The Use of Cauda-70 Score in Predicting the Prognosis in Patients with Acute Exacerbations of COPD

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Abstract:
Background: *COPD is one of the top 3 causes of death worldwide according to gold 2022 report. Most of the death happens during an acute exacerbation.Though exacerbations are so common in COPD patients, there is no widely accepted prognostic scoring system to assess the severity of exacerbation and predicting the prognosis and outcome of the patient at presentation. In this study a prognostic scoring score called CAUDA 70 is used to assess and predict the outcomes of patients with COPD.*
Materials and Methods: *In this hospital based prospective observational study, 93 patients of COPD who fulfilled the inclusion and exclusion criteria were studied over a period of 1year.Data including demographic profile and a detailed history of patient were obtained, Physical examination was done to note the acute mental status at the time of presentation to hospital. All necessary Investigations were carried out and recorded in all subjects. CAUDA-70 score variables are noted for each patient at the time of admission. Each variable is allotted one point.Patients are given appropriate treatment, either conservative treatment or with ventilator support and followed till discharge from hospital or death.outcome is assessed in terms of: (i) Recovered with conservative treatment and without need for ventilator support. (ii) Recovered with ventilator support. (iii) Death. The outcome of each patient was correlated with their respective CAUDA-70 score.*
Results: *The majority of the patients with acute exacerbation of COPD (40 (43.02%)), are between 61-70 years. Out of 93 patients 79 patients are males, which accounts for 85%. The most common symptom at presentation was dyspnea of varying grades. When assessing CAUDA 70 the confusion is present in 45 (48.38%) patients. 72 (77.41%) patients are acidotic, with pH <7.35. Blood urea nitrogen levels ≥7mmol/L is present in 42 (45.16%) patients. Dyspnea MRC ≥ 4 is present in 67 (72.04%) patients. Hypoalbuminemia (serum albumin ≤ 3.5gm/dl), is seen in 48 (51.61%), and 24 (25.81%) patients are aged ≥70yrs. 29 (31.18% patients had a CAUDA 70 score of 3. 26 (27.96%) patients had a score of 4. 9 (9.68%) patients had a score of 5, and total score of 6 was seen in 3 (3.23%) patients.In the 26 patients with a total score < 3, 21 were managed with conservative management, 5 patients required ventilator support.In patients with a total score of 3-6, most of the patients required ventilator support. In this group, out of 67 patients, 53 (79.1%) patients required ventilator support.There are a total of 6 deaths during the course of treatment in the hospital, all of which have occurred in patients with a score of 3-6. In patients with score up to 2, no patients have died during the course of treatment in the hospital*
Conclusion:*CAUDA-70 is a simple score that can be easily calculated in patients with AECOPD using physical findings and routine laboratory investigation within no time. All the variables used in the CAUDA-70 score are either directly or indirectly related to acute exacerbation of COPD. CAUDA-70 score of ≥3is associated with an increased need for ventilator support and mortality, indicating a poor prognosis.*
Key Word: *CAUDA 70; COPDAE; Prognosis; Outcome; Mortality.*

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I. Introduction

COPD is one of the top 3 causes of death worldwide according to gold 2022 report (1). Most of the death happens during an acute exacerbation. Acute exacerbation of COPD is defined as a severe worsening of respiratory symptoms associated with lung function deterioration requiring additional therapy. Exacerbations of COPD are critical events in COPD management because they negatively impact health status, increased hospital admission, readmission, and disease progression. Exacerbations cluster together in time, with a high risk of recurrent exacerbation within 8 weeks of first exacerbation (2). Though exacerbations are so common in COPD patients, there is no widely accepted prognostic scoring system to assess the severity of exacerbation and

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predicting the prognosis and outcome of the patient at presentation. There are some scoring systems like BAP 65, DECAF score used occasionally to predict outcome in acute exacerbations of COPD.

CAUDA 70 score was developed by Archibald from a multi-centreprospectiveobservational study in UK. In this study, clinical variables related to COPD exacerbations are used to predict the prognosis (in terms of mortality) of the patient at the time of presentation. These clinical variables are easy to assess and are done routinely at admission to the hospital. The variables included confusion at the time of presentation, acidosis (pH <7.35), blood urea >7mmol/L, dyspnoea grade ≥4 MRC, serum albumin <3.5 mg/dl, and age >70 years (3).

II.   Material And Methods

It is a prospective study carried out in hospitalized patients with COVID - 19 in Department of Pulmonary Medicine at Govt Hospital for Chest & Communicable diseases, Andhra medical college, Visakhapatnam from May 2021 to April 2022. A total of 93 patients were included in the study.

Study design: Hospital-based prospective observational study
Study location: Government Hospital for chest and communicable diseases, a teaching hospital of Andhra medical college, Visakhapatnam, Andhra Pradesh.
Study Duration: May 2021 to April 2022
Sample size: A total of 93 consecutive patients presenting with acute exacerbation of COPD were enrolled in the study
Subjects & Selection methods: The study population was drawn from consecutive COPD with Acute Exacerbation patients who got admitted in Govt Hospital for chest &communicable diseases, Visakhapatnam.
Inclusion criteria:
1. Age > 40 years.
2. Patients presenting to the hospital with an acute exacerbation of COPD.
3. Symptoms of exacerbation (increased breathlessness, increase in mucous production, fever, wheezing) in a known COPD patient preciously confirmed by spirometry.
Exclusion criteria:
1. Age < 40 years
2. Hospitalization for any reason other than COPD, e.g., pulmonary embolism, interstitial lung disease, other pulmonary diseases.
3. Airway disease due to any cause other than COPD (severe asthma, CCF, Pulmonary hypertension, renal failure, bronchiectasis, ABPA [allergic bronchopulmonary aspergillosis]).

Procedure methodology
- ❖ Data including demographic profile and a detailed history of patient were obtained, including presenting symptoms of AECOPD, MMRC dyspnea grade at the time of presentation, past medical history, family history and treatment history, date of COPD diagnosis, date of commencement of treatment for COPD, compliance and adherence to maintenance inhaler therapy.
- ❖ Physical examination was done to note the acute mental status at the time of presentation to hospital, to find the presentation of COPD related complications, to detect treatment-related adverse events.
- ❖ Investigations were carried out and recorded in all subjects are: Arterial blood gas analysis, Renal function tests for Blood urea Nitrogen, Serum proteins for albumin levels, other routine investigations like complete blood picture, chest X-ray, and other metabolic profile.
- ❖ CAUDA-70 score variables, i.e., confusion, acidosis (pH < 7.4), uremia (BUN >7mmol/L) dyspnea (MRC grade ≥4), serum albumin < 3.5 g/l, Age > 70, are noted for each patient at the time of admission. Each variable is allotted one point, shown as follows (table 1).

TABLE NO: 1 CAUDA 70 SCORE	
PARAMETERS ASSESSED	**POINTS GIVEN**
Confusion	1 POINT
Acidosis (pH < 7.35) in ABG	1 POINT
Uremia (BUN >7mmol/L)	1 POINT
Dyspnea- (MRC grade ≥4)	1 POINT
S. Albumin < 3.5 g/l	1 POINT
Age > 70 years	1 POINT

- ❖ Thus, each patient will have a score ranging from 1-6. Patients are given appropriate treatment, either conservative treatment or with ventilator support. Conservative treatment included bronchodilators, antibiotics, and oxygen supplementation. Ventilator support included Non-invasive ventilation and invasive mechanical ventilation.

- ❖ Patients were followed during the hospital stay, and the outcome is assessed in terms of: (i) Recovered with conservative treatment and without need for ventilator support. (ii) Recovered with ventilator support. (iii) Death.
- ❖ The outcome of each patient was correlated with their respective CAUDA-70 score.

III. Result

- ❖ The majority of the patients with acute exacerbation of COPD 40 (43.02%), are between 61-70 years. The second most common age group in this study is >70 years of age, which includes 24 (24.80%) patients (table 2).

Table 2: Age Distribution		
Age	Number	Percentage
41-50	10	10.75%
51-60	19	20.43%
61-70	40	43.02%
>70	24	24.80%

- ❖ Out of 93 patients recruited in this study, 79 patients are males, which accounts for 85%, and female patients are 14 in number accounting for 15%.
- ❖ 42 patients were active smokers, 29 patients were ex-smokers, and 22 patients were never smokers.
- ❖ The most common symptom at presentation was dyspnea of varying grades. MRC grade 3 dyspnea was seen in 26 patients, MRC grade 4 dyspnea was seen in 41 patients, and MRC grade 5 dyspnea was seen in 26 patients. 82 (88.17%) patients presented with cough and expectoration.
- ❖ When assessing CAUDA 70 the confusion is present in 45 (48.38%) patients. 72 (77.41%) patients are acidotic, with pH <7.35. Uremia defined as Blood urea nitrogen levels ≥7mmol/L is present in 42 (45.16%) patients. Dyspnea MRC ≥ 4 is present in 67 (72.04%) patients. Hypoalbuminemia, defined as serum albumin less than 3.5gm/dl, is seen in 48 (51.61%), and 24 (25.81%) patients are aged ≥70yrs (table 3).

Table 3: Study variables		
Study Variable	Number	Percentage
Confusion	45	48.38%
Acidosis (pH<7.35)	72	77.41
Uremia (>7mmol/l)	42	45.16
Dyspnoea MRC ≥4	67	72.04
Low Albumin (<3.5md/dl)	48	51.61
Age≥70yrs	24	25.81

- ❖ A total score of 1 was seen in 8 (8.6%) patients. 18 (19.35%) patients had a score of 2. 29 (31.18% patients had a score of 3. 26 (27.96%) patients had a score of 4. 9 (9.68%) patients had a score of 5, and total score of 6 was seen in 3 (3.23%) patients (table 4).

Table 4: Total Score		
Score	Number	Percentage
1	8	8.6 %
2	18	19.35 %

3	29	31.18 %
4	26	27.96 %
5	9	9.68 %
6	3	3.23 %

❖ In the 26 patients with a total score < 3, 21 were managed with conservative management, 5 patients required ventilator support (only NIV, no patients in this group required IMV). In patients with a total score of 3-6, most of the patients required ventilator support. In this group, out of 67 patients, 53 (79.1%) patients required ventilator support, and 14 (20.9%) patients were managed conservatively without the need for ventilator support (Table 5).

Table 5: Treatment given in relation to the total score			
Treatment	**Total Score**		**Total**
	1 to 2	3 to 6	
Conservative management	21	14	35
Ventilator support	5	53	58

❖ There are a total of 6 deaths during the course of treatment in the hospital, all of which have occurred in patients with a score of 3-6, 1 death each with scores 3 and 4, 2 deaths with scores 5 and 6. In patients with score up to 2, no patients have died during the course of treatment in the hospital (Table 6).

Table 6: Mortality at each scoring level		
Score	**Total patients**	**Mortality**
1	8	0
2	18	0
3	29	1 (3.4%)
4	26	1 (3.8%)
5	9	2 (22.2%)
6	3	2 (66.7%)

IV. Discussion

COPD is a progressive life-threatening disease affecting the lung, causing breathlessness and predisposes to exacerbations and serious illness. The natural course of the disease is interrupted by frequent episodes of symptom worsening termed exacerbation. Exacerbations are characterized by increased airflow obstruction due to increased inflammatory activity in the airways in response to the various triggers.

In 2015 in Egypt "assessment of in hospital mortality and need for mechanical ventilation in AECOPD 2-year prospective study" they compared 4 scoring systems CAUDA 70, BAP 65, CURB 65, CAPS. Of the four, CAUDA 70 score gave good results in predicting need for mechanical ventilation and mortality. They proved that CAUDA 70 score 3 and above have high mortality and recommended the need for mechanical ventilation (3,7,8)

The present study is intended to assess the ability of the CAUDA-70 score in predicting the prognosis of patients presenting with acute exacerbation of COPD. The variables used in this score- Confusion, Acidosis (pH<7.35), Uremia (blood Urea ≥7mmol/L), Dyspnoea (MRC grade ≥ 4), Albumin <3.5 gm/dl, and age ≥70, are related to the acute exacerbations either directly or indirectly.

Hypercapnia is the root cause of confusion and acidosis. Dynamic hyperinflation, hypoventilation, malnutrition, impaired respiratory muscle functions are responsible for the carbon dioxide retention causing respiratory acidosis and carbon dioxide narcosis. Confusion is a manifestation of carbon dioxide narcosis and hypoxic-ischemic encephalopathy due to hypoventilation (4)(5)(6). BUN has always correlated with bad prognosis in respiratory diseases. In AECOPD, it reflects intravascular volume depletion (due to decreased oral intake and hyperventilation in the hours or days before admission) (9).

Dyspnoea is a common symptom in COPD patients, aggravated during exacerbations due to increased expiratory flow limitation, dynamic hyperinflation, and neuromechanical dissociation (4).

Hypoalbuminemia in chronic diseases is a combined effect of chronic inflammation and decrease dietary intake. The majority of COPD patients with severe disease are lean and frequently malnourished or undernourished, referred to as "pulmonary cachexia syndrome" (PCS), characterized by loss of fat- free body mass, causing muscle wasting. In fact, it is estimated to occur in 25% to 40% of COPD patients, which leads to an accelerated decline in functional status, carrying an unfavourable prognosis (10,11,12). The muscle wasting in COPD not only leads to decreased skeletal muscle function associated with reduced exercise capacity, but it is also a major determinant of mortality in COPD, independent of airflow obstruction. Age is an independent risk factor for COPD exacerbation.

Patients with a score of 0- 1 are at low risk of death and can be safely managed at home. Patients with a score of 2 are also at low risk but may require hospitalization if they are confused or acidotic. Scores of 3 or more indicate poor prognosis that a patient has high mortality risk. Results of our study show that patients with CAUDA 70 score 3 and above have poor prognosis compared to those having score of 0 to 2. In this study, a male predominance was seen, 79/93 (85%). The proportion of COPD is more in men than women, which may be due to the synergistic effect of other risk factors such as smoking, tobacco use, and occupational exposure. The present study's smoking population accounts for 76% indicating significant reason for developing COPD. The total CAUDA 70 score of the patients is calculated from the study variables the patients have at the time of presentation depends on the severity of the disease, nutritional status of the patient, and hemodynamic status of the patient. In our study patients with a total score of 3-6, most of the patients (79.1%) required ventilator support. All patients who required invasive mechanical ventilation expired.

In the present study, there is no mortality recorded in patients with a score less than 3. In the patients with a score between 3 to 6, there were 6 deaths recorded. Of the total deaths, 1 patient had a score of 3, 1 patient had a score of 4, 2 patients had a score of 5, and 2 patients had a score of 6. patients with scores 1 and 2 have a good prognosis, and patients with core 3 to 6 have a bad prognosis.

V. Conclusion

❖ CAUDA-70 is a simple score that can be easily calculated in patients with AECOPD using physical findings and routine laboratory investigation within no time.
❖ All the variables used in the CAUDA-70 score are either directly or indirectly related to acute exacerbation of COPD.
❖ CAUDA-70 score of ≥3is associated with an increased need for ventilator support and mortality, indicating a poor prognosis.

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