International Journal Dental and Medical Sciences Research
Volume 4, Issue 6, Nov-Dec 2022 pp 292-295 www.ijdmsrjournal.com ISSN: 2582-6018

# "Study of Serum Electrolytes in Acute Exacerbation of Copd Patients"

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Submitted: 05-11-2022 Accepted: 20-11-2022

## I. INTRODUCTION-

Chronic Obstructive Pulmonary Disease (COPD) is a common preventable and treatable disease, and is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and co morbidities contribute to the overall severity in individual patients (1). COPD is reported to have an estimated disease burden of 210 million peopl World-wide (2). Globally COPD is the 3rd leading cause of death (6%) in world in 2012.

COPD is complicated by frequent and recurrent Acute Exacerbations (AE) that compromise quality of life, diminish respiratory functions and increased enormous health care expenditures and high morbidity. An exacerbation of COPD is an acute worsening of respiratory symptoms beyond normal day-to-day variations. It is a significant cause of mortality and morbidity and categorized in terms of clinical presentations or healthcare utilization (3). Exacerbations may cause increased dyspnoea, productive cough with altered sputum, and fever.

The GOLD 2021 update defines an acute exacerbation as COPD as an acute worsening of respiratory symptoms that result in additional therapy (4).

The Acute Exacerbation of Chronic Obstructive Pulmonary Diseases (AE COPD) patients present not only with the features of acute respiratory infections (productive ,cough, dyspnoea etc.) but also a number of metabolic disorders like hyponatremia, hypokalaemia, hypomagnesemia, hyperbilirubinemia, elevated transaminases, elevated blood urea and elevated serum creatinine arising out of the disease process or as a consequence of the therapy (such as beta2-agonists, steroids, diuretics etc). Very often they are missed or confuse the diagnosis, thus simple overlooking of the coexisting metabolic abnormalities may contribute to a great deal of mortality and morbidity in the COPD patients . Water retention and hyponatremia are typically observed in the final stages of COPD and the onset of oedema is a poor prognostic factor. In these patients the gas exchange impairment induces several hormonal abnormalities: renin (Rn), angiotensin II (AnII), aldosterone (Ald), atrial natriuretic peptide (ANP), vasopressin, anti-diuretic hormone (ADH) and endothelial factors are some of the factors involved. The systemic response to hypercapnia has the effect of reducing the renal blood flow and, as a result, increasing water and sodium retention with the final effect of oedema and hyponatremia . 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 and even death .

Along with hyponatremia, hypokalaemia may be another morbid accompaniment in the subjects with COPD. Hypokalaemia may be present independently or concomitantly with hyponatremia. Hypokalaemia in COPD may be attributed to respiratory acidosis and metabolic alkalosis or long-standing steroid therapy . Use of beta 2 agonists like fenoterol or salbutamol may also contribute to hypokalaemia in COPD patients (5).

This study was done to evaluate the prevalence of Deranged Electrolytes (Sodium, Potassium) in patients with AECOPD.

**AIM OF THE STUDY:**

To Study Dyselectrolytemia in Acute Exacerbation of Chronic Obstructive Pulmonary Disease Patients.

**OBJECTIVES:**

1. To evaluate levels of Serum Electrolytes (Sodium and Potassium) in Acute Exacerbation of Chronic Obstructive Pulmonary Disease patients.
2. To correlate dyselectrolytemia (Sodium and Potassium) with Peak Expiratory Flow Rate or Pulmonary Function Test in Acute Exacerbation of Chronic Obstructive Pulmonary Disease patients.

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## II. MATERIALS AND METHODS

**STUDY POPULATION:** Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease presenting at outdoor, indoor in department of Respiratory Medicine or in Emergency.

**INCLUSION CRITERIA**

- Age group >18 years patients
- Patients who are ready to give written consent.
- Cases of COPD patients presenting to outdoor, indoor in department of respiratory medicine or emergency with acute exacerbation.
- Patients with acute exacerbation of COPD (an increase cough, sputum production, worsening dyspnea, or sputum purulence within 3 weeks) requiring ICU admission.

**EXCLUSION CRITERIA**

- Age group <18 years patients
- Patients refusing to give written consent
- Presence of malignancy or serious co morbidities that would prevent the study completion
- Patients with active pulmonary tuberculosis.
- Other causes of dyselectrolytemia excluded from study like

- Chronic renal failure
- Diabetic ketoacidosis
- Sepsis
- Adrenocortical insufficiency
- History of vomiting/diarrhea/Gastro intestinal losses
- Cerebral wasting syndrome

**METHODS**

- Detailed history and demographic data of all the patients selected as per inclusion criteria were taken and relevant clinical and laboratory test were performed.
- Serum electrolyte values of serum sodium and serum potassium were recorded for comparison. The electrolyte values in venous blood sample measured by an Electrolyte Analyzer (NuLYTE SMART) have been taken.
- Reference range for normal values for Serum Electrolytes (6): -

- Serum Sodium: - 135 – 145 mMol/L
- Serum Potassium: - 3.5 – 5.5 mMol/L

- Peak expiratory flow rates (PEFR) (liter/minute) were measured in all the patients using a Breathometer (Cipla Ltd., India) with European Union (EU) scale.

▪ Reference range for PEFR used is :-

- Male: - 450 – 550 liter/minute
- Female: - 320 – 470 liter/minute

· As a Radiological finding of COPD, Chest X-ray has been used.

- Electrocardiography (E.C.G.) has also been record for , P" pulmonale pattern (an increase in , P" wave amplitude in lead 2, 3 and aVF).

## III. RESULTS

**Table 1: Age Distribution of subjects with AE COPD**

| AGE IN YEARS | No. | Percentage (%) |
|---|---|---|
| **41-50** | 13 | 26 |
| **51-60** | 14 | 28 |
| **61-70** | 19 | 38 |
| **>70** | 4 | 8 |
| **Total** | **50** | **100** |

The mean age distribution was 57.98 ± 8.44 years. Maximum number of individuals were in the age group of 61 to 70 years accounting to 17 (38%) followed by 14 (28%) in the age group of 51-60 years.

**Table 2: Sex Distribution of subjects with AE COPD**

| SEX | No. | % |
|---|---|---|
| **MALE** | 40 | 80% |
| **FEMALE** | 10 | 20% |

**Table 3: Distribution According to FEV1 (POST- BRONCHODILATOR) and Gender in AE COPD subjects**

| | FEMALE | | MALE | | TOTAL | |
|---|---|---|---|---|---|---|
| **FEV1** | **No.** | **%** | **No.** | **%** | **No.** | **%** |

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| | | | | | | |
|---|---|---|---|---|---|---|
| **30%-50%** | **7** | **70** | **20** | **50** | **27** | **54** |
| **<30%** | **3** | **30** | **20** | **50** | **23** | **46** |
| **TOATL** | **10** | **100** | **40** | **100** | **50** | **100** |

In females 70% had FEV1 30-50% and 30% had <30% FEV1, whereas in males equal number of patients i.e. 50% had <30% and 50% had 30-50% FEV1.

**Table 4: Serum Electrolyte Levels in AE COPD subjects**

| | | **No.** | **%** |
|---|---|---|---|
| **Serum Sodium Level** | **Below (<135)** | **46** | **92** |
| | **Normal (135-145)** | **4** | **8** |
| **Serum Potassium Level** | **Below (<3.5)** | **43** | **86** |
| | **Normal (3.5-5.0)** | **7** | **14** |

92% of patients had serum sodium levels below normal and 86% had serum potassium levels below normal limits.

**Table 5: Association between COPD GOLD Staging with Serum Sodium Levels**

| **GOLD STAGING** | **SERUM SODIUM LEVELS** | |
|---|---|---|
| | **MEAN** | **SD** |
| **SEVERE** | **131.05** | **2.87** |
| **VERY SEVERE** | **128.32** | **3.86** |
| **P VALUE- 0.007** | | |
| **SIGNIFICANT** | | |

Serum sodium levels were significantly lower in very severe GOLD staging patients as compared to severe GOLD stage patients. The mean serum sodium level with severe GOLD stage was 131.05 and that with very severe GOLD stage was 128.32 mmol/L.

**Table 6: Association between COPD GOLD Staging with Serum Potassium Levels**

| **GOLD STAGING** | **SERUM POTASSIUM LEVELS** | |
|---|---|---|
| | **MEAN** | **SD** |
| **SEVERE** | **3.28** | **0.25** |
| **VERY SEVERE** | **3.11** | **0.29** |
| **P VALUE- 0.03** | | |
| **SIGNIFICANT** | | |

Serum potassium levels were significantly lower in very severe GOLD staging patients as compared to severe GOLD stage patients. The mean serum potassium level with severe GOLD stage was 3.28 and that with very severe GOLD stage was 3.11 mEq/L.

## IV. CONCLUSION

Hyponatremia and hypokalaemia were commonly encountered in patients presenting with acute exacerbation of COPD. Direct relationship and significant correlation were seen between serum electrolytes and various indicators of severity of acute exacerbation of COPD like oxygen saturation, spirometry for lung function,

GOLD index, duration of illness, Peak Expiratory Flow Rate (PEFR).

A significant number of patients those are hospitalized due to acute exacerbation of COPD have chance of electrolyte imbalance such as hyponatremia, hypokalemia. Detection of such abnormality is very important. Preventive measures and specific management will be helpful for the reduction of mortality & morbidity in near future.

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