

Pulmonary Medicine

KEYWORDS: COPD ;

Respiratory Failure ; APACHE IV score ; SAPSIII score

ROLE OF SCORING SYSTEMS AS A PROGNOSTIC FACTOR IN PATIENTS ADMITTED IN ICU WITH COPD AND RESPIRATORY FAILURE

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**ABSTRACT:**

Background and objectives:- Chronic Obstructive Pulmonary Disease (COPD) represents an important public health challenge and is a major cause of chronic morbidity and mortality throughout the world. COPD is currently the fourth leading cause of death in the world but is projected to be the 3rd leading cause of death by 2022. More than 3 million people died of COPD in 2012, the COPD burden is projected to increase in coming decades because of continued exposure to COPD risk factors and aging of the population. This study aimed to use Scoring Systems (APACHE IV, SAPS III) to evaluate cases of COPD and Respiratory failure admitted into intensive care unit (ICU), in Benha University Hospital and Benha Teaching Hospital, for management to prevent further complication and the outcome.

Methods: This was Prospective, Randomised, Analytic Study was conducted over a period from January 2017 to December 2017 including Patients suffering from COPD exacerbation admitted to the ICU of Benha University Hospital and Benha Teaching Hospital.

Results: A total number of 100 patients suffering from COPD exacerbation and Respiratory Failure were admitted to the ICU. 70 patients were cured showing 70% of the study while 30 patients died showing 30% of the study.

Conclusion: the present study proved that COPD exacerbation and Respiratory Failure is an existing problem in our ICUs related to many etiological and risk factors. It showed Using SAPSIII score more accurate than APACHE IV score when applied on COPD patients admitted in ICU. But using two scores most accurate.

INTRODUCTION

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. (1) The chronic airflow limitation that is characteristic of COPD is caused by a mixture of small airway disease (e.g., obstructive bronchiolitis) and parenchymal destruction (emphysema), the relative contributions of which vary from person to person. (2) Respiratory failure is not a disease per se but a consequence of the problems that interfere with the ability to breathe. The term refers to the inability to perform adequately the fundamental functions of respiration: to deliver oxygen to the blood and to eliminate carbon dioxide from it. (3) Respiratory failure has many causes and can come on abruptly (acute respiratory failure) when the underlying cause progresses

rapidly—or slowly (chronic respiratory failure) when it is associated over months or even years with a progressive underlying process. Typically, respiratory failure initially affects the ability either to take up oxygen (referred to as oxygenation failure) or to eliminate carbon dioxide (referred to as ventilatory failure). (4) Assessment of medical treatment outcome was started in 1863, when Florence Nightingale first addressed this issue. (5) Initially, outcome prediction in critical illness was based on the subjective judgment of the clinicians. The rapid development of intensive care units (ICUs) created the need for quantitative and clinically relevant surrogate outcome measures in order to evaluate the effectiveness of treatment practices. Hence, scoring systems have been developed and applied for the same. The outcome of intensive care patients depends on several factors present on the 1st day in the ICU and subsequently on the patient's course in ICU. For such populations, many scoring systems have been developed but few are used. Several of these systems are known simply by their acronym. (6) A scoring system usually comprises of two parts – a score (a number assigned to disease severity) and a probability model (equation giving the probability of hospital death of the patients). A model refines the ability of scores or scales to be used in comparing various groups of patients for the purpose of treatment, triage or comparative analysis and thus helps in decision making. (7) General illness severity scores are widely used in the ICU to predict outcome, characterize disease severity and degree of organ dysfunction, and assess resource use. Scoring systems used in critically ill patients can be broadly divided into those that are specific for an organ or disease (for example, the Glasgow Coma Scale (GCS)) and those that are generic for all ICU patients. In this article, we focus on the generic scores, which can broadly be divided into scores that assess disease severity on admission and use it to predict outcome (for example, Acute Physiology and Chronic Health Evaluation (APACHE), Simplified Acute Physiology Score (SAPS), Mortality Probability Model (MPM)), scores that assess the presence and severity of organ dysfunction (for example, Multiple Organ Dysfunction Score (MODS), Sequential Organ Failure Assessment (SOFA)), and scores that assess nursing workload use (for example, Therapeutic Intervention Scoring System (TISS), Nine Equivalents of Nursing Manpower Use Score (NEMS)). (8)

PATIENTS AND METHODS

Patients collected from the Critical Care Department Banha University Hospital & Banha Teaching Hospital. 100 patients admitted to critical care department with complications of COPD were collected.

The APACHE IV, SAPS III scores were recorded on the first day of admission in the ICU. The data for was calculated and analyzed in the SPSS. All the graphs were made using Microsoft Excel.

Methods of study:

Prospective , Randomised , Analytic Study

Study population

This was done on one hundred patients admitted to ICU presented by COPD exacerbation and Respiratory failure .

they were be submitted to the following at time of admission :

- A_ history taking
- B_ laboratory investigation as:
(Arterial blood gases,liver function test, kidney function test,CBC)
- C_ imaging investigation
(Chest x-ray,CT chest in some cases)
- D_ Demographic data.
- E_ Medical treatment.
- F_ Previous ICU admission and outcome.
- G_ End organ dysfunction.
- H_ Etiological diagnosis on admission.
- I_ Different laboratories parameters.
- J_ Treatment received during ICU stay.
- K_ Duration of ICU stay.
- L_ In hospital outcome.

The score uses: (APATCH IV,SAPS III) 1_ APATCH IV ask about (age, temperature, MAP, HR, RR, Mechanical Ventilation , PO₂,arterial PH, PCO₂,Na,urine output,s.creat,albumin bilirubin, HT%, WBC, GCS, chronic health condition)

2_ SAPPSSIII askabout (age,HR,systolicBP,GCS,Temp,BP,GCS, Temperature mechanical ventilation ,PO₂,urine output, BUN,Na,K, HCO₃,bilirubinWBC,chronic disease).

The collected data were organized & tabulated and analyzed using appropriate statistical tests.

Inclusion criteria

All male and female patients with COPD exacerbations were included in the study, which stayed in ICUs for more than 24 hours.

Exclusion criteria

- All those Patients who stayed in ICU for less than 24 hours.
- Any COPD patients were admitted to ICU due to other different aetiology.

Statistical analysis

The collected data were tabulated and analyzed using SPSS version 16 soft ware (SpssInc, Chicago, ILL Company), MedCalc 16.1 software. Categorical data were presented as number and percentages while quantitative data were expressed as mean ± standard deviation, median and range. Chi square test (X²), or Fisher's exact test (FET) and McNemer's test were used to analyze categorical variables. Quantitative data were tested for normality using Shapiro-Wilks test, Man Whitney U test for not normally distributed variables . ROC curve was used to determine cutoff value of the scores with optimum sensitivity and specificity. Binary logistic regression model was used to detect the significant predictors of mortality and to design an equation for predicted mortality from these scores. The accepted level of significance in this work was stated at 0.05 (P <0.05 was considered significant)

Comparing survivors and non survivors regarding scores(Table 7)

Variable	Survivors (N=70)			Non survivors (N=30)			MWU	P
	Mean	± SD	Median (Range)	Mean	± SD	Median (Range)		
APATCHI score	68.1	16.41	62.0 (45-96)	98.3	20.24	89.0 (80-126)	5.67	<0.001 (HS)
SAPS score	25.7	10.55	25.0 (12-48)	53.6	12.10	49.0 (42-70)	7.18	<0.001 (HS)

RESULTS

Socio-demographic characters of the studied sample (Table 1)

Variable		No. (N=100)	% (100.0)
Sex	Male	93	93.0
	Female	7	7.0
	Mean ±SD	Minimum	Maximum
Age (years)	65.1± 15.7	23	81

The table show demographic characters of the studied sample(93 male , 7 female) And age range from (23 to 81).

Vital signs of the studied sample at time of admission (Table 2)

Variable	Mean ±SD	Minimum	Maximum
SAP	126±34.8	90	220
MAP	85.9±15.6	65	123
HR	102±13.7	85	130
RR	28.7±4.9	22	36
GCS	12.6±2.7	8	15

Laboratory findings of the studied sample at first day of admission(Table 3)

Variable	Mean ±SD	Minimum	Maximum
Urine output	1465±495.9	450	2000
Urea	65.3±64.2	20	240
S creat	2.09±2.3	0.7	8.8
Albumin	3.5±0.49	2.7	4.2
Bilirubin	1.08±0.14	0.8	1.3
Ht%	38.1±4.7	28	44
WBCs	13.2±7.07	4	27
S Na	135.3±7.2	118	142
K	4.1±1.3	3.1	7.7

Laboratory findings of the studied sample at the time of admission(Table 4)

Variable	Mean ±SD	Minimum	Maximum
FIO₂	32.6±14.9	21	60
Pao₂	92.9±43.5	62	216
PH	7.26±0.12	7.1	7.45
PCO₂	49.7±14.2	33	75
HCO₃	25.9±6.05	13	35

Chronic diseases among the studied sample (Table 5)

Chronic diseases	Frequency	Percent
Non	43	43.0
AKI	8	8.0
CKD	9	9.0
DM	26	26.0
HF	4	4.0
HTN-DM	10	10.0
Total	100	100.0

Descriptive statistics of APATCHI and SAPS scores among the studied sample.(Table 6)

Variable	Mean ±SD	Median	Minimum	Maximum
APATCH IV	77.2±22.3	78.5	45	126
SAPS III	34.1±16.9	27.0	12	70

Patients have APATCH IV score more than 69 have bad prognosis.

Patients have SAPS III score more than 40 have bad prognosis.

Outcome	Frequency	Percent
Survived	70	70.0
Died	30	30.0
Total	100	100.0

DISCUSSION

Chronic obstructive pulmonary disease (COPD) is a type of obstructive lung disease characterized by long-term breathing problems and poor airflow. The main symptoms include shortness of breath and cough with sputum production. COPD is a progressive disease, meaning it typically worsens over time. Eventually everyday activities, such as walking or getting dressed, become difficult. Chronic bronchitis and emphysema are older terms used for different types of COPD. The term "chronic bronchitis" is still used to define a productive cough that is present for at least three months each year for two years..(9) this study was conducted on 100 patients admitted to Banha University Hospital & Banha Teaching Hospital . critical care medicine department with complications of COPD . Our aim was to evaluate scoring systems in patients admitted in ICU with COPD and Respiratory failure as a predictor for outcome.

In this study, the mean age among patients is 65.1 ± 15.7 and the range of age is 23-81 years.that founded the age is a significant affecte on prognosis,mortality rate increase with older more than 70 years There were 93 male patients showing 93% of the study and 7 female patients showing 7% of the study. That founded no any affection on mortality .

As regarding to presence of chronic disease thire is great significantly affection that all died cases have chronic disease (DM, HTN, AKI, CKD, IHD,).

According to applied scores SAPS III more accurte than APATCH IV especialy with chest infection.

In our study, the outcome according to nature of cause of admission as DCL or no, and associated chronic diseases showed significant difference between the cured patients and patients who died especialy with acute renal failure or acute heart failure that showed significant difference.

In our study, need for mechanical ventilation was more frequent among the patients who died (P value 0.05) which is statistically significant but need for dialysis was non-significant.

In our study, multivariate analysis for predictors of mortality among critically ill patients with COPD shows that variables found to be statistically significantly related to outcome; It was found that nature of cause "acute respiratory failure", need of MV in ICU, Multiple organ dysfunction, Haemoglobin < 8 and BUN > 40 are the bad prognostic factors of outcome. Our findings in agree with **Adhikari., 2009** who reported that multivariate analysis revealed that older age at admission (HR 1.76, $p < 0.01$), disease duration > 30 years (HR 1.79, $p < 0.01$), (HR 2.03, $p < 0.05$), cardio pulmonary involvement (HR 1.94, $p < 0.01$), anemia (HR 1.76, $p < 0.05$), increased blood urea nitrogen (HR 2.10, $p < 0.01$) and increased serum creatinine (HR 2.52, $p = 0.001$) were independent predictors of mortality.

CONCLUSION:

the present study proved that COPD exacerbation and Respiratory Failure is an existing problem in our ICUs related to many etiological and risk factors Smoking and infection are the leading complications of COPD that require admission to ICU.

*Multiple organ dysfunctions, Type of end organ dysfunction "pulmonary or renal or cardio " and laboratory findings "Haemoglobin, ABG, BUN, INR",Chest X-ray, WBC, are statistically significant predictors of mortality.

*Multivariate analysis for predictors of mortality among critically ill patients with COPD shows that variables found to be statistically significantly related to outcome.

*Nature of cause "acute renal failure", need of MV in ICU, Multiple

organ dysfunction, Haemoglobin < 8 and BUN > 40 are the bad prognostic factors of outcome.

*Using SAPSIII score more accurate than APACHE IV score when apply on COPD patients admitted in ICU.

*But using tow scores most accurate.

Recommendation

applying SAPS III score and APACHE IV score on all COPD patients who admitted to ICU with COPD exacerbations and Respiratory failure .

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