Role of BAP 65 (Blood Urea Nitrogen, Altered Mental Status, Pulse, Age 65 Years) Scoring System in Risk Stratification of Patients with Acute Exacerbation of Chronic Obstructive Lung Disease in Tertiary Care Hospital

Ashish Thapa[1]

[1]Department of General Practice and Emergency Medicine, Armed Police Force Hospital, Balambu, Kathmandu, Nepal

ABSTRACT

Introduction: Exacerbations are important events in the management of COPD because they negatively impact health status, rates of hospitalization and readmission, and disease progression. COPD AE is one of the commonest case presenting to the TUTH Emergency, average being 5 patients a day. The aim of the study was to co-relate the BAP 65 score, mortality and mechanical ventilation in patients with acute exacerbation of COPD.

Methods: It was an observational study, 648 patients from emergency of TUTH were screened for the study from Magh 2073 to Asar 2074 after getting approval from the institutional review boards, among them 114 were included after applying inclusion and exclusion criteria and BAP 65 score was calculated. The patients were followed till discharge, mechanical ventilation or mortality. Data entry was done in MS EXCEL and statistical analysis was done using SPSS version 24.

Results: Total of 114 patients enrolled for the study from the emergency of TUTH. There were total 16 mortality and 12 patients were mechanically ventilated. Most of the mortality and mechanical ventilation were from severe group ie BAP class IV and V. We used Pearson Chi-squared test to compare between BAP 65 class and Mortality, and found that mortality rate increased with increasing BAP 65 class with a p value of < 0.0001. The need of Mechanical Ventilation increased as well, as the BAP 65 Class increased, less than 1% of the patients with BAP class I needed MV, the cause being Type II Respiratory Failure, while around 50% of the patients with BAP class V needed MV (based Pearson Chi-squared test, with a p value of < 0.0001).

Conclusions: BAP 65 score is an effective and simple tool to classify the patients presenting with AECOPD, it correlated well with both the need of mechanical ventilation and mortality. Higher the score higher the chances of severe disease.

Keywords: *BAP 65 score; risk stratification; tertiary hospital.*

INTRODUCTION

COPD exacerbations are complex events usually associated with increased airway inflammation, increased mucus production and marked gas trapping. Depending upon the severity of an exacerbation and/or the severity of the underlying disease, an exacerbation can be managed in either the outpatient or inpatient setting.[1]

Recently, few clinical scores have been developed to assess the severity of AECOPD aiming to help clinicians in their decisions regarding patients suffering such episodes, the most important being DECAF score, modified DECAF score, 2008 score, BAP 65 score, but none of them is yet widely accepted or recommended to be used in practice. BAP 65 (Elevated BUN, Altered Mental Status, Pulse and Age > 65) is a new model that

Correspondance:

Dr. Ashish Thapa
Armed police Force Hospital, Balambu Kathmandu, Nepal
Email: ashishthapa121@gmail.com

was developed to predict mortality and need for mechanical ventilation during hospitalization of patients with AECOPD, because it is simple and rapid score, that is designed to only use variables that are generally available to physicians at the time of presentation.[2]

The main aim of the study is to generate the role of BAP 65 scoring system in risk stratification of patients with AECOPD.

METHODS

A prospective cross-sectional study was conducted in Teaching Hospital, Kathmandu Nepal. Teaching Hospital Emergency, Observation, Medical Wards, Medical ICU, ICCU and ICU were selected as the study area. Data collection was done from Magh 2073 to Asar 2074, total of 6 months duration.

Sample size calculation

It was calculated using following formula

$n = Z^2pq/d^2$

where, n is the sample size

Z is confidence interval, for 95% confidence interval Z is 1.96

p is the prevalence of COPD in percentage

q is (100-p)

d is the desired precision (with margin of error of 4%)

Hence, sample size = $(1.96)^2 \times 5 \times (100-5)/4^2$

$= 114$

So, the necessary sample size was 114

Non probability purposive sampling method was used for the study. All the patients admitted with the primary diagnosis of COPD were assessed for the inclusion exclusion criteria during the sample collection period.

Case

Subjects were defined as the case of AECOPD on the basis of their history- clinical GOLD criteria (dyspnea, chronic cough, chronic sputum production, history of exposure to risk factors, family history of COPD) physical examination, chest x-ray and blood investigations.

Subjects with prior diagnosis of COPD by respiratory physician (with typical presentation, risk factors and exclusion of other lung pathology like Pulmonary Tuberculosis, Post TB fibrosis/bronchiectasis, Interstitial Lung Disease, Bronchogenic Carcinoma) under domiciliary oxygen were also taken as advanced COPD cases.

Inclusion criteria

The patients 40 years or older with the diagnosis of AECOPD presenting to the ED of TUTH during data collection period.

Exclusion criteria

- Patients with airway disease primarily due to
  - ✓ Asthma
  - ✓ Allergic Bronchopulmonary Aspergillosis
  - ✓ Bronchiectasis
  - ✓ Interstitial Lung Disease
- Intoxicated patients
- Patients with known renal disease
- Patients in whom active treatment is not considered appropriate such as palliative care

As the patient presented in emergency, initial assessment of patient was done after carefully applying the inclusion-exclusion criteria, those who met the inclusion criteria were then enrolled. History was taken and physical examination was done after informed consent. Performa was filled. Age, Sex, presenting symptom, major risk factor, smoking habit and smoking status were taken as the baseline characteristics in cases. Data about the discharge from ER, admission in observation, general ward, monitoring bed, need of intubation, mortality and duration of hospital stay were recorded.

Data were taken from the emergency ticket, lab report sheet and patients were followed till discharge or death in hospital.

The BAP 65 score was first introduced by Shorr et al as a risk stratification tool for AECOPD. It included following variables and we used the same for our study.

Blood Urea Nitrogen > 25 mg/dl

Altered Mental Status; initial GCS ≤ 14 or a designation by the physician of disorientation, stupor or coma

Pulse ≥ 109/min

Age ≥ 65 years

The BAP 65 classes:

Class I : none of the risk factors and age less than 65 years

Class II : none of the risk factors but age more than 65 years

Class III : one risk factor

Class IV : two risk factors

Class V : three risk factors

Groups according to BAP 65 score

Group A: low risk, mild : Class I and Class II

Group B: intermediate risk, moderate : Class III

Group C : high risk, severe : Class IV and Class V

Statistical package for social sciences (SPSS) software version 24 was used to analyze the data. Both descriptive and inferential statistics were used for analysis. In descriptive statistics; frequencies, mean and standard deviation were computed. In inferential statistics, Chi-squared test was performed to establish the significance between the variables and Pearson correlation test were applied to test the association and significant differences in proportion between categorical variables. To analyze the predictive ability of BAP 65 score for the primary end point ROC curve was used. All the statistical analysis were 2 tailed and p value of < 0.05 was considered to be statistically significant.

Study was conducted after getting approval from the IRB. Verbal and written consent was taken from the respondents for the enrolment in the study. Privacy and confidentiality were maintained during and after the collection of data. No forceful participation was induced.

RESULTS

648 patients were screened for the study from Magh 2073 to Asar 2074, among them 114 were included for the analysis and rest of them were excluded. The main reason for exclusion were patients not meeting the inclusion criteria, referral to other center due to unavailability of bed, ventilator, left against medical advice, final diagnosis changed to malignancy. The included patients were either admitted or discharged from the emergency. They were admitted either in observation, or in ward or in intensive units (ICU, MICU, ICCU). They were followed up till discharge or mortality if any.

Baseline characteristics

The baseline characteristics of the cases were analyzed and arranged on the basis of the severity as per BAP 65 classes.

Table 1. Baseline Characteristics

Variable	Mild	Moderate	Severe	Total
Need of MV	0	1 (8.33%)	11 (91.67%)	12 (100%)
Mortality	1 (6.25%)	1 (6.25%)	14 (87.50%)	16 (100%)
Total no.	41 (35.96%)	32 (28.08%)	41 (35.96%)	114 (100%)
Age (mean, SD)	68.12±9.12	68.59±9.93	71.10±8.84	69.32±9.27
Male	18	11	10	39

Variable	Mild	Moderate	Severe	Total
Female	23	21	31	75
Pulse(mean, SD)	91.73±10.07	107.97±18.303	117.32±8.713	105.49±16.61
BUN(means, SD)	13.36±5.34	25.07±20.12	34.49±11.02	24.25±15.66
Altered Consciousness	0	0	20	20
SBP(mean, SD)	113.66±20.21	110±13.91	102.93±15.69	108.77±17.50
DBP(mean, SD)	71.71±12.63	68.75±10.99	65.12±11.64	68.51±12.60

*MV = Mechanical ventilation, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, SD = Standard Deviation, BUN = Blood Urea Nitrogen

Relation Between BAP 65 Class and Mortality

We used Pearson Chi-squared test to compare between BAP 65 class and Mortality, and found that mortality rate increased with increasing BAP 65 class with a p value of < 0.0001.

Table 2. Relation Between BAP 65 Class and Mortality

BAP 65 Class	No mortality	Mortality	p value
I	15	0	0.000
II	25	1	
III	31	1	
IV	21	4	
V	6	10	
Total	**98**	**16**	

Relation Between BAP 65 class and need of Mechanical Ventilation

The need of Mechanical Ventilation increased as well, as the BAP 65 Class increased, less than 1% of the patients with BAP class I needed MV, while around 50% of the patients with BAP class V needed MV (based Pearson Chi-squared test, with a p value of < 0.0001). The relationship of intubated and non intubated patients with BAP 65 class was statistically significant based on One Way ANOVA test (p < 0.0001).

Table 3. Relation between BAP 65 class and need of MV

BAP 65 Class	No intubation	Intubation	P value
I	15	0	0.000
II	26	0	
III	31	1	
IV	21	4	
V	9	7	
Total	**102**	**12**	

Relation between admission in Intensive Units and BAP 65 Class

Out of 114 patients 19 patients were admitted in the intensive units. More than 75% patients were from Class IV and V, and the relation was found to be statistically significant based on Pearson Chi-squared test with a p-value of < 0.0001. This shows that with the increasing BAP 65 class the chance of getting admitted in the intensive units increases.

Table 4. Relation between BAP 65 class and admission in Intensive units

BAP Class	Intensive units	Wards	p value
I	0	15	0.000
II	0	26	
III	4	28	
IV	4	21	
V	11	5	
Total	**19**	**95**	

DISCUSSION

This study showed that mean age of the patients was 69.32±9.27 years with most of the cases belonging to 60-80 years of age group. The mean age of the patients is similar to the study conducted in Nepal Medical College Teaching Hospital, Nepal.[3] Similar findings were also noted in a study conducted in a Dutch population.[4] The minimum age observed was 44 years and the maximum being 93 years. About 2/3rd of the cases were older than 60 years which suggests that COPD is a disease of older age. The age distribution and mean age of the patients is similar to the study conducted in Latin America.[5]

We observed that 34.2% were males and 65.8% were females. This finding varies among different countries. Study conducted in Nepal and various other developing countries shows that females are disproportionately affected by COPD, this may be due to extensive use of biomass fuel by women living in rural community which puts women at increased risk of exposure to indoor air pollution for comparatively longer periods of time.[1] This defers from the finding in developed world where there is a significantly lower prevalence of COPD in women than in men.[2,6] A meta-analysis of 62 population-based studies on prevalence for COPD published between 1990 and 2004 reported a pooled prevalence for COPD at 9.8% among men and 5.6% among women.[7] The most recent survey from an economically advanced country, Austria, found an equal prevalence of COPD in men and women.[8]

Smoking and indoor air pollution are the well known risk factors for the development of COPD, we analyzed these risk factors in our sample and found that more than half of the patients were exposed to both the risk factors and 38 patients were current smoker. Similar findings were noted by Ana et al and Meilan et al.[9,10] Smoking is considered by far the most important risk factor associated with functional decline in COPD and air pollution following the list which can cause COPD independently of tobacco smoke.[11]

Among 114 patients, 15 patients were in class I, which is the minimum score. Most of the patients were in class III, 28.1%. There were 16 (14%) patients with the score of V. This coincides with the study conducted in Lebanese population.[12] There were 50 (43.9%) patients were BUN > 25 mg/dl, 20 (17.5%) patients with altered consciousness, 59 (51.8%) patients with pulse > 109 bpm and 78 (68.4%) patients with age > 65 years. Among the 114 patients, 37 (32.5%) were managed in the emergency and were discharged. And among those 37 patients 59.46% were from class I and II. 58 (50.87%) patients were admitted in the ward, 65.5% were from class III and IV. 11 (57.89%) of 19 patients belonging to Class V were admitted in the intensive units.

Regarding the primary endpoints, there were 16 (14%) mortality, among them 10 (62.5%) were from class V. There was no mortality in class I. We used Pearson Chi-squared test to compare between BAP 65 class and Mortality, and found that mortality rate increased with increasing BAP 65 class with a p value of <0.0001. The need of intubation increased with the increasing BAP 65 class, and the relation was statistically significant based in Pearson Chi-square test with a p value of <0.0001. 12 (10.52%) out of 114 patients needed mechanical ventilation and among them 7 (58.3%) were from class V. Not all the intubated patients were from higher class, 41.66% were from class III and IV. We analyzed the relation between intubated and non intubated patients with BAP 65 class and found it being statistically significant with p value <0.0001. We also found out that the severity of AECOPD increases when complicated by pneumonia, and the relation was statistically significant based on Pearson Chi squared test with a p value of < 0.0001. We further tested the relation between the individual variable and the primary end points based on Pearson Chi-squared test and the relation was found to be statistically significant except for age which poorly correlated with both the primary endpoints. These findings are similar with the study conducted by Tabet et al.[8]

CONCLUSIONS

Based on these results, BAP 65 score is an effective scoring system in predicting the severity of AECOPD for the need of admission, need of intensive admission, need of mechanical

ventilation and mortality. Patients in BAP class I and II are in low risk category for intubation or mortality and can be managed on home based treatment, patients in BAP class III are at intermediate risk and needs admission; whereas patients in BAP class IV and V are at high risk for intubation or mortality and needs admission preferably in intensive units. This highlights its potential usefulness. Moreover, the variables needed are easily available, score can be calculated easily. Thus it is less time consuming and cost effective.

CONFLICT OF INTEREST: None

REFERENCES

1. Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Lung Disease 2017 Report. GOLD Executive Summary. Am J Respir Crit Care Med. 2017 Jan 27;195(5):557–82.

2. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet Lond Engl. 2012 Dec 15;380(9859):2095–128.

3. Bhandari R, Sharma R. Epidemiology of chronic obstructive pulmonary disease: a descriptive study in the mid-western region of Nepal. Int J Chron Obstruct Pulmon Dis. 2012;7:253–7.

4. Afonso ASM, Verhamme KMC, Sturkenboom MCJM, Brusselle GGO. COPD in the general population: prevalence, incidence and survival. Respir Med. 2011 Dec;105(12):1872–84.

5. Menezes AM, Wehrmeister FC, Perez-Padilla R, Viana KP, Soares C, Müllerova H, et al. The PLATINO study: description of the distribution, stability, and mortality according to the Global Initiative for Chronic Obstructive Lung Disease classification from 2007 to 2017. Int J Chron Obstruct Pulmon Dis. 2017 May 18;12:1491–501.

6. Bhandari GP, Angdembe MR, Dhimal M, Neupane S, Bhusal C. State of non-communicable diseases in Nepal. BMC Public Health. 2014 Jan 10;14:23–23.

7. Yousif M, El Wahsh RA. Predicting in-hospital mortality in acute exacerbation of COPD: Is there a golden score? Egypt J Chest Dis Tuberc. 2016 Jul 1;65(3):579–84.

8. Tabet R, Ardo C, Makhlouf P, Hosry J. Application of Bap-65: A New Score for Risk Stratification in Acute Exacerbation of Chronic Obstructive Pulmonary Disease. J Clin Respir Dis Care. 2016 Mar 30;2(1).

9. Tabak YP, Sun X, Johannes RS, Gupta V, Shorr AF. Mortality and Need for Mechanical Ventilation in Acute Exacerbations of Chronic Obstructive Pulmonary Disease: Development and Validation of a Simple Risk Score. Arch Intern Med. 2009 Sep 28;169(17):1595–602.

10. Lawati NA, Mark J. Acute exacerbation of chronic obstructive pulmonary disease. BCMJ 2008 Apr;50(3):138-142.

11. Schmidt SAJ, Johansen MB, Olsen M, Xu X, Parker JM, Molfino NA, et al. The impact of exacerbation frequency on mortality following acute exacerbations of COPD: a registry-based cohort study. BMJ Open. 2014 Dec 1;4(12).

12. Buist AS, Vollmer WM, Sullivan SD, Weiss KB, Lee TA, Menezes AMB, et al. The Burden of Obstructive Lung Disease Initiative (BOLD): rationale and design. COPD. 2005 Jun;2(2):277–83.