Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Research Article

J Exp Clin Med
2022; 39(4): 1134-1142
doi: 10.52142/omujecm.39.4.37

Evaluation of demographic characteristics and laboratory results of patients with Covid-19 treated in the intensive care unit

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Received: 11.07.2022 • **Accepted/Published Online:** 22.07.2022 • **Final Version:** 29.10.2022

Abstract

We aimed to investigate the clinical features, hemodynamic and respiratory profiles as well as prognostic outcomes of critically sick COVID-19 patients admitted to intensive care units (ICUs). This retrospective study was performed using data derived from 99 adult patients treated in the ICU. Demographic and clinical data as well as hemodynamic and respiratory profiles, therapeutic outcomes were recorded. The relationship between these features and ICU stay was sought. The average age was 65.94 ± 14.93 years (24 to 96), and 73 patients (73.7%) had comorbidities. Smokers constituted 13.1% of the Covid-19 patient population (n=13) in ICU. Thirty-one cases (31.3%) had received at least one dose of Covid-19 vaccine and 63 patients (63.6%) died in the ICU after their initial hospitalization. Blood products were utilized in 29 patients (29.3%) and delta mutation was detected in 23 (23.2%) of ICU patients. The mean duration of ICU stay was 16.90 ± 11.41 days (1 to 60). The duration of ICU stay was remarkably different between groups receiving different antibiotic regimens ($p<0.001$). There was no significant relationship between the duration of ICU stay and blood groups ($p=0.052$), systolic ($p=0.572$) and diastolic blood pressure ($p=0.098$) and initial arterial oxygen saturation ($p=0.223$). We detected a high mortality rate in our series with severe COVID-19 infection treated in ICU. These data are critical for understanding the impact of COVID-19 on our hospitals, identifying areas for clinical management improvement, and allowing for continuous international and temporal comparisons of COVID-19 patient outcomes.

Keywords: COVID-19, treatment, intensive care unit, demographic, laboratory

1. Introduction

The novel Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) disease (COVID-19) first appeared in Wuhan, China, and quickly spread throughout the world. Almost 30 million people were affected, and 1 million people have died as a result (1). Although the majority of patients enter with minor illnesses and recover, life-threatening illnesses can occur, necessitating admission in an Intensive Care Unit (ICU). Acute Respiratory Distress Syndrome (ARDS), sepsis, multi-system organ failure, hyperinflammation, neurological and extrapulmonary signs, and thromboembolic illness are all symptoms of severe COVID-19 (2). Old age, the prevalence of comorbidities such as hypertension, diabetes mellitus (DM), morbid obesity, chronic lung illness, coronary artery disease, chronic renal disease, and malignancies were all linked to a poor prognosis. Lymphocytopenia and elevated levels of inflammatory biomarkers such as C-reactive protein, lactate dehydrogenase, and interleukin-6, among others, were found to be associated with a bad prognosis (3).

The COVID-19 pandemic is still a major public health concern around the world. Despite the fact that scientific knowledge of COVID-19 is growing by the day, there is a scarcity of data on the presenting symptoms and outcomes of patients who need to be admitted to critical care units (ICUs). As a result, the current study looked at the clinical features and risk variables of critically sick COVID-19 patients admitted to ICUs.

Acute respiratory distress syndrome is present in nearly all COVID-19 patients who require mechanical ventilation (ARDS). ARDS is a life-threatening, progressive inflammatory lung disease marked by diffuse alveolar destruction and fast clinical deterioration. COVID-19 patients, on the other hand, have a distinct clinical trajectory than most other ARDS patients, according to specialists around the world. A number of patient features have been linked to a higher probability of a severe disease course (4, 5).

COVID-19 patients have a different illness trajectory than most other ARDS patients, according to specialists around the world (6). COVID-19 infection causes respiratory failure in 25-70 percent of hospitalized patients, necessitating invasive mechanical ventilation (IMV) and treatment in the intensive care unit (ICU) (7). Given the different capacities to prevent, test for, and treat COVID-19, a better understanding of the variables connected to mortality in patients requiring critical

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care and mechanical ventilation is necessary (8).

The COVID-19 pandemic is still a major public health concern around the world. Despite the fact that scientific knowledge of COVID-19 is growing by the day, there is a scarcity of data on the characteristics and outcomes of patients who need to be admitted to ICUs. As a result, the current study investigated the clinical features, hemodynamic and respiratory profiles as well as prognostic outcomes of critically sick COVID-19 patients admitted to ICUs.

2. Materials and methods

This retrospective, single-center study was performed using data derived from the electronic hospital database of a tertiary care center (Prof. Dr.Murat Dilmener Emergency Hospital) after receiving permission from the Institutional Review Board. A total of 99 adult COVID-19 patients (aged 18 or older) who have been diagnosed with COVID-19 and admitted to the hospital's ICUs, between April 2021 and June 2021 were included in this study. The approval of the local institutional review board had been obtained before the study (11/11/2021-296 Health Sciences University Kanuni Sultan Süleyman Training and Research Hospital Clinical Resesarch Ethics Committee.) and adherence to the principles announced in the Helsinki Declaration was provided.

In all patients, reverse transcriptase-polymerase chain reaction (RT-PCR) was employed to confirm the diagnosis of COVID-19 disease in addition to particular computed thoracic tomography findings. Applicable data included age, body-mass index (BMI), comorbidities, blood group, smoking habit, history of vaccination for COVID-19, antibiotic treatment, culture results, prognostic outcomes, and duration of ICU stay.

Chronic comorbidities were chosen using pre-existing International Classification of Diseases classifications based on previously reported data (ICD-10). Cardiovascular illness, pulmonary disease, hypertension, diabetes, diabetes mellitus, renal disease, liver disease, and a history of a solid malignant tumor were among the conditions.

The Turkish Ministry of Health classified our hospital as a pandemic institution. Only moderate and severe COVID-19 patients needing an ICU stay were examined in this study. Patients under the age of 18, pregnant women, patients with terminal cancer, and patients with one or more hematological illnesses were excluded from the study.

The research was carried out per the Declaration of Helsinki's Good Clinical Practice principles. Since the study was retrospective, informed consent was not required. The data on baseline demographic parameters, comorbidities, interventions administered, and hospital outcomes were gathered on admission and on hospital discharge. Patients were treated according to local standards of medical care. By the time the data was analyzed, and the study conclusions were published, all the patients had either been discharged alive from the ICU or had died. Patients who were mechanically ventilated through endotracheal intubation and admitted to the ICU for hypoxemic respiratory failure were selected.

2.1. Statistical analysis

Data were analyzed using Statistical Package for Social Sciences program version 21.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as means (standard deviations) and categorical variables were demonstrated as frequencies and percentages. Missing data were not imputed. Independent Samples and Kruskal-Wallis tests were used to compare variables between groups.

2.2. Outcome parameters

Baseline descriptives under investigation include age, body-mass index (kg/m2), comorbidities, blood group, smoking habit, history of vaccine, antibiotic treatment regimen, culture results, prognostic outcome, and the duration of ICU stay were extracted from the hospital database.

3. Results

In this study, we enrolled 99 patients on mechanical ventilation who tested positive for COVID-19. Baseline demographics, patient comorbidities, data about disease progression, and treatment interventions are summarized in Table 1. The average age was 65.94 ± 14.93 years (24 to 96), and the average BMI was 29.83 ± 6.05 kg/m2 (17.65 to 57.53).

Table 1. Baseline descriptives and clinical characteristics in our series (n=99)

Variable		n	%
Comorbidity	No	20	20.2
	Yes	73	73.7
	Missing data	6	6.1
Blood group	A	31	31.3
	B	14	14.1
	0	27	27.3
	AB	2	2.0
	Missing data	25	25.3
Rh factor	No	10	10.1
	Yes	64	64.6
	Missing data	25	25.3
Smoking	No	70	70.7
	Yes	13	13.1
	Missing data	16	16.2
Vaccine	No	54	54.5
	Yes	31	31.3
	Missing data	14	14.1
Antibiotic regimen	Tazocin	18	18.2
	Ceftriaxone	3	3.0
	Combined	69	69.7
	Missing data	9	9.1
Culture results	Negative	35	35.4
	Positive	48	48.5
	Missing data	16	16.1
Delta variant	Negative	46	46.5
	Positive	23	23.2
	Missing data	30	30.3
Use of blood products	No	56	56.6
	Yes	29	29.3
	Missing data	14	14.1

In this series, 73 patients (73.7%) had comorbidities while 20 cases (20.2%) did not have any systemic diseases. The number and percentage of patients with blood groups A, B, AB, and 0 were 31 (31.3%), 14 (14.1%), 2 (2.0%), and 27 (27.3%), respectively. Rh factor was positive in 64 patients (64.6%), and negative in 10 (10.1%), respectively. Smokers constituted 13.1% of the Covid-19 patient population (n=13) in ICU. Thirty-one cases (31.3%) had received at least one dose of Covid-19 vaccine. The antibiotics administered included a combined regimen (n=69, 69.7%), ceftriaxone (n=3, 3%), and tazocin (n=18, 18.2%). Culture results were positive in 35 (35.4%) cases.

In terms of prognostic outcome, 63 patients (63.6%) died in the ICU after their initial hospitalization, while 24 patients (24.2%) were discharged from ICU. The mean duration of ICU stay was 16.87 ± 11.41 days (1 to 60). Blood products were utilized in 29 patients (29.3%) and delta mutation was detected in 23 (23.2%) of ICU patients. The modes of ventilatory support were continuous positive airway pressure (CPAP) (n=37, 37.4%), high flow nasal oxygen (HFNO) (n=23, 23.2%), CPAP and HFNO (n=2, 2.0%), and nasal oxygen (n=4, 4.0%), respectively. The mean duration of ICU stay was 16.90 ± 11.41 days (1 to 60). Table 2 outlines the characteristics and distribution of patients in ICU per clinical, hemodynamic, and respiratory variables under investigation. There was no significant relationship between the duration of ICU stay and blood groups (p=0.052), systolic (p=0.572) and diastolic blood pressure (p=0.098) at admission as well as initial arterial oxygen saturation (p=0.223). The duration of ICU stay was remarkably different between groups per antibiotic regimen (p<0.001), whereas there was no difference between antibiotic treatment groups as for systolic (p=0.366), diastolic (p=0.895), and arterial oxygen saturation at admission (p=0.110).

Table 3 The results of measurements at initial admission and at discharge or before mortality were compared. Our data yielded that serum levels of BUN (p<0.001), procalcitonin (p=0.001), pro-brain natriuretic peptide (BNP) (p<0.001), sodium (p=0.008), lactate dehydrogenase (p<0.001), lactate (p=0.001), INR (p=0.001), fibrinogen (p=0.007), ferritin (p=0.001), D-dimer (p=0.014), CRP (p<0.001), creatinine (p=0.006), basophil count (p=0.003), AST (p=0.013), and APTT (p<0.001) were significantly higher in Covid-19 patients ending up with mortality. On the other hand, monocyte (p=0.002), platelet (p<0.001), and basophil (p=0.003) counts as well as hemoglobin (p=0.003) and pH levels (p<0.001) were higher in patients who were discharged from ICU after treatment.

4. Discussion

There is a need for a national clinical characterization data infrastructure for hospital-admitted patients that is quickly accessible for clinicians, researchers, public health officials, and policymakers to inform understanding of baseline characteristics, treatment regimens, and hospital use, as well as to benchmark disease severity across waves of outbreaks and across different causative agents. This approach would be useful in both pre-and post-pandemic situations. Thus, we present our experience with adult COVID-19 patients who were treated in ICU in our tertiary care center and describe the demographic, clinical, and therapeutic features of our series are described.

Namendys-Silva et al. reported that most COVID-19 patients admitted to ICUs were males over 57 years old with hypertension and diabetes, and 6% were healthcare workers (9). More than 60% of patients with critical COVID-18 were men, according to prior investigations (2). Patients admitted to the ICU on average were 57 years old and patients with hypertension and diabetes mellitus had significantly worse survival rates, although neither of these comorbidities was an independent predictor of death. Invasive mechanical ventilation was administered to all patients, and virtually all of them received vasopressors (2). In previous research, these individuals' mortality rates ranged from 35.2%-72% (2, 10, 11).

Our mortality was consistent with these publications indicating a remarkably high risk of fatality in patients with critical COVID-19. Patients treated with severe COVID-19 in the fall had better outcomes than those admitted in the summer, with lower mortality and shorter ICU stays (12). This is most likely owing to a better understanding of COVID-19 and advancements in therapeutic options.

Age, malignancy, insurance status, and ethnicity were all linked to a higher 30-day death rate in mechanically ventilated COVID-19 patients. These findings support our hypothesis that specific patient features are linked to an increased risk of death in our patient population (8). The capacity to prevent and treat COVID-19 has varied over the World (8). Our findings add to the growing body of knowledge about the COVID-19 pandemic's critical care consequences.

COVID-19-infected patients' overall mortality may be reduced if preventive measures are improved in the elderly (13). More research is needed, however, to determine which specific protective strategies should be recommended for at-risk populations like the elderly, as well as the extent to which such treatments reduce COVID-19-related mortality (14).

The most common presenting symptoms were fever and cough, while the most common comorbidities were hypertension, diabetes, and chronic heart disease (15). There has been confusion about the best modalities of oxygenation and ventilation support for severely sick COVID-19 patients, which has likely contributed to their low utilization in this population.

Table 2. An overview of distribution of hemodynamic and respiratory variables across clinical feature groups

Variable			N	Mean ± SD	Minimum	Maximum
Comorbidity	No data	ICU stay	2	10.00 ± 8.48	4	16
		Systolic BP	3	132.00 ± 23.06	110	156
		Diastolic BP	3	83.67 ± 13.87	72	99
		Pulse rate	3	90.67 ± 34.60	65	130
		Respiratory rate	3	33.67 ± 9.07	24	42
		Arterial oxygen saturation	3	84.33 ± 10.17	74	94
	No	ICU stay	19	18.63 ± 14.00	4	16
		Systolic BP	19	134.32 ± 19.94	95	165
		Diastolic BP	19	71.21 ± 11.40	51	95
		Pulse rate	19	93.21 ± 16.85	56	115
		Respiratory rate	18	28.67 ± 7.80	18	42
		Arterial oxygen saturation	19	87.74 ± 5.57	73	94
	Yes	ICU stay	64	16.56 ± 10.68	1	50
		Systolic BP	62	142.69 ± 30.80	60	240
		Diastolic BP	62	74.65 ± 16.74	30	160
		Pulse rate	62	96.47 ± 21.30	56	160
		Respiratory rate	62	30.84 ± 8.17	16	51
		Arterial oxygen saturation	65	84.98 ± 9.26	56	96
Blood group	No data	ICU stay	14	9.79 ± 5.16	4	23
		Systolic BP	18	141.67 ± 33.23	100	240
		Diastolic BP	18	79.11 ± 23.42	60	160
		Pulse rate	18	100.72 ± 23.42	72	160
		Respiratory rate	18	28.17 ± 9.04	16	50
		Arterial oxygen saturation	18	86.39 ± 6.96	70	96
	0	ICU stay	27	19.85 ± 13.02	4	50
		Systolic BP	25	140.40 ± 35.54	60	230
		Diastolic BP	25	71.56 ± 15.30	30	110
		Pulse rate	25	97.08 ± 18.73	63	130
		Respiratory rate	25	31.36 ±7.58	18	47
		Arterial oxygen saturation	26	84.04 ± 9.15	61	93
	A	ICU stay	29	15.76 ± 8.82	4	35
		Systolic BP	27	136.70 ± 21.22	95	190
		Diastolic BP	27	70.70 ± 10.70	47	90
		Pulse rate	27	94.41 ± 18.75	56	126
		Respiratory rate	26	29.46 ± 7.66	17	42
		Arterial oxygen saturation	28	87.54 ± 7.69	60	96
	B	ICU stay	13	22.92 ± 13.41	5	60
		Systolic BP	12	147.83 ± 22.11	110	190
		Diastolic BP	12	80.25 ± 9.32	70	96
		Pulse rate	12	87.62 ± 24.17	56	130
		Respiratory rate	12	32.25 ± 6.86	22	44
		Arterial oxygen saturation	13	84.85 ± 9.32	56	92
	AB	ICU stay	2	3.00 ± 2.83	1	5
		Systolic BP	2	135.00 ± 7.07	130	140
		Diastolic BP	2	73.50 ± 4.95	70	77
		Pulse rate	2	93.00 ± 26.87	74	112
		Respiratory rate	2	42.50 ± 12.02	34	51
		Arterial oxygen saturation	2	75.00 ±19.80	61	89
Rh factor	No data	ICU stay	14	9.79 ± 5.16	4	23
		Systolic BP	18	141.67 ± 33.22	100	240
		Diastolic BP	18	79.11 ± 23.42	60	160
		Pulse rate	18	100.72 ± 23.42	72	160
		Respiratory rate	18	28.17 ± 9.04	16	50
		Arterial oxygen saturation	18	86.39 ± 6.96	70	96
	Negative	ICU stay	8	22.13 ± 13.67	5	50
		Systolic BP	8	152.13 ± 28.13	121	190
		Diastolic BP	8	76.63 ± 9.41	64	96
		Pulse rate	8	90.50 ± 25.65	56	130
		Respiratory rate	7	29.14 ± 8.42	21	44
		Arterial oxygen saturation	8	87.00 ± 6.61	72	93
	Positive	ICU stay	63	17.78 ± 11.58	1	60
		Systolic BP	58	138.41 ± 27.04	60	230
		Diastolic BP	58	72.33 ± 13.01	30	110
		Pulse rate	58	94.60 ± 19.08	56	130
		Respiratory rate	58	31.34 ± 7.73	17	51

		Arterial oxygen saturation	61	85.13 ± 9.30	56	96
Smoking	No data	ICU stay	14	12.00 ± 6.63	4	23
		Systolic BP	13	129.54 ± 21.97	87	160
		Diastolic BP	13	73.08 ± 13.21	47	99
		Pulse rate	13	92.15 ± 21.92	64	130
		Respiratory rate	14	30.43 ± 6.73	19	44
		Arterial oxygen saturation	15	84.73 ± 9.62	56	94
	No	ICU stay	60	17.65 ± 11.80	4	60
		Systolic BP	59	140.66 ± 27.93	60	240
		Diastolic BP	59	73.59 ± 16.45	30	160
		Pulse rate	59	96.12 ± 20.63	56	160
		Respiratory rate	59	29.49 ± 7.87	16	50
		Arterial oxygen saturation	57	86.20 ± 7.66	60	96
	Yes	ICU stay	11	18.82 ± 3.22	1	50
		Systolic BP	12	151.00 ± 34.93	95	230
		Diastolic BP	12	78.33 ± 14.26	51	110
		Pulse rate	12	96.25 ± 20.85	56	120
		Respiratory rate	12	35.17 ± 9.48	17	51
		Arterial oxygen saturation	12	83.42 ± 11.73	61	96
Vaccine	No data	ICU stay	11	10.09 ± 6.70	4	23
		Systolic BP	11	140.82 ± 40.02	87	240
		Diastolic BP	11	82.27 ± 29.18	43	160
		Pulse rate	11	103.73 ± 31.53	64	160
		Respiratory rate	12	33.33 ± 8.09	23	50
		Arterial oxygen saturation	12	82.08 ± 10.93	56	94
	No	ICU stay	49	18.22 ± 12.64	1	60
		Systolic BP	48	139.46 ± 25.23	95	230
		Diastolic BP	48	74.58 ± 11.42	51	110
		Pulse rate	48	92.00 ± 18.39	56	120
		Respiratory rate	47	29.70 ± 7.58	18	51
		Arterial oxygen saturation	50	86.66 ± 7.73	61	96
	Yes	ICU stay	25	17.20 ± 9.64	4	50
		Systolic BP	25	142.08 ± 29.78	60	190
		Diastolic BP	25	69.88 ± 13.61	30	96
		Pulse rate	25	98.68 ± 18.23	65	130
		Respiratory rate	24	30.54 ± 9.04	16	47
		Arterial oxygen saturation	25	85.04 ± 8.91	60	96
Antibiotic regimen	No data	ICU stay	3	7.33 ± 4.16	4	12
		Systolic BP	5	143.20 ± 18.86	110	156
		Diastolic BP	5	78.80 ± 17.17	60	99
		Pulse rate	5	108.80 ±20.85	74	130
		Respiratory rate	5	31.80 ± 9.52	17	40
		Arterial oxygen saturation	5	88.60 ± 6.54	80	96
	Tazocin	ICU stay	16	11.19 ± 10.48	4	46
		Systolic BP	18	137.06 ± 32.40	100	230
		Diastolic BP	18	75.00 ± 12.69	60	110
		Pulse rate	18	87.89 ± 17.43	64	137
		Respiratory rate	18	25.56 ± 5.48	18	34
		Arterial oxygen saturation	17	89.41 ± 2.72	84	94
	Ceftriaxone	ICU stay	3	5.33 ± 4.51	1	10
		Systolic BP	3	130.00 ± 10.00	120	140
		Diastolic BP	3	74.67 ± 2.52	72	77
		Pulse rate	3	97.67 ± 15.63	81	112
		Respiratory rate	3	35.33 ± 14.64	22	51
		Arterial oxygen saturation	3	79.67 ± 16.29	61	91
	Combined	ICU stay	63	19.32 ± 11.11	4	60
		Systolic BP	58	141.76 ± 28.77	60	240
		Diastolic BP	58	73.52 ± 16.86	30	160
		Pulse rate	58	96.64 ± 21.35	56	160
		Respiratory rate	57	31.65 ± 7.87	16	50
		Arterial oxygen saturation	62	84.55 ± 9.12	56	96
Culture results	No data	ICU stay	2	23.50 ± 27.58	4	43
		Systolic BP	6	127.67 ± 21.18	110	156
		Diastolic BP	6	73.33 ± 12.96	64	99
		Pulse rate	6	107.67 ± 24.37	77	137
		Respiratory rate	6	25.00 ± 6.54	17	35
		Arterial oxygen saturation	6	87.67 ± 8.64	72	96

	Negative	ICU stay	35	14.06 ± 11.57	4	60
		Systolic BP	34	144.47 ±32.88	60	240
		Diastolic BP	34	76.00 ±19.66	30	160
		Pulse rate	34	99.32 ± 20.45	64	160
		Respiratory rate	35	29.80 ± 7.98	16	50
		Arterial oxygen saturation	35	86.20 ± 8.06	61	94
	Positive	ICU stay	48	18.65 ± 10.43	1	50
		Systolic BP	44	139.02 ± 25.42	87	230
		Diastolic BP	44	72.91 ± 12.29	47	110
		Pulse rate	44	90.93 ± 19.49	56	126
		Respiratory rate	42	31.81 ± 8.14	17	51
		Arterial oxygen saturation	46	84.80 ± 9.08	56	96
Delta variant	No data	ICU stay	17	19.53 ± 15.32	4	50
		Systolic BP	18	142.72 ± 23.53	110	180
		Diastolic BP	18	75.00 ± 10.80	60	99
		Pulse rate	18	103.33 ± 21.12	56	137
		Respiratory rate	18	29.61 ± 8.11	17	44
		Arterial oxygen saturation	19	86.53 ± 9.19	61	96
	No	ICU stay	46	14.52 ± 10.48	1	60
		Systolic BP	45	142.58 ± 33.91	60	240
		Diastolic BP	45	74.80 ± 19.13	30	160
		Pulse rate	45	96.67 ± 20.73	63	160
		Respiratory rate	45	31.77 ± 8.30	16	51
		Arterial oxygen saturation	44	85.56 ± 7.90	61	94
	Yes	ICU stay	22	19.73 ± 8.98	8	46
		Systolic BP	21	133.81 ± 17.45	100	172
		Diastolic BP	21	72.19 ± 10.19	47	90
		Pulse rate	21	86.38 ± 17.32	56	126
		Respiratory rate	21	28.48 ± 7.47	17	44
		Arterial oxygen saturation	23	84.78 ± 9.68	56	94
Use of blood products	No data	ICU stay	2	4.00 ± 0.00	4	4
		Systolic BP	5	131.20 ± 21.62	110	156
		Diastolic BP	5	74.00 ± 14.37	64	99
		Pulse rate	5	107.20 ± 27.22	77	137
		Respiratory rate	5	24.60 ± 7.23	17	35
		Arterial oxygen saturation	6	87.00 ± 8.48	72	96
	No	ICU stay	56	12.72 ± 7.25	1	32
		Systolic BP	53	144.28 ± 28.98	87	240
		Diastolic BP	53	75.89 ± 16.92	47	160
		Pulse rate	53	95.11 ± 19.57	56	160
		Respiratory rate	52	30.73 ± 7.80	16	51
		Arterial oxygen saturation	54	85.96 ± 7.00	61	94
	Yes	ICU stay	27	26.44 ± 12.83	9	60
		Systolic BP	26	134.41 ± 28.00	60	180
		Diastolic BP	26	70.77 ± 12.81	30	90
		Pulse rate	26	94.12 ± 21.71	63	130
		Respiratory rate	26	31.08 ± 8.65	17	47
		Arterial oxygen saturation	27	84.44 ± 11.31	56	96

SD: standard deviation; BP: blood pressure; ICU: intensive care unit

Table 3. A comparative overview of laboratory parameters in Covid-19 patients in ICU

Variable	Prognostic outcome	Time	Minimum	Maximum	Mean	Standard deviation	p-value
WBC count	Discharged	Initial	2.50	22.90	10.50	5.77	0.277
		Final	1.24	28.20	10.47	5.01	
	Mortality	Initial	2.86	96.80	14.58	12.24	
		Final	0.46	163.17	17.16	21.81	
BUN	Discharged	Initial	14.7	81.9	43.45	17.20	<0.001*
		Final	11.9	147.5	41.26	29.81	
	Mortality	Initial	17.1	248.0	69.82	46.93	
		Final	23.7	380.0	138.03	76.49	
Troponin T	Discharged	Initial	0.0007	0.1340	0.214	0.035	0.662
		Final	0.0040	28.30	1.92	6.23	
	Mortality	Initial	0.0060	36.52	3.156	8.00	
		Final	0.0030	101.10	2.128	14.14	
spO_2	Discharged	Initial	42.2	98.30	80.83	19.08	0.482
		Final	33.9	99.60	86.65	16.16	
	Mortality	Initial	29.40	100.0	84.62	15.94	

		Final	51.20	99.40	86.62	11.73	
Procalcitonin	Discharged	Initial	0.02	4.01	0.41	0.84	0.001*
		Final	0.02	1.56	0.18	0.32	
	Mortality	Initial	0.02	26.70	2.02	5.10	
		Final	0.17	100.00	12.25	18.30	
ProBNP	Discharged	Initial	21.64	8307.00	1070.22	1791.55	<0.001*
		Final	10.00	4347.00	634.33	1010.68	
	Mortality	Initial	26.57	35000	3783.43	7246.43	
		Final	26.30	35000	15407.78	14968.06	
pO_2	Discharged	Initial	29.0	116.0	60.86	25.57	0.872
		Final	27.2	151.0	73.78	35.06	
	Mortality	Initial	25.3	215.0	68.65	37.45	
		Final	38.2	169.0	81.15	31.93	
Platelet count	Discharged	Initial	88000	359000	243960	77602	<0.001*
		Final	120000	600000	320820	115171	
	Mortality	Initial	84000	581000	252620	107557	
		Final	12000	571000	153520	117922	
pH	Discharged	Initial	7.30	7.63	7.43	0.065	<0.001*
		Final	7.38	7.51	7.45	0.032	
	Mortality	Initial	7.13	7.90	7.42	0.113	
		Final	6.83	7.56	7.18	0.179	
pCO_2	Discharged	Initial	20.8	70.7	42.329	10.468	0.062
		Final	32.0	83.3	45.530	12.019	
	Mortality	Initial	24.0	105.0	42.56	13.533	
		Final	28.1	97.7	54.68	16.418	
Neutrophil count	Discharged	Initial	1.83	21.80	9.41	5.56	0.321
		Final	3.72	23.45	8.33	3.97	
	Mortality	Initial	2.47	28.05	12.03	5.77	
		Final	0.36	44.30	12.83	9.39	
Sodium	Discharged	Initial	133.0	158.0	137.91	5.00	0.008*
		Final	128.0	143.0	136.30	3.43	
	Mortality	Initial	124.0	153.0	137.25	5.36	
		Final	126.0	161.0	141.74	7.76	
Potassium	Discharged	Initial	2.98	5.27	4.31	0.69	0.424
		Final	3.38	6.36	4.38	0.65	
	Mortality	Initial	3.47	5.96	4.38	0.58	
		Final	2.86	7.94	4.97	1.31	
Monocyte count	Discharged	Initial	0.03	1.09	0.37	0.25	0.002*
		Final	0.22	1.32	0.74	0.33	
	Mortality	Initial	0.02	1.72	0.40	0.31	
		Final	0.00	1.47	0.40	0.38	
Lymphocyte count	Discharged	Initial	0.14	1.85	0.78	0.46	0.776
		Final	0.61	3.45	1.75	0.83	
	Mortality	Initial	0.15	1.81	0.62	0.32	
		Final	0.08	8.65	1.49	1.52	
LDH	Discharged	Initial	65.3	1444.0	487.55	279.64	<0.001*
		Final	193.0	569.0	324.48	83.50	
	Mortality	Initial	202.0	1075.0	471.48	190.24	
		Final	230.0	5660.0	990.71	1134.91	
Lactate	Discharged	Initial	0.7	5.5	2.12	1.13	0.001*
		Final	0.7	4.1	1.98	0.97	
	Mortality	Initial	0.8	8.6	2.36	1.20	
		Final	0.6	21.0	5.66	4.07	
INR	Discharged	Initial	0.9	1.87	1.13	0.21	0.001*
		Final	0.9	1.66	1.10	0.18	
	Mortality	Initial	0.9	4.87	1.25	0.54	
		Final	0.9	4.24	1.65	0.64	
Hemoglobin	Discharged	Initial	8.2	15.3	12.82	1.80	0.003*
		Final	9.6	15.8	12.19	1.80	
	Mortality	Initial	6.6	16.6	11.86	2.04	
		Final	6.7	16.7	9.64	1.88	
Glucose	Discharged	Initial	91.2	592.00	187.28	103.50	0.816
		Final	71.5	332.00	140.23	73.68	
	Mortality	Initial	28.4	709.00	194.98	96.88	
		Final	36.3	328.80	164.22	78.06	
Fibrinogen	Discharged	Initial	260	923	600.83	158.77	0.007*

		Final	212	950	501.05	178.81	
	Mortality	Initial	148	1200	626.54	209.64	
		Final	311	1200	769.49	279.24	
Ferritin	Discharged	Initial	62.95	4738	999.63	964.07	0.001*
		Final	57.70	1868	653.84	424.13	
	Mortality	Initial	31.14	2935	943.63	721.97	
		Final	20.00	20000	4459.15	5092.95	
Eosinophil count	Discharged	Initial	0.00	0.17	0.117	0.034	0.036*
		Final	0.00	1.06	0.144	0.243	
	Mortality	Initial	0.00	0.16	0.013	0.028	
		Final	0.00	0.78	0.056	0.150	
D-dimer	Discharged	Initial	0.46	5.90	1.48	1.40	0.014*
		Final	0.54	5.90	1.44	1.25	
	Mortality	Initial	0.35	18.96	2.27	2.79	
		Final	0.56	6.95	3.45	1.87	
CRP	Discharged	Initial	2.90	294.00	110.36	77.71	<0.001*
		Final	0.96	152.18	27.91	35.09	
	Mortality	Initial	1.44	412.00	115.23	84.65	
		Final	6.69	516.23	220.32	135.58	
Creatinine	Discharged	Initial	0.40	1.63	0.79	0.27	0.006*
		Final	0.36	1.88	0.71	0.38	
	Mortality	Initial	0.30	4.06	1.08	0.76	
		Final	0.36	6.80	2.07	1.43	
Basophil count	Discharged	Initial	0.01	0.16	0.043	0.038	0.003*
		Final	0.004	0.10	0.030	0.023	
	Mortality	Initial	0.00	0.20	0.034	0.031	
		Final	0.00	0.62	0.079	0.104	
AST	Discharged	Initial	16.2	118.0	40.85	23.80	0.013*
		Final	12.3	108.9	28.90	19.06	
	Mortality	Initial	12.0	356.9	46.01	57.31	
		Final	0.0	2498.6	321.06	538.89	
ALT	Discharged	Initial	8.9	128.9	41.33	27.58	0.066
		Final	7.9	161.5	53.71	41.46	
	Mortality	Initial	4.8	288.7	42.00	50.82	
		Final	1.9	730.0	106.17	138.35	
APTT	Discharged	Initial	22.4	35.9	29.52	3.87	<0.001*
		Final	20.0	40.2	29.56	4.95	
	Mortality	Initial	20.3	53.1	30.52	7.05	
		Final	25.2	117.7	51.10	20.00	

*: statistically significant; WBC: White blood cell count; BUN: blood urea nitrogen; BNP: brain natriuretic peptide; LDH: lactate dehydrogenase; INR: international normalized ratio; CRP: C-reactive protein; AST: aspartate transaminase; ALT: alanine transaminase; APTT: activated partial thromboplastin time

Concerns about aerosolization and nosocomial amplification of COVID-19 transmission have centered on the timing of intubation and mechanical ventilation, as well as the possible risk to health care workers in adopting non-invasive ventilation and high-flow nasal oxygen (16). Due to the impossibility to fully account for confounding, eternal time, and treatment indication bias in observational studies like this one, we have not explored the connection of specific pharmaceutical or breathing treatments with clinical outcomes (15).

In hospitalized COVID-19 patients, sociodemographics, co-morbidities, and inpatient characteristics have been demonstrated to influence outcomes (12). Older age, numerous co-morbid diseases, hypertension, and obesity with a BMI of less than 35 kg/m2 were all shown to be substantially linked with an elevated risk of death in our analysis, which is consistent with the current literature (17).

COVID-19 infection can spread quickly, especially in people who have a lot of risk factors (18). Advanced age and male gender related to enhanced mortality rates in COVID-19 patients in a recent meta-analysis assessing the participants admitted to the ICU due to COVID-19 infection in Italy (19).

COVID-19 poses a significant threat to health-care systems and ICUs, a large number of patients with the same condition require simultaneous access to intense therapies. Supportive care is the mainstay of treatment for critically sick patients until effective and targeted medicines become available. All health-care systems face a problem in providing this care at a high-quality level for the large number of people they must treat (11). Our results are useful for everyday clinical practice. Due to the excess number of patients in the current pandemic, patients with ARDS are admitted to the ICU. The rate of mortality in ICU was 63.6% in our series. Thus, based on the study findings, we have concluded that recognition of clinical, hemodynamic, and respiratory characteristics may provide useful clues in the management of Covid-19 patients in ICU.

The current study has several limitations. First, our

findings may be limited in their generalizability due to the small sample size. Second, the study's observational character is a drawback, and some unaccounted confounders may be present. Finally, we lacked data on survivors' long-term outcomes or quality of life. More research is needed to extrapolate our findings in bigger groups. Further prospective, multicentric, controlled trials on larger series are warranted to achieve more reliable results.

To conclude, we present the clinical features and outcomes of 99 COVID-19 patients admitted to ICU. Our study demonstrated a high ICU mortality rate in a retrosepctive cohort of mechanically ventilated patients with severe COVID-19 infection treated in a tertiary care center. These data are critical for understanding the impact of COVID-19 on our hospitals during future pandemic waves, identifying areas for clinical management improvements, and allowing for continuous international and temporal comparisons of COVID-19 patient outcomes. Improved protective measures in individuals under higher risk may reduce total COVID-19 mortality, but further randomized controlled trials are needed to validate this link.

Acknowledgements
The authors declare no competing interests.

Funding
No financial support or funding was received for this paper.

Conflict of interest statement
Authors declare that there is no conflict of interest for this article.

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