Acta Medica Ruha E-ISSN: 2980-1184

International Journal of Medicine and Health Sciences

Original Research Article Volume:1 Issue:2 Year:2023 DOI: 10.5281/zenodo.7884207

Factors Affecting The Diagnosis And Treatment Of Non-STEMI Patients Who Were Suspected To Have COVID-19

Non-STEMI Tanısı Konulan COVID-19 Şüpheli Hastaların Tanı Ve Tedavi Süreçlerine Etki Eden Faktörler

Şebnem Kılıç[1], Yusuf Yürümez[2], Hüseyin Gündüz[3], Sami Olkaç[4], Necip Gökhan Güner[5], Ensar Durmuş[6], Nuray Aslan[7]

1 Deparment of Emergency Medicine, Muğla Bodrum State Hospital, https://orcid.org/0000-0002-1569-7301
2 Deparment of Emergency Medicine, SakaryaUniversity School of Medicine Training and Research Hospital, https://orcid.org/0000-0003-3917-9434
3 Department of Cardiology, Sakarya University School of Medicine, https://orcid.org/0000-0003-2541-4675
4 Deparment of Emergency Medicine, Hakkari Yüksekova State Hospital, https://orcid.org/0000-0003-3928-6424
5 Deparment of Emergency Medicine, SakaryaUniversity Training and Research Hospital, https://orcid.org/0000-0001-5052-9242
6 Deparment of Emergency Medicine, SakaryaUniversity Training and Research Hospital, https://orcid.org/0000-0001-7722-6639
7 Deparment of Emergency Medicine, SakaryaUniversity Training and Research Hospital, https://orcid.org/0000-0001-8059-4862

Abstract

Introduction and Objective: In this study, it was aimed to analyze the factors affecting the management of patients with suspected COVID-19 who applied to the emergency department with chest pain and were diagnosed with non-STEMI.

Method: A total of 69 patients who applied to Sakarya Training and Research Hospital between 01/05/2020 – 30/04/2021 and were diagnosed with non-STEMI with a suspicion of COVID-19 have been analyzed retrospectively. The demographic characteristics (age, gender), comorbid diseases, laboratory parameters (hemogram, biochemistry and serological test results), thorax computerized tomography (CT) findings (consistent or incompatible with COVID-19), angiography results, intervention requirements and mortality status were recorded. The diagnosis of COVID-19 has been confirmed via positive RT-PCR test.

Results: When laboratory parameters were compared according to CT results, NLR, CRP and Ferritin values were statistically higher in patients with a CT image compatible with COVID-19 ($p=0.026$, $p=0.002$, $p<0.001$). The CRP result of the patients with a COVID-19 compatible CT imaging and positive RT-PCR result was statistically significantly higher than the control group ($p=0.040$). When the laboratory parameters of the patients were compared according to the RT-PCR results, the PLR and CRP values of the patients with positive RT- PCR were statistically significantly higher ($p=0.027$, $p=0.001$, respectively). It was determined that patients with statistically low NLR, PLR and CRP values ($p=0.046$, $p=0.023$, $p=0.005$) and patients with statistically significantly high lymphocyte and troponin values required Coronary Angiography intervention ($p=0.013$, $p=0.001$). In addition, it was determined that patients whose CT was not compatible with COVID-19 and whose RT-PCR test was negative required more Coronary Angiography intervention ($p=0.004$, $p=0.003$, respectively).

Conclusion: PLR and CRP values can be used in the differential diagnosis in the presence of suspected COVID-19 in patients who present to the emergency department with chest pain and are diagnosed with non-STEMI.

Keywords: COVID-19, Non-STEMI, Mortality.

Corresponding Author: Şebnem Kılıç, e-mail: drsebnemk@gmail.com
Received: 18.04.2023; Accepted:10.05.2023; Published Online:30.06.2023
Cite: Kılıç Ş, et al. Factors Affecting The Diagnosis And Treatment Of Non-STEMI Patients Who Were Suspected To Have COVID-19. Acta Medica Ruha. 2023;1(2):70-79. https://doi.org/10.5281/zenodo.7884207

Özet

Giriş ve Amaç: Bu çalışmada acil servise göğüs ağrısı şikâyetiyle başvuran ve non-STEMI tanısı konulan COVID-19 şüpheli hastaların yönetimi üzerine etki eden faktörlerin analiz edilmesi amaçlandı.
Yöntem: Çalışma 01.05.2020-30.04.2021 tarihleri arasında Sakarya Eğitim ve Araştırma Hastanesine başvuran ve non-STEMI tanısı konulan 69 hastanın retrospektif analizi ile gerçekleştirildi. Çalışma kapsamında hastaların demografik özellikleri (yaş, cinsiyet), komorbit hastalıkları, laboratuvar analizleri (hemogram, biyokimya ve serolojik test sonuçları), toraks bilgisayarlı tomografi (BT) bulguları (Covid-19 ile uyumlu ya da uyumsuz), anjio sonuçları, müdahale gereksinimleri ve mortalite durumları kayıt altına alındı. Hastalardan istenen PCR testi pozitif gelenler Covid-19 olarak kabul edildi.
Bulgular: Çalışmaya dâhil edilen hastaların yaş ortalamaları 69,69±11,45 yıl ve 46'sının (%66,7) erkek olduğu tespit edildi. Hastalardan 27 (% 39,1) tanesine PCR testi pozitifliği ile Covid-19 tanısı konuldu. Covid-19 tanısı konulan non-STEMI hastalarındaki Platelet-Lenfosit Oranı (PLR) ve C-Reaktif Protein (CRP) değerlerinin Covid-19 tanısı konulmayan hasta grubuna göre istatistiksel olarak anlamlı derecede yüksek olduğu saptandı (sırasıyla p=0,027, p=0,001). Benzer şekilde mortalite oranlarının da Covid-19 tanısı konulan non-STEMI hastalarında istatistiksel olarak anlamlı derecede daha yüksek olduğu belirlendi (p=0,043). Göğüs BT bulgularının 35 (% 50,72) hastada Covid-19 ile uyumlu olduğu saptandı. Bu hastalarda Nötrofil-Lenfosit Oranı (NLR), CRP ve Ferritin değerlerinin Covid-19 ile uyumlu olmayanlara göre istatistiksel olarak yüksek olduğu tespit edildi (sırasıyla; p=0,026, p=0,002, p<0,001). Göğüs BT'si Covid-19 ile uyumlu ve aynı zamanda PCR testi pozitif olan 21 hastada ise sadece CRP'nin göğüs BT'si Covid-19 ile uyumlu ancak PCR testi negatif olanlara göre daha yüksek olduğu saptandı (p=0.040).
Sonuç: Acil servise göğüs ağrısı şikâyetiyle başvuran ve non-STEMI tanısı konulan hastalarda COVID-19 şüphesi varlığında ayırıcı tanıda PLR ve CRP değerleri kullanılabilir. CRP aynı zamanda Göğüs BT'si Covid-19 ile uyumlu ve aynı zamanda PCR testi pozitif olan hastaları pozitif olmayanlardan ayırt etmekte de kullanılabilir. Non-STEMI ve Covid-19 birlikteliği mortaliteyi artıran bir faktördür.

Anahtar Kelimeler: COVID-19, Non-STEMI, Mortalite.

INTRODUCTION

In December 2019, a new epidemic, which was thought to have developed due to a new coronavirus, was determined in Wuhan, Hubei province of the People's Republic of China. This epidemic could not be controlled and soon spread to all over the globe (1). Although the findings of COVID-19 infection are generally related to the respiratory system, the presence of cardiac disease findings in many of the patients drew attention to the cardiovascular system. When the data obtained from large case series with the progression of the pandemic process are examined, the most affected group and the highest mortality rate were the elderly with known cardiovascular diseases (2).

One of the most comprehensive reports (72.314 COVID-19 patients) was reported by the Chinese Center for Disease Control and Prevention. The majority (87%) of patients aged between 30 – 79 years had a mortality rate of 2.3%. The mortality rate was 8% between the ages of 70 – 79 and 14.8% for those aged 80 and over. Mortality rates in individuals with comorbidities were higher than the general population (10.5% in diabetics patients with CVS diseases) (1,3).

COVID-19 infection has been shown to be associated with myocardial infarction, myocarditis, heart failure, arrhythmia, and venous thromboembolism. The drugs used to treat COVID-19 might deteriorate the course of myocardial infarction, heart failure and arrhythmia. Additionally, the outcome is poor in cardiac patients infected with COVID-19, because chronic cardiovascular system patients tend to postpone or delay their admission to the hospital due to the fear of infection (4,5).

Mechanisms of pulmonary vascular dysfunction in Acute Respiratory Distress Syndrome (ARDS) include nonspecific systemic inflammation, endothelial dysfunction and coagulation

activation, vasoconstriction due to hypoxemia and inflammation, extrinsic compression of vessels, and fibroproliferation due to pulmonary vascular remodeling (6). SARS-CoV-2 interactions with myocardial cells can also cause cardiac dysfunction. After binding to angiotensin-converting enzyme-2 (ACE-2) receptors, the virus elicits a potent activation of the innate immune system, resulting in an intense systemic inflammatory response with the release of proinflammatory cytokines. This "cytokine storm" leads to a diffuse endothelium followed by procoagulant activity (7). SARS-CoV-2 is responsible for excessive local and systemic coagulation activation with platelet activation and dysregulated immunothrombosis (8).

Within the scope of this research, we aimed to elucidate the factors affecting the management of patients with suspected COVID-19 who applied to the emergency department with chest pain and were diagnosed with non-STEMI.

METHOD

A total of 69 patients who applied to Sakarya Training and Research Hospital between 01/05/2020 – 30/04/2021 and were diagnosed with non-STEMI with a suspicion of COVID-19 have been analyzed retrospectively. All procedures were followed in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval was granted from our institution on 15/10/2021 with protocol number 462. As this was retrospective research, no informed consent was obtained from participants.

The demographic characteristics (age, gender), comorbid diseases, laboratory parameters (hemogram, biochemistry and serological test results), thorax computerized tomography (CT) findings (consistent or incompatible with COVID-19), angiography results, intervention requirements and mortality status were recorded. The diagnosis of COVID-19 has been confirmed via positive RT-PCR test.

Statistical Analysis

Patient data collected within the scope of the study were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) for Windows 21.0 (IBM Corp., Armonk, NY) package program. Frequency and percentage for categorical data, mean and standard deviation for continuous data were given as descriptive values. For comparisons between groups, “Independent Sample T – test” was used for two groups, and “Pearson Chi-Square Test” was used for comparison of categorical variables. Kolmogorov-Smirnov test has been conducted for normality, median values and IQR values were performed for continuous variables that did not fit normal distribution, and the Mann-Whitney U-test was utilized to compare continuous endpoints. The results were considered statistically significant when the p value was less than 0.05.

RESULTS

The mean age of the patients participating in the study was 69.70±11.45 years, and 66.7% (n=46) were male. Of the 63.7% (n=44) of the individuals applied to the emergency service due to chest pain. Diabetes mellitus was the most common (n=38, 55.1%) comorbid disease. The demographic distribution of patients are elaborated in Table 1.

Table 1. Baseline Demographics Of The Patients

		n=69
Age (mean ± SD)		69,70 ± 11,45
Gender	Women n (%)	23 (33,3)
	Male n (%)	46 (66,7)
Symptoms at Admission	Chest Pain n (%)	44 (63,8)
	Shortness of breath n (%)	19 (27,5)
	Other n (%)	6 (8,7)
ComorbidDiseases	Hypertension n (%)	13 (18,8)
	Chronic Kidney Failure n (%)	6 (8,7)
	Dyslipidemia n (%)	2 (2,9)
	Anemia n (%)	1 (1,4)
	Diabetes Mellitus n (%)	38 (55,1)
	Chronic Obstructive Pulmonary Disease n (%)	6 (8,7)
	Coronary Artery Disease n (%)	13 (18,8)
	Congestive Heart Failure n (%)	13 (18,8)
	Atrial Fibrillation n (%)	1 (1,4)
	Smoking Addiction n (%)	2 (2,9)
	Other n (%)	9 (13,0)
Medical History	History of MI n (%)	5 (7,2)
	History of PCI n (%)	4 (5,8)
	CABG history	3 (4,3)
Laboratory Parameters	WBC (median ; IQR)	11,0 (8,2-13,7)
	Neutrophic (median ; IQR)	8,7 (5,9-10,9)
	Platelet (median; IQR)	201,0 (161,0-244,0)
	Lymphocyte (median; IQR)	1,6 (0,9-2,1)
	NLR (median ; IQR)	6,1 (2,8-12,2)
	PLR (median ; IQR)	144,7 (89,9-223,6)
	hs_Troponin (median ; IQR)	2112,0 (217,5-10342,0)
	D_dimer (median ; IQR)	821,0 (309,5-1655,0)
	CRP (median ; IQR)	21,2 (8,1-110,0)
	Ferritin (median; IQR)	138,0 (79,7-382,2)
	Glucose (median; IQR)	164,0 (119,0-219,0)
	INR (median ; IQR)	1,3 (1,1-1,5)
RT-PCR	Negative n (%)	42 (60,9)
	positive n (%)	27 (39,1)
CT	Incompatible with COVID 19 n (%)	34 (49,3)
	Compatible with COVID 19 n (%)	35 (50,7)
Emergency Service	Death n (%)	23 (33,3)
	Discharged n (%)	46 (66,7)
Hospitalization	Mechanical Ventilator Requirement n (%)	22 (31,9)
	Shock n (%)	10 (14,5)
	Acute Renal Failure n (%)	7 (10,1)
Coronary Angiography	Normal n (%)	2 (2,9)
	Single vessel lesion requiring intervention n (%)	11 (15,9)
	Multiple vessel lesion requiring intervention n (%)	14 (20,3)
	Findings not requiring intervention n (%)	42 (61,9)

When laboratory parameters were compared according to CT results, NLR, CRP and Ferritin values were statistically higher in patients with a CT image compatible with COVID- 19 (p=0.026, p=0.002, p<0.001) (Table 2). The CRP result of the patients with a COVID-19 compatible CT imaging and positive RT-PCR result was statistically significantly higher than the control group (p=0.040).

When the laboratory parameters of the patients were compared according to the RT- PCR results, the PLR and CRP values of the patients with positive RT-PCR were statistically significantly higher (p=0.027, p=0.001, respectively). Mortality rates were higher in RT-PCR positive patients (Table 2).

Table 2. Mortality And Laboratory Parameters Regarding RT-PCR Outcomes

	RT-PCR Pozitive (n=27)	RT-PCR Negative (n=42)	p-value
WBC (median ; IQR)	9,9 (7,7-14,1)	11,2 (8,2-13,2)	0,754
Neutrophil (median; IQR)	8,2 (5,6-12,6)	8,7 (6,0-10,3)	0,601
Platelet (median; IQR)	213,0 (164,0-293,0)	197,0 (154,0-230,7)	0,099
Lymphocyte (median; IQR)	1,5 (0,8-2,1)	1,6 (1,1-2,3)	0,363
NLR (median ; IQR)	9,5 (3,3-14,3)	5,5 (2,7-9,8)	0,253
PLR (median ; IQR)	174,4 (102,2-278,6)	11,1 (74,2-175,4)	**0,027**
hs_Troponin (median ; IQR)	2400,0 (148,0-9497,0)	1849,0 (265,0-24734,0)	0,618
D_dimer (median ; IQR)	1080,0 (312,0-1700,0)	784,5 (292,0-1825,0)	0,393
CRP (median ; IQR)	55,0 (21,2-174,0)	11,1 (3,8-47,8)	**0,001**
Ferritin (median; IQR)	200,0 (81,3-522,0)	119,6 (79,1-361,6)	0,338
Lactate (median; IQR)	1,8 (1,5-2,6)	2,6 (1,8-3,5)	0,074
Glucose (median; IQR)	169,0 (118,0-203,0)	155,0 (123,2-250,7)	0,951
INR (median ; IQR)	1,3 (1,1-1,5)	1,3 (1,1-1,4)	0,917
Mortality n (%)	12 (44,4)	9 (21,4)	**0,043**

Table 3. Mortality And Laboratory Parameters Regarding CT Imaging Findings

	CT compatible (n=35)	BT non-compatible (n=34)	p-value
WBC (median ; IQR)	11,2 (7,7-14,1)	10,9 (8,2-13,2)	0,585
Neutrophil (median; IQR)	9,3 (5,6-12,6)	7,8 (6,0-10,0)	0,362
Platelet (median; IQR)	199,0 (155,0-255,0)	201,5 (116,2-243,0)	0,952
Lymphocyte (median; IQR)	1,2 (0,7-2,1)	1,7 (1,1-2,4)	0,079
NLR (median ; IQR)	8,9 (3,7-15,1)	4,2 (2,5-8,4)	**0,026**
PLR (median ; IQR)	157,0 (96,5-278,5)	118,1 (79,4-180,5)	0,053
hs_Troponin (median ; IQR)	2729,0 (934,0-10000,0)	1007,0 (126,0-29491,0)	0,293
D_dimer (median ; IQR)	970,0 (409,0-2000,0)	642,5 (213,5-1295,0)	0,116
CRP (median ; IQR)	54,0 (14,4-174,0)	10,5 (3,8-37,4)	**0,002**
Ferritin (median; IQR)	266,0 (138,0-852,0)	85,9 (69,4-152,7)	**p<0,001**
Lactate (median; IQR)	2,3 (1,7-4,6)	2,4 (1,5-2,9)	0,349
Glucose (median; IQR)	178,0 (118,0-231,0)	145,5 (118,5-206,3)	0,316
INR (median ; IQR)	1,3 (1,2-1,5)	1,2 (1,1-1,4)	0,145
Mortality n (%)	14 (40,0)	7 (20,6)	0,08

It was determined that patients with statistically low NLR, PLR and CRP values (p=0.046, p=0.023, p=0.005) and patients with statistically significantly high lymphocyte and troponin values required Coronary Angiography intervention (p=0.013, p=0.001). In addition, it was determined that patients whose CT was not compatible with COVID-19 and whose RT- PCR test was negative required more Coronary Angiography intervention (p=0.004, p=0.003, respectively) (Table 3 - 4 - 5).

Table 4. Mortality And Laboratory Parameters With Respect To CT Compatibility And RT-PCR Positivity

	CTcompatibleRT-PCR pozitive (n=21)	CTcompatibleRT-PCRnegative (n=14)	p-value
WBC (median ; IQR)	10,3 (8,2-16,5)	11,2 (7,6-13,7)	0,724
Neutrophil (median; IQR)	9,3 (5,4-14,1)	9,1 (6,1-11,5)	1,000
Platelet (median; IQR)	212,0 (157,5-301,0)	196,0 (142,2-208,7)	0,145
Lymphocyte (median; IQR)	1,6 (0,8-2,2)	1,06 (0,5-1,9)	0,222
NLR (median ; IQR)	9,5 (3,3-13,2)	8,9 (5,3-17,3)	0,414
PLR (median ; IQR)	174,4 (96,2-276,8)	154,4 (94,4-301,7)	0,907
hs_Troponin (median ; IQR)	2729,0 (281,5-9748,5)	4063,0 (1077,0-13938,0)	0,495
D_dimer (median ; IQR)	970,0 (309,5-2035,0)	962,5 (603,5-2095,0)	0,778
CRP (median ; IQR)	72,0 (34,2-174,0)	14,0 (8,3-129,7)	**0,040**
Ferritin (median; IQR)	266,0 (148,0-788,5)	265,0 (98,6-1198,7)	0,881
Lactate (median; IQR)	2,0 (1,7-4,4)	2,7 (2,1-4,7)	0,293
Glucose (median; IQR)	178,0 (115,0-231,0)	172,5 (130,5-280,7)	0,516
INR (median ; IQR)	1,3 (1,1-1,5)	1,3 (1,2-1,6)	0,359
Mortality n (%)	11 (52,4)	3 (21,4)	0,067

Table 5. Mortality And Laboratory Parameters Regarding The Requirement For CAG İntervention

	CAG Intervention (+) (n=25)	No CAG Intervention (n=44)	p-value
WBC (median ; IQR)	11,3 (8,1-14,2)	10,8 (8,1-12,8)	0,52
Neutrophil (median; IQR)	8,8 (5,8-11,9)	8,1 (5,8-10,7)	0,871
Platelet (median; IQR)	199,0 (168,5-238,8)	201,5 (155,7-252,7)	0,886
Lymphocyte (median; IQR)	1,9 (1,3-2,9)	1,2 (0,8-2,1)	**0,013**
NLR (median ; IQR)	4,4 (2,4-8,2)	8,4 (3,3-14,5)	**0,046**
PLR (median ; IQR)	117,9 (69,7-152,3)	161,2 (96,6-256,5)	**0,023**
hs_Troponin (median ; IQR)	9286,0 (1585,0-48711,0)	971,0 (126,4-5242,7)	**0,001**
D_dimer (median ; IQR)	548,0 (250,5-1170,0)	980,5 (402,2-2100,0)	0,082
CRP (median ; IQR)	10,4 (3,6-30,6)	43,2 (10,6-123,7)	**0,005**
Ferritin (median; IQR)	133,6 (81,7-340,7)	193,0 (79,3-579,0)	0,717
Lactate (median; IQR)	2,5 (1,7-3,6)	2,2 (1,6-3,2)	0,562
Glucose (median; IQR)	170,0 (119,5-229,5)	158,0 (118,5-225,0)	0,891
INR (median ; IQR)	1,3 (1,1-1,5)	1,3 (1,1-1,4)	0,851
COVID compatible n (%) on chest CT	7 (28,0)	28 (63,6)	**0,004**
PCR Test Positive n (%)	4 (16,0)	23 (52,3)	**0,003**
Mortality n (%)	5 (20,0)	16 (36,4)	0,156

DISCUSSION

The outbreak of the COVID-19 pandemic caused a catastrophy in in healthcare services. The patient access has been limited in many different disease areas especially in the emergency service. Additionally, elective procedures have been halted and patients hesitated to visit hospital due to the risk of infection transmission (9). Non-ST-segment elevation myocardial infarction (Non-STEMI) is a critical, time-dependent emergency and prompt referral for coronary angiography intervention but the data regarding Non-STEMI is limited in mortality hospitalized COVID-19 patients (10).

People with a history of chronic disease have an increased risk of COVID-19 related complications and death. Cardiac diseases such as underlying ischemic heart disease, hypertension, heart failure, and atrial fibrillation were the most common comorbidities accompanying patients diagnosed with COVID-19 in mortality cases (11). In our study, diabetes mellitus was the most common (n=38, 55.1%) comorbid disease in patients admitted to emegency service and the most prominent symptom was chest pain (63.7%).

Platelet/lymphocyte ratio (PLR) is a marker that has recently been proven to be an important indicator of inflammation, especially in cancer patients (12). It has also been found to be associated with increased mortality and morbidity in cardiovascular diseases. Interleukin (IL-6) and C-reactive protein (CRP) are increased in myocardial infarction (13). It has been reported that ischemia attacks in patients create a prothrombotic environment with the activation of thrombotic factors and inflammatory cells (14). Thus, studies have reported that CRP and many other inflammatory markers are associated with a predisposition to thrombosis in myocardial infarction. A serious relationship between the prevalence of coronary artery disease and PLR has been elaborated in previous literature (15). In previous literature a correlation was found between increased PLR and long-term increased mortality in the coronary artery disease patients (16). In our study, NLR, CRP and Ferritin values were statistically higher in patients with a CT image compatible with COVID-19. The CRP result of the patients with a COVID-19 compatible CT imaging and positive RT-PCR result was statistically significantly higher.

Acute myocarditis has been reported in COVID-19 patients with elevated cardiac troponin, echocardiographic abnormalities (mostly changes in left ventricular function), and/or electrocardiogram with variable findings, but only a few cases have been confirmed by endomyocardial biopsy and/or cardiac magnetic resonance imaging. Cardiac histopathological findings in deceased COVID-19 patients mainly included inflammatory and prothrombotic features such as congestive cardiomyopathy, damage due to previous conditions such as atherosclerotic coronary artery disease, chronic ischemic cardiomyopathy, myocardial hypertrophy, while only a few cases have been reported as focal lymphocytic myocarditis (17-19). It has been reported that high-sensitivity cardiac troponin (hs-cTn) levels are increased in a significant proportion of COVID-19 patients (20). In a study examining 191 cases with COVID-19, hs-cTnI levels in more than 50% of those who died; It was determined that it was high at the time of admission, increased gradually until the day of death of the patients, and was an important indicator of mortality. While the rate of hs-cTnI >28 mg/ml levels among the cases that ended in death was 46%, this rate was found to be 1% in the patients who survived ($p<0.0001$) (17). Troponin elevation alone during COVID-19 infection does not diagnose acute coronary syndrome (ACS). It is strongly recommended to search for other clinical features for the diagnosis of ACS. In our study, patients with low NLR, PLR, CRP and high lymphocyte, troponin values required Coronary Angiography intervention. In addition, it was determined that patients whose CT was not compatible with COVID-19 and

whose RT-PCR test was negative required more Coronary Angiography intervention. It was determined that laboratory tests, RT-PCR test results and thorax CT findings did not have a statistically significant value in terms of determining the requirement for coronary angiography intervention.

Majeed et al. (2022) elaborated that NSTEMI patients with concomitant COVID-19 infection had a higher rate of inpatient mortality than those without COVID-19 infection. They had an accompanying increase in length of stay. COVID-19 patients also received significantly fewer invasive cardiac procedures. Moreover, higher mortality was observed among the Non-STEMI patients with COVID-19, despite the lower underlying cardiac and pulmonary comorbidities. Last but not least, they emphsized that NSTEMI patients with concomitant COVID-19 infection had a five fold mortality risk compared to Non-STEMI patients without COVID-19 infection (21).

Especially in the presence of concomitant CVS disease, COVID 19 infection is severe and the risk of death increases. COVID-19 infections can lead to many clinical pictures ranging from myocardial infection, myocarditis, heart failure and arrhythmias to venous thromboembolism. Mechanisms such as inflammation, cytokine storm, increased coagulation functions, as well as an imbalance between myocardial oxygen supply and myocardial oxygen demand, cause cardiac damage in COVID-19 infections. Apart from CVS damage due to infection, it should not be ignored that some drugs used in the treatment also have side effects on CVS (22).

CONCLUSION

PLR and CRP values can be used in the differential diagnosis in the presence of suspected COVID-19 in patients who present to the emergency department with chest pain and are diagnosed with non-STEMI. CRP can also be used to distinguish patients whose thorax CT is compatible with COVID-19 and who also have a positive RT-PCR test. The coexistence of non-STEMI and COVID-19 is a factor that increases mortality.

Funding: There is no specific funding related to this research.

Competing interests: The authors declare that they have no competing interests.

Ethical Declaration: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval has been granted from our institution. As this was a retrospective research no informed consent has been obtained from participants.

Abbreviations

ACE-2 : Angiotensin-Converting Enzyme-2

ACS : Acute Coronary Syndrome

ARDS : Acute Respiratory Distress Syndrome

CAG : Coroner Angiography

CRP : C-Reactive Protein

CT : Computerized Tomography

CVS : Cardiovascular System

DM : Diabetes Mellitus

ES : Emergency Service

hs-cTn : High-Sensitivity Cardiac Troponin

ICU : İntensive Care Unit

NLR : Neutrophil To Lymphocyte Ratio

Non-STEMI : Non- ST Elevated Myocard İnfarct

PLR : Platelet Lymphocyte Ratio

SPSS : Statistical Package for the Social Sciences

STEMI : ST Elevated Myocard İnfarct

REFERENCES

1. Bader F, Manla Y, Atallah B, Starling RC. Heart failure and COVID-19. Heart Fail Rev. 2021;26(1):1-10. doi:10.1007/s10741-020-10008-2

2. Salabei JK, Asnake ZT, Ismail ZH, Charles et al. COVID-19 and the cardiovascular system: an update. Am J Med Sci. 2022;364(2):139-147. doi:10.1016/j.amjms.2022.01.022

3. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA. 2020;323(11):1061-1069. doi:10.1001/jama.2020.1585

4. Xiang D, Xiang X, Zhang W, et al. Management and Outcomes of Patients With STEMI During the COVID-19 Pandemic in China. J Am Coll Cardiol. 2020;76(11):1318- 1324. doi:10.1016/j.jacc.2020.06.039

5. De Rosa S, Spaccarotella C, Basso C, et al. Italiana di Cardiologia and the CCU Academy investigators group. Reduction of hospitalizations for myocardial infarction in Italy in the COVID-19 era. Eur Heart J. 2020;41(22):2083-2088. doi:10.1093/eurheartj/ehaa409

6. Gao J, Lu PJ, Li CP, et al. Reconsidering treatment guidelines for acute myocardial infarction during the COVID-19 pandemic. BMC Cardiovasc Disord. 2022;22(1):194. doi:10.1186/s12872-022-02626-5

7. Liao CT, Chang WT, Yu WL, Toh HS. Management of acute cardiovascular events in patients with COVID-19. Rev Cardiovasc Med. 2020;21(4):577-581. doi:10.31083/j.rcm.2020.04.140

8. Choi H, Lee JH, Park HK, et al. Impact of the COVID-19 Pandemic on Patient Delay and Clinical Outcomes for Patients With Acute Myocardial Infarction. J Korean Med Sci. 2022;37(21):e167. doi:10.3346/jkms.2022.37.e167

9. De Luca G, Verdoia M, Cercek M, et al. Impact of COVID-19 Pandemic on Mechanical Reperfusion for Patients With STEMI. J Am Coll Cardiol. 2020;76(20):2321-2330. doi:10.1016/j.jacc.2020.09.546

10. De Luca G, Cercek M, Jensen LO, et al. Impact of COVID-19 pandemic and diabetes on mechanical reperfusion in patients with STEMI: insights from the ISACS STEMI COVID 19 Registry. Cardiovasc Diabetol. 2020;19(1):215. Published 2020 Dec 18. doi:10.1186/s12933-020-01196-0

11. Nai Fovino L, Cademartiri F, Tarantini G. Subclinical coronary artery disease in COVID-19 patients. Eur Heart J Cardiovasc Imaging. 2020;21(9):1055-1056. doi:10.1093/ehjci/jeaa202

12. Kalyoncuoglu M, Durmus G. Relationship between C-reactive protein-to-albumin ratio and the extent of coronary artery disease in patients with non-ST-elevated myocardial infarction. Coron Artery Dis. 2020;31(2):130-136. doi:10.1097/MCA.0000000000000768

13. Liu J, Ao W, Zhou J, Luo P, Wang Q, Xiang D. The correlation between PLR-NLR and prognosis in acute myocardial infarction. Am J Transl Res. 2021;13(5):4892- 4899.

14. Li L, Ma Y, Geng XB, et al. Platelet-to- lymphocyte ratio relates to poor prognosis in elderly patients with acute myocardial infarction. Aging Clin Exp Res. 2021;33(3):619-624. doi:10.1007/s40520-020- 01555-7.

15. Meng Z, Yang J, Wu J, Zheng X, Zhao Y, He Y. Association between the platelet- lymphocyte ratio and short-term mortality in patients with non-ST-segment elevation myocardial infarction. Clin Cardiol. 2021;44(7):994-1001. doi:10.1002/clc.23648

16. Willim HA, Harianto JC, Cipta H. Platelet-to-Lymphocyte Ratio at Admission as a Predictor of In-Hospital and Long-Term Outcomes in Patients With ST-Segment Elevation Myocardial Infarction Undergoing Primary Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis. Cardiol Res. 2021;12(2):109-116. doi:10.14740/cr1219

17. 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(10229):1054-1062. doi:10.1016/S0140-6736(20)30566-3

18. Weiss P, Murdoch DR. Clinical course and mortality risk of severe COVID-19. Lancet. 2020;395(10229):1014-1015. doi:10.1016/S0140-6736(20)30633-4

19. Zhang J, Wang Z, Wang X, Hu Z, Yang C, Lei P. Risk Factors for Mortality of COVID-19 Patient Based on Clinical Course: A Single Center Retrospective Case- Control Study. Front Immunol. 2021;12:581469. doi:10.3389/fimmu.2021.581469

20. American College of Cardiology. Troponin and BNP Use in COVID-19. https://www.acc.org/latest-in-cardiology/articles/2020/03/18/15/25/troponin-and-bnpuse-incovid19?utm_source=accupdate&utm_medium=email_newsletter&utm_content=20200320&utm_campaign=accupdate. (Accessed Mar 23, 2020.)

21. Majeed H, Gangu K, Sagheer S, et al. COVID-19 and NSTEMI Outcomes among Hospitalized Patients in the United States and Racial Disparities in Mortality: Insight from National Inpatient Sample Database. Vaccines 2022;10:2024. doi:10.3390/vaccines10122024

22. Salabei JK, Asnake ZT, Ismail ZH, et al. COVID-19 andthecardiovascularsystem: an update. Am J MedSci. 2022;364(2):139-147. doi:10.1016/j.amjms.2022.01.022