

Prediction of progression risk in patients with covid 19 pneumonia –THE CALL SCORE

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Abstract:

Background: Coronavirus disease 2019 (COVID-19) is a novel viral disease with multisystem involvement and substantial pulmonary symptoms.

Numerous prognostic models have so far been developed to direct therapy and resource allocation.

There aren't many studies on the effects of the disease's measurably related respiratory parameters. CALL score, based on four variables (C=co-morbidity, A=age, L=lymphocyte count, L=lactate dehydrogenase, LDH) is aimed at predicting progression toward clinical deterioration.^[2]

Materials and methods: This retrospective study was conducted in COVID-19 patients attending, Government hospital for chest and communicable diseases between October and December 2020 after obtaining written and informed consent. Data regarding age, sex, comorbidities, differential count, total leucocyte count, LDH, CRP, D-Dimer, Chest X-ray, CT chest was collected and data analysed using SPSS software.

Results: In this retrospective study conducted in Govt TB and chest hospital, Visakhapatnam, 66% of patients were males and 34% of patients were females, 72% of them were stable and 28 % progressed to severe covid 19. The average hospitalisation period was 14 –17days.

The majority of stable patients shared the following characteristics:

Age 60 (76.6%), predominantly males (72.17%), no comorbidities (96.9%), lymphocyte count > 20% (91.08%), LDH between 250 to 500 (90.4%) and 0 to 250 (86.4%), CRP, D Dimer, Liver and renal function tests, ferritin had no / little significance. At discharge, Spo2 was greater than 95%.

The following characteristics were shared by the patients in whom covid 19 pneumonia had progressed:

Age 60 years (64.9 percent), females (29 percent), comorbidities (60.5%), LDH 500, lymphocyte count 20% (54.8 percent),

D -Dimer, CRP, liver and renal function tests had little / no significance. Spo2 93 percent in room air.

Patients required either O2 or NIV During their hospital stay, 15 patients died.

Conclusion: In summary, the 4 clinical parameters in the CALL model with its high accuracy and easy-to-use features achieved an optimal prediction of progression, and can be easily tested in clinical cohorts in countries or regions that are currently experiencing large outbreaks. This may allow efficient utilization of medical resources and increase the therapeutic effect and reduce the mortality of COVID-19.

Keywords: COVID-19, Comorbidities, LDH, CRP, D-Dimer, CALL Score, Chest X-ray, CT Chest.

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I. Introduction

Coronaviruses are important human and animal pathogens. It rapidly spread, resulting in an epidemic throughout China, followed by a global pandemic. It led to millions of deaths worldwide. The study is aimed to identify the high-risk factors and to develop a scoring to predict the progression of covid 19 pneumonia. The rapidly increasing number of new COVID-19 cases daily worldwide has put a heavy burden on medical resources in countries with large outbreaks. Therefore, identifying risk factors at presentation that predict the likelihood of disease progression would help physicians decide which group of patients can be managed safely at district hospitals and who needs early transfer to tertiary centres, age, comorbidities, lymphopenia, serum

ferritin, D-dimer levels, cardiac troponin I, LDH, and interleukin-6 (IL-6) subsets have been shown to be associated with poor prognosis and increased mortality.^[1] With over 4.3 million people infected with SARS-CoV2 and over 290,000 deaths, the disease is spreading around the world. The coronavirus that causes COVID-19 has been compared to a bulldozer, capable of causing widespread severe illness and death with terrifying speed and affecting the most vulnerable.^[10]

Aims and objectives:

- To study the high-risk factors involved in covid 19 pneumonia
- To develop a scoring model to predict the progression of covid 19 pneumonia.

II. Material and methods

It is a retrospective study conducted in Government hospital for chest and communicable diseases, Department of Pulmonary Medicine, Andhra medical college, Visakhapatnam after obtaining approval from the institutional ethics committee.

Study design: Retrospective study

Study location: Tertiary care teaching hospital, Department of pulmonary medicine, Government hospital for chest and communicable diseases, Andhra Medical college, Visakhapatnam, Andhra Pradesh.

Study duration: Patients admitted in Govt hospital for chest and communicable diseases between October to December 2020

Sample size: 174 patients

Subjects and selection methods: The study population was drawn from TRUNAAT/RT-PCR confirmed Covid-19 patients who got admitted in Government Hospital for chest and communicable diseases, Visakhapatnam.

Inclusion criteria:

- 1) Covid-19 swab positive patients
- 2) Patients above the age of 12 years

Exclusion criteria:

- 1) Patients below the age of 12 years
- 2) Covid-19 negative patients
- 3) Patients who did not give consent for the study

Procedure methodology:

After obtaining written and informed consent, data regarding age, sex, co-morbidities, investigations like total leucocyte count, differential count, CRP, LDH, D – dimer, liver and renal function tests, Chest X-ray and CT chest are collected.

Progression to severe covid 19 is defined as having any of the following: Respiratory rate ≥ 30 / min, resting $\text{spo}_2 \leq 93$ % (or) requirement of mechanical ventilation (or) Worsening of radiological finding (or) death during hospital stay.

Statistical analysis:

Data was collected in Microsoft excel and analysed using SPSS software. The excel sheet contained the following parameters of name, age, sex, days of hospitalization, total count, lymphocyte count, liver and renal function tests, CRP, D-Dimer, LDH, Co-morbidities, SpO₂ at admission and discharge.

III. Result

Patients were grouped into stable and progressive depending on the criteria of saturation, respiratory rate, requirement of mechanical ventilation or death during the hospital stay.

Patients who had more than 93 % saturation and normal respiratory rate are grouped as STABLE GROUP.

Patients who had any of the following are grouped as PROGRESSIVE GROUP.

- Saturation of less than 93%
(Or)
- Respiratory rate of ≥ 25 /min
(Or)
- Required oxygen or mechanical ventilation during their hospital stay
(Or)
- Death

Co-morbidities:

Table no 1: Shows patients with and without co-morbidities among two groups

Co-morbidity	Overall (n =174)	Stable (n =125)	Progressive (n = 49)
With co-morbidity	76	30 (39.47%)	46 (60.53%)
Without co-morbidity	98	95 (96.9%)	3 (3.1%)

Age:

Patients are divided into two age groups:

Less than 60 years

More than 60 years

Table no 2: Shows age distribution among the two groups

Age	Overall (n = 174)	Stable (n = 125)	Progressive (n = 49)
<60 years	137	112 (89.96%)	25 (10.4%)
>60 years	37	13 (35.1%)	24 (64.9%)

Lymphocytecount:

Patients are divided into two groups based on lymphocyte count.

Lymphopenia is considered when lymphocyte count $\leq 20\%$

Table no 3: Shows lymphocyte count among two groups

Lymphocyte count	Overall (n =174)	Stable (n =125)	Progressive (n = 49)
$\leq 20\%$	73	33 (45.2%)	40 (54.8%)
>20%	101	92 (91.08%)	9 (8.92%)

LDH:

LDH values varied among individuals

Patients are divided into three groups (< 250mg/dl, 250 – 500mg/dl, > 500mg/dl)

Table no:4 Shows LDH levels among two groups

LDH	Overall (n =174)	Stable (n =125)	Progressive (n =49)
≤ 250 mg/dl	37	32 (86.49%)	5 (13.51%)
250-500 mg/dl	73	66 (90.41%)	7 (9.59%)
≥ 500 mg/dl	64	27 (42.19%)	37 (57.81%)

D-Dimer:

Table no: 5 Shows D-Dimer levels among two groups

D-Dimer	Overall (n = 174)	Stable (n = 125)	Progressive (n = 49)
Normal	122	88 (72.13%)	34 (27.87%)
High	52	37(69.23%)	15 (30.77%)

CRP:

Table no :6 Shows CRP levels among two groups

CRP	Overall (n =174)	Stable (n =125)	Progressive (n =48)
Normal	112	92 (82.14%)	20 (17.85%)
High	62	33 (53.22%)	29 (46.78%)

CALL SCORE:

PARAMETER	SCORE
I. Comorbidity	
With	4
Without	1

I.	Age	
	<60	1
	≥60	3
I.	Lymphocyte count	
	>20%	1
	≤ 20%	3
V.	LDH	
	<250	1
	250-500	2
	≥500	3

Patients were grouped into three classes depending upon the CALL SCORE

CLASS	CALL SCORE	STABLE (n =125)	PROGRESSIVE (n=49)	RISK OF PROGRESSION
A	4-7	75 (60%)	12 (24.49%)	LOW
B	8-10	38 (30.4%)	17 (34.69%)	MEDIUM
C	11-13	12 (9.6%)	20 (40.82%)	HIGH

As, the class of CALL SCORE increases the progression of COVID-19 increases.

Total deaths 15

Call score: 4 to 7 - 4 deaths

8 to 10 – 5 deaths

11 to 13- 6 deaths

Since in all three classes deaths are recorded, Call score is not a good score to predict mortality.

In this retrospective study conducted in Govt TB and chest hospital, Visakhapatnam, 66% of patients were males and 34% of patients were females, 72% of them were stable and 28 % progressed to severe covid 19. The average hospitalisation period was 14 -17 days Few cases needed hospitalisation until two months and have been discharged with long term oxygen therapy / patient died during their hospital stay. Almost every case which progressed had multi-lobar infiltrates or haziness in chest X-ray or CT chest. Only a few negligible number of cases had elevated liver and renal function tests.

The clinical outcomes recorded were stable (Patients Discharged at Room air), Discharge with long term oxygen therapy, recovered with O2 / NIV, death. There were almost 15 deaths.

The majority of group of patients who were **stable** had the following characteristics:

Age < 60 (76.6%), predominantly males (72.17%), had no comorbidities (96 .9%), Lymphocyte count > 20 % (91.08 %), LDH between 250 to 500 (90.4%) and 0 to 250 (86.4%), CRP, D-Dimer, Liver and renal function tests, ferritin had no / little significance. Spo2 were more than 95% at discharge.

Group of patients in whom covid 19 pneumonia has **progressed** had the following characteristics:

Age ≥ 60 years (64.9 %), predominantly females (29 %), had comorbidities (60 .5 %), LDH ≥ 500, lymphocyte count ≤ 20 % (54.8%), D – Dimer, CRP, liver and renal function tests had little / no significance. Spo2 ≤ 93 % with room air. Patients needed either O2 / NIV 15 Patients died during hospital stay.

IV. Discussion

The chance of having a major illness is higher in those over the age of 60 and in people with underlying medical conditions including high blood pressure, heart and lung issues, diabetes, obesity, or cancer^[4]. Severe infections may cause cytokine-mediated tissue damage and LDH release. Since LDH is present in lung tissue (isozyme 3), patients with severe COVID-19 infections can be expected to release greater amounts of LDH in the circulation, as a severe form of interstitial pneumonia, often evolving into acute respiratory distress syndrome, is the hallmark of the disease. Elevated LDH levels seem to reflect that the multiple organ injury and failure may play a more prominent role in this pathology in influencing the clinical outcomes in patients with COVID-19.^[5] Advanced age and high LDH level are independent risk factors for exacerbation in mild COVID-19 patients.^[6]

Natural killer cells and T cells become exhausted in the chronic condition of SARSCoV2, resulting in lymphopenia.^[7] Direct infection of lymphocytes by SARS-

Cov, lymphocyte sequestration in the lung, or cytokine-mediated lymphocyte trafficking are possible causes of SARS-associated lymphopenia. Immune-

mediated lymphocyte destruction, bone marrow or thymus suppression or apoptosis may also occur^[9]. The clinical

Characteristics and treatment efficacy of COVID-19 were linked to changes in peripherallymphocyte subsets. CD8+ T cells were found to be a reliable predictor of COVID-19 severity and treatment efficacy.^[8]

Advantages:

Call score is an easy and simpler score to identify the progression of COVID-19. It can be used in large outbreaks to identify and segregate the patients according to the score and providing better care and frequent monitoring for those patients with call score B and C.

Limitations:

Sample size is small.

It is a Retrospective study and therefore a prospective study has to be done to confirm the reliability of the score. It is a single centre study.

Xray and CT severity is not included in this study

V. Conclusion

In this study, the CALL score had significant predictive power of disease progression. Nonetheless, more prospective studies are needed to validate the score in the context of this devastating disease. Furthermore, the significance and role of comorbidities and minimal exercise oxygen desaturation tests in COVID-19 patients must be investigated further to explain and validate their role. To demonstrate authentic knowledge, the spectrum and implications of the novel coronavirus disease must be thoroughly investigated, and research on larger sample populations using multi-centre studies is required.

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