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To Determine the Outcome and Progression of Patients Presenting with Acute Severe Asthma at a Tertiary Care Hospital in Karachi, Pakistan

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ABSTRACT

Objectives: The aim of our study is to determine the outcome and progression of patients presenting with acute severe asthma (status asthmaticus) at a tertiary care hospital in Karachi, Pakistan. **Setting:** The type of study is a cross sectional study. **Period:** Two years from January 2013 to December 2015. **Place of study:** Tertiary care hospital in Karachi Pakistan, **Methods:** Consisted of 40 patients who were all admitted to the hospital with acute severe asthma. All the patients underwent strict clinical evaluation to assess the various aspects of the illness including the severity and complications. Data was analyzed using SPSS version 23. **Results:** Of the total n= 40 patients included in our study, 8 (20%) were males and 32 (80%) were females having a mean age of 52.5 +/- 20.4 years, Hypertension was the most common underlying co morbidity observed in 10 (25%) patients. The mean blood pH was found to be 7.33 +/- 0.12 at the time of presentation with a range of 6.96 to 7.57 respectively, respiratory acidosis was found in 17 (42.5%) of the patients. A total of 29 (72.5%) patients required ventilator support out of which 14 (35%) required invasive ventilator support and 15 (37.5%) required a noninvasive ventilator support. Acidaemia was found to have a significant association with the requirement for invasive mechanical ventilation (p value of less than 0.033) also the mean duration of hospital stay was also higher in patients who required ventilator support. **Conclusion:** According to the results of our study, acidemia is the most severe complication of acute severe asthma, and has a significant association with increased rate of need for artificial ventilation, complication and mortality respectively.

Keywords: Asthma, Acute severe asthma, Status asthmaticus, complications of asthma

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INTRODUCTION

Asthma is defined as a condition of chronic inflammation of the respiratory tract, which causes obstruction and bronchospasm. Prevalence of asthma has been on an increase in the last two decades, leading to increased morbidity and mortality.[1,2] The prevalence of asthma in the United States of America has increased by 15% and has a financial burden of 56 billion dollars per annum.[3] Worldwide 10% people suffer from asthma and among them 5% have severe disease,[4] it is a major public health issue globally. In lower and middle income countries the rate of mortality is high,[2] which may be due to various reasons such as poor compliance with the medications, wrong perceptions about asthma medications specially inhalers, non-affordability issues, poor follow up, over all lower socioeconomic status and lack of education.[2,5,6] Status asthmaticus or acute severe asthma is defined as exacerbation of asthma that becomes unresponsive to the conventional treatment of bronchodilators and corticosteroids, leading to potentially fatal respiratory failure.[7,8] It is one of the common reasons for visit to the emergency department and one fifth of the episodes are considered severe.[7] Failure to recognize and delay in providing appropriate treatment leads to an increase in morbidity and mortality. Fatal complications like asphyxia due to a mucoid plug, pneumothorax, pneumo-pericardium, pneumo-mediastinum, electrolyte abnormalities, cardiac arrhythmias, anoxic brain injury and myocardial infarction are some of the risks that the patients might develop and may require intensive

care monitoring and mechanical ventilation.[7,9,10] Predictors of morbidity and mortality for acute severe asthma are of prime importance as they dictate the course of the illness, the length of hospital stay and the course of management. The aim of our study is to determine the clinical course, variables of prognostic value, complications and outcomes for patients presenting with status asthmaticus at a tertiary care center in Karachi Pakistan.

METHODOLOGY

Setting: It is a cross sectional study.

Period: Two years from January 2013 to December 2015

Place of study: A tertiary care hospital in Karachi Pakistan,

Methods: Consisted of 40 patients who were all admitted to the hospital with acute severe asthma. The inclusion criteria was all the patients above the age of 16 years, and who were diagnosed as a case of acute severe asthma. Patients who were younger than 16 years of age and had underlying lung diseases such as bronchiectasis, interstitial lung disease, chronic obstructive pulmonary disease and with a long-term smoking history of more than ten years were duly excluded from the study. All the patients underwent strict clinical evaluation to assess the various aspects of the illness including the severity and complications. A predesigned proforma was filled for all the patients which included various variables such as demographic data, age, gender, co morbidities, current medications taken for asthma, past history, family history, laboratory investigations including arterial blood gases at the time of presentation, use of mechanical ventilation, complications and eventual outcome of the illness respectively. APACHE scores were also calculated to determine the severity.[11] Data was analyzed using SPSS version 23. Mean and standard deviation were used for quantitative variables and frequency and percentage was used for qualitative variables, Pearson Chi square test was used to determine differences in the baseline characteristics of the groups, and independent t test was utilized to assess the difference of the means. A p value of less than 0.05 was considered as statistically significant.

RESULTS

Of the total 40 patients included in our study, 8 (20%) were males and 32 (80%) were females having a mean age of 52.5 +/- 20.4 years, Hypertension was the most common underlying co morbidity observed in 10 (25%) patients, while other co morbidities were as follows, Ischemic heart disease in 4 (10%) patients, diabetes in 3 (7.5%) patients, and no co morbidities in rest of the patients. The mean blood pH was found to be 7.33 +/- 0.12 at the time of presentation with a range of 6.96 to 7.57, respiratory acidosis was found in 17 (42.5%) of the patients. PaCO2 was 52.8 +/- 23.5, mean length of hospital stay was found to be 8.1 +/- 5.9 days and mean APACHE II score was found to be 9.35 +/- 4.41 respectively. Refer to table 1. 5 (12.5%) had APACHE II scores between 0 – 4, 17 (42.5%) had between 5 – 9, 12 (30%) had between 10 – 14, and 5 (12.5%) had scores greater than 14, the rates of complications were higher for higher APACHE II scores. A total of 29 (72.5%) patients required ventilator support out of which 14 (35%) required invasive ventilator support and 15 (37.5%) required a noninvasive ventilator support while 11 (27.5%) patients required no support. 4 (10%) of the patients required noninvasive ventilation post extubation.

Table 1: Characteristics of patients who survived compared with those who did not survive.

Variables	Survivors	Non-survivors	p-value
Gender			
Male	7 (17.5%)	1 (2.5%)	0.560
Female	30 (75%)	2 (5%)	
Age in years	52.4 +/- 19.1	62.5 +/- 30.2	0.366
Mean arterial pH	7.34 +/- 0.10	7.25 +/- 0.09	0.08
Mean PaCO2	50.5 +/- 22.8	73.2 +/- 20	0.044
Mean APACHE II score	9.2 +/- 4.3	12.4 +/- 3.4	0.098

Acidaemia was found to have a significant association with the requirement for invasive mechanical ventilation (p value of less than 0.033), also the mean duration of hospital stay was also higher in patients who required ventilator support. Refer to table 2. Complications were seen in 30 (75%) of the patients, of which 38 (70%) had respiratory failure, 4 (10%) had sepsis, 6 (15%) had arrhythmias and 1 (2.5%) had pneumothorax. Higher the APACHE II score higher the rate of development of complications respectively. 3 (7.5%) of the patients unfortunately did not survive during the hospital stay, 1 patients died due to sepsis, 1 patient

died due to myocardial infarction, and 1 patient died due to respiratory failure. The use of ventilator support (both invasive and noninvasive) was found to be associated with higher rates of complications, while invasive ventilator support was found to be associated with increased length of hospital stay.

Table 2: Differences in the clinical outcome of patients

	Use of invasive ventilation			Use of noninvasive ventilation		
Variable	**Yes**	**No**	**P value**	**Yes**	**No**	**P value**
Complications						
Present	14	16	0.006	17	11	0.001
Absent	0	9		1	9	
Length of Hospital stay						
>7 days	8	6	0.036	9	6	N.S
<7 days	7	18		9	14	
Clinical Outcome						
Discharge	13	24	N.S	20	17	N.S
Death	2	0		0	0	

DISCUSSION

The incidence of asthma is suspected to increase worldwide. Even though 5% of asthmatics belong to the severe disease category but these patients account for 60% of the financial burden of asthmatics.[4,12] According to the results of our study acidemia on initial presentation was the most significant predictor of clinical outcome and prognosis. It was also associated with a longer duration of hospital stay and a requirement for mechanical ventilation. A recent study reports a PaCO2 of (63.8 +/-21.3 versus 47.8 +/-19.1mm Hg; p<0.01) and pH of (7.09 +/- 0.12 versus 7.27 +/-0.12; p<0.0001) in patients of acute severe asthma who survived as compared to those who did not.[9] While according to another study hypercapnia was found to be the independent factor for mortality.[13] Another study showed that patients with lower arterial pH required a higher rate of mechanical ventilation and also a higher mortality rate (p<0.001).[14] In our study the requirement of invasive mechanical ventilation was 37.5% and mortality rate was 7.5% which is similar to other studies which report the mortality rate to be between 1% to 5% respectively,[15] while it lies between 0% and 40% for those patients who require mechanical ventilation.[9,13-18] The difference is hospital and physician dependent. In our study there was more number of females as compared to males which is also found to be true generally, as there is a predilection of female gender for status asthmaticus cases reported in the past,[9,13,18] which could be explained due to the fact that severe asthma depends on gender specific hormonal, biochemical and anatomical variables, also could be due to perception of the disease, as males present later as compared to females.[13,19,20] Respiratory failure, sepsis and cardiac arrhythmias were the common complications we found in patients, while other studies report sepsis and acute respiratory distress syndrome as common complications of asthmatics admitted in the intensive care unit, while non pulmonary organ failure and pneumothorax are also common.[13,15] In our study we found complications in those patients who required the use of mechanical ventilation, as it causes barotraumas, and complications lead to an increase in hospital stay, hence patients are at risk of developing infections and sepsis. The use of APACHE II scores for classifying the illness according to its severity and to make a prognosis has been used before, and higher scores lead to poor outcomes.[11] Other studies who used the APACHE II scores on asthmatics also reported that higher scores lead to higher rate of complications.[9,21] But we did not find any significant data in our study to support this claim, but it was observed that high APACHE II scores was found in those who did not survive. We had some limitations in our study such as the small sample size, but this was due to the strict exclusion criteria which excluded patients who were smokers and had COPD, as COPD is a confounding factor leading to errors in the results.[13] This exclusion might also explain the high number of females, as in our society males smoke more. And our study was a single center study and therefore cannot be generalized, but it does leave the room open for further investigations.

CONCLUSION

According to the results of our study, acidemia is the most severe complication of acute severe asthma, and has a significant association with increased rate of need for artificial ventilation, complication and mortality respectively.

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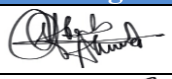
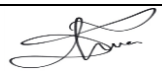
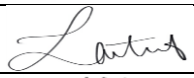
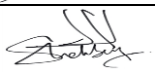
AUTHORSHIP AND CONTRIBUTION DECLARATION

Name of Author	Contribution to the paper	Author's Signatures
Dr. Aftab Ahmed	Concept, analysis, data collection, layout	
Dr. Shua Nasir	Data collection, final layout	
Dr. Lutuf Ali	write-up, data collection, final layout	
Dr. Lal Shehbaz	data collection, final layout	
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