International Journal of Medical Science and Clinical Invention 11(6): 7142-7152, 2024
DOI:10.18535/ijmsci/v11i6.03
https://valleyinternational.net/index.php/ijmsci

Relationship between Troponin and Red Cell Distribution Width Levels and Mortality in Post-Covid Patients

Melek Doganci, Guler Eraslan Doganay

Ankara Atatürk Sanatorium Training and Research Hospital, Anesthesiology and Reanimation Clinic

Abstract:

Introduction: There are very few studies on the TR value, which expresses the simultaneous increase in Troponin and Red Cell Distribution Width (RDW), which are markers of myocardial damage commonly seen in Covid-19 disease. This study aims to show the relationship of troponin, RDW and TR values with mortality and prognostic factors post-Covid-19.

Methods: 204 patients diagnosed with Covid-19 who were admitted to the adult tertiary Covid ICU between April,2021 and March,2022 were included in the study. Demographic data, comorbidities, treatments, length of stay in intensive care and hospital, and laboratory parameters were evaluated. According to our hospital's reference ranges, RDW value over 16% and troponin value over 15ng/L were defined as high value. Patients with both troponin value over 15ng/L and RDW value over 16% were considered to have high TR.

Results: In the study, when the values checked at the time of discharge/before discharge were examined, it was seen that the intubation rate was higher and the duration of mechanical ventilation was longer in patients with high troponin and TR levels. In patients with high RDW and TR values, platelet, hemoglobin and hematocrit values were lower before discharge/discharge compared to those with low RDW and TR values.

Conclusion: In our study, it was found that the intubation rate was higher and mechanical ventilation durations were longer in patients with elevated troponin and TR. We are of the opinion that early intubation practices applied in our clinic for patients with high TR and desaturation are reduced mortality.

Keywords: Covid-19, Intensive care, Post-covid-19, Red Cell Distribution Width, TR score, Troponin.

Introduction:

Starting in the city of Wuhan, China in 2019 and rapidly spreading worldwide, the disease Covid-19 was declared a pandemic by the World Health Organization and is an extremely fatal viral illness [1]. As of May 24, 2023, there have been reported over 766 million cases of Covid-19 worldwide and more than 6.9 million deaths [2].

Acute myocardial injury, ischemia, and infarction risk can occur in relation to an increased inflammatory, prothrombotic, and procoagulant state following an acute infection (viral or bacterial) [3]. Numerous studies have shown a strong association between high Red Cell Distribution Width (RDW) values and morbidity and mortality of coronary artery disease. Additionally, high RDW has been demonstrated to be an independent risk factor for both in-hospital and long-term mortality in patients with acute coronary syndrome (ACS) [4].

Myocardial injury is common in Covid-19 patients. The increase in cardiac troponin is among the prevalent prognostic factors indicating myocardial injury in Covid-19 patients. These increases in troponin can be due to chronic injury, acute non-ischemic injury, or acute myocardial infarction [5].

While there are studies showing the association between high RDW values and poor prognosis in Covid-19 , research exploring the relationship between troponin and RDW in predicting the prognosis of Covid patients is limited [6]. During the pandemic period, the efficient use of resources in prognosis prediction is extremely important. Therefore, tests that are readily available and low-cost should be preferred. In our study, we aimed to demonstrate the relationship between troponin and RDW values and mortality in patients who have had Covid-19, and their association as prognostic factors.

Materials And Methods:

204 patients who were hospitalized with a diagnosis of Covid-19 between April 11, 2021,

and March 16, 2022, in the adult tertiary care Covid ICU were included in the study. Ethical approval for this study (decision number: 716) was provided by the Medical Specialization Education Board of Health Sciences University Ankara Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Ankara, Turkey on 04 March 2021.

Patients requiring tertiary care ICU who were diagnosed with Covid-19 based on contact history, clinical and typical radiological findings, and a positive SARS-CoV-2 PCR test were included in the study. Patients who clinically suggested Covid but repeatedly received negative results from the SARS-CoV-2 PCR test were excluded from the study.

The age, gender, underlying diseases (presence of Diabetes Mellitus (DM), Hypertension (HT), Coronary Artery Disease (CAD), Congestive Heart Failure (CHF), previous Pulmonary Thromboembolism (PTE), previous Cerebrovascular Event (CVE), and Chronic Kidney Disease (CKD)), Charlson Comorbidity Index Score (CCIS), Acute Physiology and Chronic Health Evaluation Score-II (APACHE-II), Covid-19 vaccination history, tracheostomy and intubation status, need and duration for invasive/non-invasive mechanical ventilation (IMV/NIMV), need and duration for high-flow nasal oxygen (HFNO2), durations of stay in ICU and hospital, and 1-week and 1-month mortalities were recorded.

As laboratory parameters, complete blood count, D-dimer, Lactate Dehydrogenase (LDH), and troponin levels taken at the time of ICU admission and before discharge from the ICU or at the event of exitus were recorded. Since our hospital's reference value for RDW is between 11.8% and 16%, values above 16% were considered as high RDW. For troponin, the reference value is below 15ng/L, so values above 15ng/L were deemed as high troponin. Patients whose troponin values were above 15ng/L and whose RDW values were also above 16% were indicated as having high TR.

The effect of troponin, RDW, and TR elevation measured at the time of discharge/before exitus on prognosis and mortality was compared among the patients.

Statistical analysis and sample size

Data analyses were performed by using SPSS for Windows, version 22.0 (SPSS Inc., Chicago, IL, United States). Whether the distribution of continuous variables was normal or not was determined by the Kolmogorov Smirnov test. Levene test was used for the evaluation of homogeneity of variances. Unless specified otherwise, continuous data were described as mean ± SD and median (Q1 :first quartile – Q3 :third quartile). Categorical data were described as a number of cases (%). Statistical analysis differences in normally distributed variables between two independent groups were compared by Student's t-test, Mann Whitney U test was applied for comparisons of the not normally distributed data. Categorical variables were compared using Pearson's chi-square test or fisher's exact test was accepted p-value <0.05 as a significant level on all statistical analysis.

Results:

Between April 11, 2021, and March 16, 2022, 111 male and 93 female patients were admitted to the adult tertiary care Covid ICU with a diagnosis of Covid-19. When patients were compared in terms of DM, HT, CAD, CHF, previous PTE, previous CVE, and CKD, it was found that the 1-month mortality was statistically significant in patients with a history of previous CVE. In those with detected 1-month mortality, compared to those without detected mortality, statistically the number of days on HFO2 and NIMV were lower, the number of intubations was lower, hospital stay was shorter, APACHE-II score was higher, admission lymphocyte value was lower, and admission leukocyte value was higher.

When comparing those with troponin values above 15ng/L to those with 15ng/L and below during the discharge/before exitus, it was observed that those with high troponin levels had statistically significant fewer days on NIMV, a higher rate of intubation and longer IMV duration, higher leukocyte values at admission and before discharge/exitus, and higher D-dimer and LDH values measured before discharge/exitus (Table-1).

Table 1. Comparison of the variables according to the troponin value measured before discharge/exitus

	Troponin ≤15 (n:57)					**Troponin >15(n:147)**					**p value**
	Mean	SD	Median	Q1	Q3	Mean	SD	Median	Q1	Q3	
Age	68.04	14.13	69.00	37.00	102.00	67.88	13.91	69.00	29.00	106.00	0.980 *
HFO_2 duration (day)	5.12	5.30	4.00	2.00	6.00	4.24	5.64	2.00	1.00	6.00	0.027 *
NIMV duration (day)	5.12	5.30	4.00	2.00	6.00	4.18	5.64	2.00	1.00	5.50	**0.018 ***
IMV Duration (day)	3.84	8.48	0	0	2.50	5.33	8.00	2.00	0	7.00	**0.002 ***
LOS ICU	8.91	10.02	5.00	2.00	11.00	9.59	9.16	6.00	3.00	12.00	0.335 *
LOS hospital	19.07	18.05	14.00	7.00	25.00	18.06	13.54	15.00	8.00	23.50	0.744 *
CCIS	3.86	2.15	4.00	2.00	5.00	3.85	2.28	4.00	2.00	5.00	0.860 *
APACHE-II	21.79	8.43	20.00	17.00	26.00	23.41	8.08	20.50	18.00	29.00	0.182 *
Hos. leukocyte	11.75	5.93	10.60	8.21	13.65	14.05	7.06	13.25	9.36	17.29	**0.009 ***
Hos.lymphocyte	0.93	1.05	0.61	0.38	1.14	0.86	1.12	0.63	0.45	0.94	0.834 *
Hos. D-dimer	10.82	47.96	1.92	1.32	2.65	18.98	81.67	2.33	1.17	6.40	0.145 *
Hos. LDH	556.85	270.59	534.00	382.00	705.00	623.97	775.31	498.00	356.00	697.00	0.655 *
Hos. Hb	13.11	4.40	13.20	11.50	14.60	12.76	2.15	12.90	11.20	14.20	0.282 *
Hos. Hct	39.6	7.18	40.6	35.4	44.4	39.2	5.89	39.0	35.1	43.10	0.793

	2		0	0	0	9		0	0		$^{\beta}$
Hos. Neutrophil	12.33	10.44	11.52	7.91	14.02	13.41	10.67	11.80	8.10	15.93	0.382*
Hos. Platelet	261.30	101.21	256.00	187.00	326.00	260.78	123.82	242.00	165.00	336.00	0.994$^{\beta}$
Hos. PDW	16.35	0.42	16.40	16.00	16.60	17.29	12.28	16.30	15.90	16.60	0.506*
Hos. PCT	0.25	0.09	0.25	0.18	0.31	1.63	11.98	0.26	0.18	0.33	0.531*
Hos. troponin	25.74	70.05	7.46	3.40	14.49	193.94	591.56	45.00	10.39	143.03	**<0.001***
D/E Hb	11.80	2.64	11.70	10.60	13.30	11.66	2.33	11.70	10.10	12.90	0.782$^{\beta}$
D/E Htc	43.26	45.52	37.50	33.30	42.20	36.43	6.67	36.40	31.80	40.80	0.358*
D/E leukocyte	12.90	6.98	12.03	8.45	15.55	15.75	7.99	14.29	10.07	20.47	**0.019***
D/E lymphocyte	1.29	2.38	0.74	0.53	1.12	2.25	5.23	0.75	0.43	1.51	0.651*
D/E Neutrophil	11.33	6.89	9.99	7.11	14.78	14.89	10.38	12.96	9.00	19.08	0.006*
D/E Platelet	240.74	132.47	230.00	152.00	307.00	204.27	126.08	189.00	98.00	277.00	0.064$^{\beta}$
D/E PDW	18.83	19.04	16.30	16.00	16.70	16.40	0.53	16.40	16.10	16.70	0.246*
D/E PCT	0.25	0.13	0.22	0.15	0.29	0.21	0.12	0.20	0.12	0.28	0.118*
D/E D-Dimer	4.45	7.25	1.97	0.94	3.50	8.91	11.80	3.93	1.65	11.87	**<0.001***
D/E LDH	557.30	957.27	431.00	260.00	574.00	1325.63	2690.8	598.00	398.00	942.00	**<0.001***
D/E RDW	15.1	4.58	14.3	13.4	16.2	15.8	2.86	15.1	13.9	17.10	0.055

	4		0	0	0	6		0	0		*

Continuous variables are expressed as the mean ± standard deviation (SD) and median(Q1 :first quartile – Q3 :third quartile). Continuous variables were compared with student test $^{\beta}$ or the mann whitney u test.*

HFO_2: High flow nasal oxygen, NIMV: Non invasive mechanical ventilation, IMV: Invasive mechanical ventilation, LOS: Length of stay, ICU:Intensive care unit, CCIS: Charlson Comorbidity Index, APACHE-II: Acute Physiology and Chronic Health Assessment Score-II, Hos: Hospitalization, LDH: Lactate Dehydrogenase, Hb: Hemoglobin, Htc: Hematocrit, PDW: Platelet distribution width, PCT: Procalcitonin, D/E: before discharge/exitus, RDW: Red Cell Distribution Width

When comparing those with RDW values above 16% to those with 16% and below, it was observed that those with high RDW values had statistically significant lower levels of hemoglobin, hematocrit, PDW values at admission and before discharge/exitus, and lower platelet and PCT values measured before discharge/exitus compared to those with lower RDW values (Table-2).

Table 2. Comparison of variables according to the RDW value measured before discharge/exitus

	RDW ≤16 (n:134)					**RDW >16(n:70)**					**p value**
	Mean	SD	Median	Q1	Q3	Mean	SD	Median	Q1	Q3	
Age	68.74	13.91	69.00	29.00	106.00	67.39	13.98	70.00	41.00	89.00	0.565 *
HFO_2 duration (day)	4.60	5.97	3.00	1.00	6.00	3.94	4.43	3.00	1.00	5.00	0.826 *
NIMV duration (day)	4.54	5.97	2.50	1.00	6.00	3.96	4.42	3.00	1.00	5.00	0.973 *
IMV Duration (day)	3.89	6.90	0	0	4.00	6.44	9.71	2.00	0	8.00	0.030 *
LOS ICU	8.49	8.49	6.00	2.00	12.00	10.40	10.72	6.00	3.00	14.00	0.312 *
LOS hospital	17.25	13.67	14.00	8.00	22.00	19.29	16.95	14.50	7.00	27.00	0.861 *
CCIS	3.99	2.21	4.00	2.00	5.00	3.89	2.39	4.00	2.00	5.00	0.707 *
APACHE-II	23.55	8.54	21.00	18.00	29.00	22.63	8.12	20.50	18.00	28.00	0.696 *
Hos. leukocyte	13.63	7.09	12.50	8.70	16.73	12.96	6.62	12.01	8.47	15.30	0.454 *
Hos.lymphocyte	0.85	0.85	0.62	0.41	0.94	0.94	1.44	0.66	0.40	1.05	0.799 *
Hos. D Dimer	14.03	64.36	2.05	1.38	5.74	20.98	85.51	2.11	1.27	4.28	0.636 *

Hos.LDH	632.62	777.02	523.00	382.00	684.00	549.81	356.67	468.00	352.00	708.00	0.429 *
Hos. Hb	13.22	2.66	13.40	12.40	14.80	12.21	3.49	12.00	10.30	13.60	**<0.001***
Hos. Hct	40.54	6.54	40.60	37.60	44.60	37.32	6.15	37.40	33.60	41.20	**<0.001***
Hos. Neutrophil	13.73	12.53	11.01	7.45	15.59	11.63	4.59	11.80	8.06	14.09	0.952 *
Hos. Platelet	268.81	121.51	256.50	176.00	344.00	240.04	110.28	240.00	147.00	309.00	0.106 $^{\beta}$
Hos. PDW	17.47	12.68	16.40	16.10	16.70	16.12	0.49	16.10	15.70	16.40	**<0.001***
Hos. PCT	0.57	3.44	0.26	0.18	0.34	2.37	16.14	0.24	0.17	0.32	0.181 *
Hos. Troponin	187.74	611.31	22.40	5.80	137.00	71.31	139.51	21.80	6.80	69.90	0.360 *
Hos. RDW	13.94	1.10	13.70	13.10	14.60	17.05	2.83	16.40	15.60	18.20	**<0.001***
D/E Hb	12.26	2.55	12.35	11.00	13.90	10.75	2.07	10.90	9.10	12.10	**<0.001** $^{\beta}$
D/E Htc	40.58	30.15	37.90	34.20	42.50	34.50	6.26	34.80	29.90	38.60	**<0.001***
D/E leukocyte	14.69	7.81	13.22	9.32	18.43	15.47	7.85	14.48	10.28	19.24	0.295 *
D/E lymphocyte	2.12	5.30	0.73	0.41	1.24	1.78	3.00	0.76	0.53	1.81	0.083 *
D/E Neutrophil	13.52	8.52	11.88	7.72	16.90	14.58	11.31	13.46	8.57	17.92	0.343 *
D/E Platelet	234.50	132.40	226.00	140.00	296.00	172.59	108.51	162.00	89.00	240.00	**0.001***
D/E PDW	17.56	12.41	16.50	16.20	16.80	16.18	0.51	16.20	15.90	16.50	**<0.001***
D/E PCT	0.23	0.12	0.22	0.15	0.30	0.19	0.12	0.18	0.10	0.25	**0.009** $^{\beta}$
D/E D-Dimer	8.36	12.46	2.71	1.17	11.87	6.60	7.31	3.63	1.99	8.29	0.168 *
D/E LDH	944.42	1918.29	502.00	334.00	776.00	13604.47	2914.53	534.00	383.00	943.00	0.180 *
D/E Troponın	403.25	2326.88	34.60	11.50	133.10	1329.45	5776.11	49.10	17.00	352.20	0.070 *

*Continuous variables are expressed as the mean ± standard deviation (SD) and median(Q1 :first quartile – Q3 :third quartile). Continuous variables were compared with student test $^{\beta}$ or the ma*nn whitney u test*.*

HFO_2: High flow nasal oxygen, NIMV: Non invasive mechanical ventilation, IMV: Invasive mechanical ventilation, LOS: Length of stay, ICU:Intensive care unit, CCIS: Charlson Comorbidity Index, APACHE-II: Acute Physiology and Chronic Health Assessment Score-II, Hos: Hospitalization, LDH: Lactate Dehydrogenase, Hb: Hemoglobin, Htc: Hematocrit, PDW: Platelet distribution width, PCT: Procalcitonin, RDW: Red Cell Distribution Width, D/E: before discharge/exitus

When comparing the high TR values (combined high troponin and RDW) measured at discharge/before exitus to the low TR values (low troponin and/or RDW), those with high TR values had a statistically significantly higher rate of intubation and longer MV duration. Those with low TR values had higher Hb, Htc, PDW values at admission and before discharge/exitus, and higher PCT values before discharge/exitus. When compared to those with low TR values, those with high TR values had a higher RDW value at admission, lower platelet values before discharge/exitus, and statistically significantly higher D-dimer and LDH values measured before discharge/exitus. (Table 3).

Table-3. Comparison of variables according to the TR value measured before discharge/exitus

	TR LOW (N:134)					**TR HİGH (N:70)**					p value
	Mean	SD	Median	Q1	Q3	Mean	SD	Median	Q1	Q3	
Age	67.90	13.94	68.50	29.00	106.00	68.85	13.92	72.50	42.00	89.00	0.563*
HFO_2 duration (day)	4.59	5.82	3.00	1.00	6.00	3.87	4.52	2.50	1.00	5.00	0.606*
NIMV duration (day)	4.53	5.81	3.00	1.00	6.00	3.88	4.51	2.50	1.00	5.00	0.729*
IMV Duration (day)	4.24	7.42	0	0	5.00	6.46	9.59	2.00	0	7.50	**0.018***
LOS ICU	8.83	9.01	6.00	2.00	12.00	10.33	10.30	6.00	3.00	13.00	0.306*
LOS hospital	17.80	14.60	15.00	8.00	22.00	18.73	15.91	13.50	7.50	26.00	0.923*
CCIS	3.89	2.20	4.00	2.00	5.00	3.98	2.42	4.00	2.50	5.50	0.823*
APACHE-II	23.07	8.57	20.50	17.00	28.00	23.52	7.99	20.50	18.00	29.00	0.625*
Hos. leukocyte	13.40	7.06	12.16	8.35	16.65	13.48	6.68	12.36	9.35	16.27	0.767*
Hos.lymphocyte	0.86	0.85	0.62	0.41	1.10	0.95	1.59	0.67	0.51	1.05	0.649*
Hos. D-dimer	15.65	67.22	2.14	1.32	5.90	19.22	86.66	2.09	1.16	4.28	0.316*
Hos. LDH	634.2	743.8	530.	382.	721.	521.	354.	431	348.	635	0.13

	7	0	00	00	00	54	60	.00	00	.00	5*
Hos. Hb	13.27	3.18	13.35	12.20	14.70	11.69	2.17	11.60	9.80	13.00	**<0.001***
Hos. Hct	40.24	6.57	40.50	37.40	44.40	36.95	6.05	36.60	33.30	40.40	**<0.001***
Hos. Neutrophil	13.51	11.94	11.01	7.91	15.59	11.54	4.44	11.80	8.06	13.96	0.948*
Hos. Platelet	268.34	119.47	257.00	176.00	344.00	231.84	110.99	230.00	146.00	292.00	0.056$^{\beta}$
Hos. PDW	17.35	11.98	**16.40**	16.10	16.70	16.10	0.49	**16.10**	15.70	16.40	**<0.001***
Hos. PCT	0.53	3.25	0.26	0.18	0.34	3.07	18.58	0.23	0.16	0.30	0.153*
Hos. RDW	14.15	1.36	13.85	13.10	14.90	17.47	2.95	16.80	15.90	18.60	**<0.001***
Hos.Troponın	168.42	579.51	15.80	5.59	113.00	89.63	156.49	32.61	7.30	96.70	0.477*
D/E Hb	12.09	2.50	12.15	10.80	13.60	10.63	2.11	10.90	8.50	12.10	**<0.001***
D/E Htc	39.85	28.59	37.60	33.20	42.40	34.21	6.34	35.00	28.80	38.40	**0.001***
D/E leukocyte	14.52	7.87	12.99	8.75	18.10	15.96	7.70	14.90	10.36	19.40	0.129*
D/E lymphocyte	2.06	5.04	0.74	0.43	1.27	1.86	3.34	0.75	0.49	1.68	0.452*
D/E Neutrophil	13.32	8.46	11.79	7.64	16.90	15.32	12.23	13.65	9.74	18.03	0.139*
D/E Platelet	230.93	131.45	206.00	136.00	292.00	161.51	104.44	157.00	82.00	221.00	**<0.001***
D/E PDW	17.40	11.73	16.50	16.10	16.70	16.20	0.55	16.30	15.90	16.50	**0.001***
D/E PCT	0.23	0.12	0.22	0.15	0.29	0.17	0.10	0.18	0.09	0.24	**0.001***
D/E D-Dimer	7.66	11.67	2.70	1.18	9.33	7.53	8.02	3.84	2.30	10.80	**0.023***
D/E LDH	888.98	1819.23	491.00	328.00	731.00	1650.68	3311.08	598.00	383.00	1138.00	**0.013***
D/E Troponın	357.15	2189.93	28.25	8.10	127.60	1745.65	6582.39	107.25	39.00	451.40	**<0.001***
D/E RDW	14.55	2.94	14.30	13.40	15.20	18.56	2.86	17.50	16.70	19.50	**<0.001***

Continuous variables are expressed as the mean ± standard deviation (SD) and median(Q1 :first quartile – Q3 :third quartile). Continuous variables were compared with student test $^{\beta}$ or the mann whitney u test.*

HFO_2: High flow nasal oxygen, NIMV: Non invasive mechanical ventilation, IMV: Invasive mechanical ventilation, LOS: Length of stay, ICU:Intensive care unit, CCIS: Charlson Comorbidity Index, APACHE-II: Acute Physiology and Chronic Health Assessment Score-II, Hos: Hospitalization, LDH: Lactate Dehydrogenase, Hb: Hemoglobin, Htc: Hematocrit, PDW: Platelet distribution width, PCT: Procalcitonin, D/E: before discharge/exitus, RDW: Red Cell Distribution Width

Discussion:

In this study, aimed at demonstrating the association of troponin and RDW values with mortality in Covid-19 patients and their relationship as prognostic factors, we analyzed the values taken at the time of discharge or just before exitus. Among those with elevated troponin levels, the intubation rate was higher and the duration of mechanical ventilation was longer compared to those with lower troponin levels. For patients with higher RDW values, platelet, hemoglobin, and hematocrit levels were lower at the time of discharge or just before exitus when compared to those with lower RDW values. In cases exhibiting both high troponin and RDW values (referred to as TR high), the intubation rate was more frequent and the mechanical ventilation duration was longer. Moreover, platelet, hemoglobin, and hematokrit levels were also found to be lower upon discharge or just before exitus compared to those with low TR values. Troponin and RDW values taken at admission were also found to be high during discharge.

In patients presenting to the intensive care unit with sepsis, elevated troponin levels have been associated with a longer duration of mechanical ventilation and have also been linked with a higher risk of developing septic shock [7]. In a study examining severe Covid-19 patients, an increase in troponin value was found to be associated with higher needs for mechanical ventilation and higher mortality rates [8]. In another study, troponin value was found to be an independent risk indicator for mortality and the need for invasive mechanical ventilation in patients hospitalized due to Covid-19 [9].

While the troponin value can predict the need for mechanical ventilation and in-hospital mortality in Covid-19 patients, it cannot predict the duration of mechanical ventilation in these patients [10]. In our study as well, we found that in patients with elevated troponin and TR values, the intubation rate was higher and the duration of mechanical ventilation was longer compared to those with lower troponin and TR values. No significant difference was observed between RDW and the duration of intubation and mechanical ventilation. The relationship between elevated TR values and the rate of intubation and the duration of

mechanical ventilation was thought to be a result of elevated troponin values. Even in critically ill patients admitted to intensive care without acute coronary syndrome or cardiac dysfunction, the risk of myocardial damage is quite high [11]. There is often an imbalance between oxygen supply and demand in critically ill patients on mechanical ventilation. This condition causes dysfunction in many organs, including the myocardium. Since troponin is one of the earliest indicators of organ dysfunction, it can serve as a basis for initiating treatments aimed at improving general tissue oxygenation and perfusion early on [12].

RDW reflects erythrocyte morphology and is used in the differential diagnosis of anemias. It can also increase in conditions like systemic inflammation, nutritional disorders, ineffective erythropoiesis, and bone marrow dysfunction [13]. Especially in septic shock patients accompanied by thrombocytopenia, a high RDW at presentation is commonly observed and is associated with mortality [14]. In a meta-analysis conducted by Taneri and colleagues, it was demonstrated that hemoglobin and ferritin levels vary according to the severity of COVID-19 [15]. In our study as well, among COVID-19 patients, those who had higher RDW and TR values upon discharge or just before exitus exhibited lower levels of platelets, hemoglobin, and hematocrit. It should be kept in mind that in COVID-19 patients with elevated RDW, critical illness markers such as anemia and thrombocytopenia might also be present.

In deceased patients, while significant changes are observed in cardiac troponin levels, RDW values have been found to be one of the most effective predictive biomarkers for mortality risk in Covid-19 [16]. In a study examining 1198 patients, an

increase in RDW value was shown to be associated with an increased risk of death for adult Covid-19 patients [17]. Elevated RDW is a common finding in patients hospitalized due to Covid-19 and is present in almost half of the patients upon admission [18]. In our study, an elevated RDW was observed in 34.3% of the Covid-19 patients monitored in intensive care. However, no statistically significant relationship was found between the values of troponin, RDW, and TR measured before discharge/death within one month and the mortality rate. We believe the reason for this discrepancy from the literature is the use of different reference ranges for elevated RDW and troponin values in the studies conducted.

The study had several limitations. Being a single-center, retrospective study, the number of patients was limited. Furthermore, since our study only looked at one-month mortality and post-discharge clinical status could not be determined, long-term outcomes are unknown. There is a need for larger, multi-center studies with longer follow-up durations to validate the findings.

Conclusion

Patients with elevated troponin and TR levels have a higher rate of intubation. Additionally, the duration of mechanical ventilation is also found to be longer in these patients.

However, no relationship was found between RDW and troponin values taken before death or at the time of discharge and one-month mortality. In our clinic, for patients with elevated TR levels and detected desaturation, we believe that the early intubation practice adopted by our clinic reduces mortality.

Acknowledgements: None

References:

1. Dadras O, SeyedAlinaghi S, Karimi A, Shamsabadi A, Qaderi K, Ramezani M, Mirghaderi SP, Mahdiabadi S, Vahedi F, Saeidi S, Shojaei A, Mehrtak M, Azar SA, Mehraeen E, Fabrício A, Voltarelli FA. COVID-19 mortality and its predictors in the elderly: A systematic review. *Health science reports*, 2022; *5*(3), e657.
2. World Health Organization. WHO coronavirus (COVID-19) dashboard. Accessed November 19, 2021.https://covid19.who.int/
3. Musher DM, Abers MS, Corrales-Medina VF. Acute infection and myocardial infarction. New England Journal of Medicine, 2019; 380(2), 171-176
4. Şahin H, Poyraz E. Akut Koroner Sendromlu Hastalarda Eritrosit Dağılım Aralığının (Rdw) Değerlendirilmesi. *Kocatepe Tıp Dergisi*, 2014; *15*(2), 99-105.
5. Lippi G, Lavie CJ, Sanchis-Gomar F. Cardiac troponin I in patients with coronavirus disease 2019 (COVID-19): evidence from a meta-analysis. Progress in cardiovascular diseases, 2020; 63(3), 390.)
6. Guaní-Guerra E, Torres-Murillo B, Muñoz-Corona C, Rodríguez-Jiménez JC, Macías AE, Scavo-Montes DA, Alvarez JA. Diagnostic Accuracy of the RDW for Predicting Death in COVID-19. Medicina. 2022; 58(5): 613.
7. Abdalla M, Sohal S, Mohamed W. Effect of troponin I elevation on duration of mechanical ventilation and length of intensive care unit stay in patients with Sepsis. Journal of clinical medicine research, 2019; 11(2), 127.
8. LFK Wardhani, MY Alsagaff, IP Dewi, YH Oktaviono, CP Budianto, H Susilo, BB Dharmadjati, A Subagjo, BS Pikir, N Luthfah, RA Nugraha, TS Putra, RI Gunadi, MJ Al-Farabi, Y Azmi. The relevance of hs-troponin and global longitudinal strain in predicting the need for mechanical intubation in severe COVID-19 patients. European Heart Journal: Acute Cardiovascular Care, 2023; 12(Supplement_1), zuad036-123.
9. Almeida Junior GLGD, Braga F, Jorge JK, Nobre GF, Kalichsztein M, Faria PDMPD, Bussade B, Penna GL, Alves VO, Pereira MA, Gorgulho PDC, Faria MRDSED, Drumond LE, Carpinete FBS, Neno ACLB, Neno ACDA. Prognostic value of troponin-T and B-type natriuretic peptide in patients hospitalized for COVID-19. Arquivos Brasileiros de Cardiologia, 2020; 115, 660-666.
10. Hanna HWZ, Salam R, Youssef MM, El Aziz RA, Saeed M (2023). Cardiac Troponin-I and COVID-19: a prognostic

tool for in-hospital mortality. Alexandria Journal of Medicine, 2023; 59(1), 59-67.

11. Quenot JP, Le Teuff G, Quantin C, Doise JM, Abrahamowicz M, Masson D,Blettery B. Myocardial injury in critically ill patients: relation to increased cardiac troponin I and hospital mortality. Chest, 2005; 128(4), 2758-2764.
12. Bardaji A, Carrasquer A, Sanchez-Gimenez R, Lal-Trehan N, del-Moral-Ronda V, Peiro OM, Bonet G, Castilho G, Fort-Gallifa I, Benavent C, Recio G, Gutiérrez C, Villavicencio C, Auguet T, Carme Boquéb C. Prognostic implications of myocardial injury in patients with and without COVID-19 infection treated in a university hospital. Revista Española de Cardiología (English Edition), 2021; 74(1), 24-32.
13. Salvagno GL, Sanchis-Gomar F, Picanza A, Lippi G. Red blood cell distribution width: A simple parameter with multiple clinical applications. Crit Rev Clin Lab Sci 2015; 52: 86-105.
14. Ling J, Liao T, Wu Y, Wang Z, Jin H, Lu F, Fang M. Predictive value of red blood cell distribution width in septic shock patients with thrombocytopenia: A retrospective study using machine learning. Journal of Clinical Laboratory Analysis, 2021; 35 (12), e24053.
15. Taneri PE, Gómez-Ochoa SA, Llanaj E, Raguindin, PF, Rojas LZ, Roa-Díaz ZM, Salvador D, Groothof D, Minder B, Kopp-Heim D, Hautz WE, Eisenga MF, Franco OH, Glisic M, Muka T. Anemia and iron metabolism in COVID-19: a systematic review and meta-analysis. European journal of epidemiology, 2020; 35, 763-773.
16. Huyut MT, Huyut Z, Ilkbahar F, Mertoğlu C. What is the impact and efficacy of routine immunological, biochemical and hematological biomarkers as predictors of COVID-19 mortality?. International Immunopharmacology, 2022; 105, 108542.
17. Foy BH, Carlson JC, Reinertsen E, Valls RP, Lopez RP, Palanques-Tost E, Mow C, Westover MB, Aguirre AD, Higgins JM. Elevated RDW is associated with increased mortality risk in COVID-19. Med Rxiv, 2020; 2020-05.
18. Ramachandran P, Gajendran M, Perisetti A, Elkholy KO, Chakraborti A, Lippi G, Goyal H. Red blood cell distribution width in hospitalized COVID-19 patients. Frontiers in Medicine, 2022; 8, 582403.