e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(8); 1182-1186

Original Research Article

Study of Predictors of Outcome in Acute Exacerbation of COPD Patients Admitted in a Tertiary Care Centre

Devendra Pratap Yadav[1], Bhuvaneshvari Prasad Verma[2], Govind Narayan Srivastava[3]

[1]Assistant Professor, Pulmonary Medicine, Department of General Medicine, Mahamana Pandit Madan Mohan Malviya Cancer Centre and Homi Bhabha Cancer Hospital Varanasi 221005
[2]Assistant Professor, Dept of Respiratory Medicine, Saraswati Medical College, Unnao
[3]Ex Professor Department of TB and Respiratory Diseases, Institute of Medical Sciences BHU

Received: 25-05-2024 / Revised: 23-06-2024 / Accepted: 26-07-2024
Corresponding Author: Dr. Bhuvaneshvari Prasad Verma
Conflict of interest: Nil

Abstract:

Background: Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

Material and Methods: This study was conducted at a tertiary care centre in North India which caters mostly rural population of Uttar Pradesh, Bihar, Madhya Pradesh and Jharkhand. Demographical, clinical and radiological data were collected and analyzed with various biostatistical tools.

Result: Cumulative smoking (pack years), previous history of exacerbations, total duration of illness and CAT scores are important predictors of mortality and need of post hospital support. Low Glasgow ComaScore (<15), High respiratory rate, cyanosis, baseline low arterial pH, high pCO2 are predictors of mortality and morbidity. B type natriuretic peptide, ie, BNP is significant predictors of in hospital mortality. CRP was positively correlated to high total leucocyte countsuggesting role of infections in AECOPD.

Conclusion: These are simple prognostic factors for use in patients with COPD exacerbationspresenting to the emergency department. The corresponding variables are very easy to measure at entry in the real-life context, and represent powerful predictors of the risk of both death and need for post-hospital support.

Keywords: Chronic Obstructive Pulmonary Disease, Prognostic Factors, BNP.

Introduction

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease with significant extrapulmonary effects that may contribute to the severity in individual patients. COPD is currently the 3rd leading cause of death in the world. More than 3 million people died of COPD in each year accounting for 6% of all deaths globally. It represents a major public health challenge that is both preventable and treatable. The most common respiratory symptoms include dyspnoea, cough, sputum production and wheezes. Exacerbation of COPD is defined as acute worsening of respiratory symptoms those results in additional therapy. Exacerbation accelerates the rate of decline of lung function and associated with significant morbidity and mortality [1]

Exacerbation of COPD can be precipitated by several factors; most common causes are respiratory tract infections. Goal for the treatment of COPD exacerbation is to minimize negative impact of present exacerbation and to prevent subsequent events. Short acting inhaled beta2-agonist with or without short acting inhaled anticholinergics, are recommended as initial bronchodilators in exacerbation. Maintenance therapy with long acting bronchodilators should be started as soon as possible before hospital discharge. Systemic corticosteroids can improve lung function, shorten recovery time and hospitalization duration. Therapy should not be more than 5-7 days. Antibiotics, when indicated, can shorten recovery time, reduce risk of early relapse, treatment failure and hospitalization duration. It should be given for 5-7 days. Non-invasive ventilation should be first mode of ventilation used in patients with acute respiratory failure as it improves gas exchange, reduces work of breathing and need for intubation and improves survival.

Rough estimates suggest there are 30 million COPD patients in India at present. India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world; i.e. more than 64.7 estimated age standardized death rate per100,000 people. [2] In stable COPD, prognostic indices have been thor-

oughly investigated and tools predicting mortality risk, such as the BODE Score, are well established. However, prognostic research in exacerbations requiring hospitalization has been limited. Therefore studies that assessprognostic indices in shorter duration of exacerbation are warranted in this subset of population. Keeping these factors in mind, the present study is designed.

Material and Methods

This study was prospective cohort study conducted at tertiary care centre in north India. This hospital serves as tertiary care centre for people in eastern part of Uttar Pradesh adjoining areas of Bihar, Jharkhand and Madhya Pradesh. Total 50 Patients were recruited prospectively from Chest department and Emergency OPD. Inclusion criteria include all patients with acute exacerbation of COPD above 45-year, COPD diagnosed earlier by clinical criteria, clinical history, spirometry test with compatible clinical findings.

Patient not giving consent for participation in study were excluded. Patients who are presented with exacerbation due to other disease like bronchial asthma, bronchiectasis, ILD, TOPD were excluded. Patients with associated systemic diseases, multi organ dysfunction and cardiac diseases were excluded from study. During hospital admission all the patients were evaluated throughly. Clinical evaluation and investigations were done as par recommendations. Patients were treated with standard protocol including oxygen support, inhaled bronchodilators, oral or intravenous antibiotics, steroid as recommended by treating physician. Non-invasive Ventilation and Mechanical ventilation support was given whenever mandated. Patients were later classified into two groups Survived or Non-survived depending on in hospital mortality. Survived patient were assessed on need for any domiciliary supportive care like Long term oxygen therapy and Non Invasive Ventilation.

The data was classified accordingly. All the collected data was analyzed by SPSS version 16. Independent student-t test was used for comparing the means of two groups. Chi- square test was used for non-parametric variables and p value of less than 0.05 was considered statistically significant and Correlation between variables are derived using Pearson correlation analysis.

Results

Mean age of patients in survived group was 62.31 years with standard deviation of 9.35 and in non-survived group mean age of patients was 65.11 years with standard deviation of 7.50. The difference in both groups was not significant statistically. Percentage of male and female patients in both groups was different in both group. In survived group, Males were more than females (54% v/s 46 %) whereas in non-survived groups female were more than males% (55.6%v/s 44.4%). Overall percentage of male was slightly more than females. This may point to rampant indoor smoke exposure in this part of the world to females.

Table 1: Smoking

	Non survived (n=9)		Survived (n=41)		Total	
	N	%	N	%	N	%
Non smoker	4	44.4%	8	19.5%	12	24.0%
Smoker	5	55.6%	23	56.1%	28	56.0%
Ex-smoker	0	0.0%	10	24.4%	10	20.0%
Total	9	100.0%	41	100.0%	50	100.0%

Percentage of smokers was more than non-smokers in survived group (55.6% vs 44.4%), it may be due to indoor smoke exposures in female population. There was no ex-smoker in this group. In survived group also, percentage of smokers was more than nonsmokers and ex-smokers (56%vs24%vs20%) Mean duration of pack years was significantly higher in non- survived group than survived group.

Table 2: Dyspnoea: mMRC Scale

mMRC grade	Non survived (n=9)		Survived (n=41)		Total	
	N	%	N	%	N	%
1	0	0.0%	1	2.4%	1	2.0%
2	3	33.3%	21	51.2%	24	48.0%
3	6	66.67%	17	41.5%	23	46.0%
4	0	0.0%	2	4.9%	2	4.0%
Total	9	100.0%	41	100.0%	50	100.0%

Maximum percentage of patients in non-survived groups was of mMRC grade 3 whereas in survived group of grade 2. We found in our study that Sputum production was present inall non-survived patients whereas it was in 82.9% patients in survived group. We found in our study that Mean of no. of exacerbations were more in non-survived groupwhen compared with survived group. It was statistically significant.

Table 3: CAT Score

	Mean±SD		
	At admission	**Discharge**	**Paired t-test**
Survived	27.26±2.13	17.65±3.07	t=18.269p=0.000(HS)
Non survived	29.77±1.56	-	-
Student's t-test	t=3.326 p=0.0 02	-	

CAT score was more in non-survived group in comparison to survived group and it was statistically significant. At time of discharge CAT score showed significant improvement. Patients in non-survived group had low GCS score in comparison to survived group having more GCS score and it was statistically significant.

Respiratory rate was more in non-survived group as compared with survived group and it wasstatistically significant. At time of discharge it improved significantly (29.3% of patients using accessory muscles of respiration) 44.4% people in non-survived group had cyanosis at the time of admission compared with only 4.9% in survived group. This was found to be significant in our study.

PaCO2 in the arterial blood was increased in non-survived group when compared to survived group and it was found to be significant in our study. It denotes type 2 respiratory failure predicts in hospital mortality. At time of discharge, PCO2 improved in survived patients.

Table 4: pH

	Mean±SD		
	At admission	**Discharge**	**Paired t-test**
Survived	7.32±0.045	7.37±0.014	t=-7.537 p=0.000
Non survived	7.16±0.92		-
Student's t-test	t=-8.134 p=0.000	-	

Patients in non-survived group have low pH, ie. Respiratory acidosis in comparison to survived group and it was statistically significant. In this study low pH was significantly associated with mortality and need for domiciliary care. We found in our study that HCO_3 levels were more raised in non-survived group when compared with survived group. It was statistically significant

Table 5: Arterial Oxygen Saturation (SPO2) Percentage

	Mean±SD		
	At admission	**Discharge**	**Paired t-test**
Survived	90.70±3.62	93.39±3.42	t=-10.226p=0.000 (HS)
Non survived	85.11±5.08		-
Student's t-test	t=-3.8 89 p=0.000	-	

Patient in non-survived group have low oxygen saturation in comparison to survived group and it was statistically significant. At time of discharge it improved significantly in survived patients.

We found in our study that TLC levels were more raised in non-survived group when compared with survived group. It was statistically significant. At time of discharge it improved although it as not statistically not significant.

CRP level was more raised in non-survived group in comparison to survived group and it was statistically not significant.

In this study RVSP values were more increased in non-survived group when compared with survived group. It was statistically significant

LVEF was decreased in non-survived group in comparison to survived group. It was statisticallysignificant. It shows decreased left ventricular function is responsible for in hospital mortality.

We found in our study that BNP levels were more raised in non-survived group when compared with survived group. It was statistically significant.

In hospital stay percentage of patients required NIV vs Mechanical Ventilation supportwas 36% VS 28% whereas 36% required only pharmacological treatment (no intervention). Out of 14 patients on MV support, 9 patients expired during hospital stay.

Mean BNP was higher in patients who required MV support in comparison to patient's needed NIV support or no intervention. It shows BNP as a marker of requirement of IntensiveCare support in hospital.

BNP vs PaCO2

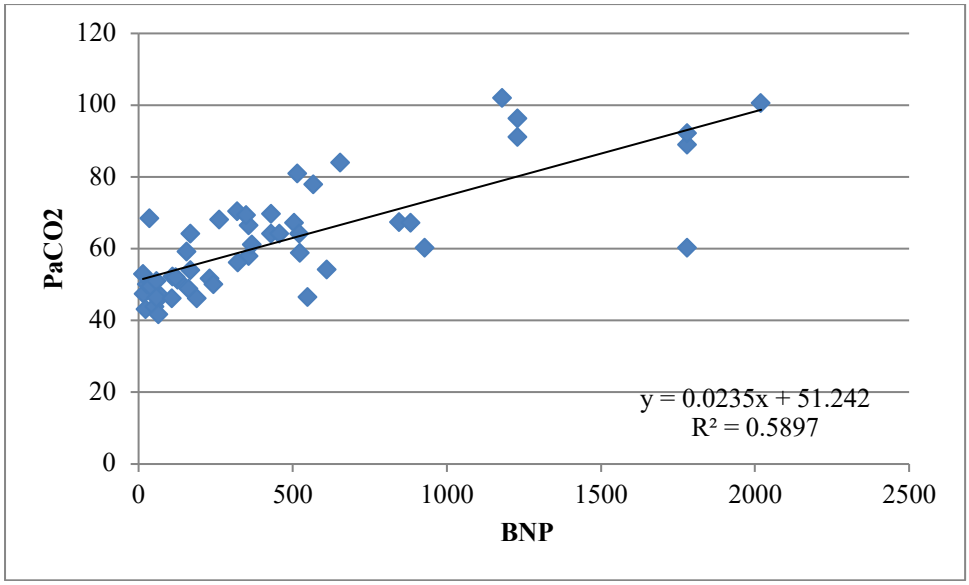

Figure 1: PaCO2 and BNP shows positive correlation

PHvs BNP

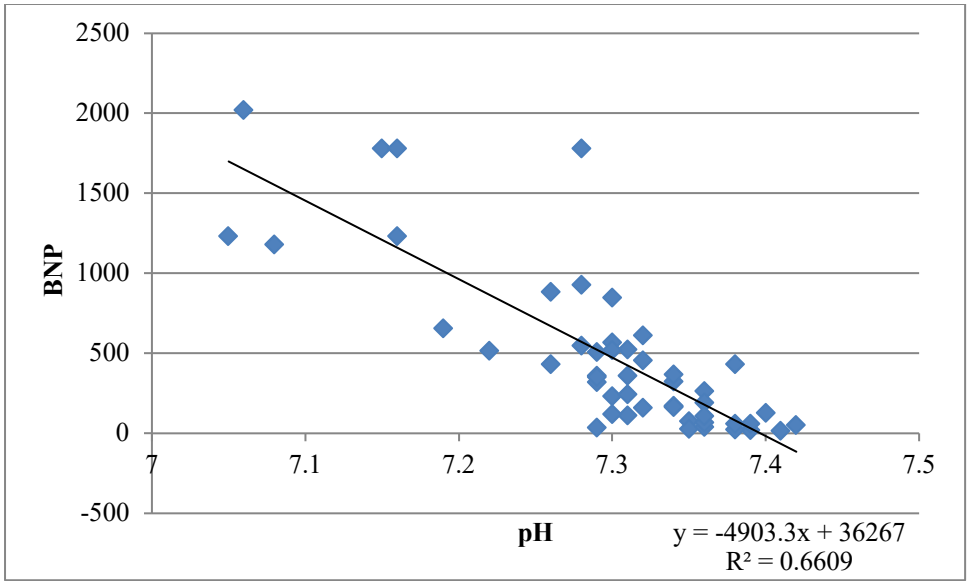

Figure 2: PHvs BNP

In this study BNP was negatively correlated with pH (Acidaemia) This association was found to be significant.

Discussion

In this study age was not a predictive factor for in hospital mortality (p- value = 0.407). Mean age of the two groups in our study was comparable. Few studies have reported male sex as a predictor for mortality which is in contrast to finding of this study. Patil SP et al [3] have suggested that this might be due to fact that men are more likely to seek care later in the course of disease Total duration of illness was a significant predictor of outcome in this study (p-value=0. 001). Dransfield MT et al [4], 2007 have also shown that duration of stay in hospital was a predictor of mortality in their study through multivariate regression analysis. Worsening of clinical signs that represent respiratory distress (Increased respiratory rate, use of accessory muscle, cyanosis) were found to be significant in our study. 2D echocardiography features like Right atrium or ventricle dilatation, increased right ventricle systolic pressure and decreased left ventricular ejection fraction were found significant in non-survived group. Mean Glasgow Coma Score of Non-survived group was 12.88±1.16 as compared with that in survived group was 14.41±0.70 (p-value <0.001). Total leucocyte count was increased in non-survived groups in comparison to survived groups and it was statistically significant. In survived patients TLC decreased which shows infections as a major cause of exacerbations and mortality. Creatinine and total leucocyte count are a part of

APACHE ll score which has shown promise in predicting mortality in COPD patients admitted in ICU. COPD assessment test (CAT) score is associated with the changes of systemic inflammation following exacerbation. It was found to be an easy and significant predictor of short term mortality. In survived patients it improved significantly at time of discharge. C- reactive protein is a marker of inflammation and correlated with degree of pulmonary inflammation in COPD. In our study CRP was significantly raised in non- survived group, however this could be due to overall inflammation process. BNP is marker of cardiovascular dysfunction and mortality in acute exacerbation of COPD. BNP was raised in non-survived groups in comparison to survived groups and it was statically significant.

Conclusion

Age and sex are not predictors of mortality and need of post hospital support in acute exacerbation of COPD. Cumulative smoking (pack years), exacerbations, total duration of illness and CAT scores are important predictors of mortality and need of post hospital support. Glasgow Coma Score (<15), respiratory rate, cyanosis, use of accessory respiratory muscle are predictors of mortality and post hospital support requirement. Low pH, Low arterial oxygen saturation, high $PaCO_2$, are predictors of mortality. T. BNP is significant predictors of in hospital mortality. CRP was positively correlated to total leucocyte count suggesting role of infections in AECOPD. Moreover our findings also corroborated earlier studies that BNP and CRP values are positively correlated in acute exacerbation of COPD. pH and BNP values were negatively correlated in our study, signifying rise of BNP in acute exacerbation with Type 2 respiratory failure. Meanwhile variation in predictors of mortality and morbidity may require further studies in this context.

References

1. Global initiative for chronic obstructive lung disease, GOLD 2018.
2. Salvi S, Agarwal A. India needs a national COPD prevention and control programme. J Assoc.Physician India 2012; 60 supple:5-7
3. Patil SP, Krishnan JA, Lechtzin N, Diette GB. In-hospital mortality following acute exacerbations of chronic obstructive pulmonary disease. Arch Intern Med 2003; 163:1180– 1186.
4. Dransfield MT, Rowe SM, Johnson JE, Bailey WC, Gerald LB. Use of beta blockers and the risk of death in hospitalized patients with acute exacerbations of COPD. Thorax 2008; 63:301–305.
5. Roche N, Zureik M, Soussan D, Neukirch F, Perrotin D; Urgence BPCO (COPD Emergency) Scientific Committee. Predictors of outcomes in COPD exacerbation cases presenting to the emergency department. Eur Respir J 2008; 32:953–961.
6. Onadeko BO, Khadadah M, Abdella N, Mukhtar M, Mourou M, Qurtom M, Samad M, Al- Shayeb A. Prognostic factors in the management of exacerbation of chronic obstructive pulmonary disease in Kuwait. Med Princ Pract 2005; 14:35–40.
7. Ai Ping C, Lee KH, Lim TK. In-hospital and 5-year mortality of patients treated in theICU foracute exacerbation of COPD: a retrospective study. Chest 2005; 128:518–524.
8. Nevins ML, Epstein SK. Predictors of outcome for patients with COPD requiring invasive mechanical ventilation. Chest 2001; 119: 1840–1849.
9. Roberts CM, Lowe D, Bucknall CE, Ryland I, Kelly Y, earson MG. Clinical audit indicators of outcome following admission to hospital with acute exacerbation of chronic obstructive pulmonary disease. Thorax 2002; 57:137–141.
10. Warren PM, Flenley DC, Millar JS, Avery A. Respiratory failure revisited: acute exacerbations of chronic bronchitis between 1961–68 and 1970–76. Lancet1980; 1:467–470.
11. Dahl M, Tybjaerg-Hansen A, Vestbo J, Lange P, Nordestgaard BG. Elevated plasma fibrinogen associated with reduced pulmonary function and increased risk of chronic obstructive pulmonary disease. American Journal of Respiratory & Critical Care Medicine 2001; 164(6):1008-11.
12. Mannino, D. M., Homa, D. M., Akinbami, L. J., Ford, E. S. & Redd, S.C. 2002.Chronic obstructive pulmonary disease surveillance--United States, 1971- 2000. Respir Care, 47, 1184-99.