Research Article

Severity Grade as a Predictor of Mortality in Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease in the Emergency Department

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Chronic Obstructive Pulmonary Disease (COPD), a common preventable and treatable disease, with significant extra- pulmonary effects. The principal factor to determine exacerbation severity is the severity of the underlying COPD or the patient baseline condition. The prognostic & predictive value of the grade of the severity used in our study has been reviewed. To assess if increasing in the severity of COPD exacerbation on the grade of the severity used in our study were associated all with adverse outcomes in COPD exacerbations and increased mortality in patients with acute exacerbations of COPD admitted to Emergency Department at Suez Canal University Hospital. Patients and methods: This observational Cross sectional study was conducted on 79 patients with acute exacerbation of COPD admitted to the Emergency Department at Suez Canal University Hospital on the second of May 2013 to the first of May 2015. Inclusion criteria: Both genders, adult patients (more than 40 years old) with acute exacerbation of COPD. Exclusion criteria: The following patients were excluded from the study: patients with severe renal impairment, persistent hemodynamic instability, myocardial infarction and cardiac arrest before admission. Demographics, full medical history, vital signs, ABGs and ECG were recorded. Results: Mortality rate was (2.53%). Increasing in the severity of COPD exacerbation on the grade of the severity used in our study was associated with adverse outcomes in COPD exacerbations. It also found that life threatening grade predicted increased mortality. Increasing in the severity of COPD exacerbation on the grade of the severity used in our study was associated all with adverse outcomes in COPD exacerbations and increased mortality.

Introduction

Chronic obstructive pulmonary disease (COPD) is a lung disease characterized mainly by airflow limitation that is not fully reversible, and corresponds to the major cause of chronic respiratory failure and Core pulmonale [2].

COPD remains an important cause of morbidity and mortality worldwide. It is a worldwide health issue [3]. COPD is currently the fourth leading cause of death in the world, accounting for 3.8% of total deaths, and it was the sixth leading cause of death in nations of low and middle income [4].

In addition to deterioration of lung function, a large proportion of patients presented with a change of their symptoms that become worth, including the amount of the sputum become more, cough and dyspnea become worth

and increased in number and duration respectively. During exacerbations, patients frequently need hospitalization, and mortality is increased [5]. The principal factor to determine exacerbation severity is the severity of the underlying COPD or the patient baseline condition; considerable changes in disease severity are unusual in exacerbations identified from diary cards and often imply alternative diagnoses, such as pneumonia and pulmonary embolism. There are no established criteria for assessing severity in less severely ill patients not requiring hospital assessment. The patients required hospital admission, or at least hospital assessment, can be categorized for severity, based on the presence or absence of respiratory failure, arterial blood-gas measurement breathing room air [6]. Patients known to be COPD on an oral or parenteral corticosteroid prescription could be considered to be severe. While those

with a respiratory-related antibiotic could be classified as a mild/moderate exacerbation, provided there was no alternative reason for the prescription. A relapse could be defined when the exacerbation definition is reached within 28 days of a previous exacerbation [7].

Accordingly the objective of the current study is to explore the validation of the severity grade as a predictor of mortality in patients with acute exacerbation of COPD. The aim of the work is to assess if increasing in the severity of COPD exacerbation on the grade of the severity used in our study was associated with adverse outcomes in COPD exacerbations and increased mortality.

Materials and Methods

Patients and methods

This study was conducted as observational Cross sectional study was conducted in patients with acute exacerbation of COPD admitted to the Emergency Department at Suez Canal University Hospital on the second of May 2013 to the first of May 2015. The calculated sample size was 79 patients.

Inclusion criteria:

Both genders, adult patients (more than 40 years old) with acute exacerbation of COPD. The following patients were excluded from the study: patients with Sever renal impairment, persistent hemodynamic instability, myocardial infarction and cardiac arrest before admission.

Exclusion criteria

The following patients were excluded from the study: patients with severe renal impairment, persistent hemodynamic instability, myocardial infarction and cardiac arrest before admission.

The clinical data was collected by the researcher in a pre-organized data sheet for each patient, the following were studied: Socio- demographic data, Clinical evaluation regarding vital signs, general and various body systems examination and grading of the Severity of COPD exacerbation was done.

Laboratory investigations

Complete blood count, arterial blood gases, and renal functions

Treatment and follow up

Patients followed up for the effectiveness of the emergency management and outcome. Grading of the Severity of COPD exacerbation was done cited from Burge S. et al, 2003[1].

Mild	An exacerbation treated with antibiotics but no systemic corticosteroid. If no blood gases are available the absence of respiratory failure is assumed
Moderate	An exacerbation treated with parenteral corticosteroids with or without an antibiotic. If no blood gases are available the absence of respiratory failure is assumed
Severe	Type 1 respiratory failure with hypoxaemia but no carbon dioxide retention or acidosis; $PaO_2 > 8$ kPa (60 mmHg) and $PaCO_2 = 6$ kPa (45 mmHg)
Very severe	Type 2 respiratory failure, compensated with hypoxia, carbon dioxide retention but no acidosis; $PaO_2 > 8$ kPa
	(60mmHg), $PaCO_2 < 6$ kPa (45 mmHg) and hydrogen ion concentration=44 nM (pH=7.35)
Life-threatening	Type 2 respiratory failure, decompensated with acidosis and carbon dioxide retention; $PaCO_2 < 6$ kPa (45 mmHg) and hydrogen ion concentration<44 nM (pH>7.35)

Results

Among the 79 studied patients 68 were males and 11were females. Most of the patients were in age group 47 – 60 years old (40.51%). Mean age was 62.67 years old with range from 47 to 86 years old. The demographic data of the studied patients was summarized in Table 1. It is shown in Table 2 that the most common risk factor for COPD was cigarette smoking whether alone (40.5%) or with shisha smoking (39.2%).

Table 1. Socio-demographic data of the study population (n=79)

Socio-demographic variables		Frequency	Percent
Age (years)	47 - < 60	32	40.51%
	60 - <70	24	30.38%
	≥70 – 86	23	20.11%
		Range 47-86 Mean ± SD 62.67+ 9.55	
Gender	Male	68	86.08%
	Female	11	13.92%

Table 2. Risk factor for COPD among the studied patients (n=79)

		Number (79)	Percentage
Risk factor for COPD	Cigarette smoking	63	79.7%
	Shisha smoking	36	45.6%
	Baking	5	6.3%
	Occupational exposure	6	7.6%
Smoking index (pack .year)	Mean ± SD Range	43.71 ± 13.48 15 - 122	
Duration of smoking	Mean ± SD Range	35.92 ± 9.81 years 15 – 55 years	

The most common symptom was found to be increase in dyspnea perceived by patients (78.48%). More than half of patients were presented complaining of at least 2 symptoms (54.43%). Nine patients were presented complaining of increase in all of cough, dyspnea and sputum volume & purulence (Tab. 3). By general clinical examination, flapping tremors was reported among 44.3% while central cyanosis was detected among 41.77% (Tab. 4, Fig. 1).

Table 3. Symptoms among the studied patients (n=79)

Symptoms	Number	Percentage
Increase in cough	38	48.1%
Increase in dyspnea	62	78.48%
Change in sputum volume and purulence	40	50.63%
One symptom only	27	34.18%
Two symptoms	43	54.43%
The three above symptoms	9	11.39%

Table 4. Clinical signs among the studied patients (n=79)

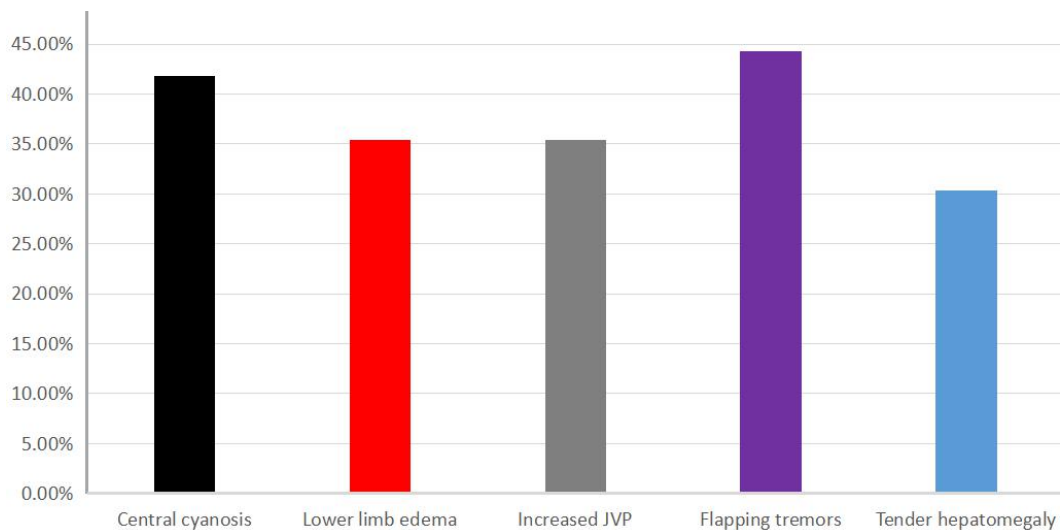| Clinical signs	Number	Percentage
Central cyanosis	33	41.77%
Lower limb edema	28	35.44%
Increased JVP	28	35.44%
Flapping tremors	35	44.3%
Tender hepatomegaly	24	30.38%

Figure 1. Clinical signs among the studied patients

Four patients were presented with moderate COPD exacerbation (5.06%), 29.11% have severe COPD exacerbation, 15.19% of patients have very severe form of exacerbation while 50.63% of patients have life threatening form of COPD exacerbation(Tab. 5). Table 6 shows that statistically significant difference among 4 categories (analysis of variance test).

Table 5. COPD exacerbation severity grading on presentation to ER among the studied patients (n=79)

COPD exacerbation severity grade	Number	Percentage
Moderate	4	5.06%
Severe	23	29.11%
Very severe	12	15.19%
Life threatening	40	50.63%

Table 6. ABG on presentation to ER according to severity grade (n=79)

ABG	After initial treatment				p-value
	Moderate	Severe	Very severe	Life threatening	
pH	7.35 ± 0 ^{ab}	7.4 ± 0.05 ^{a}	7.34 ± 0.007 ^{b}	7.25 ± 0.07 ^{c}	0.001*
PO2	80 ± 4.08 ^{a}	78.7 ± 9.15 ^{a}	53.2 ± 9.3 ^{b}	64.5 ± 6.38 ^{c}	0.001*
PCO2	26 ± 1.15 ^{a}	39 ± 4.46 ^{b}	61.9 ± 2.88 ^{c}	62.4 ± 6.5 ^{c}	0.001*
HCO3	13.75 ± 0.96 ^{a}	22.5 ± 1.8 ^{b}	29.6 ± 3.8 ^{c}	26.5 ± 5.8 ^{c}	0.001*

a, b, c indicate statistically significant difference within categories (Bonferroni test – post hoc analysis).

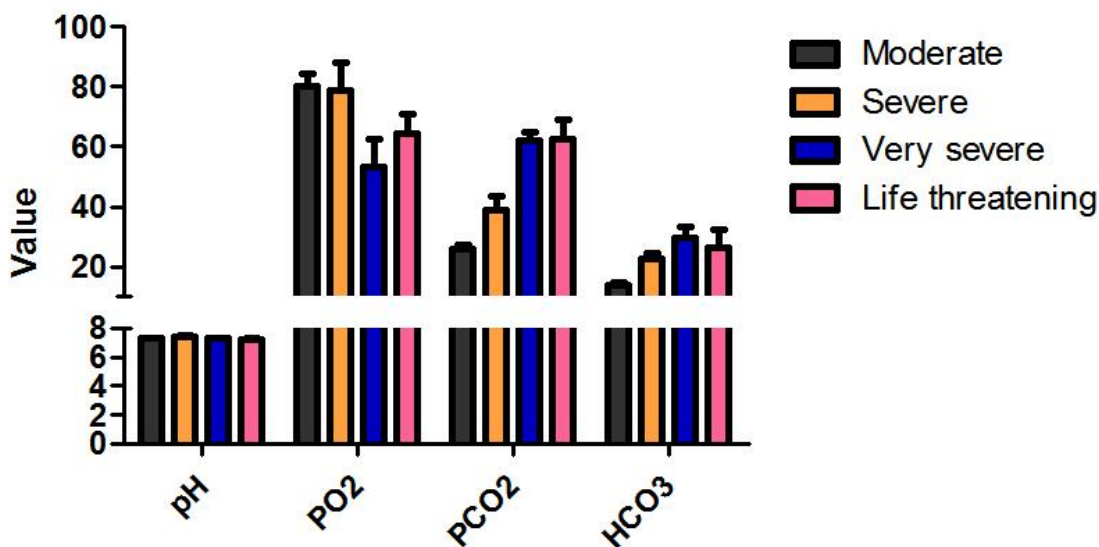*statistically significant difference (p-value < 0.05).

Figure 2.   ABG on presentation to ER according to severity grade (n=79)

Table 7 shows that with initial treatment in ER, 7 patients have been downgraded from life-threatening form of COPD exacerbation to very severe form of exacerbation while other patients remain in same class of COPD exacerbation. ER mortality was found to be 2.53% among studied patients. 29.11% of patients were discharged from ER after initial treatment. Rate of admission to ICU was 15.19% (Fig. 3).

Discussion

The present study showed that most of the studied patients were males (68%) with a mean age of 62.67 years. Our results are comparable with a study did in Utrecht, the Netherlands by Karin H. Groenewegen et al (2008) in which most of the patients were males (72%) [8].

Table 7. COPD exacerbation severity grading after initial treatment in ER among the studied patients (n=79)

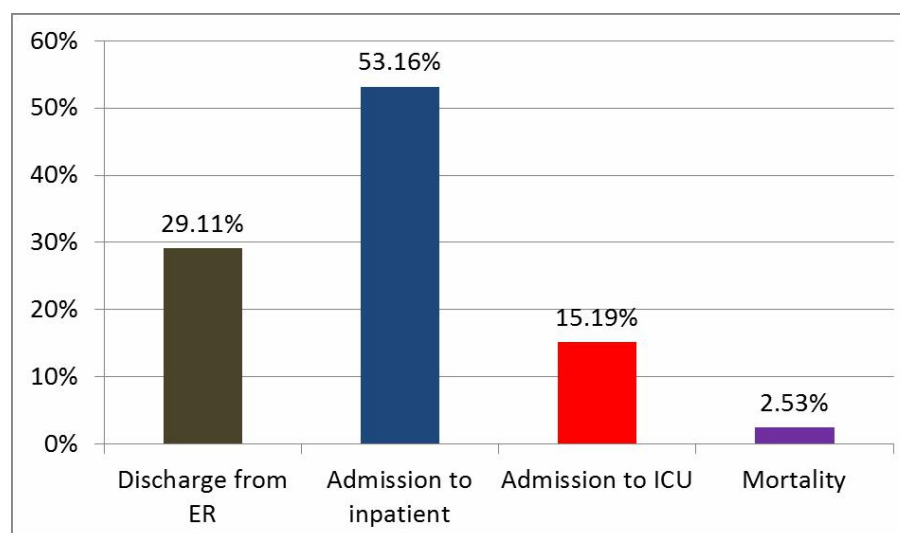| COPD exacerbation severity grade	Number	Percentage
Moderate	4	5.06%
Severe	23	29.11%
Very severe	19	24.05%
Life threatening	33	41.77%

Figure 3. Outcome of the studied patients (n=79)

Only 7.6% of patients were never smokers (occupational exposure) which match with another study which was done by Nicolas Roche et al (2014) in which 6.6% of patients were never smokers [9].

As regard general examination, cyanosis was detected among (41.77%), lower limb edema (35.44%).This agrees with '2008 Score' in which Cyanosis (29%) & lower limb edema (23.3%) were detected in the cases(9). Patient's data on ER presentation, including oxygenation measured by pulse oximetry ,arterial blood gas analysis (pO2, pCO2, pH), blood pressure, and respiratory frequency, and manually scored according to COPD severity grading was used in this study (cited from Burge S. et al ,2003) [1] . More than half of the patients (65%) in our study had arterial O2 tension less than 60 mmHg and had arterial PCO2 more than 60 mmHg on presentation to the ED. This match to a near extent to another study was done by Vidar Soyseth et al (2013) in which thirty of the patients among the references had arterial O2 tension less than 60 mmHg and 50% of the AECOPD patients had arterial PCO2 on more than 60 mmHg arrival to the hospital [10] .

The result of the severity grading was four patients were presented with moderate grade of COPD exacerbation (5.06%), 23(29.11%) had severe COPD exacerbation, 12 (24.05%) of patients had very severe form of exacerbation while 40 (41.77%) of patients had life threatening form of COPD exacerbation.

Indeed, in our study 2 patients died in the ED (2.53%) which was roughly similar to Roche et al, 2008 study in which (1.25%) of the patients died in the ED [11].

The significant information derived from the present study is that increasing in the severity of COPD exacerbation on the grade of the severity used in our study was associated all with adverse outcomes in COPD exacerbations.

Conclusion

Increasing in the severity of COPD exacerbation on the grade of the severity used in our study was associated all with adverse outcomes in COPD exacerbations.

Competing interests

The authors declare that they have no competing interests.

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