

A comparative Study on Abg Analysis in Chronic Bronchial Asthma Patients with Normal Reference Values

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ABSTRACT: Bronchial asthma is a chronic inflammatory disorder of the airways which is characterised by heightened responses of the trachea-bronchial system to a variety of stimuli. A cross sectional study is done on 35 asthmatic patients of age group between 20-75 years who presented to a tertiary care hospital in a duration of 18 months with chronic bronchial asthma. This study revealed that there are slight disturbances in acid base status, ventilation in very low patients suffering from chronic bronchial asthma. However arterial blood gas analysis alone is not sufficient to evaluate severity of attack it should be supported by further investigations like PEFr, FEV1 along with correlation of signs and symptoms clinically.

Key words- chronic bronchial asthma, respiratory acidosis, respiratory alkalosis, hypercapnia, hypoxemia

1. INTRODUCTION

It is a chronic inflammatory disorder of the airways which is characterised by heightened responses of the trachea-bronchial system to a variety of stimuli. Boundless narrowing of airways occurs as a result of this and can be relieved either by medication or spontaneously. Asthma is common and widely prevalent, and in the latter part of the last century there has been a rapid and steady rise. It is reported that at least 4% of people suffer from this. It affects all age groups but the most prevalent ones are below 10 years of age (50%). In elderly the ratio is 1:1. Male to Female ratio in children is 2:1. Asthma is multifactorial in origin arising from the interaction of both genetic and environmental factors. Inflammation of airways occurs in genetically susceptible individuals when they are exposed to environmental factors. The inhalation of an allergen in a sensitized atopic asthmatic patient results in Broncho constrictor response. The inhaled allergen rapidly interacts with mucosal mast cells via an IgE dependent mechanism resulting in the release of mediators such as histamine which lead to broncho-constriction. A full spectrum of inflammatory cells however is involved in the perpetuation of the chronic inflammatory reaction in the bronchial wall which characterizes asthma. It is now known that epithelial cells and smooth muscle cells are also involved in initiation of asthma in non-atopic patients. The airways can be oedematous and are infiltrated with eosinophils, lymphocytes and neutrophils with or without an increase in the collagen content of the epithelial basement membrane. Some important features in asthma are: 1. Microvascular leakage 2. Epithelial shredding 3. Mucous plugging in air ways 4. Decreased mucociliary clearance. 5. Because of on going airway inflammation there can be features like- thickening of walls of bronchi by oedema, cellular infiltration, hypertrophy of mucous secreting glands, increased mass of smooth muscle. Whatever may be the type of asthma but the features of airway inflammation are common Fundamentally arterial blood gas analysis is recommended if the physician suspects that the patient has significant aberration in oxygen or carbon dioxide gas exchange or acid base balance. Most reviews point out that the entire therapeutic approach to patients with bronchial asthma and especially those with impending respiratory failure is

based on the presence and extent of blood gas and pH abnormalities. So the present study is done to observe the variations in arterial blood gas analysis in patients with chronic bronchial asthma.

AIM AND OBJECTIVES: To compare and correlate the values of arterial blood gas analysis in chronic bronchial asthma patients.

2. MATERIALS AND METHODS:

A cross sectional study is done on 35 asthmatic patients of age group between 20-75 years who presented to a tertiary care hospital in a duration of 18 months. Pregnant women, children, smokers, patients suffering from other respiratory disorders were excluded from the study. The entire procedure is explained in detail to the patient. Informed consent is taken. The radial or ulnar or femoral arteries are palpated and Allen’s test is performed. 2cc syringe with 24G needle flushed with heparin 25,000 IU in 5 ml.2ml of blood is drawn from any of the above mentioned artery by syringing technique. The blood sample is analysed with “MEDICA” a blood gas analyser giving pH, PaO₂, PaCO₂, HCO₃⁻ VALUES.

3. RESULTS:

Table 1: Age distribution of study population

AGE	NUMBER OF PATIENTS
25-40 YEARS	9
41-50 YEARS	7
51-60 YEARS	8
61-70 YEARS	6
71- 75 YEARS	5

Table 2: Sex distribution of study population

SEX	NUMBER	PERCENTAGE
FEMALE	24	68.57%
MALE	11	31.42%
TOTAL	35	

Table 3: pH of study population

pH RANGE	Number of patients	percentage
NORMAL	29	82.85%
RESPIRATORY ACIDOSIS	2	5.71%
RESPIRATORY ALKALOSIS	4	11.42%
TOTAL	35	

Table 4: PaO₂ levels of study population

PaO ₂	NUMBER OF PATIENTS	PERCENTAGE
NORMAL	32	91.42%
DECREASED PaO ₂	3	8.57%

Table 5: PaCO₂ levels of study population

PaCO ₂	NUMBER OF PATIENTS	PERCENTAGE
NORMAL	32	91.42%
HYPERCAPNIA	2	5.71%
HYPOCAPNIA	4	11.42%

Table 6: HCO₃⁻ levels of study population

HCO ₃ ⁻ LEVELS	No of patients	percentage
NORMAL	29	82.85%
DECREASED BICARBONATE LEVELS	1	2.85%
INCREASED BICARBONATE LEVELS	5	14.28%

4. DISCUSSION:

In our study of ABG analysis in chronic bronchial asthma patients out of 35 patients it was observed that 9 patients were between 25-40 years ,7 patients were between 41-50 years ,8 patients were in the age group between 51-60 years, 6 patients were in the age group 61-70 years and remaining 5 patients were in the age group 71-75 years. In our study population majority is 24 females were present accounting for 68.57% of study population and remaining 31.42% were males. Out of 35 study population observed pH was normal in 29 patients accounting for 82.85%, respiratory acidosis was observed in 2 patients accounting for 5.71% of study population and respiratory alkalosis was observed in 4 patients accounting for 11.42% of study population. On comparison of PaO₂ levels of study population it is normal in 32 patients accounting for 91.42% of study population and decreased in 3 patients accounting for 8.57% of total study population. On comparison of PaCO₂ levels it is normal in 32 patients accounting for 91.42% of study population, hypercapnia was observed in 4 patients accounting for 11.42% of study population and hypercapnia was observed in 2 patients accounting for 5.71% of study population. On comparison of bicarbonate levels ,29 patients have normal bicarbonate levels accounting for 82.85% of study population, bicarbonate levels were decreased in 1 patient accounting for 2.85% of the study population and the bicarbonate levels were elevated in 5 patients accounting for 14.28% of the total study population. The change in ventilation and perfusion alters the chemical composition of blood mainly PaO₂, PaCO₂ and pH. The hydrogen ion concentration and alterations in respiratory gas composition profoundly influence respiration. Response to carbon dioxide and blood pH depend on central chemo receptors located in brain and response to hypoxia depends mostly on peripheral chemoreceptors located in aortic carotid bodies. In severe acute bronchial asthma there occurs marked airway inflammation resulting in airway narrowing. This causes increased resistance to air flow through airways (i.e.; resistance is inversely proportional to radius).But this increased resistance is not uniform throughout, resulting in preferential direction of inspired air to areas of lowest resistance .Thus relatively small volume of less than 30% of total lung volume hyperventilate receiving more than 80% of inspired air resulting in washing out excess of carbon dioxide resulting in hypercapnia, hyperventilation and increase in ventilation perfusion ratio and respiratory alkalosis. The rest of 75% of lung volume having higher airflow resistance will receive less amount of inspired air and fall in ventilation perfusion ratio resulting in hypoxemia. This hypoxemia can't be compensated by very few hyperventilating units, thus resulting in fall in partial pressure of oxygen. Partial pressure of carbon dioxide will be low if the hyperventilating units wash off excess CO₂.It will be normal when there is a balance between hypo ventilating and hyperventilating units.

5. CONCLUSION:

This study revealed that there are slight disturbances in acid base status, ventilation in very low patients suffering from chronic bronchial asthma. Therefore, may serves as one of the guide for physicians in crucial decisions regarding treatment. Most of the patients in this study presented with normal pH, very few patients presented with respiratory alkalosis. The respiratory acidosis is not a common presentation in chronic bronchial asthma as per my study findings. However arterial blood gas analysis alone is not sufficient to evaluate severity of attack it should be supported by further investigations like PEFr, FEV1 along with correlation of signs and symptoms clinically.

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