CMJ Original Research December 2021, Volume: 43, Number: 4
Cumhuriyet Tıp Dergisi (Cumhuriyet Medical Journal) 384-395
http://dx.doi.org/10.7197/cmj.1017675

Clinical characteristics and outcomes of hospitalized COVID-19 patients with diabetes: A multi-center, retrospective study in Turkey

Hastanede yatan diyabetik COVID-19 hastalarının klinik özellikleri ve sonuçları: Türkiye'de çok merkezli, retrospektif bir çalışma

Fatih Türker [1], Süleyman Ahbab [1], Betül Çavuşoğlu Türker [2], Hayriye Esra Ataoglu [1],Savaş Öztürk [3]

[1] University of Health Sciences, Haseki Training and Research Hospital, Internal Medicine Clinic, İstanbul, Turkey
[2] Taksim Training and Research Hospital, Internal Medicine Clinic, İstanbul, Turkey
[3] Istanbul University, Istanbul Faculty of Medicine, Department of Internal Medicine, Division of Nephrology, Istanbul, Turkey
Corresponding author: Fatih Türker, MD, University of Health Sciences, Haseki Training and Research Hospital, Internal Medicine Clinic, İstanbul, Turkey
E-mail: fatihturker1985@hotmail.com
Received/Accepted: November 02, 2021 / December 25, 2021
Conflict of interest: There is not a conflict of interest.

SUMMARY

Objective: Diabetes mellitus is known as one of the potential risk factors for severe COVID-19.This study it was aimed to evaluate and compared demographic, clinical and laboratory findings,mortality and outcomes of hospitalized diabetic and non-diabetic COVID-19 patients.
Method: The data of all consecutive adult patients admitted to the pandemic units of the participating hospitals' internal medicine clinics with the diagnosis of Covid-19 disease were gathered between April 20th 2020 and July 23th 2020.Only swab or serological tests positive patients were included in the study.Patients with clinical and/or radiological findings were considered to have Covid-19 disease and those having negative swab tests were excluded.The clinical characteristics, treatment and discharge outcomes and laboratuary tests of the patients at presentation were divided into two groups and compared as diabetic and non-diabetic COVID-19 patients.
Results: The median age was 52 years.There were 226 diabetic (21.2 %) and 839 (78.8%) non-diabetic patients.Diabetic patients were older than nondiabetics . Chronic diseases in the group of diabetic patients were found to be significantly higher than non-diabetic patient group (p<0,001).There was no significant difference in major symptoms such as dry cough,fatigue fever between two groups.Percentage of anorexia was significantly elevated in the diabetic group (p<0,001).In diabetic group,baseline (at the time of diagnoses) serum eGFR,hemoglobin levels were decreased and sedimentation,CRP,procalcitonin,D-dimer were elevated than nondiabetic group (p<0,001,p=0,009,p:<0.001,p<0.001,p<0.001,p=0.029 respectively). Admission to the intensive care unit and mortality were increased in diabetic patients group.(p<0.001)
Conclusions: Diabetes are associated with increased complications, prolonged hospital stay, and mortality in COVID-19 patients.
Keywords: COVİD 19, Diabetes Mellitus, clinical characteristics and outcomes.

Fatih Türker
Süleyman Ahbab
Betül Çavuşoğlu Türker
Hayriye Esra Ataoglu
Savaş Öztürk

ORCID IDs of the authors:
F.T. 0000-0002-8281-0319
S.A. 0000-0001-9239-9132
B.Ç.T. 0000-0002-8041-1904
H.E.A. 0000-0002-6559-2575
S.Ö. 0000-0002-6259-6132

ÖZET

Amaç: Diyabet, şiddetli COVID-19 için potansiyel risk faktörlerinden biri olarak bilinmektedir. Bu çalışmada, hastaneye yatırılan diyabetik ve diyabetik olmayan COVID-19 hastalarının demografik, klinik ve laboratuvar bulguları, mortalite ve sonuçlarının değerlendirilmesi ve karşılaştırılması amaçlandı.

Yöntem: Hastanelerin dahiliye kliniklerinin pandemi servislerine Covid-19 hastalığı tanısı ile 20 Nisan 2020 ile 23 Temmuz 2020 tarihleri arasında yatırılan tüm yetişkin hastaların verileri incelendi. Sadece sürüntü veya serolojik testleri pozitif olan hastalar çalışmaya dahil edildi. Klinik ve/veya radyolojik bulguları olan hastalar Covid-19 hastalığı olarak kabul edildi ve sürüntü testi negatif olanlar çalışma dışı bırakıldı. Hastaların başvuru anında klinik özellikleri, tedavi ve taburculuk sonuçları ile laboratuvar testleri diyabetik ve diyabetik olmayan COVID-19 hastaları olarak iki gruba ayrılarak karşılaştırıldı.

Bulgular: Ortanca yaş 52 saptandı. Çalışmada 226 diyabetik (%21.2) ve 839 (%78.8) diyabetik olmayan hasta vardı. Diyabetik hastalar diyabetik olmayanlardan daha yaşlıydı. Diyabetik hasta grubunda kronik hastalıklar diyabetik olmayan hasta grubuna göre anlamlı derecede yüksek bulundu (p<0,001). İki grup arasında kuru öksürük, halsizlik, ateş gibi majör semptomlar açısından anlamlı fark yoktu. Anoreksi yüzdesi diyabetik grupta anlamlı olarak yüksekti (p<0,001). Diyabetik grupta başlangıç (tanı anında) serum eGFR, hemoglobin seviyeleri diyabetik olmayan gruba göre azalmış ve sedimantasyon, CRP, prokalsitonin, D-dimer yükselmiştir (p<0,001,p=0,009,p:<0,001,p< 0,001,p<0,001,p=0,029 sırasıyla). Diyabetik hasta grubunda yoğun bakıma yatış ve mortalite daha fazla saptandı.(p<0,001)

Sonuç: Diyabet, COVID-19 hastalarında artmış komplikasyonlar, uzamış hastanede kalış süresi ve mortalite ile ilişkilidir.

Anahtar sözcükler: COVİD 19, Diabetes Mellitus, klinik özellikler ve sonuçlar.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a disease caused by a novel coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease has spread all over the world and become pandemic [1,2]. The COVID-19 infection creates a complex situation for people with underlying comorbid diseases which are associated with increased morbidity and mortality [3,4]. Since diabetic patients are known to be more susceptible to infections, diabetes mellitus will increase the incidence of contagious diseases and related comorbidities. Diabetes mellitus is now known to be one of the most frequent comorbid disease (33.8%) in hospitalized patients with COVID-19 infection [5]. Besides diabetes, hypertension (17%), cardiovascular (5%) and respiratory diseases (2%) are important health problems for these patients [6,8]. There is limited data on the characteristics and outcomes of COVID-19 patients with diabetes hospitalized in Turkey. It was aimed to evaluate and compare the demographic, clinical and laboratory findings, mortality, and outcomes of hospitalized diabetic and non-diabetic COVID-19 patients in this study.

MATERIAL AND METHODS

Data source

This multicenter cohort study was performed using the data collected from pandemic units of internal medicine clinics of 5 training and research hospitals in Istanbul. COVID-19 patients were hospitalized in pandemic units these internal medicine clinics. Ethics committee approval was received from the Health Sciences University Istanbul Haseki Training and Research Hospital Ethics Committee (Reference No: 44-2020). Informed consent was waived due to the global urgent data requirement. All the data were collected anonymously without including patient identification information.

Study population, data collection

The data of all consecutive adult patients admitted to the pandemic units of the participating hospitals' internal medicine clinics with the diagnosis of COVID-19 were gathered between April 20th 2020 and July 23th 2020. Only swab or serological tests positive (confirmed case) patients were included in the study. Patients with clinical and/or radiological findings were considered to have COVID-19 (possible case) and those having negative swab tests and/or serological tests were excluded. We included patients who fully recovered and were discharged, patients in the ICU, and deceased patients. Patients still in hospital pandemic clinics or hospitalized for other reasons were not included. Re-admissions were also not included. The patients data were recorded such as demographic information, history of chronic diseases, drugs used in the history, laboratory analyzes, complete blood count, erythrocyte sedimentation rate (ESR), serum creatinine, estimated glomerular filtration rate (eGFR) ,albumin, alanine aminotransferase (ALT),

aspartate aminotransferase (AST), lactate dehydrogenase (LDH), creatinine kinase, amylase, lipase, C-reactive protein (CRP), d-dimer, ferritin, hemoglobin, lymphocyte, platelet count, chest computed tomography (CT) findings, drugs used in the treatment of COVID-19, length of hospital stay, intensive care unit (ICU) admission, the common complications of COVID-19 and patients outcomes. All swab positive COVID-19 patients were screened by a chest computed tomography (CT) The clinical characteristics of the patients at presentation were divided into two groups and compared as diabetic and non-diabetic COVID-19 patients. Patients age, gender, chronic diseases, drugs used in the history, drugs used in the treatment of COVID-19, presentation symptoms and duration between first symptom and diagnosis were recorded. Hemoglobin, platelet, sedimentation, creatinine, eGFR , AST, ALT, LDH, CK, ferritin, lymphopenia percentages at diagnosis were compared between the two groups. CRP, procalcitonin, d dimer values at the time of diagnosis and chest CT (computed tomography) findings were categorized and compared between the two groups. Development of leukopenia (white blood cell count less than 4000/mm3), lymphopenia (lymphocyte count less than 1200/mm3), anemia (hemoglobin less than 10 g/dL), thrombocytopenia (platelet count less than 150.000/mm3), an increase in serum creatinine, AST, ALT, LDH, CK, ferritin (more than twice the upper limit of normal, compared to baseline values) and decrease in serum albumin (less than 3.0g/dl) were recorded.

Statistical Method:

IBM SPSS Statistics for Windows (Version 25.0, IBM Corp., Armonk, NY, USA) was used for statistical analysis. Categorical variables were given as number and percentage, and numerical variables were given as median and interquartile range (25th-75th percentile). The recorded parameters were compared between survivors vs. non-survivors, and between non-survivors/or patients still in the ICU vs. those discharged. The chi-square test was used for the comparisons of categorical variables. The student's t-test was used to compare two independent groups in the analyses of normally distributed numerical data. In the case of abnormal distribution of numerical data, the Mann-Witney-U test was used to compare the two groups. Cox regression analysis (with Backward LR selection) was used in survival analyzes. Parameter found to be different between outcomes (non-survivor vs. survivor patients, and non-survivors/or those still in the ICU vs. discharged) were included in the regression models to find out parameters showing independent relationship with these outcomes. A p-value of less than 0.05 was considered significant.

RESULTS

This study was consisted of 1917 patients from 5 centers who were treated by hospitalization between 20th April 2020 and 23rd July 2020. COVID-19 PCR swab tests were positive in 1065 (55.5%) of 1899 patients. Patients with a positive PCR were included in the study. The median age was 52 (IQR: 38-63) years. There were 226 diabetic (21.2 %) and 839 (78.8%) non-diabetic patients. 109 (48.2 %) of these cases were male and 117 (51.8 %) were female. ($p<0,001$) Diabetic patients (median: 59) were older than nondiabetics (median: 49). Chronic diseases in the group of diabetic patients (Hypertension, Ischemic Heart Disease, Heart Failure, Chronic Kidney Disease, Chronic obstructive pulmonary disease, Cardiovascular Disease) were found to be significantly higher than non-diabetic patient group ($p<0,001$). Insulin, Oral Antidiabetics, Statin use was found to be significantly higher in the diabetic group in the medical history. ($p<0,001$) (Table 1). There was no significant difference in major symptoms such as dry cough, fatigue fever between two groups. Percentage of anorexia was significantly elevated in the diabetic group ($p<0,001$). Percentage of symptomatic patients at the time of diagnosis was found significantly elevated in the diabetic group, ($p<0,001$). Asymptomatic disease at diagnosis COVID-19 was significantly higher in the non-diabetic group. ($p<0,001$). Moderate-to-severe disease was significantly higher in diabetic COVID-19 patients. In chest CT, single lesion was more common assigned in the non-diabetic group. ($p<0,001$). Ground glass opacity and bilateral multiple lesion was significantly elevated in the diabetic group according to chest CT results, ($p:0.008$), ($p<0,001$). Normal findings on chest computed tomography are higher than non diabetic COVID-19 patients. ($p<0,001$) (Table 2). In diabetic group, baseline (at the time of diagnoses) serum eGFR, hemoglobin levels were decreased and sedimentation, CRP, procalcitonin, D-dimer were elevated than

nondiabetic group (p<0,001, p=0,009, p:<0.001, p<0.001, p<0.001, p=0.029 respectively) (Table3). Anticoagulant, vitamin supplementation, antibiotics, favipiravir/lopinavir and ritonavir treatments were found more frequently in the diabetic hospitalized group. (p<0.002, p<0.001, p<0.001, p<0.001). 11 (4.9%) patients in the diabetic group and 13 (1.5%) patients in the non-diabetic group were non-survived. Admission to the intensive care unit were 11 (4.9%) patients in diabetic and 15 (1.8 %) were in the non-diabetic group. Admission to the intensive care unit and mortality were increased in diabetic patients group, p<0.001 .It was observed anemia (hemoglobin less than 10 g/dL), an increase in serum creatinine, sedimentation, LDH, CK, arrhythmia and decrease in serum albumin (less than 3.0g/dl) in during hospitalization in diabetic group (Table 5) .Cox Regression Analysis of Factors determining exitus and/or ICU in diabetic patients were evaluated. Gender (male), heart failure, moderate-to-severe disease at the time of diagnosis, low albumin and secondary bacterial infection during hospitalization were found to increase mortality in diabetics (Table 6).

DISCUSSION

Co-morbid diseases such as diabetes are associated with increased complications, prolonged hospital stay, and mortality in COVID-19 patients [8,10] . In this study, we found the mortality and ICU rate of diabetic COVID-19 cases was approximately 9.8%. These rates are higher than those observed in the general population with COVID-19 [11] . Several theories exist for the role of hyperglycemia in the viral respiratory infections. Elevated glucose levels may negatively affect pulmonary function, suppress the immune system and increasing the production of inflammatory cytokines [12,15] . Considering all this ;in this study ; diabetic patients (median: 59) were older than nondiabetics (median: 49) . Chronic diseases in the group of diabetic patients (Hypertension, Ischemic Heart Disease, Heart Failure, Chronic Kidney Disease, Chronic obstructive pulmonary disease, Cardiovascular Disease) were found to be significantly higher than non-diabetic patient group. In diabetic group, baseline (at the time of diagnoses) serum eGFR, hemoglobin levels were decreased and sedimentation, CRP, procalcitonin, D-dimer were elevated than nondiabetic group. As a result, moderate -to -severe disease were seen significantly higher in diabetic COVID-19 patients. For all that there was no significant difference in major symptoms such as dry cough, fatigue fever between two group. This may indicate that diabetes mellitus increases risk of bad prognosis in COVID-19 patients [14] . As a sign that; in this study development of anemia, doubling of creatinine, LDH and lowering of albumin below 3.0 g/dl and development of arrhythmia and muscle injury during hospitalization were statistically significantly more common in diabetic group than non-diabetic group patients. Likewise, chest computed tomography ground glass consolidations were significantly higher in the diabetic group. Anticoagulant use, vitamin supplementation ,macrolide and favipiravir/lopinavir-ritonavir use were found more frequently in the diabetic hospitalized group. All these findings support the relationship between diabetes and poor prognosis in COVID-19 patients [17] . In accordance, admission to the intensive care unit and exitus was seen higher in diabetics in this study . According to Cox regression analysis, when the factors determining the admission and/or hospitalization of diabetic patients to the intensive care unit are evaluated, the results obtained give us data about the parameters that affect the severity of COVID-19 in diabetic patients. Male gender, heart failure, moderate to severe disease, hypoalbuminemia, and presence of secondary bacterial infection were associated with poor prognosis in diabetics. This findings are consistent with the results of the study by Sridharan Raghavan et al. [18] . Considering the mortality of diabetic COVID-19 patients; clinical presentation and laboratory findings should be closely monitored and followed. Considering all these results; diabetes mellitus will increase the COVID-19 mortality and related comorbidities [19] .

CONCLUSION

This retrospective study showed that patients had diabetes will increase severity of COVID-19. Although these finding are interesting, caution should be used in the interpretation of these results and more comprehensive studies on large populations are needed.

Tablo 1: Baseline Characteristics of Diabetic and Nondiabetic COVID-19 Patients

		Total (n=1065)	**Nondiabetic patients n=839 (%78,8)**	**Diabetic patients n= 226 (%21,2)**	p
Gender n (%)	Male	626 (58,8%)	517 (61,6%)	109 (48,2%)	**<0,001**
	Female	439 (41,2%)	322 (38,4%)	117 (51,8%)	
Age (years), median		52 (39-63)	49 (34-60)	59 (51-70)	**<0,001**
Coexisting disorder n (%)	Hypertension	356 (33,5%)	200 (23,8%)	156 (69,6%)	**<0,001**
	Ischaemic heart disease	102 (9,7%)	49 (5,9%)	53 (24,1%)	**<0,001**
	Heart failure	34 (3,2%)	20 (2,4%)	14 (6,4%)	**0,003**
	Chronıc renal failure	39 (3,7%)	23 (2,7%)	16 (7,3%)	**0,002**
	COPD	64 (6,1%)	38 (4,5%)	26 (11,8%)	**<0,001**
	Cancer	22 (2,1%)	14 (1,7%)	8 (3,6%)	0,106
	Chronic liver disease	3 (0,3%)	1 (0,1%)	2 (0,9%)	0,112
	Autoimmune Disease	35 (3,3%)	27 (3,2%)	8 (3,6%)	0,771
	Cerebrovascular Disease	33 (3,1%)	22 (2,6%)	11 (5,0%)	0,076
	Cardiovascular disease	129 (12,1%)	68 (8,1%)	61 (27,4%)	**<0,001**
Medications n (%)		445 (41,8%)	242 (28,8%)	203 (89,8%)	**<0,001**
	ACE inhibitors	141 (33,3%)	82 (35,5%)	59 (30,7%)	0,300
	ARBs	70 (16,6%)	33 (14,3%)	37 (19,5%)	0,155
	Calcium channel blockers	133 (31,2%)	75 (32,2%)	58 (30,1%)	0,636
	Beta-Blockers	119 (28,1%)	59 (25,3%)	60 (31,4%)	0,165
	NSAIDs	42 (10,0%)	28 (12,1%)	14 (7,5%)	0,117
	Other antihypertensives	72 (17,1%)	39 (17,0%)	33 (17,4%)	0,911
	Insülin	49 (11,6%)	0 (0,0%)	49 (25,8%)	**<0,001**
	Oral antidiabetics	156 ()36,5%	0 (0,0%)	156 (80,0%)	**<0,001**
	Statins	65 (15,3%)	22 (9,5%)	43 (22,3%)	**<0,001**
	Antiaggregant or anticoagulants	132 (31,1%)	66 (28,4%)	66 (34,4%)	0,190

Abbreviations : COPD, *Chronic obstructive pulmonary disease* ;ACE, Angiotensin-converting enzyme; ARBs, Angiotensin II receptor blockers; NSAIDs, Non-steroidal anti-inflammatory drugs ; Note: *Statistically significant variables (p< 0.05).

Table 2: Symptoms And Clinic Signs of Diabetic and Nondiabetic COVID-19 Patients

Time between first symptom and diagnosis (days), median		4 (3-7)	4 (3-7)	4 (3-7)	0,256
Symptoms at Admission n (%)	Fever	464 (43,7%)	363 (43,3%)	101 (44,9%)	0,673
	Fatigue	467 (44,0%)	357 (42,8%)	110 (48,7%)	0,112
	Dispnea	311 (29,2%)	236 (28,1%)	75 (33,2%)	0,138
	Dry cough	568 (53,3%)	451 (53,8%)	117 (51,8%)	0,596
	Phlegm cough	84 (7,9%)	61 (7,3%)	23 (10,2%)	0,152
	Anorexia	54 (5,1%)	29 (3,5%)	25 (11,1%)	**<0,001**
	Myalgia	217 (20,4%)	168 (20,0%)	49 (21,7%)	0,583
	Sore throat	136 (12,8%)	117 (13,9%)	19 (8,4%)	**0,027**
	Headache	138 (13,0%)	110 (13,1%)	28 (12,4%)	0,774
	Diarrhea	68 (6,4%)	51 (6,1%)	17 (7,5%)	0,431
	Anosmia	46 (4,3%)	38 (4,5%)	8 (3,5%)	0,516
	No complaints	95 (8,9%)	84 (10,0%)	11 (4,9%)	**0,016**
Clinical Presentation	Asymptomatic	103 (9,7%)	95 (11,3%)	8 (3,5%)	**<0,001**
	Mild–moderate disease	788 (74,0%)	618 (73,7%)	170 (75,2%)	
	Severe–critical disease	174 (16,3%)	126 (15,0%)	48 (21,2%)	
Chest CT findings n (%)	Single lesion	47 (4,5%)	38 (4,7%)	9 (4,1%)	**<0,001**
	Unilateral multipl lesion	77 (7,5%)	69 (8,5%)	8 (3,6%)	
	Bilateral multiple lesion	772 (74,7%)	577 (71,0%)	195 (88,6%)	
	Normal	137 (13,3%)	129 (15,9%)	8 (3,6%)	
	Ground Glass Consolidation	871 (95,2%)	661 (94,2%)	210 (98,6%)	**0,008**

Note: *Statistically significant variables (p< 0.05).

Tablo 3: Laboratory Results At the Time Of The Diagnose Diabetic and Nondiabetic COVID-19 Patients

Laboratory findings, median	Hemoglobin (G/Dl)	13,3 (12-14,6)	13,6 (12,3-14,7)	12,5 (11,4-13,6)	**<0,001**
	Neutrophil (/Mm3)	3760 (2680-5225)	3730 (2660-5070)	3915 (2708-5623)	0,210
	Platelet (X1000/Mm3)	205 (160-258)	204 (160-251)	208,5 (163-283,25)	0,206
	Erythrocyte Sedimentation Rate (Mm/Hour)	27 (10-49)	22 (10-44)	43 (29,5-66)	**<0,001**
	Creatinine (Mg/Dl)	0,86 (0,70-1,04)	0,86 (0,71-1,02)	0,85 (0,70-1,12)	0,568
	eGFR Median (IQR)	107,4 (78,2-149,7)	108,1 (80,6-150,8)	104,2 (61,8-149,1)	**0,009**
	Ast (Iu/L)	27 (20-37)	27 (20-36)	28 (21-41)	0,058
	Alt (Iu/L)	25 (17-39)	25 (17-39)	25 (16,5-39)	0,836
	Ldh (Iu/L)	315 (238-421)	318 (238,5-422)	305 (238-418,5)	0,366
	Ck (Iu/L)	84 (56-164)	84 (57-160)	81 (52,5-179)	0,691
	Amylase (Iu/L))	58 (46-78,3)	58 (47-79)	60 (44,3-77)	0,933
	Ferritin (ng/ml)	172 (85,5-353,25)	169 (82,1-353,5)	183 (99,2-360,2)	0,230
Lymphopenia n (%)		402 (37,7%)	317 (37,8%)	85 (37,6%)	0,962
CRP, *n*/*N* (%) (> × upper limit)	Normal	250 (23,5%)	222 (26,5%)	28 (12,4%)	**<0,001**
	1-10	517 (48,5%)	413 (49,2%)	104 (46,0%)	
	10-20	162 (15,2%)	110 (13,1%)	52 (23,0%)	
	>20	136 (12,8%)	94 (11,2%)	42 (18,6%)	
Procalsitonin n (%)	Normal	789 (85,2%)	646 (88,1%)	143 (74,1%)	**<0,001**
	High	137 (14,8%)	87 (11,9%)	50 (25,9%)	
D dımer *n*/*N* (%) (> × upper limit)	Normal	580 (57,0%)	477 (59,3%)	103 (48,4%)	**0,011**
	1-<3	272 (26,7%)	200 (24,9%)	72 (33,8%)	

	>3	165 (16,2%)	127 (15,8%)	38 (17,8%)	

Abbreviations : eGFR, estimates glomerular filtration rate ; AST, aspartate aminotransferase; ALT, alanine aminotransferase ; LDH, Lactate dehydrogenase;CK, Creatinine Kinase .Note: *Statistically significant variables (p< 0.05).

Table 4: Treatment And Discharge Outcomes Of Diabetic and Nondiabetic COVID-19 Patients

Drug treatments, *n*/*N* (%)	Oseltamivir]	537 (50,4%)	412 (49,1%)	125 (55,3%)	0,098
	Macrolides	734 (69,0%)	555 (66,2%)	179 (79,6%)	**<0,001**
	Hydroxychloroquine	1041 (97,8%)	824 (98,3%)	217 (96,0%)	0,066
	Favipiravir	275 (25,8%)	194 (23,1%)	81 (36,0%)	**<0,001**
	Lopinavir-Ritonavir	33 (3,1%)	19 (2,3%)	14 (6,2%)	**0,001**
	Glucocorticoids	44 (4,1%)	30 (3,6%)	14 (6,2%)	0,079
	Tocilizumab	17 (1,6%)	13 (1,5%)	4 (1,8%)	0,768
	NSAID's	10 (0,9%)	7 (0,8%)	3 (1,3%)	0,448
	Anticoagulans	744 (70,0%)	567 (67,7%)	177 (78,3%)	**0,002**
	Vitamin Supplement	308 (28,9%)	220 (26,2%)	88 (38,9%)	**<0,001**
Any side effects related to these drugs, *n*/*N* (%)		30 (3,1%)	27 (3,5%)	3 (1,6%)	0,174
ICU admission, *n*/*N* (%)		67 (6,3%)	38 (4,5%)	29 (12,8%)	**<0,001**
Length of stay at hospital, day, median		9 (6-14)	9 (6-14)	9 (6-12,25)	0,529
Outcome n (%)	discharged	1015 (95,3%)	811 (96,7%)	204 (90,3%)	**<0,001**
	Exitus and ICU admission	78 (7,3%)	46 (5,5%)	32 (14,2%)	**<0,001**
	healed	987 (92,7%)	793 (94,5%)	194 (85,8%)	
Exitus n (%)		24 (2,3%)	13 (1,5%)	11 (4,9%)	**0,003**

Abbreviations : NSAIDs, Non-steroidal anti-inflammatory drugs ;ICU, intensive care unit Note: *Statistically significant variables (p< 0.05).

Table 5: Laboratory Tests During Hospitalization

n (%)	Leukopaenia	157 (14,8%)	124 (14,8%)	33 (14,7%)	0,981
	Lymphopaenia	491 (46,2%)	380 (45,3%)	111 (49,6%)	0,262
	Anaemia (<10g/Dl)	181 (17,1%)	127 (15,2%)	54 (24,1%)	**0,002**
	Thrombocytopaenia	157 (14,8%)	127 (15,2%)	30 (13,4%)	0,509
	Creatinine (>2× upper limit of normal)	46 (4,3%)	29 (3,5%)	17 (7,6%)	**0,007**
	Ast (>2× upper limit of normal)	218 (20,5%)	174 (20,8%)	44 (19,7%)	0,734
	Ldh (>2× upper limit of normal)	205 (19,7%)	146 (17,8%)	59 (26,9%)	**0,003**
	Alt (>2× upper limit of normal)	247 (23,3%)	199 (23,7%)	48 (21,4%)	0,466
	Albümin <3.0g/Dl	135 (12,8%)	90 (10,8%)	45 (20,3%)	**<0,001**
	ARDS/Cytokine Storm/Macrophage Activation Syndrome	46 (4,4%)	32 (3,8%)	14 (6,4%)	0,104
	Thrombosis/Thromboembolic Event	9 (0,8%)	5 (0,6%)	4 (1,8%)	0,098
	Secondary Bacterial Infection	94 (8,9%)	74 (8,8%)	20 (9,0%)	0,938
	Sepsis/DIC	14 (1,3%)	10 (1,2%)	4 (1,8%)	0,507
	Arrhythmia	7 (0,7%)	2 (0,2%)	5 (2,3%)	**0,006**
	Rhabdomyolysis	34 (3,2%)	22 (2,6%)	12 (5,4%)	**0,039**
	Acute Pancreatitis	7 (0,7%)	5 (0,6%)	2 (0,9%)	0,642
	Ferritin (>2× upper limit of normal)	228 (22,8%)	174 (22,1%)	54 (25,5%)	0,292
	Highest Value in Sedimentation Rate	40 (12-70)	30,5 (10-66,75)	58 (35,5-85,5)	**<0,001**

Abbreviations : AST, aspartate aminotransferase; LDH, Lactate dehydrogenase ;ALT, alanine aminotransferase ; ARDS, Acute respiratory distress syndrome; DIC, *Disseminated intravascular coagulation* ; Note: *Statistically significant variables (p< 0.05).

Table 6: Cox Regression Analysis Of Factors determining exitus and/or ICU in diabetıc COVID-19 patients

	p	HR	%95 CI	
Gender (Male)	**0,003**	0,350	0,174	0,705
Heart failure	**0,001**	4,396	1,881	10,273
Moderate to Severe illness	**0,000**	3,870	1,834	8,167
Elevated Prokalsitonin	0,072	0,474	0,210	1,070
Hypoalbuminemia	**0,004**	2,951	1,406	6,192
Secondary bacterial infection	**0,001**	3,561	1,661	7,632

Note: *Statistically significant variables ($p < 0.05$).

REFERENCES

1. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet. 2020;395:470-473.

2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395:497-506.

3.Garg S, Kim L, Whitaker M, O'Halloran A, Cummings C, Holstein R, Prill M, Chai SJ, Kirley PD, Alden NB, Kawasaki B, Yousey-Hindes K, Niccolai L, Anderson EJ, Openo KP, Weigel A, Monroe ML, Ryan P, Henderson J, Kim S, Como-Sabetti K, Lynfield R, Sosin D, Torres S, Muse A, Bennett NM, Billing L, Sutton M, West N, Schaffner W, Talbot HK, Aquino C, George A, Budd A, Brammer L, Langley G, Hall AJ, Fry A. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 - COVID-NET, 14 States, March 1-30, 2020. MMWR Morb Mortal Wkly Rep. 2020;69:458-464.

4. Kobayashi T, Jung SM, Linton NM, Kinoshita R, Hayashi K, Miyama T, Anzai A, Yang Y, Yuan B, Akhmetzhanov AR, Suzuki A, Nishiura H. Communicating the Risk of Death from Novel Coronavirus Disease (COVID-19). J Clin Med 2020;9:580.

5. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW; the Northwell COVID-19 Research Consortium, Barnaby DP, Becker LB, Chelico JD, Cohen SL, Cookingham J, Coppa K, Diefenbach MA, Dominello AJ, Duer-Hefele J, Falzon L, Gitlin J, Hajizadeh N, Harvin TG, Hirschwerk DA, Kim EJ, Kozel ZM, Marrast LM, Mogavero JN, Osorio GA, Qiu M, Zanos TP. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA 2020;323:2052–9.

6. Yang J, Zheng Y, Gou X, Pu K, Chen Z, Guo Q, Ji R, Wang H, Wang Y, Zhou Y. Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. Int J Infect Dis. 2020;94:91-95.

7. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395:497-506

8. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DSC, Du B, Li LJ, Zeng G, Yuen KY, Chen RC, Tang CL, Wang T, Chen PY, Xiang J, Li SY, Wang JL, Liang ZJ, Peng YX, Wei L, Liu Y, Hu YH, Peng P, Wang JM, Liu JY, Chen Z, Li G, Zheng ZJ, Qiu SQ, Luo J, Ye CJ, Zhu SY, Zhong NS; China Medical Treatment Expert Group for Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in China. N Engl J Med. 2020;382:1708-1720.

9. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, Wu Y, Zhang L, Yu Z, Fang M, Yu T, Wang Y, Pan S, Zou X, Yuan S, Shang Y. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med.2020;8:475-81.

10 Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, Akdis CA, Gao YD. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. Allergy. 2020;75:1730-1741

11. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zhang L. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study.The Lancet. 2020;395:507-13.

12. Hsia CCW, Raskin P. The diabetic lung: Relevance of alveolar microangiopathy for the

use of inhaled insulin. The American Journal of Medicine. 2005;118:205-11.

13. Goldman MD. Lung Dysfunction in Diabetes. Diabetes Care. 2003;26:1915-8.

14. Kiselar JG, Wang X, Dubyak GR, El Sanadi C, Ghosh SK, Lundberg K, Williams WM. Modification of β-Defensin-2 by Dicarbonyls Methylglyoxal and Glyoxal Inhibits Antibacterial and Chemotactic Function In Vitro. PLoS One. 2015;10:e0130533.

15. Knapp S. Diabetes and infection: is there a link?--A mini-review. Gerontology.

2013;59:99-104.

16. Onat A, Şenocak M, Örnek E, Gozukara Y, Şurdumavcı G, Karaaslan Y, Özışık U, İşler M, Taşkın V, Tabak F, Öz Ö, Özcan R . Survey on Prevalence of Cardiac Disease and its Risk Factors in Adults in Turkey: 3. Prevalence of Heart Diseases. Turk Kardiyol Dern Ars.1991; 19: 26-33

17. Kumar A, Arora A, Sharma P, Anikhindi SA, Bansal N, Singla V, Khare S, Srivastava A. Is diabetes mellitus associated with mortality and severity of COVID-19? A meta-analysis. Diabetes Metab Syndr. 2020;14:535-545.

18. Raghavan S, Vassy JL, Ho YL, Song RJ, Gagnon DR, Cho K, Wilson PWF, Phillips LS. Diabetes Mellitus-Related All-Cause and Cardiovascular Mortality in a National Cohort of Adults. J Am Heart Assoc. 2019;8:e011295

19. Berbudi A, Rahmadika N, Tjahjadi AI, Ruslami R. Type 2 Diabetes and its Impact on the Immune System. Curr Diabetes Rev. 2020;16:442-449.