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Original Research Paper

General Medicine

STUDY OF CLINICAL SCORING SYSTEM FOR ASSESSING THE SEVERITY OF COVID-19 PATIENTS.

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ABSTRACT **Background:** Coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). In present study, we tested a risk prediction score in patients with COVID-19, to help to identify patients at the time of hospital admission who are likely to develop critical illness. **Material and Methods:** Present study was a hospital based observational study conducted in patients with age >18 years, confirmed COVID-19 Patients. A clinical score based on age, fever, cough, breathlessness, respiratory rate, baseline oxygen saturation, heart rate, systolic blood pressure, H/O diabetes mellitus, hypertension, respiratory disease, cardiac disease, renal disease was developed & tested in study patients. **Results:** In present study total 199 patients were studied. 30% mortality noted in present study. There was no statistically significant difference found between Survivors and Non Survivors with respect to age, gender. A statistically significant difference found between Survivors and Non Survivors with respect to Breathlessness, H/O respiratory disease and H/O renal disease. A statistically significant difference found between Survivors and Non Survivors with respect to Heart Rate, Respiratory Rate, SBP, S. FERRITIN and LDH. We noted a statistically significant difference found between severity and outcome. The performance of this risk score was satisfactory with accuracy based on AUCs in both the development and validation cohorts of 0.77. Sensitivity, Specificity, PPV & NPV of clinical score for prediction of mortality was 85.25%, 61.87%, 49.50% & 90.50% respectively. **Conclusion:** Present clinical score has possibility of prediction of severity of COVID-19 infection, this scoring system could help patients to receive appropriate treatment at a very early stage & to reduce mortality.

KEYWORDS : COVID-19, severe disease, scoring system, prediction.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). COVID-19 infection is highly contagious & mortality is noted cases with high severity of the disease.[1]

The clinical spectrum of COVID-19 pneumonia ranges from mild to critically ill cases. Patients with mild disease present with symptoms of fever and cough, followed by sputum production and fatigue. Sepsis, respiratory failure, acute respiratory distress syndrome, heart failure and septic shock are commonly observed in critically ill patients.2 In patients with critical disease, complications such as respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, thromboembolism, and/or multiorgan failure, including acute kidney injury and cardiac injury are noted.[3]

Due to mortality associated with the disease, clinicians should be aware of the different potential risk factors associated with fatal outcome.4,5 Early detection of patients who are likely to develop critical illness & high risk of mortality is of great importance and may aid in delivering proper care and optimizing use of limited resources. In present study, we tested a risk prediction score in patients with COVID-19, to help to identify patients at the time of hospital admission who are likely to develop critical illness.

MATERIAL AND METHODS

Present study was a hospital based observational study conducted in the department of General Medicine at R L Jalappa hospital, Kolar. Study duration was of 2 months (MENTION STUDY PERIOD) Institutional ethical committee approval was taken prior to start of the study.

Patients with fever, cough and breathlessness visiting the Emergency Department at RL Jalappa hospital, Kolar were considered for study.

Inclusion criteria:

Age >18 years, confirmed COVID-19 Patients (Positive throat/nasal swab for COVID-19 processed either by RT-PCR or Rapid antigen test).

Exclusion criteria: Pregnant women, patients not willing to participate.

Informed written consent was obtained from all patients participating in the study after clearly explaining the study procedure. Patients underwent history taking & general physical examination.

Routine investigations CBC, plasma glucose, LFT, KFT, serum electrolytes, serum ferritin, LDH, D-dimers and CRP levels were done. Radiological investigations such as X ray chest, HRCT were done whenever indicated.

A clinical score based on age, fever, cough, breathlessness, respiratory rate, baseline oxygen saturation, heart rate, systolic blood pressure, H/O diabetes mellitus, hypertension,

respiratory disease, cardiac disease, renal disease was developed & tested in study patients. Patients were managed as per current Guidelines and Protocol issued by government of India.

Table 1- Clinical score

Variable	Score		
	0	1	2
Age (in years)	<60	60-80	>80
Fever (^{0}F)	<99	99-101	>101
Cough	Absent	Present	
Breathlessness	Absent	MMRC 1-2	MMRC 3-4
Respirator Rate (per minute)	<24	24-30	>30
Oxygen Saturation at room air	<94%	94-90%	<90%
Heart Rate (per minute)	60-100	100-130	>130
Systolic Blood Pressure (mm of Hg)	>100	90-100	<90
H/O Diabetes Mellitus	Absent		Present
H/O Hypertension	Absent		Present
H/O Respirator Disease	Absent		Present
H/O Cardiac Disease	Absent		Present
H/O Renal Disease	Absent		Present

Patients were assessed and a clinical score 0, 1 and 2 for each sign and symptoms was given. Total score was calculated and patients were divided based on low, moderate, severe groups and followed.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. P value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

In present study total 199 patients were studied. 30% mortality noted in present study. There was no statistically significant difference found between Survivors and Non Survivors with respect to age, gender.

Table 2:- Distribution of subjects according to age, gender and outcome

Parameter	Survivors (n= 139)	Non Survivors (n= 60)	P value
Mean age (in years)	53.11 ± 13.2	56.02 ± 14.3	0.168
Gender			
Female	48 (34.5%)	16 (26.7%)	0.323
Male	91 (65.5%)	44 (73.3%)	

A statistically significant difference found between Survivors and Non Survivors with respect to Breathlessness, H/O respiratory disease and H/O renal disease.

Table 3- Comparison of symptoms, comorbidities according to outcome

Variable	Survivors		Non Survivors		P value
	N	%	N	%	
Fever	87	62.6%	39	65.0%	0.746
Cough	68	48.9%	30	50.0%	0.889
Breathlessness	82	59.0%	51	85.0%	<0.001
H/O T2DM	68	48.9%	33	55.0%	0.701
H/O hypertension	41	29.5%	21	35.0%	0.422
H/O respiratory disease	5	3.6%	8	13.3%	0.023
H/O cardiac disease	18	12.9%	3	5.0%	0.131
H/O renal disease	6	4.3%	10	16.7%	0.008

A statistically significant difference found between Survivors and Non Survivors with respect to Heart Rate, Respiratory Rate, SBP, S. FERRITIN and LDH.

Table 4:- Comparison of various parameters according to outcome

Variable	Survivors		Non Survivors		P value
	Mean	SD	Mean	SD	
Heart Rate	93.45	15.66	102.43	16.86	<0.001
Respiratory Rate	25.89	5.12	32.00	8.33	0.006
SBP	120.09	12.43	126.33	18.26	<0.001
S. FERRITIN	307.92	265.16	563.86	327.35	<0.001
LDH	394.63	199.38	744.52	518.61	<0.001

We noted a statistically significant difference found between severity and outcome.

Table 5:- Distribution of subjects according to severity and outcome

	Survivors		Non Survivors		P value
	N	%	N	%	
MILD	62	44.6%	0		<0.001
MODERATE	46	33.1%	1	1.7%	
SEVERE	31	22.3%	59	98.3%	

The performance of this risk score was satisfactory with accuracy based on AUCs in both the development and validation cohorts of 0.77. Sensitivity, Specificity, PPV & NPV of clinical score for prediction of mortality was 85.25%, 61.87%, 49.50% & 90.50% respectively.

Table 6- Statistics of clinical score

Area under the ROC curve (AUC)	0.770			
95% Confidence interval	0.705 to 0.826			
P value	<0.0001			
Cut off value	Sensitivity	Specificity	PPV	NPV
>316	85.25%	61.87%	49.5%	90.5%

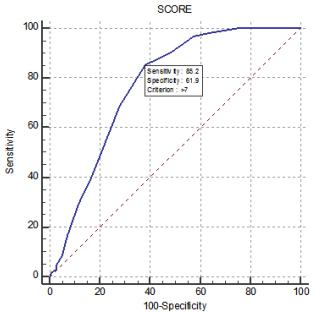

Figure 1 - Area under the ROC curve

DISCUSSION

In majority of Coronavirus disease 2019 (COVID-19) patients, symptoms at onset are relatively mild and a significant proportion of patients do not show apparent symptoms prior to the development of respiratory failure.[6] Clinically, this makes it difficult to predict the progression of severity in patients until respiratory failure develops. Early risk prediction and effective treatment can reduce mortality and morbidity as well as relieve resource shortages.

Older age, smoking and underlying noncommunicable diseases (NCDs), such as diabetes, hypertension, cardiac disease, chronic lung disease and cancer, have been reported as risk factors for severe disease and death.[6]

Chest computed tomography (CT) plays an important role in screening, diagnosing, and evaluating the progress of the disease according to the results of different studies. Also, it may manifest abnormalities earlier than RT-PCR testing and yields a typical pattern with 97% sensitivity.[7,8] So, the Coronavirus disease imaging reporting system (COVID-RADS) classification was developed based on CT findings aiming to standardize CT report in different COVID-19 patients, which will be helpful in clinical diagnosis and research applications.[9]

The review of literature leads to various score to assess the severity of disease or mortality risk or complication risk in patients with COVID-19 infection.[10,11,12]

Hetal Pandya et al., studied various clinical scoring systems in predicting progression and outcome in COVID 19 infection in 300 patients, 197(65.6%) were male and 103(34.3%) were female with mean age of 49.74±15.69 years. 95(31.6%) patients had co-morbidities, hypertension being the most common (21%) followed by diabetes (14.3%). Using WHO clinical disease severity, 160 (53.3%) patients had mild disease, 68(22.6%) had moderate and 72(24%) had severe disease. Similar parameters were noted in present study.

Wenhua Liang et al., studied 1590 patients. the mean age of patients was 48.9 ± 15.7 years. From 72 potential predictors, 10 variables were independent predictive factors and were included in the risk score: chest radiographic abnormality, age, hemoptysis, dyspnea, unconsciousness, number of comorbidities, cancer history, neutrophil-to-lymphocyte ratio, lactate dehydrogenase and direct bilirubin. The mean AUC in the development cohort was 0.88 (95%CI, 0.85-0.91) and the AUC in the validation cohort was 0.88 (95%CI, 0.84-0.93). Similar validation was noted in present clinical score.

Development of a clinical score will help in evaluation of patients in a systematic method and is helping in communication between various centers regarding different outcomes. This score may also help in developing various treatment strategies and divide patients into subgroups for proper use of medical resources in their management. If feasible, such an approach could expedite the identification and management of patients with severe disease in specific instances where a fast triage method is needed.

Major limitations of present study were limited sample size for validation and from a particular geographical area which limits the generalizability of the risk score. Further validation studies for the COVID risk score are required.

CONCLUSION

Present clinical score has possibility of prediction of severity of COVID-19 infection, This scoring system could help patients to receive appropriate treatment at a very early stage & to reduce mortality.

Conflict of Interest: None to declare
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REFERENCES

1. Mohapatra RK, Pintilie L, Kandi V, Sarangi AK, Das D, Sahu R, et al. The recent challenges of highly contagious COVID-19, causing respiratory infections: Symptoms, diagnosis, transmission and immunotherapy. Chem Biol Drug Des. 2020;00:01-22.
2. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1054-1062
3. Epidemiology Working Group for NCIP Epidemic Response, Chinese Center for Disease Control and Prevention. Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(2):145-151.
4. Li K, Wu J, Wu F, Guo D, Chen L, Fang Z, et al. The clinical and chest CT features associated with severe and critical COVID-19 pneumonia. Invest Radiol. 2020;55(6):327-31.
5. Francone M, Iafrate F, Masci GM, Coco S, Cilia F, et al. Chest CT score in COVID-19 patients: Correlation with disease severity and short-term prognosis. Eur Radiol. 2020;1-10.
6. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. 2020;395(10223):497-506.
7. Ai T et al Correlation of chest CT and RT-PCR testing for coronavirus disease 2019 (COVID-19) in China: a report of 1014 Cases. Radiology 296(2): E32–E40, 2020.
8. Pan Y et al Initial CT findings and temporal changes in patients with the novel coronavirus pneumonia (2019-nCoV): a study of 63 patients in Wuhan. China Eur Radiol 30(6):3306–3309, 2020.
9. Salehi S et al Coronavirus disease 2019 (COVID-19) imaging reporting and data system (COVID-RADS) and common lexicon: a proposal based on the imaging data of 37 studies. Eur Radiol 30:4930–4942, 2020.
10. Abhijeet Ashok Salunke, Pathak Subodh Kumar, Dhanwate Anant, Warikoo Vikas, Nandy Kunal, Mendhe Harshal, et al. A proposed ABCD scoring system for patient's self assessment and at emergency department with symptoms of COVID-19,Diabetes & Metabolic Syndrome. Clin Res Rev 2020;14(Issue 5):1495e501.
11. Duca A, Piva S, Foca E, Latronico N, Rizzi M. Calculated decisions: brescia-COVID respiratory severity scale (BCRSS)/Algorithm [Internet] Emerg Med Pract 2020 Apr 16 [cited 2020 May 5];22(5 Suppl):CD1e2.
12. Hu H, Yao N, Qiu Y. Comparing rapid scoring systems in mortality prediction of critical ill patients with novel coronavirus disease [Internet] Acad Emerg Med 2020 Apr 20
13. Hetal Pandya, Arti Muley, Roop Gill, Jeevana, Comparison of Various Clinical Scoring Systems in Predicting Progression and Outcome in COVID 19 Infection, Asian Journal of Research in Infectious Diseases 5(3): 9-19, 2020.
14. Liang W, Liang H, Ou L, et al. Development and Validation of a Clinical Risk Score to Predict the Occurrence of Critical Illness in Hospitalized Patients With COVID-19. JAMA Intern Med. 2020;180(8):1081–1089.