International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 10; Issue 12 (A); December 2021; Page No.25591-25593
DOI: http://dx.doi.org/10.24327/ijcar.2021.25593.5108

Research Article

COVID-GRAM SCORE AS A PREDICTOR OF DESATURATION IN PATIENTS WITH COVID-19 INFECTION

Nitharsha Prakash M., N Nag Anand., Karthik Ramalingam., Anandan P and Abhilash B Nair

Department of General Medicine, Sree Balaji Medical College and Hospital, Chromepet, Chennai-44

A R T I C L E I N F O

Article History:
Received 06th September, 2021
Received in revised form 14th October, 2021
Accepted 23rd November, 2021
Published online 28th December, 2021

Key words:
COVID-19, Scoring, Desaturation, Pandemic

A B S T R A C T

Background: COVID -19 has been infecting large number of people worldwide. The need for proper isolation and along with a health-care facility that has been modified to handle these patients has been high demand throughout the year. The cost for additional infrastructure to support these patients and treat them has been dear which has aggravated the economic burden on the sick. Predicting the need for oxygen requirement can help in providing home quarantine to those who wouldn't need oxygen support, thus freeing up hospital resources for patients who really need the critical care. Hence a proper means of identifying these patients could serve an important role in decision making.
Objective: To validate a pre-existing clinical score (COVID-GRAM score) to predict the need for oxygen requirement or to predict those who are at risk of desaturation.
Patients and Methods: All patient data was obtained without disclosure of personal identifying information from hospital records. The COVID GRAM Score was calculated in these patients as per admission day clinical and laboratory parameters. The collected data were analysed with IBM.SPSS statistics software 23.0 Version.
Results: The study included 234 patients. A cut-off score of 72.3 showed an AUC of 0.965 with a sensitivity of 90% and specificity of 89.6%, (95% CI, 0.94-0.98)
Conclusion: From this study, we found that patients will a GRAM SCORE of more than 72 were very most-likely to need oxygen requirement and it can be used as a cut-off to predict risk of desaturation.

INTRODUCTION

Even after a year, the COVID-19 pandemic continues to plague the world. Doctors face multitudes of challenges in handling this patient, which has included the large number of cases, the extensive protective measures needed for prevention of its spread, lapse in understanding of the pathogen, the social restrictions placed in various parts of the world etc. [2]Among these, prediction of the clinical course has been quite elusive. Although studies have found factors associated with more severe forms of diseases and identified people who may require intensive care, definitive distinctions do not exist.One of the first questions that arises in a patient with COVID-19 is that if he/she would require oxygen as a result of desaturation. Hence, we set out to formulate a way to predict the need for oxygen support in patients with COVID – 19. The ability to accurately predict this would mean, that patients unlikely to desaturate can be safely quarantined at home. This would decrease the economic burden on patients, as well as the patient burden on hospital. Thereby, more care is given to sicker patients.

Corresponding author:* **Nitharsha Prakash M
Department of General Medicine, Sree Balaji Medical College and Hospital, Chromepet, Chennai-44

So, this study was designed to calculate the COVID-GRAM score in patients with COVID-19 and to analyse if the same scoring system can be used to patients who are likely to desaturate.

METHODS

Data Collection and Processing

Data from all patients admitted in COVID-19 ward of Sree Balaji Medical College and Hospital were included in the study. The study was approved by Ethics committee of Sree Balaji Medical College. Written informed consent was waived as data was collected from case reports without identifying information. COVID-19 diagnoses were confirmed by positive high real-time reverse-transcription polymerase-chain-reaction (RT-PCR) assay for nasal and pharyngeal swab specimens. All data collection was done and cross checked by two physicians.234 patients were included in the study. Inclusion criteria was all patients admitted with COVID-19 infection and treated in the hospital. Patients who were referred or discharged against medical advice were excluded from the study. The clinical (Haemoptysis, Unconsciousness, Age, Dyspnoea, Number of co-morbidities and Cancer History) and laboratory parameters (X-ray, Neutrophil-Lymphocyte Ratio, LDH and Direct Bilirubin)were collected on the admission day

and COVID – GRAM score was calculated using the online calculator (https://www.mdcalc.com/covid-gram-critical-illness-risk-score#evidence) using the above mentioned parameters. Data was obtained on which of the study patients went into desaturation during the course of the treatment was obtained.

Statistical Analysis

The data was collected in Microsoft Excel and obtained data were analysed with IBM.SPSS statistics software 23.0 Version.

RESULTS

In our study patient data was used from 234 patients. Of them, the patient population consisted of A total of 44 patients (18.8%) desaturation during their clinical course and had need for oxygen support. Of the patients included 142(60.7%) were male and 92 (39.3%) were female. The mean (SD) of age of the population was 43.1 (15.11) years. 126 (54%) of patient were asymptomatic and 108 (46%) had symptoms of COVID-19. 76 (36.4%) of those patients had at least one co-morbidity of which 53 (22.64%) had Diabetes Mellitus and 35 (14.95%) had Hypertension. Those were the most common co-morbidities present among the population. No patients had cancer history. 41 (17.5%) patients had desaturation and were given oxygen support.

The lowest COVID-GRAM score obtained was 19.6 and highest was 149.6 with a mean (SD) of 55.7SPSS software was used for data processing. To assess the relationship between the COVID – GRAM score and need for oxygen support Pearson's Correlation was used. The Receiver Operator Characteristic (ROC) curve analysis was used to find efficacy of Gram score cut off with Sensitivity, Specificity on O2 dependency. The AUC of COVID-GRAM was found to be 0.965 for a cut off value of 23 with a sensitivity of 90.2% and specificity of 89.6% (95%CI, UB: 0.986, LB: 0.944) In the above statistical tools the probability value .05 is considered as highly statistically significant level.

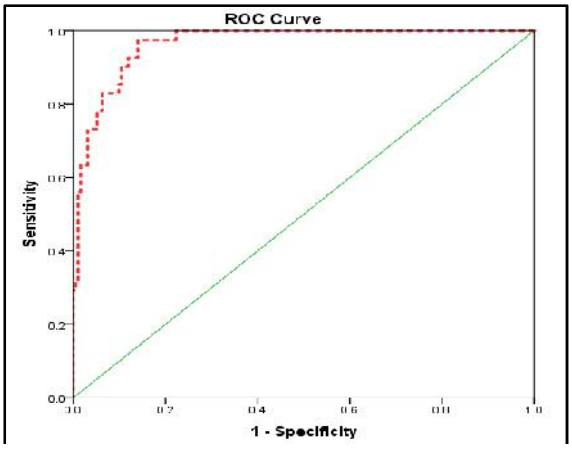

Fig 1 ROC Curve for the cut-off of 72.3 showing an area of 0.895

Table 1 Statistical Analysis reports for the cut-off of 2.3

Area Under the Curve of AOP					
Area	p-value	95% C.I		Cut off	72.3
		LB	UB	Sensitivity	90.2%
.965	0.0005 **	.944	.986	Specificity	89.6%
** Highly Statistical Significant at p < 0.01 level					

DISCUSSION

COVID-19 virus belongs to the SARS family of viruses and are associated with respiratory tract infections. The outbreak that began in Wuhan, China has emerged to be a global pandemic due to its high transmissibility and abundance of air travel. In terms of transmission, it has surpassed the SARS and MERS virus. As of November 30, 2020, it had infected 62 million people and killed 1.5 million people in spite of various measures enforced to prevent and contain its spread.

When the outbreak developed in Italy, one of the key challenges was availability of health care to tackle the large number of cases during the epidemic. But in due time, nations have managed to improve and adapt the health-care infrastructure to match the needs of the pandemic. Public halls, stadiums were converted into make-shift areas to accommodate the infected. Each person needed to quarantined properly and the health-care workers needed effective personnel protective gear to prevent the spread. The public were enforced to wear masks at public places and social distancing was advised.

Months into the pandemic, the health sector and the general public have adapted well to the situation. But all this has come at a big cost, literally. The price of health care has gone up and there is a certain apprehension among practitioners about contracting the infection during their day-to-day practice.

SARS-CoV-2 is spread primarily via respiratory droplets during close face-to-face contact. The average incubation period is 5 days, and 97.5% of people who develop symptoms do so within 11.5 days.[7] The clinical manifestations include fever, loss of smell, loss of taste, dry cough, and shortness of breath and occasionally loose stools and abdominal pain. Clinical presentation can vary in severity from asymptomatic infection to full-blown sepsis and respiratory failure. Radiographic and laboratory abnormalities, such as lymphopenia and elevated lactate dehydrogenase, are common, but nonspecific. Diagnosis is made by detection of SARS-CoV-2 via reverse transcription polymerase chain reaction testing, although sensitivity is low. Approximately 5% of patients with COVID-19, and 20% of those hospitalized, experience severe symptoms necessitating intensive care.[6] More than 75% of patients hospitalized with COVID-19 require supplemental oxygen.[4] And a portion of patients might never end up getting treated as they have no features suggestive of COVID – 19.

The COVID-GRAM scoring system was developed in China and internally validated. However, it hasn't been externally validated. This scoring system is designed to predict the risk of critical illness in patients with COVID-19. The study was done a development cohort of 1590 patients and a validation cohort of 790 patients. The study was designed with 72 potential predictor variables and10 variables were validated and used for scoring. The mean AUC in the development cohort was 0.88 (95% CI, 0.85-0.91) and the AUC in the validation cohortwas 0.88 (95% CI, 0.84-0.93). The score has been translated into an online risk calculatorthat is freely available to the public.[1] In this study, we adapted this scoring system and considered using this to assess if it can be used to predict desaturation in patients with COVID-19 score. COVD-GRAM score was calculated in all the 234 patients and the scores of patients who desaturated and who didn't were compared and it was found

that this score of 72.3 was found to predict desaturation with a sensitivity 90.2% and specificity of 89.6%.

Limitation

The small sample size is a limitation in this study. The scoring system needs external validation.

CONCLUSION

Using this cut off score, patients can be easily triaged and patients with lower scores could be home quarantined safely, thus bringing the cost of health care for these patients and further reduce risk of transmission in the community. At the same time, this would help primary health centres to make decisions as which patients need referral to higher centre. Further studies can be done to predict the need for mechanical ventilation using the same scoring system.

Article Information

Conflict of Interest: None

***Funding For the Study*:** None

Author contributions:

Dr Nitharsha Prakash and Dr N N Anand are the co-first authors. They are responsible for the integrity of the data and had full access to all data inthe study.

Study concept and Designing: Dr Karthik Ramalingam

Acquisition, analysis and interpretation of data: Dr Nitharsha Prakash, Dr Abhilash B Nair

Critical revision of manuscript: Dr Anandan P

***Supervision*:** Dr N N Anand

Acknowedgements

I would like to thank the management, my professors for their support, my colleagues: Dr Siri N, Dr Vijay, Dr ArvindhM and Dr Alex J for their support and my seniors, juniors, the staff and the ward-attenders for their help.

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How to cite this article:

Nitharsha Prakash M *et al* (2021) 'Covid-Gram Score As A Predictor Of Desaturation In Patients With Covid-19 Infection', *International Journal of Current Advanced Research*, 10(12), pp. 25591-25593. DOI: http://dx.doi.org/10.24327/ijcar.2021.25593.5108

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