Comparison of the effectiveness of the quick COVID-19 severity index and the COVID-19 gram critical illness risk score in identifying critical patients with COVID-19

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ABSTRACT

Objectives: This study aimed to compare the effectiveness of the Quick COVID-19 Severity Index (qCSI) and the COVID-GRAM Critical Illness Risk Score (CGCIRS) in identifying critically ill patients with COVID-19 admitted to the emergency department of a tertiary hospital.

Methods: Patients over 18 years of age with a positive PCR test who presented to the Emergency Department of Bursa Yüksek İhtisas Training and Research Hospital between 15.03.2020 and 15.03.2021 with COVID-19 findings were retrospectively included in the study. Mortality, qCSI (respiratory rate per minute, oxygen saturation, oxygen demand per minute), and CGCIRS (x-ray abnormality, age, hemoptysis, dyspnea, impaired consciousness, comorbid disease, presence of cancer, neutrophil/lymphocyte ratio, lactate dehydrogenase (LDH) value, direct bilirubin value) were investigated within 1, 7 and 28 days.

Results: A total of 1499 patients with a positive COVID-19 PCR test were included in the study. Invasive mechanical ventilation was performed in 44 (2.9%) and non-invasive mechanical ventilation in 63 (4.2%) patients. 57 (3.8%) patients were hospitalized in the intensive care unit (ICU). Mortality occurred in the first 24 hours in 1 (0.1%) and 28 days in 41 (2.7%) patients. Having comorbidities, use of 10 lt/min oxygen, use of high flow oxygen, need for non-invasive and invasive mechanical ventilation, and need for ICU were found to increase 28-day mortality significantly. The qCSI and CGCIRS were found to be significantly different in patients who developed 28-day mortality with qCSI and CGCIRS, respectively ($p<0.001$), ($p<0.001$). In the ROC analysis for 28-day mortality, the area under the curve (AUC) value of qCSI was 0.966 [(95% CI: 0.934-0.998), ($p<0.001$)] and the AUC value of CGCIRS was 0.971 [(95% CI: 0.959-0.983), ($p<0.001$)]. qCSI had a sensitivity of 97.6% and specificity of 84% with a cut-off value of 4.5 for 28-day mortality; CGCIRS had a sensitivity of 95.1% and specificity of 91.2% with a cut-off value of 116.5 for 28-day mortality.

Conclusions: This study demonstrated that both qCSI and CGCIRS have significant predictive capabilities in identifying critical Covid-19 patients over a 28-day period. These scores are valuable for early identification and appropriate management of critically ill patients in the emergency department.

Keywords: COVID-19, prognosis, pandemic, qCSI, CGCIRS, mortality.

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INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has recently emerged and rapidly spread globally. The emerging coronavirus disease 2019 (COVID-19) has been declared a pandemic by the World Health Organization (WHO) [1]. In adults, COVID-19 has been found to cause clinical manifestations ranging from asymptomatic infection to respiratory failure and death. The disease is easily transmitted from person to person, causing it to become active worldwide [2]. To date, despite the existence of various prognostic scales in COVID-19, none have been as universally accepted and used in routine clinical practice as the CURB-65 (confusion, blood urea nitrogen, respiratory rate, blood pressure, and age 65 or older) or the Pneumonia Severity Index scales [3].

Due to the rapidly increasing number of people infected with the virus, new disease-related scoring systems were needed to predict morbidity and mortality. For the qCSI score, vital signs, oxygen requirement, and high oxygen / invasive / non-invasive ventilation requirement within 24 hours were examined in patients hospitalized due to Covid-19 disease in the United States. With the qCSI scoring system, it was aimed to determine the respiratory prognosis of the patients within 24 hours [4].

CGCIRS was developed to ensure early detection of patients exposed to COVID-19. This score aims to help in the early recognition of those who will progress to critical illness, to provide appropriate treatment, and to use the existing facilities most efficiently [5,6].

In our study, we aimed to compare qCSI with CGCIRS in identifying critically ill patients with COVID-19 admitted to the emergency department of our hospital and to investigate their effectiveness in predicting morbidity and mortality.

METHODS

Before the start of the study, the study information was registered with the Ministry of Health, General Directorate of Health Services, and Scientific Research Studies Platform, and approval was obtained. The study was conducted using the 2011-KAEK-25 2021/02-07 protocol approved by the Bursa Yüksek İhtisas Training and Research Hospital Clinical Research Ethics Committee.

Patients who presented to the Adult Emergency Department of the University of Health Sciences Bursa Yüksek İhtisas Training and Research Hospital between 15.03.2020 and 15.03.2021 with COVID-19 symptoms, who were diagnosed with COVID-19 pneumonia, who had positive RT-PCR test, who were 18 years of age or older, of both sexes and whose complete study data could be accessed were retrospectively included in the study. Patients whose complete study data were unavailable, under 18 years of age, who had a negative RT-PCR test, and who did not have COVID-19 pneumonia were excluded from the study.

Since our study was retrospective, written or verbal informed consent was not obtained from the patients included in the study. A standardized study data entry form was created. The patients' data included in the study were obtained from the hospital information management system and emergency patient files. Demographic data (age, gender), date of presentation to the emergency department, vital signs (respiratory rate, Glasgow Coma Score (GCS), systolic blood pressure (SBP), diastolic blood pressure (DBP), fingertip oxygen saturation (SPO2), presence/absence of confusion, complaints at presentation, Data such as chronic diseases, thoracic computed tomography imaging findings, laboratory values (BUN, d-dimer, lymphocyte count), RT-PCR results, patient's outcome from the emergency department (discharge, ward admission, intensive care unit admission, death) were obtained. In addition, the mortality of the patients within 28 days was followed.

Statistical Analysis

IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp. Armonk, NY, USA, 2012) software package was used for the study. In statistical analyses, descriptive statistics of numerical variables were expressed as mean ± standard deviation (minimum-maximum), while descriptive statistics of categorical variables were reported as a number of cases and percentage (%).

In order to use parametric test statistics for continuous numerical variables between groups, assumptions must be met. When these assumptions were met, the significance of the difference was tested using the student's t-test. When the assumptions of parametric test statistics were not met, the significance of the difference in continuous numerical variables was evaluated by Mann-Whitney U test.

Pearson correlation analysis was used to evaluate the relationships between variables for variables with

parametric distribution, and Spearman correlation analysis was preferred for variables with non-parametric distribution.

ROC curve plotting was performed to investigate the diagnostic values of variables and 28-day mortality of qCSI and CGCIRS. Results were presented at 95% confidence intervals and p<0.05 was considered statistically significant.

RESULTS

5216 patients were included in the study. 1923 patients with negative COVID-19 PCR test, 1022 patients under 18 years of age and 772 patients with incomplete data were excluded from the study. The study included 1499 patients with positive COVID-19 PCR test and complete data. The median age of the patients included in the study was 43 years (IQR 25-75: 32-59). 763 (50.9%) of the patients were male and 1283 (85.6%) were Turkish citizens. The most common symptoms were fatigue (n= 787, 52.5%) and cough (n= 738, 49.2%). 433 (28.9%) of the patients had a history of comorbidity and the most common comorbidities were hypertension (HT) (n= 308, 20.5%) and diabetes mellitus (DM) (n=152, 10.1%). Invasive mechanical ventilation was performed in 44 (2.9%) and non-invasive mechanical ventilation in 63 (4.2%) patients. Of these patients, 1099 (73.3%) were treated with hydroxychloroquine and 679 (45.3%) with favipiravir. 655 (43.7%) of the patients were hospitalized in the ward, while 57 (3.8%) were hospitalized in the intensive care unit (ICU). Mortality occurred in the first 24 hours in 1 (0.1%) and in 28 days in 41 (2.7%) of these patients (Table 1).

The mean body temperature was 36.92 ± 0.58 °C, median systolic blood pressure (SBP) was 130 (IQR 25-75: 120-150) mm/Hg, median respiratory rate was 17/min (IQR 25-75: 15-20), median qCSI value 0 (IQR 25-75: 0-0), median CGCIRS 63 (IQR 25-75: 37-90), mean CRP level 34.83 ± 63.52 mg/dL and mean troponin level 9.71 ± 39.71 ng/L (Table 2).

Mann Whitney U test was performed to investigate whether there was a difference between the laboratory values of the patients and 28-day mortality. At 28 days, LDH (p<0.001), D-dimer (p<0.001), Troponin (p<0.001), CRP (p<0.001), ferritin (p<0.001), WBC (p<0.001), Neutrophil count (p<0, 001), lymphocyte count (p<0.001), NLO (p<0.001), hemoglobin (p=0.005), platelet count (p=0.001) and bilirubin (p=0.006) values were significantly different.

Table 1. Demographic and clinical information of the patients

Gender	Male	763 (50.9)
	Woman	736 (41.9)
Nationality	Republic of Turkey	1283 (85.6)
	Foreign Nationals	216 (14.4)
Symptoms	Fatigue	787 (52.5)
	Cough	738 (49.2)
	Muscle/Joint Pain	736 (49.1)
	Fire	556 (37.1)
	Shortness of breath	384 (25.6)
	Sore Throat	343 (22.9)
	Headache	327 (21.8)
	Loss of taste/odor	284 (18.9)
	Diarrhea	197 (13.1)
	Chest Pain	57 (3.8)
	Loss of Speech / Movement	6 (0.4)
	Hemoptysis	3 (0.2)
	Other	13 (0.9)
Additional Diseases	Hypertension	308 (20.5)
	Diabetes Mellitus	152 (10.1)
	Coronary Artery Disease	118 (7.9)
	Chronic Renal Failure	28 (1.9)
	Chronic Obstructive Pulmonary Disease/Asthma	69 (4.6)
	Cerebrovascular Disease	24 (1.6)
	Malignancy	16 (1.1)
	More than 10 lt/min oxygen demand	104 (6.9)
Additional Diseases	Non-invasive Mechanical Ventilation	63 (4.2)
	Invasive Mechanical Ventilation	44 (2.9)
	High Flow Oxygen	61 (4.1)
	Hydroxychloroquine	1099 (73.3)
	Favipiravir	679 (45.3)
	Other Antibiotics	562 (37.5)
	Anticoagulant	437 (29.2)
	Steroid	50 (3.3)
	Discharged	817 (54.5)
Emergency Room Treatment#	Service Hospitalization	655 (43.7)
	Intensive Care Unit Admission	57 (3.8)
	Dispatch	5 (0.3)
	Treatment Rejection	3 (0.2)
	Low	683 (45.6)
	Middle	747 (49.8)
	High	69 (4.6)
Intensive care needs in the first 24 hours#		24 (1.6)
Mortality in the first 24 hours		1 (0.1)
Mortality in the first 7 days#		10 (0.7)
Mortality in the first 28 days		41 (2.7)

n (%). & Median (IQR 25-75)

Table 2. Clinical and Laboratory Data of the Patients

Variables	Value
Quick COVID-19 Severity Index Median IQR (25-75)	0 (0-0)
COVID-GRAM Critical Illness Risk Score Median IQR (25-75)	63(37-90)
Fever Mean ± SD	36.92 ± 0.58
Heart Rate Median IQR (25-75)	90 (80-98)
SBP mm/Hg Median IQR (25-75)	130 (120-150)
DBP mm/Hg Median IQR (25-75)	80 (75-90)
Oxygen Saturation Median IQR (25-75)	96 (94-98)
Respiratory Count Median IQR (25-75)	17 (15-20)
Length of Hospitalization Mean ± SD	3.77 ± 5.39
LDH Mean ± SD	254.73 ± 118.87
D-dimer Mean ± SD	1.16 ± 10.99
Troponin Mean ± SD	9.71 ± 39. 71
CRP Mean ± SD	34.83 ± 63.51
Ferritin Mean ± SD	203.91 ± 321.52
Leukocyte Count Mean ± SD	6526.2 ± 2.61
Neutrophil count Mean ± SD	4134.2 ± 2.19
Lymphocyte count Mean ± SD	1666.1 ± 0.78
NLR Mean ± SD	3.30 ± 4.10
Hemoglobin Mean ± SD	13.75±1.76
Platelets Mean ± SD	240556±7960
Bilirubin Mean ± SD	0.40±0.30

SBP: Systolic Blood Pressure. DBP: Diastolic Blood Pressure. LDH; Lactate dehydrogenase. CRP; *C-reactive protein*. NLR: Neutrophil/Lymphocyte Ratio

Chi-square/Fisher's exact analysis performed to determine the relationship between comorbidities and 28-day mortality showed a significant relationship between age (p<0.001), comorbidity (p<0.001), HT (p<0.001), DM (p<0.001), CAD (p<0.001), CRF

Table 3. Relationship between the Presence of Comorbidities and 28-Day Mortality

Variables			28-Day Mortality		Ki-kare/Fisher's exact test
			No	YES	
Age			42 (32-58)	70 (64-81)	**p<0.001**#
Gender	Woman	n (%)	746 (97.8)	17 (2.2)	p>0.05&
	Male	n (%)	712 (96.7)	24 (3.3)	
Comorbidity	No	n (%)	1064 (99.8)	2(0.2)	**p<0.001&**
	Yes	n (%)	394 (91.0)	39 (9.0)	
HT	No	n (%)	1183 (99.3)	8 (0.7)	**p<0.001&**
	Yes	n (%)	275 (89.3)	33 (10.7)	
DM	No	n (%)	1330 (98.7)	17 (1.3)	**p<0.001&**
	Yes	n (%)	128 (84.2)	24 (15.8)	
CAD	No	n (%)	1358 (98.3)	23 (1.7)	**p<0.001&**
	Yes	n (%)	100 (84.7)	18 (15.3)	
CKF	No	n (%)	1436 (97.6)	35 (2.4)	**p<0.001&**
	Yes	n (%)	22 (78.6)	6 (21.4)	
COPD/Asthma	No	n (%)	1391 (97.3)	39 (2.7)	p>0.05&
	Yes	n (%)	67 (97.1)	2 (2.9)	
malignancy	No	n (%)	1443 (97.3)	40 (2.7)	p>0.05&
	Yes	n (%)	15 (93.8)	1 (6.3)	
CVH	No	n (%)	1440 (97.6)	35 (2.4)	**p<0.001&**
	Yes	n (%)	18 (75.0)	6 (25.0)	
Total		n (%)	1458 (97.3)	41 (2.7)	

&; Fisher's exact test. HT; Hypertension. DM; Diabetes Mellitus. CAD: Coronary Artery Disease. CKD; Chronic Kidney Failure. COPD; Chronic Obstructive Pulmonary Disease. CVH; Cerebrovascular Disease # Mann Whitney U Test

(p<0.001) and other comorbidities and 28-day mortality, respectively (Table 3).

The Mann Whitney U test performed to investigate whether there was a difference between qCSI and CGCIRS and 28-day mortality showed that qCSI (p<0.001) and CGCIRS (p<0.001) were significantly different in patients with mortality at 28 days, respectively (Table 4).

Table 4. Relationship between qCSI and CCGIRS and 28-Day Mortality

	28-day mortality	n	Value	p value #
Quick COVID-19 Severity Index	No	1458	0 (0-0)	**<0.001**
	Yes	41	12 (9.5-12)	
	Total	1499	0 (0-0)	
COVID-GRAM Critical Illness Risk Skoru	No	1458	61 (37-87)	**<0.001**
	Yes	41	149 (131-171)	
	Total	1499	63 (37-90)	

Mann Whitney U Test

In the ROC analysis of qCSI and CGCIRS for 28-day mortality, the area under the curve (AUC) value of qCSI was 0.966 [(95% CI: 0.934-0.998), (p<0.001)] and the AUC value of CGCIRS was 0.971 [(95% CI: 0.959-0.983), (p<0.001)] (Figure 1)

qCSI has a sensitivity of 97.6% and specificity of 84.0% for 28-day mortality with a cut-off value of 4.5, and a sensitivity of 92.7% and specificity of 84.0% with a cut-off value of 5.5. 91.5%. In 28-day mortality, CGCIRS had a sensitivity of 95.1% and specificity of 91.2% with a cut-off value of 116.5 and a sensitivity of 92.7% and specificity of 91.5% with a cut-off value of 117.5 (Table 5).

In the Spearman correlation analysis performed to investigate whether there was a relationship

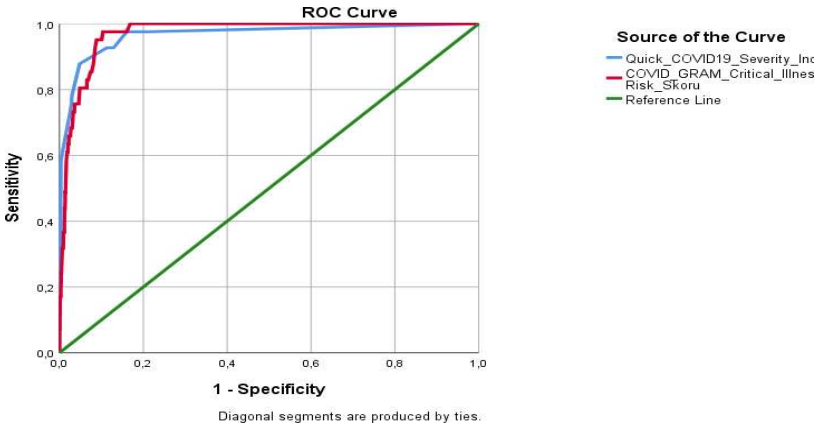

Figure 1. ROC Analysis Curve Showing the Effect of Variables on 28-Day Mortality

between qCSI, CGCIRS, LDH, D-dimer, Troponin, CRP, ferritin, and NLO levels of the patients, qCSI was correlated with CGCIRS (p<0.001, r= 0.613), LDH (p<0.001, r= 0.613), LDH (p<0, 001, r= 0.3711), D-dimer (p<0.001, r= 0.296), Troponin (p<0.001, r= 0.393), CRP (p<0.001, r= 0.322), ferritin (p<0.001, r= 0.249) and NLO (p<0.001, r= 0.169) levels (Table 6).

Table 5. 28-Day Mortality Rate of Variables According to ROC Analysis

AUC (% 95 CI)	p	Risk Factor	Cut-off value	Sensitivity %	Specified %
0.966 (0.934-0.998)	<0.001	Quick COVID-19 Severity Index	4.5	97.6	84
			5.5	92.7	91.5
			6.5	87.8	91.9
0.971 (0.959-0.983)	<0.001	COVID-GRAM Critical Illness Risk Score	116.5	95.1	91.2
			117.5	92.7	91.5
			118.5	87.8	91.9

AUC: Area Under the Curve; CI: Confidence Interval

DISCUSSION

It is known that rapid and reliable biomarkers and scoring systems are critical for prognosis prediction in patients admitted to the emergency department and diagnosed with Covid-19 pneumonia. Prognosis prediction plays an important role in making decisions such as whether the patient should be treated as an outpatient or hospitalized and followed up. Our study found that qCSI has a high sensitivity (97.6%) and a slightly lower specificity (84.0%) and may be less successful in accurately ruling out true negative results. On the other hand, we found that CGCIRS had lower sensitivity (95.1%) and higher specificity (91.2%) than qCSI, meaning that it may be more successful in ruling out true negative results. However, in terms of implementation, we found that qCSI was faster and more practical and could more quickly predict a patient's ICU admission decision without waiting for laboratory results.

Table 6. Spearman Correlation Analysis of Variables

Variables		qCSI	CGCIRS	LDH	D-dimer	Troponin	CRP	Ferritin	NLR
qCSI	r	1	*.613***	*.371***	*.296***	*.393***	*.322***	*.249***	*.169***
	p		*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
CGCIRS	r	*.613***	1	*.585***	*.419***	*.557***	*.440***	*.344***	*.304***
	p	*<0.001*		*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
LDH	r	*.371***	*.585***	1	*.281***	*.337***	*.344***	*.365***	*.194***
	p	*<0.001*	*<0.001*		*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
D-dimer	r	*.296***	*.419***	*.281***	1	*.336***	*.319***	*.103***	*.204***
	p	*<0.001*	*<0.001*	*<0.001*		*<0.001*	*<0.001*	*<0.001*	*<0.001*
Troponin	r	*.393***	*.557***	*.337***	*.336***	1	*.312***	*.281***	*.206***
	p	*<0.001*	*<0.001*	*<0.001*	*<0.001*		*<0.001*	*<0.001*	*<0.001*
CRP	r	*.322***	*.440***	*.344***	*.319***	*.312***	1	*.281***	*.310***
	p	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*		*<0.001*	*<0.001*
Ferritin	r	*.249***	*.344***	*.365***	*.103***	*.281***	*.281***	1	*.134***
	p	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*		*<0.001*
NLR	r	*.169***	*.304***	*.194***	*.204***	*.206***	*.310***	*.134***	1
	p	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	

qCSI; Quick COVID- 19 Severity Index. CGCIRS; COVID-GRAM Critical Illness Risk Score LDH: Lactate dehydrogenase. CRP; *C-reactive protein*. NLR: Neutrophil/Lymphocyte Ratio

There are many reports that COVID-19 is more severe in men. One meta-analysis analyzed 39 studies and 77,932 patients. In this analysis, it was found that men were significantly more at risk for a severe course of the disease (OR=1.63; 95% CI=1.28-2.06), men had a higher mortality rate than women (OR=1.71; 95% CI=1.51-1.93), and the mortality rate increased in the subgroup analysis over the age of 50 (OR=1.94; 95% CI=1.16-3.26) [7]. In a study by Fang et al., it was shown that men were at higher risk for the development of acute respiratory distress syndrome, the need for intensive care, the need for invasive ventilation, cardiac abnormalities, and death [8]. In a study conducted by Sezgin et al. with 248 patients, no significant difference was found between genders [9]. In our study, although the disease was more common in men, no significant difference was found between genders. In the literature, it has been shown in many studies that disease severity and mortality increase with advancing age. In a study of 548 patients in

China, advanced age was associated with the severity of COVID-19. In addition, it was found that 56.9% of patients aged 65 years and older and 26.9% of patients younger than 65 years had severe disease [10]. In a review of patients with SARS-CoV-2 pneumonia by Sagnelli et al., it was reported that advanced age was considered an important risk factor [11]. In a study of 191 patients, age was an independent risk factor for mortality (OR=1.10, 95% CI=1.03-1.17 increase per year; p=0.0043) [12]. The median age of the patients in our study was 43 years (IQR,25-75: 32-59). The mortality rate increased with age, and there was a correlation between 28-day mortality and increasing age. Our results show a statistically significant relationship between age and mortality, parallel to other studies.

One of the risk factors of COVID-19 is the presence of comorbid diseases. In a systemic analysis, a relationship was found between the presence of comorbid diseases and the severity of COVID-19 [8]. In a meta-analysis by Wang et al., it was found that COVID-19 was more severe, and the mortality rate was higher in the patient group with comorbid diseases [13]. A meta-analysis by Khan et al. analyzed 27,670 cases from 40 studies and found that the most common comorbidities in COVID-19 patients were hypertension (39.5%), cardiovascular disease (12.4%), and diabetes (25.2%). In this meta-analysis, COVID-19 patients with pre-existing comorbidities were proven to have a higher risk of death [14]. One or more comorbid diseases were identified in 433 (28.9%) of the patients included in our study. The most common diseases were hypertension (n=308, 20.5%) and diabetes mellitus (n=152, 10.1%), respectively. The need for intensive care and mortality were found to be higher in patients with comorbid diseases.

In a systematic meta-analysis by Rodriguez-Morales et al., the most common complaints were fever (88.7%), cough (57.6%), and dyspnea (45.6%) [15]. In a study by Satıcı et al., 681 patients were analyzed, and the most common presenting complaints were cough (71.2%), fever (32.5%), and dyspnea (27.3%) [16]. Similarly, the most common symptoms and findings in the patient population included in our study were fatigue (n=787, 52.5%), cough (n=739, 48.2%), muscle/joint pain (n=736, 49.1%) and fever (n=556, 37.1%).

Elevated D-dimer levels are a reliable coagulation parameter in predicting poor prognosis and mortality. A retrospective study of 343 patients reported that in-hospital mortality could be predicted with a sensitivity of 92.3% and specificity of 83.0% when the D-dimer cut-off value was 2.0 µg/ml [17]. In a study conducted in China, D-dimer levels were statistically significantly higher in patients who needed intensive care than patients who did not need intensive care (p=0.0042) [18]. In a systemic review of prognostic factors in COVID-19 patients, D-dimer elevation was found to be associated with both severe disease and mortality [19]. Our study found a significant correlation between D-dimer level and 28-day mortality (p<0.001). The relationship between mortality and D-dimer level is consistent with the literature.

The qCSI score developed by Haimovich et al. [4] effectively predicts the risk of critical respiratory illness in COVID-19 patients and can help predict the need for ICU. In a study by Shi et al., 257 patients were included. It was reported that CURB-65 was better in predicting death in hospitals than CGCIRS, and the negative predictive value of CURB-65 was found to be 97.2% for death in hospitals and 88.1% for critical illness [20]. According to Arminanzas et al. [21], CGCIRS was more successful than CURB-65 in predicting the severity of COVID-19 disease, but both scores could be used for risk stratification. Another study found that CURB 65 was superior to qCSI in predicting mortality [22].

Rodriguez-Nava et al. [23] found that qCSI successfully predicted intensive care unit admission in COVID-19 patients. In our study, qCSI had a higher sensitivity for 28-day mortality than CGCIRS, while CGCIRS had a higher specificity for 28-day mortality than qCSI.

CONCLUSION

qCSI is a scale used to assess the risk of 28-day mortality. With a low cut-off value, qCSI has a high sensitivity and ability to detect true positive results accurately. However, it has a slightly lower specificity and may be less successful in accurately ruling out true negative results.

CGCIRS is also a score used to assess 28-day mortality risk. CGCIRS again has a high sensitivity and ability to detect true positive results accurately. Its specificity is also slightly higher than qCSI, so it may be more successful in ruling out true negative results. However, it is important to note that qCSI is faster and more practical in application and can predict the patient's ICU admission decision faster without waiting for laboratory results.

Regarding ease of use, qCSI is superior in

identifying critically ill patients with COVID-19 in the Emergency Department. However, the use of CGCIRS is also useful.

Limitations

In this study, one of the most important limiting factors was the study's retrospective nature and the fact that data searches were performed through files and the Hospital Information Management System. In addition, the single-center nature of the study and the fact that some patients had to be excluded due to missing data are other limitations of our study. In this study, one of the most important limiting factors was the study's retrospective nature and the fact that data searches were performed through files and the Hospital Information Management System. In addition, the single-center nature of the study and the fact that some patients had to be excluded due to missing data are other limitations of our study.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The protocol of the study was approved by the Medical Ethics Committee of Bursa Yüksek Ihtisas Training & Research Hospital, Bursa, Türkiye. (Decision number: 2011-KAEK-25 2021/02-07).

Authors' Contribution

Study Conception: BN, MOA; Study Design: MY, HK; Literature Review: BN, YI, MY; Critical Review: HK, MY; Data Collection and/or Processing: YI, MY, HK,; Analysis and/or Data Interpretation: YI, HK; Manuscript preparing: BN, YI, MOA.

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