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The Effect of Polymerase Chain Reaction Test Positivity and Negativity on COVID-19-Related Symptoms

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ABSTRACT

Objective: It was aimed to evaluate the prevalence of symptoms, chronic diseases, lung CT findings and blood parameters by dividing the patients hospitalized with the diagnosis of COVID-19 in our hospital into two groups as PCR (polymerase chain reaction) (+) and PCR (-) and to compare the two groups.

Material and Methods: Between January 2021 and June 2021, 451 patients who were hospitalized in our hospital's COVID-19 service and met the study criteria were included in the study. The patients were divided into two groups as PCR (+) and PCR (-) according to PCR results. Demographic data, chronic diseases, symptom prevalence, blood parameter results and lung CT findings of the patients were analyzed and compared between the two groups.

Results: Contact history was significantly higher in the PCR (-) group than in the PCR (+) group (p= 0.021). The distribution of chronic diseases did not differ according to the groups (p> 0.05). Smell and taste disorders were significantly higher in the PCR (+) group than in the PCR (-) group (p= 0.019, p= 0.007). Fever and diarrhea were found to be significantly higher in patients younger than 65 years of age compared to those over 65 years of age (p< 0.001, p= 0.039).The most common lung CT finding was bilateral, peripheral, ground-glass appearance. Rates of lung findings did not differ according to the groups (p> 0.05).There was no statistically significant difference in blood parameters according to the groups (p> 0.05).

Conclusion: In COVID-19 patients, smell and taste disorders are observed significantly higher in the PCR (+) group than in the PCR (-) group.

Keywords: COVID-19, smell disorders, taste disorders

ÖZ

Polimeraz Zincir Reaksiyon Testi Pozitifliği ve Negatifliğinin COVID-19 ile İlişkili Semptomlara Etkisi

Giriş: Hastanemizde COVID-19 tanısıyla yatan hastaları PCR (Polimeraz zincir reaksiyon) (+) ve PCR (-) olarak iki gruba ayırarak semptom prevalanslarını, kronik hastalıklarını, akciğer BT bulgularını ve kan parametrelerini değerlendirerek iki grup arasında karşılaştırmayı amaçladık.

Gereç ve Yöntemler: Ocak 2021-Haziran 2021 tarihleri arasında hastanemiz COVID-19 servisinde yatan ve çalışma kriterlerini karşılayan 451 hasta çalışmaya dahil edildi. Hastalar PCR sonucuna göre PCR (+) ve PCR (-) olarak iki gruba ayrıldı. Hastaların demografik verileri, kronik hastalıkları, semptom prevalansları, kan parametresi sonuçları ve akciğer BT bulguları incelenerek iki grup arasında karşılaştırıldı.

Bulgular: Temas öyküsü PCR (-) grubunda PCR (+) grubuna göre anlamlı olarak yüksekti (p= 0.021). Kronik hastalıkların dağılımı gruplara göre farklılık göstermedi (p> 0.05). Koku ve tat alma bozuklukları PCR (+) grubunda PCR (-) grubuna göre anlamlı olarak yüksekti (p= 0.019, p= 0.007). Ateş ve ishal 65 yaş altı hastalarda 65 yaş üstü hastalara göre anlamlı olarak yüksek bulundu (p< 0.001, p= 0.039). En sık akciğer BT bulgusu bilateral, periferik, buzlu cam görüntüsüydü. Akciğer bulgu oranları gruplara göre farklılık göstermedi (p> 0.05). Gruplara göre kan parametrelerinde istatistiksel olarak anlamlı fark yoktu (p> 0.05).

Sonuç: COVID-19 hastalarında koku ve tat bozukluğu PCR (+) olan grupta PCR (-) olan gruba göre anlamlı olarak daha yüksek izlenmektedir.

Anahtar Kelimeler: COVID-19, koku bozuklukları, tat bozuklukları

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INTRODUCTION

A number of unexplained cases of pneumonia were reported in December 2019 in Wuhan, China. This virus was named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the World Health Organization (WHO) (1,2). These viruses are commonly found in animals, but they are known to affect humans due to mutations they have undergone in recent years (3). In the early days of the outbreak in Wuhan, most patients with COVID-19 had a history of contact with animal markets suggesting that the virus spread from animals to humans. Later, with the increase in the number of patients, the disease began to occur in people who were not exposed to animal markets, and the virus was shown to spread from person to person with an average incubation period of 5.2 days (4).

General symptoms of COVID-19 are fever, cough, and shortness of breath (5). In addition, patients present with symptoms such as sore throat, headache, myalgia, diarrhea, nausea, vomiting, nasal congestion, rhinorrhea, and smell and taste disturbance. COVID-19 symptoms can affect all systems, including the central nervous system, and findings vary according to the system involved (6). In severe cases, SARS-CoV-2 causes acute respiratory distress syndrome (ARDS), and death (7). SARS-CoV-2 spread to countries such as Germany, Italy, Spain and America in February 2020 and affected the whole world in time, and WHO announced SARS-CoV-2 as a pandemic (8,9). On March 11th, 2020, Türkiye announced its first official case of COVID-19.

The symptoms of COVID-19 are so wide that almost every clinic should be aware of these symptoms, patients should be diagnosed and treated early, and necessary isolation measures should be taken. The symptoms of COVID-19 may differ from country to country and the prevalence of symptoms may vary due to reasons such as interracial genetic factors, the mutation of the virus and the formation of different strains.

In this study, it was aimed to evaluate the prevalence of symptoms, chronic diseases, lung CT findings and blood parameters by dividing the patients hospitalized with the diagnosis of COVID-19 in our hospital into two groups as PCR (+) and PCR (-) and to compare the two groups.

MATERIALS and METHODS

According to the COVID-19 guide of the General Directorate of Public Health of the Ministry of Health, patients who met the definition of probable/definite case and who needed to be followed up in the hospital were included in the study. Between the dates of January 2021 and June 2021, 648 patients hospitalized in the COVID-19 service of our hospital were examined.

Patients with PCR results, blood parameters and lung tomography were included in the study, and these results were recorded from the hospital information system. The patients were asked to fill out a questionnaire in which we questioned their symptoms and chronic diseases. Patients who could not fill out the questionnaire in which we questioned their symptoms and chronic diseases and those who did not want to participate in the study were excluded from the study. Four hundred and fifty-one patients who met the study criteria were included in the study.

According to the COVID-19 guide of the Turkish Ministry of Health, General Directorate of Public Health, "possible cases" of COVID-19 are defined as:

1. At least one of the symptoms of fever and acute upper respiratory tract infection (such as cough, shortness of breath) that cannot be explained by any other reason and that the patient or a relative was abroad 14 days before the onset of symptoms,

2. At least one of the symptoms of fever and acute upper respiratory tract infection (such as cough, shortness of breath) that cannot be explained by any reason and the patient has been in close contact with a person positive for COVID-19 14 days before the onset of symptoms,

3. It is necessary to have at least one of the symptoms of fever and acute upper respiratory tract infection (such as cough, shortness of breath) that cannot be explained by any reason and to be hospitalized for treatment,

4. Or the sudden onset of fever without a runny nose and shortness of breath.

"Definitive cases" are defined as patients whose SARS-CoV-2 positivity meets the positive case definition made in molecular methods (PCR).

Oropharyngeal and nasopharyngeal swabs were obtained from patients with clinical symptoms of COVID-19. Samples were sent to the laboratory, and reverse transcription-polymerase chain reaction (RT-PCR) tests were performed. Later, lung computed tomographies of the patients were taken and blood was taken for hemogram, coagulation, and biochemistry analysis.

Demographic data of the patients (age, sex, history of contact, smoking and alcohol use), concomitant diseases hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), chronic kidney failure (CRF) was questioned. "Contact history" was considered to be close-range contact with a person diagnosed with COVID-19.

The results of blood parameters [procalcitonin, C-reactive protein (CRP), ferritin, D-dimer, lymphocyte %, fibrinogen] were analyzed from the hospital registry system. Fever, cough, dyspnea, sore throat, myalgia, rhinorrhea, taste perversion, olfactory disorder and diarrhea were questioned. Specific information about the sense of smell and taste was assessed on a 0 to 10 numerical rating scale (NRS) (0: no sense of smell/taste and 10: normal sense of smell/taste)(10).

Lung CT findings (retained lobe, involvement site, ground glass appearance, pleural effusion, mediastinal/hilar lymphadenopathy) were obtained from the radiology information system.

This study was approved by the ethics committee decision (Decision no: 1172, Date: 16.12.2020).

Statistical Analysis

Data analysis was performed using SPSS 22.0 package program. Demographic data of the groups were compared with Student's t-test and Chi-square test, and blood parameters were compared with Mann-Whitney U test. Comorbidities, symptoms, and lung CT findings were compared using the Chi-square test. P-values <0.05 were considered significant.

RESULTS

A total of 451 patients were included in the study, 147 were PCR (-) and 304 were PCR (+). Mean age was 61.88 ± 14.09 years. There was no difference between the groups in terms of mean age, age distribution, sex, smoking, and alcohol use. Contact history was higher in those who were PCR negative groups (p= 0.021) (Table 1).

The most common chronic disease in both groups was HT. The distribution of chronic diseases did not differ according to the groups (p> 0.05) (Table 2).

The most common symptoms were myalgia (84.3%), cough (72.9%), fever (64.5%), shortness of breath (63.6%), smell disorders (48.8%), taste disorders (48.6%), sore throat (34.1%), diarrhea (31.7%), and runny nose (15.7%). Patients who were PCR (+) had higher rates of smell and taste disoders (p= 0.019, p= 0.007). Runny nose was more common in those who were PCR (-), but no statistically significant difference was observed (p> 0.05). Although the presence of other symptoms did not differ according to the groups (p> 0.05), all symptoms except runny nose were found with a higher rate in the PCR (+) group (Table 3).

Fever and diarrhea rates were significantly higher in those aged under 65 years (p< 0.001, p= 0.039). Although there was no statistical difference according to the age groups, all symptoms except dyspnea were found with a higher rate in patients aged under 65 years (p> 0.05) (Table 4).

The most common lung CT finding was bilateral, peripheral, ground-glass appearance. Rates of lung findings did not differ according to the groups (p> 0.05) (Table 5).

Table 1. Average age, age distribution, sex, smoking, alcohol use, and contact history by groups

		PCR (-) (n= 147)		PCR (+) (n= 304)		Total (n= 451)		
		Mean ± SD	**min-max**	**Mean ± SD**	**min-max**	**Mean ± SD**	**min-max**	**p1**
Age		61.39 ± 14.42	28-91	62.12 ± 13.95	18-97	61.88 ± 14.09	18-97	0.605
		n	%	n	%	n	%	**p2**
Age (years)	<65	76	51.7	160	52.6	236	52.3	0.853
	>65	71	48.3	144	47.4	215	47.7	
Sex	Female	58	39.5	135	44.4	193	42.8	0.319
	Male	89	60.5	169	55.6	258	57.2	
Smoke	No	27	18.4	55	18.1	82	18.2	0.943
	Yes	120	81.6	249	81.9	369	81.8	
Alcohol	No	137	93.2	286	94.1	423	93.8	0.716
	Yes	10	6.8	18	5.9	28	6.2	
Contact History	No	89	60.5	149	49.0	238	52.8	**0.021**
	Yes	58	39.5	155	51.0	213	47.2	

p1: Student's t-test, p2: Chi-square test.

Table 2. Chronic diseases by groups

	PCR (-) (n= 147)		PCR (+) (n= 304)		Total (n= 451)		
	n	%	n	%	n	%	p
Hypertension	87	59.2	174	57.2	261	57.9	0.695
Diabetes mellitus	73	49.7	145	47.7	218	48.3	0.696
Coronary artery disease	37	25.2	104	34.2	141	31.3	0.052
Chronic obstructive pulmonary disease	45	30.6	94	30.9	139	30.8	0.947
Chronic renal failure	16	11.0	44	14.5	60	13.3	0.304

p: Chi-square test.

Table 3. Distribution of symptoms according to groups

	PCR (-) (n= 147)		PCR (+) (n= 304)		Total (n= 451)		
	n	%	n	%	n	%	p
Sense of smell disorder	60	40.8	160	52.6	220	48.8	0.019
Sense of taste disorder	58	39.5	161	53.0	219	48.6	0.007
Myalgia	120	81.6	260	85.5	380	84.3	0.287
Fever	92	62.6	199	65.5	291	64.5	0.550
Cough	102	69.4	227	74.7	329	72.9	0.236
Diarrhea	43	29.3	100	32.9	143	31.7	0.436
Runny nose	28	19.0	43	14.1	71	15.7	0.180
Sore throat	47	32.0	107	35.2	154	34.1	0.498
Dyspnea	85	57.8	202	66.4	287	63.6	0.074

p: Chi-square test.

Table 4. Symptoms in patients over 65 and under 65 years of age

	Age <65 years (n= 236)		Age >65 years (n= 215)		Total (n= 451)		
	n	%	n	%	n	%	p
Sense of smell disorder	123	52.1	97	45.1	220	48.8	0.137
Sense of taste disorder	121	51.3	98	45.6	219	48.6	0.227
Myalgia	199	84.3	181	84.2	380	84.3	0.968
Fever	170	72.0	121	56.3	291	64.5	**<0.001**
Cough	180	76.3	149	69.3	329	72.9	0.096
Diarrhea	85	36.0	58	27.0	143	31.7	**0.039**
Runny nose	41	17.4	30	14.0	71	15.7	0.319
Sore throat	90	38.1	64	29.8	154	34.1	0.061
Dyspnea	144	61.0	143	66.5	287	63.6	0.226

p: Chi-square test.

Table 5. Lung findings of the groups

	PCR (-) (n= 147)		PCR (+) (n= 304)		Total (n= 451)		
	n	%	n	%	n	%	p
Lung							
No involvement	18	12.2	54	17.8	72	16.0	0.354
Right lung involvement	6	4.1	8	2.6	14	3.1	
Left lung involvement	2	1.4	2	0.7	4	0.9	
Bilateral involvement	121	82.3	240	78.9	361	80.0	
Lung parenchyma							
No involvement	16	10.9	54	17.8	70	15.5	0.107
Peripheral involvement	112	76.2	222	73.0	334	74.1	
Central involvement	19	12.9	28	9.2	47	10.4	
Ground-glass appearance in the lung							
Yes	18	12.2	54	17.8	72	16.0	0.134
No	129	87.8	250	82.2	379	84.0	
Pleural effusion							
No	135	91.8	283	93.1	418	92.7	0.795
Yes	12	8.2	21	6.9	33	7.3	
Mediastinal/hilar lymphadenopathy							
uNo	141	95.9	289	95.4	430	95.6	0.631
Yes	6	4.1	14	4.6	20	4.4	

p: Chi-square test.

Lymphopenia and increased D-dimer, procalcitonin, CRP, ferritin, and fibrinogen were observed in all patients. D-dimer, procalcitonin, CRP, fibrinogen values were higher in the PCR (-) group, and ferritin was higher in the PCR (+) group. There was no statistically significant difference in blood parameters according to the groups (p> 0.05) (Table 6).

DISCUSSION

World Health Organization announced the COVID-19 pandemic on March 11th, 2020, and reported 118.000 infected cases and approximately 4.300 deaths from 115 countries (11). According to the Centers for Disease Control and Prevention (CDC), transmission of SARS-CoV-2 occurs mostly from person to person through respiratory droplets at a range of 180 cm (12). Symptoms begin to appear after an average incubation period of 4-5 days. In our study, we evaluated the prevalence of symptoms, comorbid diseases, laboratory tests, and lung CT findings in PCR (+) and PCR (-) patient groups.

Symptoms may differ between studies in PCR (+) and PCR (-) patients. In some studies, the most common symptom in PCR (+) patients is cough (4,9), and myalgia and fever are observed in some studies (6). In PCR (-) patients, fever or cough is the most common symptom in different studies. (6,9). In our study, myalgia was the most common symptom in both PCR (+) and PCR (-) patients.

Smell and taste disorders are among the most specific symptoms that cause patients with COVID-19 to present to ENT clinics. Çallıca Utku et al., have detected taste and smell disorders more in a PCR (+) group (p< 0.005), and Jerome et al., have found that smell and taste disorders are more frequent in young female patients in their study (9,13). In a study by Virtue et al., a PCR (+) COVID-19 group has been compared with a control group consisting of healthy volunteers, and 61.7% of patients had a smell disorder and 27.2% had taste disorders (p< 0.001) (14). Although histopathologic studies indicate that there is damage to the olfactory mucosa, the

Table 6. D-dimer, lymphocyte, procalcitonin, CRP, ferritin and fibrinogen values of the groups

	PCR (-) (n= 147)		PCR (+) (n= 304)		Total (n= 451)		
	Mean ± SD Median (Q1-Q3)	min-max	Mean ± SD Median (Q1-Q3)	min-max	Mean ± SD Median (Q1-Q3)	min-max	p
D-dimer (90-500)	1641.12 ± 2779.2 792 (504-1320)	100-22.700	1137.82 ± 1428.93 710 (404.75-1290)	0.5-11.000	1301.87 ± 1984.09 730 (456-1300)	0.5-22.700	0.057
Lymphocyte (15-43)	12.23 ± 9.01 10 (6-16)	1.2-51	15.59 ± 30.94 11.35 (7-19)	0.2-526	14.49 ± 25.95 11 (7-18)	0.2-526	0.076
Procalcitonin (0.05-2)	4.54 ± 49.66 0.09 (0.05-0.23)	0.01-600	0.79 ± 5.51 0.07 (0.04-0.19)	0.01-87	2.01 ± 28.64 0.08 (0.04-0.2)	0.01-600	0.176
CRP (0-8)	95.56 ± 87.08 77 [31-132]	0.7-487	88.41±85.46 74 [24.25-117]	1-600	90.74 ± 85.96 75 [25-124]	0.7-600	0.435
Ferritin (23-336)	457.96 ± 412.64 321 (149-638)	12-2710	738.23 ± 3009.57 290.5 (152.5-574.75)	7-48.000	646.88 ± 2484.2 300 (150-596)	7-48.000	0.314
Fibrinogen (180-350)	541.5 ± 191.31	16-988	513.1 ± 163.72	20-900	522.35 ± 173.49	16-988	0.103*

p: Mann-Whitney U test, *:Student's t-test.

exact location of the damage is not yet understood (15). Many patients who present to the otolaryngology clinic with colds and flu are diagnosed as having post-viral anosmia. Many studies have shown that the SARS-CoV-2 virus binds to the ACE2 receptor. The places where these receptors are most common, such as the lung, GIS mucosa, kidney, and heart, are the places where the virus is most effective (16). In addition, ACE2 receptors are found in the cheek, gingiva, and most frequently on the tongue (17), which may explain taste disorders. The cause of the olfactory disorder may be nasal obstruction due to mechanical inflammation, damage to the olfactory epithelium with neurotrauma, and involvement of olfactory neurons (18). The smell and taste disorders in SARS-CoV-2 may also be related to the neuroinvasive nature of the virus. smell disorders may be seen more in European patients because of the high ACE2 receptor expression in the nasal mucosa. Smell and taste disorders may be the only symptom in patients with COVID-19. In our study, smell and taste disorders were found to be significantly higher in the PCR (+) group (p= 0.019, p= 0.007).

This symptom should be paid attention to in the isolation of this disease. Many patients we consider as asymptomatic continue to spread the virus in the society because smell and taste disorders are not considered and questioned. In some patients, smell and taste disorders are permanent. It is still not clear in which patients it will be permanent, or after how many days it improves in patients whose sense of smell and taste returns.

The most common reasons for admission to ENT outpatient clinics are non-specific upper respiratory tract symptoms such as runny nose, nasal congestion, sore throat, headache, and smell-taste disorder. As in all viral diseases, these symptoms constitute the highest rate of admissions to ENT outpatient clinics in SARS-CoV-2. In our study, while runny nose was observed more frequently in the PCR (-) group, all other symptoms were observed more frequently in the PCR (+) group. However, although very rare, symptoms such as tinnitus, vertigo, cervical lymphadenopathy and parotitis have been reported in the literature.

In recent systematic reviews, total gastrointestinal symptoms have been found in 17.6%, including 26% anorexia, 12.5% diarrhea, 10.2% nausea-vomiting, and 9.2% abdominal pain, and viral RNA in stool has been demonstrated as 70.3% (19). Luis et al., have stated that the most common symptoms are myalgia (56%), cough (53%), fever (43%), diarrhea (7.3%), and abdominal pain (3.7%) (5). Diarrhea is the biggest risk factor for hospitalization. The virus may invade the gastrointestinal tract because ACE2 receptors are abundant in intestinal epithelial cells. Viral RNA has been detected in the stool of 50% of patients. This rate has been found to be higher in those with diarrhea. SARS-CoV-2 uses ACE2 receptors as it enters the cell. ACE2 receptors are responsible for intestinal inflammation, and recent studies have shown that the presence of SARS-CoV-2 replication in the intestinal epithelium indicates that the fecal-oral route may be a source of contamination (20). In summary, diarrhea is an important

symptom of hospitalization in patients with COVID-19 and fecal-oral transmission should be considered. In our study, diarrhea was seen in 31.7% of our patients, more than in the most recent systematic reviews. As in the study of Çallıca Utku et al., diarrhea symptom was more common in the PCR (+) group and became an important symptom on admission to the hospital (9). For this reason, fecal-oral transmission should be taken into consideration, and observation should be increased. In our study, diarrhea was observed in 31.7% of the total patients, but there was no significant difference between the PCR (+) and PCR (-) groups. However, the incidence of diarrhea in patients under 65 years of age is significantly higher than those over 65 years of age.

COVID-19 symptoms can also vary according to age, sex, and ethnicity. Çallıca Utku et al., have found a higher rate of fever, myalgia, and taste disturbance in patients aged under 65 years, and cough symptoms in those aged over 65 years (9). In our study, while dyspnea was more common in patients over 65 years of age, all other symptoms were more common in patients under 65 years of age. Among the reasons for the difference in symptoms among the studies, inter-racial genetic polymorphism in ACE2 receptors, mutation of the virus and different strains in different regions, and the effect of sex hormones can be counted (13).

In patients with SARS-CoV-2, ground glass appearance, especially bilateral lower regions placed circumferentially, was detected on lung CT (4,6). While the most common imaging was consolidation in the non-COVID group in lung tomography, in the COVID-19 group, ground glass involvement was seen most frequently, especially in the lower right zone, with peripheral consolidation (21). In our study, similar to this study, the most common lung finding was bilateral, peripheral ground-glass appearance. Only 16% of our patients had no lung findings, and pleural effusion and lymphadenopathy were seen in very few patients.

Coagulopathy is quite common in patients with COVID-19. Systemic microvascular thrombosis can occur in most deaths. Little is known about d-dimer in patients with COVID, which is thought to be important in the progression of COVID-19. Yong et al., in their studies, have found higher D-dimer levels on first admission in severe COVID-19 patients than mild COVID-19 patients ($p< 0.005$) (22). During follow-up, D-dimer levels decreased in the moderate group but remained high in the severe disease group. D-dimer elevation is blamed for pulmonary thrombosis in severe cases (23). D-dimer levels were found to be higher in the group with CVS disease in the severe disease group compared with those without CVS (cardiovascular system) disease ($p< 0.005$). The D-dimer levels of patients who died in the severe disease group without CVS disease were significantly higher than those who survived ($p> 0.05$). D-dimer levels, which is a marker of coagulation activity, were found to be significantly higher in patients with severe COVID-19. Even D-dimer values higher than 1 µg/L are a biomarker for mortality (24).

In a meta-analysis performed by Gita et al., a significant decrease has been observed in leukocyte, neutrophil, and platelet levels in seven studies, and a significant decrease in lymphocyte and platelet levels, and a significant increase in leukocyte, neutrophil, D-dimer, and CRP levels have been observed in 26 studies (25). Low platelet count, especially in severe COVID-19 infection, has made it an important laboratory parameter for use in both diagnosis and prognosis follow-up. Low leukocyte and neutrophil counts are markers of COVID-19 infection, but in contrast, higher numbers indicate that COVID-19 is progressive. Although lymphocyte, D-dimer, and CRP levels do not show diagnostic value, they all show the severity of COVID-19. In the early stages of COVID-19 disease, circulating leukocytes and neutrophils are reduced with suppression of the bone marrow by viral infection and peripheral destruction. This process increases secondary bacterial infections in severe cases of COVID-19 and leukocytosis occurs. Wang et al., have shown that leukocytosis and neutrophilia are observed in deceased patients and those with severe COVID-19 due to secondary infections or as a result of cytokine storm caused by the infection, and these two parameters are significantly increased compared with a non-severe COVID-19 group (26). The mechanism of thrombocytopenia seen in early and late COVID-19 cases is multifactorial. Suppression of the bone marrow by viral load triggers apoptosis by inhibiting the growth of megakaryocytes, a progenitor cell, and platelet production decreases (27). In addition, virus-triggered immune complexes increase platelet consumption due to lung damage and pulmonary thrombosis. Excessive thrombocytopenia can often occur due to the development of DIC in severe and critical illness conditions.

In our study, we evaluated the blood results of the patients during their first admission to the emergency department. While lymphocyte values were lower in the PCR (-) group, D-dimer, procalcitonin, fibrinogen and CRP values were higher. Ferritin values were higher in PCR (+) group.

These laboratory parameters may be useful in distinguishing PCR (-) patients in the emergency department.

CONCLUSION

As a result, taste and smell disorders were significantly higher in the PCR (+) group than in the PCR (-) group.

Ethics Committee Approval: Ethics committee approval was received for this study from the Adana City Training and Research Hospital Clinical Research Ethics Committee (Decision no: 1172, Date: 16.12.2020). Written informed consent was obtained from the patients.

Author Contributions: Concept/Design: AK, HES; Analysis/Interpretation: AK, BT, ZAE; Data Acquisition: AK, HES; Writting: AK, BT, ZAE; Critical Revision: AK, SE; Final Approval: HES, SE.

Conflict of Interest: The authors have no conflict of interest to declare.

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REFERENCES

1. *Chau CH, Strope JD, Figg WD. COVID-19 clinical diagnostics and testing technology, Pharmacotherapy 2020;40(8):857-68. https://doi.org/10.1002/phar.2439*
2. *Warkentin T, Kaatz S. COVID-19 versus HIT hypercoagulability. Thromb Res 2020;196:38-51. https://doi.org/10.1016/j.thromres.2020.08.017*
3. *Pourbagheri-Sigaroodi A, Bashash D, Fateh F, Abolghasemi H. Laboratory findings in COVID-19 diagnosis and prognosis. Clin Chim Acta 2020;510:475-82. https://doi.org/10.1016/j.cca.2020.08.019*
4. *Ramphul K, Mejias SG. Coronavirus disease: A review of a new threat to public health. Cureus 2020;12(3):e7276. https://doi.org/10.7759/cureus.7276*
5. *Díaz LA, García-Salum T, Fuentes-López E, Ferrés M, Medina RA, Riquelme A. Symptom profiles and risk factors for hospitalization in patients with SARS-CoV-2 and COVID-19: A large cohort from South America. Gastroenterology 2020;159(3):1148-50. https://doi.org/10.1053/j.gastro.2020.05.014*
6. *Cheng Z, Lu Y, Cao Q, Qin L, Pan Z, Yan F, et al. Clinical features and chest CT manifestations of coronavirus disease 2019 (COVID-19) in a single-center study in Shanghai, China. Am J Roentgenol 2020;215(1):121-6. https://doi.org/10.2214/AJR.20.22959*
7. *Liao D, Zhou F, Luo L, Xu M, Wang H, Xia J, et al. Haematological characteristics and risk factors in the classification and prognosis evaluation of COVID-19: A retrospective cohort study. Lancet Haematol 2020;7(9):e671-8. https://doi.org/10.1016/S2352-3026(20)30217-9*
8. *Wong DKC, Gendeh HS, Thong HK, Lum SG, Gendeh BS, Saim A, et al. A review of smell and taste dysfunction in COVID-19 patients. Med J Malaysia 2020;75(5):574-81.*
9. *Çalıca Utku A, Budak G, Karabay O, Güçlü E, Okan HD, Vatan A. Main symptoms in patients presenting in the COVID-19 period. Scott Med J 2020;65(4):127-32. https://doi.org/10.1177/0036933020949253*
10. *Dell'Era V, Farri F, Garzaro G, Gatto M, Aluffi Valletti P, Garzaro M. Smell and taste disorders during COVID-19 outbreak: Cross-sectional study on 355 patients. Head Neck 2020;42(7):1591-6. https://doi.org/10.1002/hed.26288*
11. *World Health Organization. Coronavirus disease 2019 (COVID-19) situation report-48. Available from: https://www.who.int/emergencies/ diseases/novel-coronavirus-2019/situation-reports/ (Accessed date: 09.03.2020).*
12. *Mardani R, Ahmadi Vasmehjani A, Zali F, Gholami A, Mousavi Nasab SD, Kaghazian H, et al. Laboratory parameters in detection of COVID-19 patients with positive RT-PCR; a diagnostic accuracy study. Arch Acad Emerg Med 2020;8(1):e43.*
13. *Lechien JR, Chiesa-Estomba CM, Place S, Van Laethem Y, Cabaraux P, Mat Q, et al; COVID-19 Task Force of YO-IFOS. Clinical and epidemiological characteristics of 1420 European patients with mild-to-moderate coronavirus disease 2019. J Intern Med 2020;288(3):335-44. https://doi.org/10.1111/joim.13089*
14. *Altin F, Cingi C, Uzun T, Bal C. Olfactory and gustatory abnormalities in COVID-19 cases. Eur Arch Otorhinolaryngol 2020;277(10):2775-81. https://doi.org/10.1007/s00405-020-06155-9*
15. *Van Riel D, Verdijk R, Kuiken T. The olfactory nerve: A shortcut for infuenza and other viral diseases into the central nervous system. J Pathol 2015;235:277-87. https://doi.org/10.1002/path.4461*
16. *Zou X, Chen K, Zou J, Han P, Hao J, Han Z. The single-cell RNA-seq data analysis on the receptor ACE2 expression reveals the potential risk of different human organs vulnerable to Wuhan 2019-nCoV infection. Front Med 2020;14(2):185-92. https://doi.org/10.1007/s11684-020-0754-0*
17. *Xu H, Zhong L, Deng J, Peng J, Dan H, Zeng X, et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. Int J Oral Sci 2020;12(1):8. https://doi.org/10.1038/s41368-020-0074-x*
18. *Klopfenstein T, Kadiane-Oussou NJ, Toko L, Royer PY, Lepiller Q, Gendrin V, et al. Features of anosmia in COVID-19. Med Mal Infect 2020;50(5):436-9. https://doi.org/10.1016/j.medmal.2020.04.006*
19. *Cheung KS, Hung IFN, Chan PPY, Lung KC, Tso E, Liu R, et al. Gastrointestinal manifestations of SARS-CoV-2 infection and virus load in fecal samples from a Hong Kong cohort: Systematic review and meta-analysis. Gastroenterology 2020;159(1):81-95. https://doi.org/10.1053/j.gastro.2020.03.065*
20. *Hashimoto T, Perlot T, Rehman A, Trichereau J, Ishiguro H, Paolino M, et al. ACE2 links amino acid malnutrition to microbial ecology and intestinal inflammation. Nature 2012;487(7408):477-81. https://doi.org/10.1038/nature11228*
21. *Younes N, Al-Sadeq DW, Al-Jighefee H, Younes S, Al-Jamal O, Daas HI, et al. Challenges in laboratory diagnosis of the novel coronavirus SARS-CoV-2. Viruses 2020;12(6):582. https://doi.org/10.3390/v12060582*
22. *Li Y, Zhao K, Wei H, Chen W, Wang W, Jia L, et al. Dynamic relationship between D-dimer and COVID-19 severity. Br J Haematol 2020;190(1):e24-7. https://doi.org/10.1111/bjh.16811*
23. *Wang ZF, Su F, Lin XJ, Dai B, Kong LF, Zhao HW, et al. Serum D-dimer changes and prognostic implication in 2009 novel influenza A(H1N1). Thromb Res 2011;127(3):198-201. https://doi.org/10.1016/j.thromres.2010.11.032*
24. *Weiss P, Murdoch DR. Clinical course and mortality risk of severe COVID-19. Lancet 2020;395:1014-5. https://doi.org/10.1016/S0140-6736(20)30633-4*
25. *Vita Soraya G, Syambani Ulhaq Z. Crucial laboratory parameters in COVID-19 diagnosis and prognosis: An updated meta-analysis Med Clin 2020;155(4):143-51. https://doi.org/10.1016/j.medcli.2020.05.017*
26. *Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA 2020;323(11):1061-9. https://doi.org/10.1001/jama.2020.1585*
27. *Yang M, Ng MH, Li CK. Thrombocytopenia in patients with severe acute respiratory syndrome. Hematology 2005;10:101-5. https://doi.org/10.1080/10245330400026170*