



## Pulmonary Medicine

## PREVALENCE OF DYSELECTROLYTEMIA IN PATIENTS WITH ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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**ABSTRACT** **INTRODUCTION:** With ever increasing industrialization and smoking, the prevalence of COPD is increasing where exacerbations are the most common cause of hospitalization among COPD patients with high socioeconomic burden. These patients are predisposed to electrolyte imbalances which in turn can cause respiratory muscle weakness, cardiac arrhythmias leading to a significantly poor outcome among them. Moreover, the prevalence of dyselectrolytemia and its impact on morbidity & mortality in such patients has not yet been established.

**AIMS & OBJECTIVES:** The aim is to study the prevalence of dyselectrolytemia in patients with acute exacerbation of COPD requiring hospitalization.

**MATERIALS & METHODS:** This prospective study included 66 patients of acute exacerbation of COPD admitted in the department of pulmonary medicine and 60 age-sex matched healthy controls. Blood samples from all the subjects are estimated for serum electrolytes like sodium and potassium in auto analyzer.

**OBSERVATION AND CONCLUSION:** In our study, the prevalence of hyponatremia and hypokalemia among patients with acute exacerbation are 30.3% and 12.12% respectively. We also observed that, there is a decrease in the mean serum levels of sodium and potassium among cases (133.9±2.83 and 3.42±0.35) when compared to controls (140.25±1.58 and 4.06±0.09) which is statistically significant p value < 0.05. Electrolytes may get deranged in COPD exacerbation and can be taken as a predictive marker for bad clinical course, warranting prompt identification and correction. Hence, routine screening of serum electrolyte abnormalities and correction of hyponatremia and hypokalemia may actually improve the outcomes in exacerbations.

**KEYWORDS :** COPD, Electrolytes, Acute exacerbation.

**INTRODUCTION:**

With ever increasing industrialization and smoking, the prevalence of COPD is increasing where exacerbations are the most common cause of hospitalization among COPD patients with high socioeconomic burden.

COPD affects 6-10% of the adult population and is a leading cause of morbidity and mortality responsible for 5.1% of all deaths worldwide.<sup>(1,2)</sup> Most of the COPD patients present with the features of acute respiratory infections (productive cough, dyspnoea etc). But 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, blood urea and serum creatinine etc<sup>(3)</sup>

These electrolyte imbalances impair nerve conduction as well as smooth muscle and skeletal muscle contraction, which in turn can cause respiratory muscle weakness, cardiac arrhythmias leading to a significantly poor outcome among them. As these are correctable, simple overlooking of the coexistent metabolic abnormalities may contribute to a great deal of mortality and morbidity in the COPD patients. Moreover, the prevalence of dyselectrolytemia and its impact on morbidity & mortality in such patients has not yet been established.

**METHODS AND MATERIALS:**

This prospective study was conducted in the Department of Pulmonary Medicine, Dr. PSIMS & RF, Gannavaram. It included 66 COPD patients admitted in hospital and 60 healthy age sex matched community controls.

**Inclusion criteria:** All cases of COPD with acute exacerbation admitted in the hospital.

**Exclusion criteria:** COPD patients admitted for causes other than

COPD exacerbation with pre-existing renal, hepatic, endocrinal or cardiac illness.

Informed consent from the subjects or their legal relatives was taken and all the tests were done with due permission from the Institutional Ethical Committee. Fasting blood samples from all the subjects were collected for the estimation of serum sodium and potassium in auto analyzer and assessed by SPSS software at the clinical laboratory Dr. PSIMS & RF. Significance of differences of average serum sodium and potassium levels in two groups were evaluated statistically using Student's t test. (p- Value < 0.05 was considered to be significant).

**RESULTS:**

Out of 66 COPD cases, 56 were males and 10 were females. Out of 60 age sex matched healthy controls, 50 were males and 10 were females.

Subjects of COPD were in the age range of 47-85 years & mean age is 57.82 ± 10.81 yrs. Controls were in the age range of 47- 85 years & average age is 55.53 ± 9.78 years.

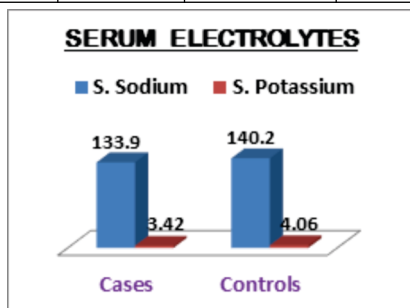
Among patients with acute exacerbation, the prevalence of Hyponatremia is 30.3% and Hypokalemia is 12.12%.

The mean serum sodium (mEq/L) in cases and controls is 133.9±2.83 and 140.25±1.58 respectively.

The mean serum potassium (mEq/L) in cases and control is 3.42±0.35 and 4.06±0.09 respectively.

The patients with acute exacerbation of COPD had significantly low serum sodium and potassium levels (p value : 0.005 and p value : 0.014 respectively).

Groups	Age (years)	Serum Sodium (mEq/L)	Serum Potassium (mEq/L)
Cases (COPD)	57.82 ± 10.81	133.9±2.83	3.42±0.35
Controls	55.53 ± 9.78	140.25±1.58	4.06±0.09



#### DISCUSSION:

Exacerbations are the most common cause of hospitalization among COPD patients.<sup>4</sup>

In a case of acute exacerbation of COPD, 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 liver function abnormalities. Though most of the abnormalities are correctable, attempt is not made to correct either due to overlooking or due to lack of lab facility for 24 hrs monitoring.

Estimation of serum electrolytes showed hyponatremia ( $S.Na^+ < 135$ ) & hypokalemia ( $S.K^+ < 3.5$ ) in COPD cases with mean serum sodium and potassium levels (mEq/L)  $133.9 \pm 2.83$  and  $3.42 \pm 0.35$  respectively. In controls, mean serum sodium and potassium levels (mEq/L)  $140.25 \pm 1.58$  and  $4.06 \pm 0.09$  respectively.

There is a statistically significant decrease in the mean sodium and potassium levels in COPD cases when compared with controls ( $P < 0.05$ )

These results are similar to the observation of several other studies.

In the study by Das et al, who measured the serum  $K^+$  and  $Na^+$  in 64 patients with acute exacerbation of COPD and compared the results with 20 healthy volunteers.<sup>10</sup> They reported a significant decrease in serum  $Na^+$  and  $K^+$  in COPD patients ( $133 \pm 6.86$  mEq/lit,  $3.39 \pm 0.96$  mEq/lit respectively) than in normal controls ( $142 \pm 2.28$  mEq/lit,  $4.52 \pm 0.02$  mEq/lit respectively,  $p < 0.05$ ).

In a study by Goli et al., among 62 patients who were admitted with acute exacerbation of COPD and 20 healthy age and sex matched controls<sup>12</sup>, found a significantly low level of serum sodium and potassium in the COPD patients ( $132 \pm 5.65$  mEq/L and  $3.29 \pm 0.96$  mEq/L respectively) than that of the healthy controls ( $140 \pm 2.28$  mEq/L and  $4.51 \pm 0.02$  mEq/L respectively) ( $p$  value  $< 0.05$  in each case).

Patients with COPD are susceptible to hyponatremia due to development or worsening of hypoxia, hypercapnia and respiratory acidosis and right side heart failure, renal insufficiency, use of diuretics, Activation of the renin angiotensin aldosterone system and inappropriately elevated plasma arginine vasopressin (AVP) in COPD may aggravate the electrolyte imbalance during acute exacerbation of COPD (Bauer et al)<sup>5</sup>

Hypokalemia may be present independently or concomitantly with hyponatremia. Hypokalemia in COPD may be attributed to respiratory acidosis and metabolic alkalosis or long standing steroid therapy (Saini et al, 2008).<sup>7</sup> 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).<sup>6,9</sup>

Acute respiratory failure associated with hypokalemia was found to have a high mortality rate among the COPD patients (Hussain et al, 2008).<sup>8</sup>

#### CONCLUSION:

Electrolytes may get deranged in exacerbation of COPD.

Patients of acute exacerbation of COPD should be screened for electrolyte imbalance.

Hyponatremia and hypokalemia may further worsen the clinical course causing mortality and morbidity.

Hence, routine screening of serum electrolyte abnormalities and correction of hyponatremia and hypokalemia should be done at the earliest so that it might actually improve the outcomes in exacerbations.

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