

# Serum Electrolyte Profile in Subjects Admitted with Acute Exacerbation of Chronic Obstructive Pulmonary Disease

L Harshavardhan<sup>1</sup>, Prashanth Chikkahonnaiah<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of General Medicine, K.R.Hospital, Mysore Medical College and Research Institute, Mysore, Karnataka, India, <sup>2</sup>Assistant Professor, Department of Pulmonary Medicine, PKTB and CD Hospital, Mysore Medical College and Research Institute, Mysore, Karnataka, India

## Abstract

**Introduction:** Chronic obstructive pulmonary disease (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. It is important to identify factors associated with acute exacerbation of COPD and poor outcome among exacerbation cases.

**Materials and Methods:** The study was conducted in the Department of General Medicine, Krishna Rajendra Hospital, Mysore. It was a cross-sectional study done till adequate sample size patients were enrolled. Permission from the Institutional Ethical Committee was obtained for the proposed study. The study included 100 COPD patients and 100 healthy controls.

**Results:** In our study, we found that there was a statistically significant difference ( $P < 0.001$ ) between serum levels of sodium in patients with acute exacerbation of COPD ( $131.7 \pm 5.07$  mEq/L) as compared to healthy controls ( $138.66 \pm 3.83$  mEq/L). Furthermore, serum potassium levels in COPD exacerbation cases ( $3.31 \pm 0.33$  mEq/L) was significantly low ( $P < 0.001$ ) as compared to that of controls ( $3.87 \pm 0.36$  mEq/L).

**Conclusion:** Serum electrolyte levels were significantly low among patients of acute exacerbation of COPD. Hence screening for these abnormalities may improve outcome.

**Key words:** Chronic obstructive pulmonary disease, Potassium, Serum electrolytes, Sodium

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a disease state characterized by progressive airflow limitation that is not fully reversible. 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>

Exacerbations are the most common cause of hospitalization among COPD patients.<sup>3</sup> The economic and social burden created by acute exacerbations of COPD are extremely

high. Thus, it is important to identify factors associated with exacerbation. It is also important to identify factors associated with poor outcome among COPD exacerbation cases. Since electrolytes are important for nerve conduction as well as smooth muscle and skeletal muscle contraction, it may significantly alter the outcome of COPD exacerbation if untreated. Thus, this study aims at evaluating serum electrolyte levels in acute exacerbation of COPD.

## MATERIALS AND METHODS

The study was conducted in the Department of General Medicine, Krishna Rajendra Hospital, Mysore. It was a cross-sectional study done till adequate sample size patients were enrolled. Permission from the Institutional Ethical Committee was obtained for the proposed study. The study included 100 COPD patients and 100 healthy controls. COPD diagnosis was made based on history, clinical examination, chest X-ray, and pulmonary function

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Month of Submission : 10-2016  
Month of Peer Review : 11-2016  
Month of Acceptance : 11-2016  
Month of Publishing : 12-2016

**Corresponding Author:** Dr. Harshavardhan L, Assistant Professor, Department of General Medicine, K. R. Hospital, Mysore Medical College and Research Institute, Mysore, Karnataka, India. E-mail: prshnthcr@gmail.com

test. Age and sex matched healthy controls were enrolled from patients attendants/hospital staff.

### Inclusion Criteria

All cases of COPD patients presenting to outpatient department or emergency with acute exacerbation.

### Exclusion Criteria

1. COPD patients admitted for causes other than COPD exacerbation
2. COPD patients requiring mechanical ventilation
3. Patients with pre-existing renal, hepatic, endocrinal or cardiac illness.

All subjects undergoing the study were given necessary information and informed consent taken in a standard proforma. Detailed history was taken. After thorough clinical examination, necessary investigations for the confirmation of COPD were done. Under strict aseptic conditions, 2 ml of fasting blood was collected. Blood was centrifuged and serum was separated. Serum electrolyte levels measured by ion specific electrode method. Study was analyzed by SPSS software. Statistical significance analyzed by Student's *t*-test ( $P < 0.005$  was considered as statistically significant).

## RESULTS

The mean age of cases was  $57.92 \pm 12.91$  years and mean age of controls was  $53.73 \pm 8.98$  years. Mean serum levels of sodium among cases and controls were  $131.7 \pm 5.07$  mEq/L and  $138.66 \pm 3.82$  mEq/L, respectively. There was a statistically significant difference in mean serum sodium levels among cases and controls ( $P < 0.001$ ).

Mean serum potassium levels among cases and controls were  $3.3081 \pm 3.3126$  mEq/L and  $3.8740 \pm 3.6003$  mEq/L, respectively. The patients with acute exacerbation of COPD had significantly low serum potassium levels ( $P < 0.001$ ).

## DISCUSSION

COPD is a leading cause of morbidity and mortality worldwide. With increasing industrialization and smoking, the prevalence of COPD is increasing. Exacerbations are the most common cause of hospitalization among COPD patients.<sup>3</sup>

The economic and social burden created by acute exacerbations of COPD are extremely high. Thus, it is important to identify factors associated with exacerbation and poor outcome. Common causes of deranged serum sodium levels include hyperglycemia, use of thiazides or

nonsteroidal anti-inflammatory drug, congestive cardiac failure, chronic renal failure, and low dietary salt intake.<sup>4</sup> Common causes of hypokalemia include diarrhea, laxative abuse, vomiting, certain diuretics, drugs like insulin,  $\beta$  agonists, and theophylline.<sup>5</sup> Thus, COPD patients *per se* are predisposed to electrolyte imbalance. In turn electrolyte imbalance can cause respiratory muscle weakness, cardiac arrhythmia, low cardiac output, etc.<sup>6</sup> Thus the presence of electrolyte imbalance leads to significantly poor outcome among COPD patients. This study aimed at evaluating serum electrolyte levels in patients with acute exacerbation of COPD.

In this study 100 patients with COPD acute exacerbation and 100 healthy controls were enrolled. The mean age of cases was  $57.92 \pm 12.91$  years and the mean age of controls was  $53.73 \pm 8.98$  years.

Serum sodium and potassium levels were measured in cases as well as healthy controls. Mean serum levels of sodium among cases were  $131.7 \pm 5.07$  mEq/L and among controls were  $138.66 \pm 3.82$  mEq/L. There was a statistically significant difference in mean serum sodium levels among cases and controls ( $P < 0.001$ ).

Mean serum potassium levels among cases were  $3.3081 \pm 3.3126$  mEq/L and among controls were  $3.8740 \pm 3.6003$  mEq/L. The patients with acute exacerbation of COPD had significantly low serum potassium levels ( $P < 0.001$ ).

Parameter	Age		P value
	Group I	Group II	
Age (mean±SD)	57.92±12.92	53.73±8.98	0.008
Sex (Male/Female)	12/88	14/86	0.674
Serum sodium (mean±SD)	131.7±5.07	138.66±3.83	0.000
Serum potassium (mean±SD)	3.31±0.33	3.87±0.36	0.000

SD: Standard deviation

Our study results were similar to that of Das *et al.* who conducted the study on 64 acute exacerbations of COPD cases and 20 healthy controls. Average levels of serum sodium and potassium in COPD patients were  $133 \pm 6.86$  and  $3.39 \pm 0.96$  mEq/L, respectively. Serum sodium and potassium levels in the control group were  $142 \pm 2.28$  and  $4.52 \pm 0.02$  mEq/L, respectively.<sup>7</sup> The study concluded that it is important to identify electrolyte imbalance among COPD acute exacerbation cases to prevent adverse outcome.

Thus, although there are no established guidelines which advice for routine screening of serum electrolyte levels in COPD acute exacerbation cases, it is important to screen the patients for the same. Correction of serum electrolyte levels among acute exacerbation of COPD cases may actually improve the outcome.

## CONCLUSION

Patients of acute exacerbation of COPD should be screened for electrolyte imbalance. Correction of these electrolyte imbalance could improve outcome of exacerbation.

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**How to cite this article:** Harshavardhan L, Chikkahonnaiah P. Serum Electrolyte Profile in Subjects Admitted with Acute Exacerbation of Chronic Obstructive Pulmonary Disease. *Int J Sci Stud* 2016;4(9):31-33.

**Source of Support:** Nil, **Conflict of Interest:** None declared.