



“DYSELECTROLYTEMIA IN ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) “

General Medicine

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ABSTRACT

Background : Various metabolic disorders have been associated with patients of COPD, especially Acute exacerbation of COPD (AECOPD). These disorders include hyponatremia, hypokalemia, hypocalcemia, hypomagnesemia, hypophosphatemia and amongst them, hyponatremia and hypokalemia are the most commonly reported. (1) **Objective :** To determine the serum electrolyte levels (sodium, potassium, magnesium, chloride, and calcium) in patients admitted as AECOPD and to correlate the levels of serum electrolytes with disease outcomes. (2) **Methods :** A prospective clinical study was conducted at Mahadevappa Rampure Medical college , Kalaburgi during the period of August 2022-January 2024 on 100 patients admitted to in patient department of general medicine with acute exacerbation of copd and evaluated for the same. **Results :** Study observed that out of 100 AECOPD patients; 5(5.0%) of patients were died and 95(5.0%) of patients were survived. There was statistically significant difference of mean electrolytes of Serum Sodium, Serum Potassium and Serum Magnesium, Serum Chloride and Serum Calcium with outcome of the Study ($P < 0.05$) and ($P < 0.01$). In the mortality patients, the mean electrolytes were seen significantly lower as compare to survived patients. **Conclusion :** Hyponatremia was the commonest electrolyte imbalance in patients with AECOPD followed by hypomagnesemia, hypocalcemia and hypokalemia. Patients with two or more electrolyte imbalances required long-term oxygen therapy or non invasive ventilation at the time of discharge.

KEYWORDS

COPD (Chronic obstructive pulmonary disease), AECOPD (Acute exacerbation of COPD).

INTRODUCTION :

Chronic obstructive pulmonary disease (COPD) in general terms pertains to the chronic outflow obstruction that develops due to various reasons, most commonly due to chronic tobacco smoking.

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2023 has defined COPD as follows: “COPD is a heterogeneous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum production, exacerbations) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive airflow obstruction”.⁽³⁾

Acute exacerbations of COPD (AECOPD) are important episodes in the natural history of the disease as they adversely affect health status, rate of hospitalization, and disease progression.

The frequency and severity of COPD exacerbations have increased in the last few decades⁽⁵⁾. The hospital admission rate due to acute exacerbations of COPD is also progressively raised, especially in the winter season. The injudicious use of corticosteroids and bronchodilators, irrational uses of antibiotics, low pre-treatment FEV1 (forced expiratory volume in the first second), history of more than three episodes of exacerbation in the previous two years, and comorbid or immunocompromised state are the common risk factors for exacerbation relapses of COPD.⁽⁶⁾⁽⁷⁾

Various metabolic disorders have been associated with patients of COPD, especially AECOPD. These disorders include hyponatremia, hypokalemia, hypocalcemia, hypomagnesemia, hypophosphatemia, elevated liver enzymes, and uric acid levels, and amongst them, hyponatremia , hypomagnesemia and hypokalemia are the most commonly reported.

While hyponatremia develops due to causes like chronic hypoxia, hypercapnia, heart failure, or syndrome of inappropriate antidiuretic hormone secretion (SIADH), hypokalemia primarily develops due to metabolic alkalosis or long-term beta-2 agonist and steroid use.⁽⁸⁾⁽⁹⁾ Magnesium (Mg) is crucial in numerous physiological processes, including membrane stabilization.⁽¹⁰⁾

In view of the above varied electrolyte imbalances the above study was done in cases of acute exacerbation of COPD .

Objectives :

- 1) To determine the serum electrolyte levels (sodium, potassium, magnesium, chloride, and calcium) in patients admitted as AECOPD.
- 2) To correlate the levels of serum electrolytes with disease outcomes.

MATERIALS AND METHODS :

A prospective clinical study was conducted at Mahadevappa Rampure Medical college , Kalaburgi during the period of August 2022-January 2024 on 100 patients admitted to in patient department of general medicine with acute exacerbation of copd and evaluated for the same. Data was analysed using appropriate inferential statistics .

Study Design : Hospital based prospective study

Source Of Data : All established cases of COPD who came with symptoms of acute exacerbation to basaveshwara teaching and general hospital attached to mahadevappa rampure medical college , kalaburgi and admitted during the time period of august 2022-january 2024 , were evaluated .

Inclusion Criteria :

- 1) Diagnosed cases of COPD with acute exacerbation of symptoms
- 2) Age more than 18 yrs

Exclusion Criteria :

- 1) Chronic renal failure
- 2) Diabetic ketoacidosis

Sample Size Estimation : 100 cases based on the hospital in patient admissions and appropriate age in accordance to our hospital statistics was selected .

Statistical Analysis : Statistical data was analyzed by IBMSPSS25.0 version software. Collected data were spread on excel sheet and prepared master chart. Through the master chart tables and graphs were constructed. For quantitative data analysis mean and standard deviations were calculated, t-test was applied for statistical significant. For qualitative data analysis chi-square test and Fisher exact probability tests were applied for statistical significance. If P-value was less than 0.05 considered as significant

RESULTS :

Table No.1: Determine the serum electrolyte levels of sodium, potassium, magnesium, chloride, and calcium in patients admitted as AECOPD

Electrolytes	Levels	Number of patients	Percentage	P-value
Sodium	Normal (135to 145 mmol/L)	9	9.0%	P=0.000,HS
	Abnormal	91	91.0%	
Potassium	Normal (3.6 to 5.2 mEq/L)	11	11.0%	P=0.000,HS
	Abnormal	89	89.0%	
Magnesium	Normal (1.7to 2.2 mg/dL)	7	7.0%	P=0.000,HS
	Abnormal	93	93.0%	
Chloride	Normal (96 to 106 mEq/L)	38	38.0%	P=0.001,HS
	Abnormal	62	62.0%	
Calcium	Normal (8.5to 10.5 mg/dL)	42	52.0%	P= 0.024,S
	Abnormal	58	48.0%	

Bar diagram represents serum electrolyte levels

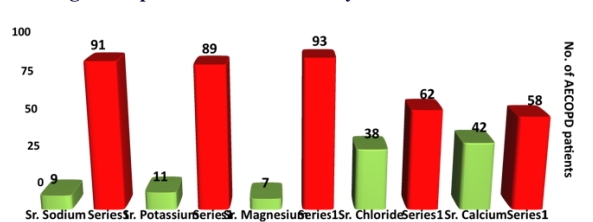


Table No.2: Correlation of levels of serum electrolytes with disease outcomes

Electrolytes	StudyOutcome		t- test, P-Value and Significance
	Survived(N=95)	Died(N=5)	
	Mean±SD	Mean±SD	
Sodium	130.69 ± 3.82	114.10±5.04	t = 9.374, P=0.001,HS
Potassium	3.17 ± 0.62	2.58 ± 0.43	t = 2.902, P=0.034,S
Magnesium	1.65 ± 0.34	1.32 ± 0.27	t = 2.933, P=0.025,S
Chloride	97.98 ± 6.51	85.60 ± 4.39	t = 4.192, P=0.002,HS
Calcium	8.93 ± 1.24	7.21 ± 0.65	t = 2.871, P=0.038,S

Study observed that out of 100 AECOPD patients; 5(5.0%) of patients were died and 95(5.0%) of patients were survived.

DISCUSSION :

The aim of our study was to analyse the serum electrolytes of patients with acute exacerbation of COPD on admission and determine the prognosis based on the results.Out of study in 100 patients ,the serum electrolytes values of sodium were abnormal in 89% of patients , magnesium 93% and calcium 58% of patients . Also it was seen that there was statistically significant difference of mean electrolytes of Serum Sodium (130.69 ± 3.82),Serum Potassium(3.17 ± 0.62) and Serum Magnesium(1.65 ± 0.34), Serum Chloride (97.98 ± 6.51) and Serum Calcium (8.93 ± 1.24) with outcome of Study (P<0.05) and (P<0.01). In the mortality patients the mean electrolytes were seen significantly lower as compared to survived patients.

Similarly a study conducted by P Das et al showed that low level of serum sodium (133± 6.86 meq/lit) and potassium (3.39 ± 0.96 meq/L)) in subjects with acute exacerbation of COPD than their healthy counterparts [sodium-142 ± 2.28 meq/L and potassium- 4.52 ± 0.02 meq/L (p<0.05)].¹¹

A study conducted by Akash Deep et al showed that the mean serum sodium and calcium levels were lower in patients with AECOPD while the mean serum potassium levels were higher. A total of five deaths were recorded in patients with two or more electrolyte imbalances.¹²

CONCLUSION :

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of mortality and morbidity worldwide. Due to lack of awareness about the precipitating factors and predictors of prognosis, cases of acute exacerbation of COPD often suffer the fatal outcomes. This present study concludes that the serum electrolyte levels were significantly low in patients with acute exacerbations of COPD. Hypomagnesemia being more common than hyponatremia and hypocalcemia.

As COPD is not fully reversible with medications, we need to look into the modifiable factors such as serum sodium, potassium and magnesium to reduce morbidity and mortality.

Timely correction of these electrolytes during the presentations might prevent the adverse outcomes like central nervous system dysfunction, impaired nerve-muscle conduction, respiratory muscle dysfunction, and more. Also , the correction of these help to reduce number of exacerbations and hence the number of hospital admissions .

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