Clinical and Laboratory Predictors of COVID-19 Severity: Identifying Key Biomarkers for Risk Stratification and Patient Outcomes

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Abstract- Identifying clinical and laboratory markers associated with COVID-19 severity can aid in risk stratification and management. This study investigates the correlation between demographic, clinical, and laboratory parameters with disease severity and patient outcomes. This study encompassed all COVID-19 patients admitted to hospitals in Thi-Qar, Iraq, from January 2020 to February 2022. A total of 148 COVID-19 patients were evaluated. Two skilled chest radiologists separately examined all Computed Tomography (CT) scans. Key variables, including age, diastolic blood pressure, respiratory rate, Oxygen saturation (O_2 Sat), white blood cell count (WBC), blood urea nitrogen (BUN), potassium (K), albumin (Alb), creatine phosphokinase (CPK), C-reactive protein (CRP), and lactate dehydrogenase (LDH). Data analysis was conducted using SPSS version 23. The variables of age, diastolic blood pressure, respiratory rate, O_2 Sat, WBC, BUN, K, Alb, CPK, CRP, and LDH were significantly associated with the severity of the disease. The results found strong correlations between clinical and laboratory variables and CT severity scores, with oxygen saturation demonstrating a negative correlation with CT severity in both discharged (-0.41, P<0.001) and expired (-0.344, P=0.003) patients. WBC and absolute neutrophil count (ANC) were positively correlated with CT severity in both patient groups, while LDH and CRP exhibited strong positive correlations with CT severity in both discharged and expired patients. Additionally, serum albumin showed a negative correlation with CT severity in discharged patients, and potassium had a positive correlation in the discharged group. In expired patients, total bilirubin exhibited a negative correlation with CT severity. Comorbidities such as ischemic heart disease and cancer also significantly influenced patient outcomes. Our study identifies the significant role of clinical and laboratory parameters in predicting COVID-19 severity, highlighting the importance of early detection and intervention.

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Introduction

The emergence of COVID-19, instigated by the novel coronavirus SARS-CoV-2, has created substantial challenges for healthcare infrastructures worldwide. Since the virus was first identified in December 2019, it has rapidly spread across the globe, leading to unprecedented levels of morbidity and mortality, overwhelming health systems, and straining resources. The clinical manifestations of COVID-19 are highly

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variable, ranging from asymptomatic or mild cases to severe respiratory distress, pneumonia, acute respiratory distress syndrome (ARDS), and multi-organ failure, with severe outcomes often observed in individuals with pre-existing comorbidities or advanced age (1,2). Given the diversity in clinical presentation, it can be difficult to make an accurate diagnosis based solely on symptoms, making laboratory and radiologic testing critical for confirming the presence of SARS-CoV-2 and determining disease severity (3).

A confirmed diagnosis of COVID-19 is typically established through a positive result from molecular testing, most commonly reverse transcription-polymerase chain reaction (RT-PCR), which detects the presence of viral RNA (4). Although RT-PCR is considered the gold standard for diagnosis, several limitations exist. First, the test can produce false-negative results, particularly when samples are not collected properly or when viral loads are low, such as in the early stages of infection or in asymptomatic individuals (5). Additionally, the widespread demand for RT-PCR testing during the early stages of the pandemic led to bottlenecks and delays in testing, creating challenges in timely diagnosis. Furthermore, RT-PCR tests require specialized laboratory infrastructure and trained personnel, which can limit their accessibility, particularly in resource-limited settings (6). As a result, clinicians and healthcare providers have increasingly turned to alternative diagnostic modalities, such as imaging, to aid in the detection of COVID-19, especially when RT-PCR results are inconclusive or unavailable.

Chest Computed Tomography (CT) scans have emerged as a valuable diagnostic tool in the evaluation of COVID-19 patients, offering a non-invasive, rapid method for assessing pulmonary involvement. CT imaging provides high-resolution, detailed visualization of the lungs, allowing for the identification of characteristic abnormalities associated with COVID-19. Radiologic features such as ground-glass opacities (GGOs), consolidations, reticular patterns, and crazy paving patterns are commonly observed in COVID-19 patients and are crucial indicators of infection (7,8). These findings reflect the pathological processes of the disease, including inflammatory changes, alveolar damage, and interstitial edema, which can manifest early in the disease course, even before clinical symptoms or a positive RT-PCR result. Chest CT scans, therefore, offer a significant advantage in early detection and in assessing disease severity, which is particularly valuable in managing patients in critical care settings (9,10).

The presence of specific radiological patterns on chest CT can help differentiate COVID-19 from other types of pneumonia and respiratory diseases. For instance, ground-glass opacities—regions of increased lung opacity without complete consolidation—are often seen in COVID-19 patients, especially in the early to middle stages of the disease (11). These findings may progress to more significant consolidation and reticular patterns as the disease advances. In some cases, the CT scan also reveals a "crazy paving" pattern, characterized by a combination of ground-glass opacities with interlobular septal thickening, which is considered a hallmark of viral infections such as COVID-19 (12). These radiological markers can not only confirm the presence of COVID-19 but also provide insights into the extent of lung involvement, which correlates with clinical outcomes such as the need for mechanical ventilation, oxygen support, and overall prognosis (12).

While CT scans are highly sensitive and effective for detecting pulmonary changes in COVID-19 patients, their role in clinical decision-making extends beyond diagnostic confirmation (13).

The correlation between chest CT findings and clinical, demographic, and laboratory characteristics has been explored in several studies, offering insights into how radiologic imaging can be integrated with other diagnostic modalities for a comprehensive understanding of the disease. Factors such as age, sex, comorbidities, and laboratory markers (e.g., white blood cell count, lymphocyte count, C-reactive protein levels) have been found to influence the severity of the disease and the extent of lung involvement on CT scans (14-16). Studies have shown that lower oxygen saturation levels, elevated inflammatory markers, and increased white blood cell counts are often associated with more severe CT findings, suggesting that chest CT can complement laboratory and clinical assessments in determining the severity of illness and guiding management decisions (16).

This study assessed the relationship between chest CT scores and various demographic, clinical, and laboratory features in COVID-19 patients. Through this study, we seek to enhance our understanding of the effectiveness of these variables in diagnosing and managing COVID-19.

Materials and Methods

Sample's collection

This retrospective observational study was conducted on patients diagnosed with COVID-19 and admitted to hospitals in Thi-Qar, Iraq, between January

2020 and February 2022. A total of 148 patients were included, comprising 83 men (56.08%) and 65 women (43.92%), with a mean age of 55.19±13.66 years. Patients were classified into two groups based on their clinical outcomes: discharged (recovered) and expired (deceased).

The investigated variables included demographics (such as gender and age), pre-existing medical conditions (like smoking, hypertension, diabetes, ischemic heart disease, and hyperlipidemia), and previous medication use (including ACE inhibitors, ARBs, calcium channel blockers, beta-blockers, aspirin, and statins). Additionally, patient conditions at admission (vital signs, symptoms, and time from disease onset to hospital admission) were analyzed.

Demographic, clinical, and laboratory data were extracted from patient medical records. The variables analyzed included age, diastolic blood pressure, respiratory rate, oxygen saturation (O_2 Sat), white blood cell count (WBC), Absolute neutrophil count (ANC), blood urea nitrogen (BUN), potassium (K), albumin (Alb), Total bilirubin (TB), Alanine aminotransferase (ALT), creatine phosphokinase (CPK), C-reactive protein (CRP), and lactate dehydrogenase (LDH). Additionally, the presence of comorbidities such as hypertension, ischemic heart disease, and history of cancer, as well as symptoms like cough, nausea, and vomiting, were recorded.

Imaging assessment

Chest computed tomography (CT) imaging was conducted using a 16-detector CT scanner (Emotion; Siemens). Patients were positioned supine, and images were captured during a single inspiratory breath hold, covering the area from the lung apex to the costophrenic angle. The CT scan settings included 120 kVp for the x-ray tube, 350 mAs, 0.5-second rotation time, 1.0 pitch, 5 mm section thickness and intersection space, with additional reconstruction using a sharp convolution kernel and a 1.5 mm slice thickness.

The initial and subsequent chest CT scans, which average 4.5 days and 11.6 days after the onset of the disease, were retrospectively evaluated for the severity and progression of pneumonia.

In a typical clinical picture archiving and communication system (PACS) workstation, two chest radiologists with over a decade of experience independently reviewed all CT scans without access to clinical and laboratory information. They employed a semi-quantitative scoring method to evaluate the extent of pulmonary involvement, based on the affected area. The five lung lobes were scored as follows: 0 for no involvement, 1 for less than 5%, 2 for 5-25%, 3 for 26-49%, 4 for 50-75%, and 5 for more than 75% involvement. The overall CT score was the average of the five lobe scores, ranging from 0 (no involvement) to 5 (maximum involvement). The mean scores were then compared between discharged patients and those who had died (12).

Statistical analysis

All statistical analyses were performed using SPSS software (version 23, IBM Corp., Armonk, NY, USA). Continuous data were expressed as mean (standard deviation), while categorical data were represented as frequencies and percentages. Independent t-tests or Mann-Whitney U-tests were utilized to compare continuous variables. Chi-square tests were employed for nominal variables. The relationship between chest CT severity scores and various demographic, clinical, and laboratory parameters was evaluated using the Spearman correlation coefficient to assess the strength and direction of associations. A *P* of less than 0.05 was deemed statistically significant.

Results

In the present study, 83 men (56.08%) and 65 women (43.92%), with a mean age of 55.19±13.66 years were evaluated. As shown in Table 1, the variables of age, diastolic blood pressure, respiratory rate, O_2 Sat, WBC, BUN, K, Alb, CPK, CRP, and LDH were significantly associated with the severity of the disease.

As shown in Figure 1, the variables of hypertension, ischemic heart disease, nausea, and/or vomiting were significant. Also, the relationship between demographic, clinical, and laboratory findings and outcomes of patients with COVID-19 based on the average score of chest CT, variables of history of cancer, cough, nausea and/or vomiting, and ischemic heart disease were significant ($P<0.05$) (Table 2).

Table 3 presents the Spearman correlation coefficients for the association between chest CT severity scores and various demographic, clinical, and laboratory parameters among discharged and expired COVID-19 patients.

Oxygen saturation demonstrated a strong negative correlation with CT severity scores in both discharged (-0.41, $P<0.001$) and expired (-0.344, $P=0.003$) patients. White blood cell count showed a significant positive correlation in both discharged (0.22, $P=0.012$) and expired (0.896, $P=0.016$) patients. Absolute neutrophil

count was positively correlated with CT severity scores in discharged patients (0.252, *P*=0.004), but no significant correlation was observed in expired patients. Lactate dehydrogenase had a strong positive correlation with CT severity in both discharged (0.287, *P*<0.001) and expired (0.314, *P*=0.007) patients. C-reactive protein significantly correlated with severity in both discharged (0.243, *P*=0.005) and expired (0.284, *P*=0.015) patients. Serum Alb exhibited a significant negative correlation with CT severity scores in discharged patients (-0.272, *P*=0.002). Serum potassium level had a positive correlation in discharged patients (0.228, *P*=0.008), while no significant association was found in expired patients. Total bilirubin was negatively correlated with CT severity scores in expired patients (-0.287, *P*=0.015). Alanine aminotransferase showed a mild positive correlation with CT severity in discharged patients (0.179, *P*=0.042), but no significant correlation in expired patients.

Table 1. Summary of participants' demographic information, initial vital signs, and laboratory results

	Discharged Mean (±SD)	Expired Mean (±SD)	*P*
Age	58.07 (15.57)	66.54 (14.78)	<0.001
Systolic blood pressure	127.67 (18)	125.56 (23.06)	0.427
Diastolic blood pressure	80 (11.02)	75.93 (14.14)	0.013
Pulse rate	93.06 (12.52)	92.33 (15.37)	0.69
Respiratory rate	21.04 (5.16)	23.23 (6.25)	0.004
Temperature	36.82 (0.77)	36.87 (0.77)	0.653
O_2 Sat	83.82 (10.9)	70.44 (16.66)	<0.001
WBC	8.18 (4.48)	9.98 (5.91)	0.008
ANC	6373.93 (4179.42)	8388.79 (5174.39)	0.001
ALC	1168.01 (699.53)	1057.51 (894.42)	0.29
Hb	12.71 (2.06)	12.7 (2.15)	0.981
PT	17.19 (6.96)	16.6 (2.71)	0.446
PTT	35.55 (16.33)	33.17 (7.13)	0.193
BUN	21.08 (14.58)	31.31 (21.5)	<0.001
Cr	1.51 (1.84)	1.76 (1.49)	0.286
Na	139.3 (3.87)	138.26 (4.62)	0.062
K	4.46 (0.55)	4.82 (0.87)	<0.001
AST	70.07 (66.72)	116.16 (362.34)	0.133
ALT	59.8 (92.04)	103.34 (456.39)	0.262
ALP	239.93 (148.95)	242.48 (116.06)	0.891
Alb	3.72 (0.36)	3.48 (0.37)	<0.001
TB	0.91 (0.73)	0.93 (0.62)	0.901
DB	0.34 (0.52)	0.35 (0.29)	0.846
CPK	233.95 (347.2)	625.26 (1413.08)	0.002
LDH	785.09 (632.29)	1022.21 (621.01)	0.005
ESR	58.33 (32.59)	57.75 (32.04)	0.905
CRP	64.96 (28.11)	73.96 (22.89)	0.01

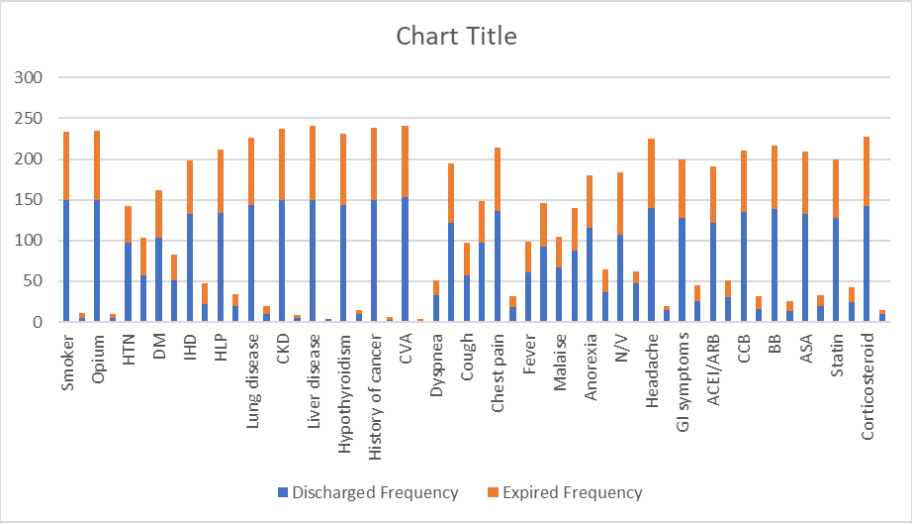

Figure 1. Detail of demographic data, past medical/drug history, and baseline signs/symptoms of all studied patients

Table 2. Demographic, clinical, and laboratory characteristics, along with outcomes of COVID-19 patients categorized by average chest CT scores

		Discharged		Expired	
		CT mean score (±SD)	***P***	**CT mean score (±SD)**	***P***
Gender	Male	2.25 (1.13)	0.89	3.37 (1.29)	0.623
	Female	2.25 (1.25)		3.56 (1.19)	
Smoker	No	2.23 (1.16)	0.458	3.44 (1.24)	0.851
	Yes	2.8 (1.64)		3.25 (1.7)	
Opium	No	2.27 (1.2)	0.412	3.42 (1.25)	0.743
	Yes	1.8 (0.44)		3.66 (1.52)	
HTN	No	2.32 (1.24)	0.522	3.27 (1.3)	0.217
	Yes	2.13 (1.08)		3.63 (1.19)	
DM	No	2.21 (1.25)	0.499	3.44 (1.27)	0.928
	Yes	2.33 (1.04)		3.41 (1.24)	
IHD	No	2.28 (1.23)	0.67	3.65 (1.18)	**0.024**
	Yes	2.05 (0.84)		2.9 (1.3)	
HLP	No	2.27 (1.23)	0.713	3.43 (1.28)	0.849
	Yes	2.11 (0.83)		3.44 (1.13)	
Lung disease	No	2.22 (1.16)	0.196	3.47 (1.23)	0.52
	Yes	2.66 (1.41)		3 (1.54)	
CKD	No	2.27 (1.2)	0.412	3.47 (1.24)	0.121
	Yes	1.8 (0.44)		2 (1.41)	
Liver disease	No	2.24 (1.17)	0.914	3.43 (1.25)	-
	Yes	2.5 (1.73)		0	
Hypothyroidism	No	2.2 (1.16)	0.114	3.46 (1.23)	0.617
	Yes	2.9 (1.28)		3 (1.82)	
History of cancer	No	2.26 (1.19)	0.781	3.49 (1.22)	**0.047**
	Yes	2 (1)		1.5 (0.7)	
CVA	No	2.26 (1.18)	0.223	3.45 (1.23)	0.646
	Yes	1 ()		3 (2)	
Dyspnea	No	2.1 (0.97)	0.46	3.05 (1.47)	0.215
	Yes	2.29 (1.23)		3.55 (1.17)	
Cough	No	2.25 (1.26)	0.977	3.08 (1.31)	**0.023**
	Yes	2.25 (1.14)		3.74 (1.14)	
Chest pain	No	2.25 (1.17)	0.721	3.39 (1.3)	0.614
	Yes	2.23 (1.3)		3.7 (0.94)	
Fever	No	2.18 (1.12)	0.57	3.57 (1.21)	0.365
	Yes	2.29 (1.22)		3.31 (1.29)	
Malaise	No	2.25 (1.1)	0.759	3.56 (1.26)	0.499
	Yes	2.25 (1.25)		3.34 (1.25)	
Anorexia	No	2.16 (1.16)	0.161	3.35 (1.34)	0.536
	Yes	2.54 (1.25)		3.65 (0.98)	
N/V	No	2.24 (1.2)	0.864	3.58 (1.19)	**0.029**
	Yes	2.27 (1.15)		2.63 (1.36)	
Headache	No	2.23 (1.19)	0.717	3.42 (1.26)	0.897
	Yes	2.38 (1.19)		3.66 (1.15)	
GI symptoms	No	2.18 (1.17)	0.182	3.55 (1.24)	0.096
	Yes	2.56 (1.19)		2.92 (1.25)	
ACEI/ARB	No	2.34 (1.55)	0.196	3.49 (1.15)	0.673
	Yes	1.96 (0.88)		3.2 (1.65)	
CCB	No	2.3 (1.16)	0.41	3.38 (1.3)	0.45
	Yes	2.13 (1.3)		3.77 (0.97)	
BB	No	2.27 (1.15)	0.809	3.43 (1.26)	0.834
	Yes	2.16 (1.52)		3.33 (1.36)	
ASA	No	2.26 (1.22)	0.835	3.51 (1.22)	0.147
	Yes	2.26 (0.96)		2.75 (1.48)	
Statin	No	2.35 (1.24)	0.081	3.49 (1.21)	0.488
	Yes	1.8 (0.74)		3.2 (1.47)	
Corticosteroid	No	2.27 (1.21)	0.979	3.47 (1.23)	0.32
	Yes	2.2 (0.91)		2.8 (1.64)	

CT: Computed Tomography; HTN: Hypertension; DM: Diabetes Mellitus; IHD: Ischemic Heart Disease; HLP: Hyperlipidemia; CKD: Chronic Kidney Disease; CVA: Cerebrovascular Accident (Stroke); N/V: Nausea and/or Vomiting; GI: Gastrointestinal; ACEI/ARB: Angiotensin-Converting Enzyme Inhibitor/Angiotensin II Receptor Blocker; CCB: Calcium Channel Blocker; BB: Beta-Blocker; ASA: Acetylsalicylic Acid (Aspirin)

Table 3. Correlation between chest CT score and demographic, clinical, and laboratory characteristics

		Spearman correlation coefficient	*P*
Age	Discharged	-0.015	0.863
	Expired	-0.008	0.95
Systolic blood pressure	Discharged	-0.141	0.103
	Expired	0.05	0.673
Diastolic blood pressure	Discharged	-0.125	0.15
	Expired	0.079	0.508
Pulse rate	Discharged	0.083	0.344
	Expired	0.113	0.348
Respiratory rate	Discharged	0.089	0.308
	Expired	0.141	0.245
Temperature	Discharged	0.154	0.082
	Expired	0.052	0.677
O2 saturation	Discharged	-0.41	<0.001
	Expired	-0.344	0.003
WBC	Discharged	0.22	0.012
	Expired	0.896	0.016
ANC	Discharged	0.252	0.004
	Expired	-0.003	0.981
ALC	Discharged	-0.082	0.355
	Expired	0.002	0.988
Hb	Discharged	-0.065	0.46
	Expired	0.226	0.058
PT	Discharged	0.129	0.136
	Expired	-0.201	0.089
PTT	Discharged	0.072	0.417
	Expired	-0.194	0.102
BUN	Discharged	0.102	0.24
	Expired	0.017	0.883
Cr	Discharged	0.065	0.454
	Expired	-0.102	0.388
Na	Discharged	-0.041	0.636
	Expired	-0.117	0.326
K	Discharged	0.228	0.008
	Expired	-0.023	0.844
AST	Discharged	0.043	0.629
	Expired	0.158	0.194
ALT	Discharged	0.179	0.042
	Expired	0.044	0.717
ALP	Discharged	-0.078	0.384
	Expired	0.11	0.369
Alb	Discharged	-0.272	0.002
	Expired	-0.118	0.343
TB	Discharged	0.016	0.854
	Expired	-0.287	0.015
DB	Discharged	0.021	0.814
	Expired	-0.134	0.264
CPK	Discharged	0.106	0.235
	Expired	-0.193	0.113
LDH	Discharged	0.287	<0.001
	Expired	0.314	0.007
ESR	Discharged	0.287	0.003
	Expired	0.129	0.349
CRP	Discharged	0.243	0.005
	Expired	0.284	0.015

Discussion

Although most people are mildly infected with COVID-19, in a small number of people, it quickly develops pneumonia, leading to acute respiratory distress syndrome (ARDS), considerable organ failure, or death (17).

In our study, chest CT demonstrated significant utility in diagnosing and stratifying COVID-19 severity, particularly when integrated with clinical and laboratory data. The diagnostic performance of chest CT can be substantially enhanced by careful evaluation of

parenchymal patterns characteristic of COVID-19 pneumonia (e.g., peripheral ground-glass opacities, consolidation) while simultaneously considering alternative diagnoses. This multimodal approach becomes particularly crucial in scenarios involving false-negative RT-PCR results, where CT findings may provide the first indication of COVID-19 infection (18). Importantly, our analysis of CT severity scores in conjunction with laboratory markers (such as LDH, CRP, and lymphopenia) offers a robust framework for distinguishing COVID-19 pneumonia from other entities, including:

Other viral pneumonias (e.g., influenza), bacterial pneumonia, organizing pneumonia, which may mimic COVID-19 but often demonstrates reverse halo signs, Non-infectious processes like hypersensitivity pneumonitis (typically upper-lobe predominant) or vasculitis (often accompanied by renal involvement).

The present study aims to evaluate the correlation between various demographic, clinical, and laboratory characteristics with disease severity and patient outcomes.

Several studies have reported similar findings regarding the correlation between inflammatory markers and COVID-19 severity. For instance, a study by Li *et al*., (19) found that elevated CRP and LDH were significantly associated with increased mortality in COVID-19 patients, which aligns with our findings. Similarly, our study confirmed a strong correlation between high CRP and LDH levels and disease severity, reinforcing their role as key inflammatory markers in COVID-19 progression.

Another study by Banoei *et al*., (20) highlighted that low O_2 Sat levels upon admission were a strong predictor of severe outcomes. Our study confirmed this finding, revealing a significant negative correlation between O_2 saturation and mortality. However, our study included a more diverse patient population in terms of comorbidities, which might explain slight variations in statistical strength compared to previous reports.

The role of WBC count in COVID-19 severity has been widely discussed. A study conducted in Italy by Tjendra *et al*., (21) demonstrated a substantial increase in WBC count among critically ill patients, supporting our results that higher WBC levels are significantly correlated with disease severity. However, while our study showed a moderate correlation in discharged patients, previous studies have reported even stronger associations. This discrepancy may be attributed to differences in population characteristics and sample size variations.

Moreover, low serum Alb levels have been associated with poor prognosis in COVID-19 patients. A study by Huang *et al.,* (22) demonstrated that hypoalbuminemia was prevalent among deceased patients, similar to our findings. Additionally, TB levels were elevated in non-survivors in our study, aligning with the findings of another study in China that linked hepatic dysfunction to COVID-19 severity. Differences in liver function alterations across studies may be due to varying levels of pre-existing liver disease in different populations.

The results showed that the grade of CT findings was independently associated with age, history of cancer, cough, O2 saturation, WBC, nausea and/or vomiting, ischemic heart disease, and absolute neutrophil count in COVID-19 patients.

The results of previous studies reported that several clinical and laboratory features characteristic of COVID-19 patients, including fever, increased erythrocyte sedimentation rate, C-reactive protein, procalcitonin, LDH, and decreased lymphocyte count, were associated with chest CT findings in infected patients (23,24).

In the systematic review of 1014 patients by Ai *et al*., the positive chest CT (87.5% vs. 88%) ratio was higher than the positive RT-PCR (57.5% vs. 59%) for the diagnosis of COVID-19 (25).

A meta-analysis involving five studies found that chest CT specificity ranged from 25% to 56% in the diagnosis of COVID-19, and a combined specificity of 37% was reported (26). Previous studies have also shown that radiological scores in patients with more acute diseases are higher than those with non-critical diseases (27-29).

A survey conducted by Pugliese *et al*., reported that in patients with COVID-19, two different radiological scores were associated and alone associated with age, LDH, and calculated glomerular filtration rate and diabetes (30).

Xiong *et al.,* demonstrated that in COVID-19 patients, C-reactive protein, erythrocyte sedimentation rate, and lactate dehydrogenase levels positively correlated with pneumonia severity as assessed by initial CT scans (23).

Elevated blood potassium levels may reflect renal dysfunction or tissue damage in severe COVID-19, consistent with prior studies (31). The weaker correlation in expired patients could stem from heterogeneous terminal metabolic disturbances. Also, lower DBP in severe cases may indicate hemodynamic

instability or sepsis-related vasodilation.

Our study, like any study, had several limitations. Firstly, the chest CT severity score relies on lung opacity as a proxy for COVID-19 yet lacks histological verification. Secondly, further investigation is needed to assess the consistency of chest CT severity scores across varying levels of radiological experience. Lastly, additional validation through studies involving larger patient groups across multiple centers is crucial to confirm the reliability of chest CT severity scores and the proposed thresholds for clinical use.

This study indicates that lower O_2 Sat, elevated inflammatory markers (CRP and LDH), and altered white blood cell parameters (WBC and ANC) significantly correlate with disease severity and mortality. Additionally, serum albumin levels were identified as a potential prognostic marker, with lower levels linked to more severe cases. The study also underscores the importance of comorbidities such as ischemic heart disease and cancer in predicting patient outcomes. These results emphasize the need for early identification and monitoring of high-risk patients based on these biomarkers, which could help guide treatment strategies and improve clinical outcomes. Further research is warranted to explore targeted interventions based on these predictive markers to optimize COVID-19 management.

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