimum, Max: Maximum, WBC: White blood cell, PLT: Platelet, CRP: C-Reactive protein, BUN: Blood urea nitrogen, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase.*

Significant differences were found between the presence of shortness of breath and the absence of myalgia or back/joint pain at admission, in relation to hospitalization status (p <0.001) .

The symptoms, chronic diseases, demographic characteristics, and analysis results according to hospitalization status are shown in table 2.

Table 2. *Demographic characteristics and distribution of chronic diseases according to hospitalization status.*

n :220		Hospitalization Status			p
		Total	No n(%)	Yes n(%)	
Gender	Female	102 (%46.3)	22 (21.6)	80 (78.4)	0.598 *
	Male	118 (%53.6)	29 (24.6)	89 (75.4)	
Torax CT	Compatible	182 (%82.7)	24 (13.2)	158 (86.8)	**<0.001***
	Suspicious	9 (%4.2)	4 (44.4)	5 (55.6)	
	No	29 (%13.1)	23 (79.3)	6 (20.7)	
GIS Symptoms	No	196 (%89)	48 (24.5)	148 (75.5)	0.189*
	Yes	24 (%11)	3 (12.5)	21 (87.5)	
Shortness of breath	No	142 (%64.5)	43 (30.3)	99 (69.7)	**<0.001***
	Yes	78 (%35.4)	8 (10.3)	70 (89.7)	
Cough	No	124 (%56.3)	30 (24.2)	94 (75.8)	0.686*
	Yes	96 (%43.7)	21 (21.9)	75 (78.1)	
Myalgia-back/joint pain	No	189 (%85.9)	35 (18.5)	154 (81.5)	**<0.001***
	Yes	31 (%14.1)	16 (51.6)	15 (48.4)	
Fever	No	189 (%85.9)	47 (24.9)	142 (75.1)	0.143*
	Yes	31 (%14.1)	4 (12.9)	27 (87.1)	
Weakness	No	146 (%66.3)	36 (24.7)	110 (75.3)	0.466*
	Yes	74 (%33.6)	15 (20.3)	59 (79.7)	
Other Symptoms	No	193 (%87.7)	44 (22.8)	149 (77.2)	0.718*
	Yes	27 (%12.3)	7 (25.9)	20 (74.1)	
Other chronic diseases	No	192 (%87.2)	47(24.5)	145 (75.5)	0.232*
	Yes	28 (%12.8)	4 (14.3)	24 (85.7)	
DM	No	150 (%68.2)	35(23.3)	115 76.7)	0.938*
	Yes	70 (%31.8)	16(22.9)	54 77.1	
HT	No	108 (%49)	26(24.1)	82 (75.9)	0.758*
	Yes	112 (%51)	25(22.3)	87 (77.7)	
CAD	No	179 (%81.3)	41(22.9)	138 (77.1)	0.839*
	Yes	41 (%18.7)	10(24.4)	31 (75.6)	
CHF	No	210 (%95.4)	51(24.3)	159 (75.7)	0.122**
	Yes	10 (%4.6)	0(0.0)	10 (100.0)	
Cancer	No	205 (%93)	46(22.4)	159 (77.6)	0.347**
	Yes	15 (%7)	5(33.3)	10 (66.7)	
Hyperlipidemia	No	206 (%93.7)	49 (23.8)	157 (76.2)	0.307**
	Yes	13 (%6.3)	1 (7.7)	12 (92.3)	
Asthma-COPD	No	203 (%92.2)	46 (22.7)	157 (77.3)	0.552**
	Yes	17 (%7.8)	5 (29.4)	12 (70.6)	
CRF	No	209 (%95)	50 (23.9)	159 (76.1)	0.464**
	Yes	11 (%5)	1 (9.1)	10 (90.9)	

* Chi Square Test, **Fisher's Exact Test. **Abbreviations:** CT: Computerized tomography, GIS: Gastrointestinal system, DM: Diabetes Mellitus, HT: Hypertension, CAD: Coronary Artery Disease, CHF: Congestive heart failure, COPD: chronic obstructive pulmonary disease, CRF: Chronic renal failure.*

Other chronic diseases are found 12.7% (cerebrovascular oclusion, Parkinson's disease, atrial fibrillation, hypothyroidism, epilepsy, benign prostatic hyperplasia, dementia, osteoporosis, and bipolar disorder).

A regression model was established to estimate the hospitalization status of patients. The model was developed using the following predictors: age, AST, CRP, hemoglobin, values, and thorax CT findings, myalgia-back/joint pain CAD, HT, asthma-COPD, CRF, and weakness. The correct classification rate was 89.1%, Cox&Snell R^2 was 0.414 and Nagelkerke R^2 was 0.626. CRP levels, thoracic CT findings consistent with COVID-19/viral pneumonia, and asthma-COPD were positive predictors of hospitalization. Conversely, age, hemoglobin levels, and myalgia-back/joint pain were statistically significant negative predictors (Table 3).

Table 3. *Evaluation of risk factors affecting the hospitalization status of the patients in the multivariate logistic regression model.*

	B	S.E	Wald	Sig.	Exp(B)	95% CI Lower	95% CI Upper
Age	-0.063	0.018	13.024	**<0.001**	0.939	0.907	0.971
AST	0.042	0.022	3.611	0.057	1.043	0.999	1.089
CRP	0.223	0.071	9.766	**0.002**	1.250	1.087	1.438
Hemoglobin	-0.397	0.146	7.399	**0.007**	0.672	0.505	0.895
Torax CT			27.317	**<0.001**			
Torax CT Suspicious	0.134	1.173	0.013	0.909	1.143	0.115	11.395
Torax CT Compatible	3.479	0.701	24.601	**<0.001**	32.431	8.202	128.244
Myalgia-back/joint pain	-1.946	0.621	9.813	**0.002**	0.143	0.042	0.483
CAD	0.889	0.636	1.957	0.162	2.433	0.700	8.453
HT	0.751	0.538	1.948	0.163	2.119	0.738	6.080
Asthma-COPD	1.665	0.843	3.903	**0.048**	5.284	1.013	27.560
Weakness	0.664	0.545	1.488	0.223	1.943	0.668	5.652
Constant	7.336	2.277	10.384	**0.001**	1534.566		

Omnibus test p <0.001, Hosmer & Lemeshow test p :0.765 **Abbreviations:** AST: Aspartate aminotransferase, CRP: C-reactive protein, CT: Computerized tomography CAD: Coronary Artery Disease, HT: Hypertension, COPD: Chronic obstructive pulmonary disease.

DISCUSSION

In the study, there was no significant difference in the prevalence of chronic diseases between hospitalized and non-hospitalized patients, except for asthma-COPD, which significantly influenced the decision to hospitalize. In terms of symptoms, shortness of breath was more in the hospitalized group, while myalgia-back/joint pain was less and this difference was statistically significant.

Zhang et al. (6) found that being male was a risk factor for the decision to hospitalize COVID-19 patients. Haitao et al. (7) observed that the rates of hospitalization and disease severity were higher in males. In the study, however, no difference was found in the hospitalization status according to the gender of the patients.

In a study conducted by Salje et al. (8) the mean age of patients hospitalized with the diagnosis of COVID-19 in France until May 2020 was 68 years, and hospitalization increased with age. In the study by the CDC COVID-19 Response Team, the mean age of the hospitalized patients was found to be higher than that of patients who were not hospitalized; in our study, the mean age of the hospitalized patients was found to be significantly lower than that of the patients who were not hospitalized. Among patients diagnosed with COVID-19, 45% of hospitalizations and 80% of deaths related to COVID-19 are in the 65 years and older group (9). The reason for this may be that the curfew imposed on people over 65 years old and with chronic diseases as of 11.03.2020 reduced their exposure to viral load.

According to the study conducted by Stokes et al. (10) common symptoms in patients diagnosed with COVID-19 included cough (50.3%), fever (43.1%), shortness of breath (28.5%), and myalgia (36.1%). Chen et al. (11) found fever in 83% of patients, cough in 82%, shortness of breath in 31%, and myalgia in 11%. In our study, the symptoms and percentage of patients were cough (43.6%), shortness of breath (35.5%), weakness (33.6%), myalgia-back/joint pain (14.1%), fever (14.1%), other symptoms (general mood disorder, epistaxis, headache, chest pain; 12.3%) and GIS symptoms (10.9%). Consistent with the findings of Stokes and Chen, cough was the most common symptom in COVID-19 patients in our study.

Rodriguez-Morales claimed that the symptoms and their incidence rates in COVID-19 patients were fever (88.7%), cough (57.6%), and dyspnea (45.6%) (12). Guan suggested that fever was seen in 88% and cough in 70% of patients with COVID-19 (13).

It is suggested that myalgia in COVID-19 may be associated with blood lactate levels and could influence the course of the disease (14). Our study evaluated the symptoms of patients at the time of presentation to the COVID-19 clinic, suggesting that myalgia symptoms may have been overlooked as an indication for hospitalization, and that hospitalized patients tended to be younger.

In Petrilli et al.'s study (15), the prevalence rates of chronic diseases in patients diagnosed with COVID-19 were as follows: 42.7%, HT; 32.5%, dyslipidemia; 22.6%, DM; 14.9%, asthma/COPD; 13.3%, KAH; 12.3%, CRF; and 7%, CHF. In our study, the prevalence rates of these diseases were 50.9% HT, 31.8% DM, 18.6% KAH, 12.7% other diseases, 7.7% asthma/COPD, 6.8% cancer, 5.9% dyslipidemia, 5%

CRF, and 4.5% CHF. In a study by Wei-Jie-Guan et al. (13), the most common chronic diseases were HT, DM, and CAD, and in a study by Zhou et al., 75% DM, 62% HT, and 16% CAD (16). Consistent with these findings, in our study, HT and DM were the most common chronic diseases in COVID-19 patients, which is consistent with the prevalence of HT and DM in Turkey.

Tao et al. (17) showed that anemia detected within the first 24 h after hospitalization was associated with progression to severe COVID-19. Seung et al. (18) reported that anemia at the time of admission was independently associated with increased odds of all-cause mortality among patients hospitalized with COVID-19. In our study, the mean hemoglobin level was significantly lower in hospitalized patients, and hemoglobin levels were negatively associated with the likelihood of hospitalization.

Guan et al. (13) showed that lymphocytopenia and leukopenia are more common in patients with severe disease than in those without. In a study conducted by Parasher et al. (19) lymphopenia was found in most patients, and it was accepted as a poor prognostic criterion. In our study, lymphocyte counts were significantly lower in hospitalized patients.

Henry et al. (20) observed significant elevations in inflammation and coagulation markers, heart and muscle damage, and liver and kidney dysfunction in hospitalized COVID-19 patients. Parasher also found high levels of AST, ALT, LDH, and neutrophil values in hospitalized COVID-19 patients (19). In our study, AST levels were found to be higher in hospitalized patients.

Analysis of 16 retrospective studies showed that inflammatory markers, especially CRP, PCT, interleukin-6, and erythrocyte sedimentation rate, are associated with the severity of COVID-19. CRP elevation was also found to be common in the study by Singhal et al. (21) In a study by Chen et al. (22), a high CRP level was associated with poor prognosis and was found more frequently in patients with dyspnea. In our study, CRP levels were significantly higher in hospitalized patients.

Lorant et al. (23), in their cohort study on COVID-19 patients examined at the time of application, showed that the first thoracic CT of 5.2% of the cases was normal and the remaining 94.8% was compatible with COVID-19/viral pneumonia. In a study in which a total of 84 articles and 5,340 patients were examined, 92.6% of the patients had thoracic CT results compatible with COVID-19/viral pneumonia (24). In two separate studies, a picture compatible with COVID-19/viral pneumonia was observed in 89% and 97.2% of thoracic CT scans at the time of admission (25, 26). Liu et al. (27) reported that 37 (92.5%) of 40 COVID-19 patients followed in the hospital were compatible with thoracic CT with viral/COVID-19 pneumonia.

Thoracic CT findings of 82.7% of the patients in our study were compatible with COVID-19 pneumonia, while 92% of these patients were hospitalized.

Limitations

Our study has limitations, including its single-center design, absence of examination of patient follow-up data, lack of weight, blood pressure, SpO2, ferritin and d-dimer in the dataset.

Conclusion

In our study, the most common complaint in COVID-19 patients was cough (43.6%), and the most common chronic disease was HT (50.9% (n =112). Findings compatible with COVID-19/viral pneumonia were observed in 82.7% (n =112) of the thoracic CT scans, and 92% of these patients were hospitalized. Compatibility of CT toraks with COVID-19/viral pneumonia increases hospitalization 32.43 times, asthma-COPD 5.28 times, CRP 1.25 times, and decrease in age and hemoglobin. Contrary to popular beliefs, it is recommended to be careful about the need for hospitalization in young patients. It may be useful to consider these parameters when evaluating hospitalization decisions in patients with suspected COVID-19.

REFERENCES

1. Jeon J, Baruah G, Sarabadani S, Palanica A. Identification of risk factors and symptoms of COVID-19: analysis of biomedical literature and social media data. J Med Internet Res 2020; 22: e20509.
2. Health Minister of Turkiye COVID-19 Information Platform. COVID-19 Salgın Yönetimi ve Çalışma Rehberi. Covid-19 rehberi genel bilgiler epidemiyoloji ve tani. Ankara 2021.
3. Abdukahil SA, Abe R, Abel L et al. COVID-19 symptoms at hospital admission vary with age and sex: results from the ISARIC prospective multinational observational study. Infection 2021; 49: 889-905.
4. Larsen JR, Martin MR, Martin JD, Kuhn P, Hicks JB. Modeling the onset of symptoms of COVID-19. Front Public Health 2020; 8: 473.
5. Jain V, Yuan J-M. Predictive symptoms and comorbidities for severe COVID-19 and intensive care unit admission: a systematic review and meta-analysis. Int J Public Health 2020; 65: 533-46.
6. Zhang J, Wang X, Jia X et al. Risk factors for disease severity, unimprovement, and mortality in COVID-19 patients in Wuhan, China. Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis 2020; 26: 767-72.
7. Haitao T, Vermunt JV, Abeykoon J, Ghamrawi R, Gunaratne M at al. COVID-19 and sex differences. Mayo Clin Proc 2020; 95: 2189-203.
8. Salje H, Tran Kiem C, Lefrancq N et al. Estimating the burden of SARS-CoV-2 in France. Science 2020; 369: 208-11.
9. CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19) - United States, February 12-March 16, 2020. MMWR Morb Mortal Wkly Rep 2020; 69: 343-6.
10. Stokes EK, Zambrano LD, Anderson KNet al. Coronavirus Disease 2019 case surveillance - United States, January 22-May 30, 2020. MMWR Morb Mortal Wkly Rep 2020; 69: 759-65.
11. Chen N, Zhou M, Dong X et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet Lond Engl 2020; 395: 507-13.
12. Rodriguez-Morales AJ, Cardona-Ospina JA, Gutiérrez-Ocampo E et al. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. Travel Med Infect Dis 2020; 34: 101623.
13. Guan Wj, Liang Wh, Zhao Y et al. Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis. Eur Respir J 2020; 55: 2000547.
14. Yükselmiş Ö. COVID-19 enfeksiyonunda miyalji şiddetinin prognoz üzerine etkisi. International Anatolia Academic Online Journal Health Sciences 2022; 8: 122-7.
15. Petrilli CM, Jones SA, Yang J et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. BMJ 2020; 369: m1966.
16. Zhou F, Yu T, Du R et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020; 395: 1054-62.
17. Tao Z, Xu J, Chen W et al. Anemia is associated with severe illness in COVID-19: A retrospective cohort study. J Med Virol 2021; 93: 1478-88.
18. Oh SM, Skendelas JP, Macdonald E et al. On-admission anemia predicts mortality in COVID-19 patients: A single center, retrospective cohort study. Am J Emerg Med 2021; 48: 140-7.
19. Parasher A. COVID-19: Current understanding of its pathophysiology, clinical presentation and treatment. Postgrad Med J 2021; 97: 312-20.
20. Henry BM, de Oliveira MHS, Benoit S, Plebani M, Lippi G. Hematologic, biochemical and immune biomarker abnormalities associated with severe illness and mortality in coronavirus disease 2019 (COVID-19): a meta-analysis. Clin Chem Lab Med 2020; 58: 1021-8
21. Singhal T. A Review of Coronavirus Disease-2019 (COVID-19). Indian J Pediatr 2020; 87: 281-6
22. Chen G, Wu D, Guo W, Cao Y, Huang D et al. Clinical and immunological features of severe and moderate coronavirus disease 2019. J Clin Investig 2020; 130: 2620-9.
23. Leonard-Lorant I, Severac F, Bilbault P, Muller J, Leyendecker P at al. Normal chest CT in 1091 symptomatic patients with confirmed Covid-19: frequency, characteristics and outcome. Eur Radiol 2021; 31: 5172-7.
24. Li J, Yan R, Zhai Y, Qi X, Lei J. Chest CT findings in patients with coronavirus disease 2019 (COVID-19): a comprehensive review. Diagn Interv Radiol 2021; 27: 621-32.
25. Long C, Xu H, Shen Q, Zhang X, Fan B et al. Diagnosis of the Coronavirus disease (COVID-19): rRT-PCR or CT? Eur J Radiol 2020; 126: 108961.
26. Falaschi Z, Danna PSC, Arioli R, Pasché A at al. Chest CT accuracy in diagnosing COVID-19 during the peak of the Italian epidemic: A retrospective correlation with RT-PCR testing and analysis of discordant cases. Eur J Radiol 2020; 130: 109192.
27. Liu H, Luo S, Li H, Zhang Y, Huang C et al. Clinical characteristics and longitudinal chest CT features of healthcare workers hospitalized with coronavirus disease 2019 (COVID-19). Int J Med Sci 2020; 17: 2644-52.