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Dyselectrolytemia in Chronic Obstructive Pulmonary Diseases with acute exacerbation.

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Summary: Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of mortality and morbidity world wide. Due to lack of awareness about the precipitating factors and predictors of prognosis, cases of acute exacerbation of COPD often suffer the fatal outcomes. In our study we assessed the levels of serum sodium and potassium in subjects with acute episodes of COPD and their healthy controls. We found a significantly low level of serum sodium (133 ± 6.86 meq/lit) and potassium (3.39 ± 0.96 meq/lit)) in subjects with acute exacerbation of COPD than their healthy counterparts [sodium-142 ± 2.28 meq/lit and potassium- 4.52 ± 0.02 meq/lit ($p<0.05$)]. Therefore, our study findings suggest that, serum sodium and potassium levels may get deranged in subjects with acute exacerbations of COPD which should be routinely checked for to avoid fatal outcomes.

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Key words: COPD, dyselectrolytemia, sodium, potassium.

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is the sixth leading cause of death and therefore a disease of increasing public health importance around the world. Estimations of Global Initiative for Chronic Obstructive Lung Disease (GOLD) suggest that COPD will rise to the third most common cause of death worldwide by 2020 (Reilly J, 2005).

Not only a leading cause of death, following an acute exacerbation of COPD, majority of the patients experience a temporary or permanent decrease in the quality of life. Moreover, more than half the patients discharged, often require re-admission in the subsequent six months (Mohan et al, 2006). Thus, the economic and social burden created by acute execrations of COPD are extremely high. In spite of such alarming outcomes, very less data are available there regarding the precipitating factors and predictors of prognosis in patients with acute exacerbation of COPD especially from the developing countries.

Though the COPD patients mostly present with the features of acute respiratory infections (productive cough, dyspnoea etc.), there may be a number of metabolic derangements arising out of the disease process or as a consequence of the therapy instituted like hyponatremia, hypokalemia, hyperbilirubinemia , elevated transaminases, elevated blood urea and elevated serum creatinine etc (Mohan et al,2006). Though most of these features are correctable, very often they are missed or confuse the diagnosis. Thus simple overlooking of the coexistent metabolic abnormalities may contribute to a great deal of mortality and morbidity in the COPD patients.

With this background, in the present study we attempted to measure the concentration of major serum electrolytes (sodium, potassium) in COPD patients with acute exacerbation and compare those finding with that of normal healthy controls to verify the occurrence of dyselectrolytemia in the said group

of patients which may be one of the major risk factors for increased mortality and morbidity in them.

MATERIAL & METHODS

Study was conducted on 64 patients of acute exacerbation of COPD from the Department of Medicine at Medical College and Hospital, Kolkata and 20 age- sex matched healthy community control. All the tests were done with due permission from the Institutional Ethical Committee and informed consent from the subjects or their legal relatives.

Subjects were included on the basis of their diagnosis of COPD by the attending physicians. Unrelated causes of dyselectrolytemia other than COPD or its management like known cases of chronic renal failure, diabetic ketoacidosis, adrenocortical insufficiency, cerebral salt wasting were excluded from the study. Disease free 20 healthy volunteers from the community were examined as controls.

Fasting blood samples from all the subjects were collected for the estimation of serum electrolytes like sodium and potassium in auto analyzer (Easylyte plus- sodium, potassium, chloride analyzer, Medica Corporation, USA. Kit used was supplied by the same company.) at the clinical laboratory of Medical College and Hospital, Kolkata.

Data were analyzed by STATA 10 and Microsoft Excel software. Significance of differences of average sodium and potassium levels in two groups were evaluated statistically using Student's' test. (p- Value <0.05 was considered to be significant).

RESULTS

Total 64 patients of COPD (47 males and 17 females) and 20 age sex matched healthy controls (15 males and 5 females) were investigated. Subjects of COPD were in the age range of 40-78 years, average age of presentation being 62.22 ± 12.45 years. In the control group, subjects were in the age range of 40- 78 years, average age being 61 ± 10.5 years. Average serum sodium and potassium levels in COPD patients were 133 ± 6.86 meq/lit and 3.39 ± 0.96 meq/lit respectively. The above levels in the control group were 142 ± 2.28 mEq/lit and 4.52 ± 0.02 meq/lit respectively. All the data are summarized in table-1.
Table-1:

DISCUSSION

Reliable epidemiological data regarding the clinical presentation and outcome of acute execerbations of COPD are grossly lacking from the developing countries. It has been observed that besides the signs of acute infection, there may be number of co-morbid conditions like type II respiratory failure and carbon dioxide narcosis, metabolic abnormalities such as dyselectrolytemia, uremia and hepatic function derangement etc. Though most of them are correctable, active attempt often can not be made either due to overlooking or due to unavailability of facilities for round-the-clock laboratory monitoring. In our study we attempted to measure the major electrolyte levels (sodium and potassium) in patients of COPD with acute exacerbation (except the subjects with exclusion criteria). We found a significantly low level of serum sodium and potassium in the COPD patients than that of the healthy controls (p- value < 0.05 in each case).

Table 1:
Values of the parameters studied in COPD and control groups.

Groups	Age (years)	Male:female ratio	Serum sodium (meq/lit)	Serum potassium (meq/lit)
COPD	62.22 ± 12.45	47: 17	133 ± 6.86*	3.39 ± 0.96*
control	61 ± 10.5	15: 5	142 ± 2.28	4.52 ± 0.02

**-Values are significantly different from the control group (p<0.05).*

Patients with COPD are susceptible to hyponatremia for a number of reasons. Chronic hypoxia and hypercapnia secondary to the underlying pulmonary illness, heart failure or renal insufficiency, use of diuretics, SIADH (Syndrome of Inappropriate Antidiuretic Hormone Synthesis), use of bronchodilators or steroids, malnutrition, and poor intake during acute exacerbations are common contributing factors for hyponatremia in such patients. Activation of the renin-angiotensin-aldosterone system and inappropriately elevated plasma arginine vasopressin (AVP) in COPD may cause hyponatremia (Bauer et al, 1965). Irrespective of the underlying mechanism of development, hyponatremia itself may be a predictor of poor outcome in patients of COPD. It may lead to central nervous system dysfunction; confusion, convulsions, coma, reversible cardiac conduction defect, secondary renal insufficiency even death (Suri et al, 2009; Porcel et al, 2002). Therefore, hyponatremia should be meticulously searched for in every patient with acute exacerbation of COPD and should be actively tackled at the earliest.

Along with hyponatremia, hypokalemia may be another morbid accompaniment in the subjects with COPD. Hypokalemia may be present independently or concomitantly with hyponatremia. In our study

COPD, dyselectrolytemia, sodium, potassium.

there was a significantly low level of serum potassium in COPD patients than the healthy controls. Hypokalemia in COPD may be attributed to respiratory acidosis and metabolic alkalosis or long standing steroid therapy (Saini et al, 2008). Use of beta 2-adrenoceptor agonists like fenoterol or salbutamol may also contribute to hypokalemia in COPD patients (Yang et al, 1998). Moreover, acute respiratory failure associated with hypokalemia was found to have a high mortality rate among the COPD patients (Hussain et al, 2008). High mortality in hypokalemia may be attributed to cardiac arrhythmias or hampered nerve-muscle conduction. So, it appears from our study that hypokalemia may be a common associated finding in the subjects with COPD that should be corrected promptly to avoid fatal outcomes.

In conclusion, Serum sodium and potassium levels may get deranged in subjects with acute exacerbation of COPD. So, these levels should be monitored routinely in those patients and attempt should be made to correct them at the earliest to avoid poor outcomes.

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