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A Study of Serum Electrolytes in Acute Exacerbation of Chronic Obstructive Pulmonary Diseases in Tertiary Care Hospital.

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Abstract

Chronic obstructive pulmonary disease (COPD) affects a huge number of individuals and is linked with severe morbidity, disability, and death. COPD is made more difficult by frequent and repeated acute exacerbations, which are linked to significant morbidity and large medical costs. The disease process or the treatment for COPD may result in a variety of metabolic abnormalities that might lead to hyponatremia, hypokalemia, hyperbilirubinemia, high transaminases, raised blood urea and elevated serum creatinine.

Keywords: Acute Exacerbation, COPD, Prognosis, Quality of life, Serum electrolytes

Introduction

Chronic obstructive pulmonary disease (COPD) affects a huge number of individuals and is linked with severe morbidity, disability, and death. COPD is made more difficult by frequent and repeated acute exacerbations, which are linked to significant morbidity and large medical costs.1,2

A COPD exacerbation is described as "an event in the natural course of the disease characterized by a change in the baseline dyspnea, cough, and/or sputum and beyond normal day to day variations, that is acute in onset, and that may warrant a change in regular medication in a patient with underlying COPD."

Exacerbations are divided into two groups based on the clinical presentations (number of symptoms) or the use of healthcare.3,4

In addition to the financial burden incurred in providing treatment for these patients, additional "costs" associated with this condition include days lost at work and a substantial reduction in quality of life (QOL).5 Despite the fact that respiratory infections are thought to be the primary causes of COPD exacerbations, additional illnesses have been discovered, such as sedatives, industrial pollutants, allergies, congestive heart failure, and pulmonary embolism.6

A COPD exacerbation may have several contributing factors, such as air pollution or viral infections, which may worsen the airway inflammation already present and increase the risk of additional bacterial infections. The disease process or the treatment for COPD may result in a variety of metabolic abnormalities that might lead to hypernatremia, hypokalemia, hyperbilirubinemia, high transaminases, raised blood urea, elevated serum creatinine, etc. Mohan et al. Even though the

majority of these characteristics are correctable, they often go unnoticed or complicate the diagnosis.7

Therefore, a simple failure to recognize the coexisting metabolic disorders may result in significant morbidity and death. Therefore, it is essential to identify these metabolic anomalies early and fix them quickly. Serum electrolytes in COPD patients who are experiencing an acute exacerbation were the focus of the investigation. Given this context, we tried to evaluate the levels of important serum electrolytes (sodium, potassium) in COPD patients who were experiencing an acute exacerbation in our study.

Aims And Objectives:

To assess serum electrolyte and its abnormality in AECOPD. To determine relation of serum electrolyte levels and effect of correction on mortality and morbidity.

Methodology:

A cross sectional study was conducted among 74 patients of COPD admitted at Department of General Medicine at SMIMER, Surat.

Inclusion Criteria:

1. Patients with acute Exacerbation of COPD. Exclusion criteria (All/any of the following):
2. Renal failure
3. Congestive cardiac failure
4. Liver failure
5. Diabetic ketoacidosis
6. Pregnant women
7. COPD patients not admitted for other causes other and not for exacerbation

Sample Size:

$z2\sigma 2/L2$

z = level of significance 95% = 1.96

σ = standard deviation of Na+ among patients of Acute exacerbation of COPD is4.83 from previous study of "Serum Electrolytes in Acute Exacerbation of COPD published in Journal of Gandaki Medical College , Nepal."8 L = allowable error =1.1So, Sample size is 74.

Operational Definition:

Acute Exacerbation of COPD: "Acute exacerbations of chronic obstructive pulmonary disease (AECOPD) are the abrupt deterioration of airway function and respiratory symptoms in COPD patients"

Data Collection And Analysis:

After taking Ethical permission from the IEC committee of the institute data collection was started. Information regarding patients socio- demographic profile, Clinical presentation during admission, Medical history was collected and entered in to excel sheet. After the data collection the data was entered in MS-excel than exported to IBM-SPSS Version 25.0 for analysis. The statistical analysis was carried out considering p value <0.05 for statistical significance or association between groups. For quantitative data Mean± SD was calculated. To find mean difference in two groups unpaired t test was applied. For qualitative data frequency and percentage wise table made and chi square test was applied to check significant association between groups.

Results:

Only Sixteen (21.60%) patients were fall age group of 31-40 and eleven (14.90%) patients were fall age group more than 61 years. Here, male patients were more in age group 41-50 followed by 51-60 years and more than 61 years. There were no association between gender and age group. Thus, there was no selection bias for the age and gender among study participants. [Table 1] Among seventy-four patients, majority thirty-nine patients (52.7%) have fever, fifty-two patients (70.3%) have cough, forty-three patients (58.1%) have Dyspnea, forty-six patients (62.2%) have crepitation, sixty-one patients (82.4%) have fever, only fewer twenty- four patients (32.4%) have cyanosis, thirty-one patients (41.9%) have clubbing. [Figure 1] Among seventy-four patients, majority thirty-nine patients (52.7%) were classified with moderate gold Criteria followed by severe (27%) , mild (10.8%) and very severe among 9.5%. [Figure 2] the duration of illness of total forty one patients were fall under the 10 age years, twenty one patients were fall under 11- 20 age years and twelve patients were fall under more than 20 age years. Among 74 patients, fourteen (34.10%) patients, whose duration of illness was less than 10 years, were in Hyponatremia condition and twenty-seven (65.90%) patients were in normal condition. Twenty-one (100%) patients, whose duration of illness was 11-20 years, were in Hyponatremia condition and No patients were in normal condition. Twelve (100%) patients, whose duration of illness was greater than 20 years, were in Hyponatremia condition and No patients were in normal condition. The level of sodium among COPD patients was significantly associated with the duration

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of illness. [Table 2] Total forty one patients were fall under the 10 age years, twenty one patients were fall under 11-20 age years and twelve patients were fall under more than20 age years. Among 74 patients, twenty (48.80%) patients, whose duration of illness was less than 10years, were in hypokalemia condition and twenty one (51.20%) patients were in normal condition. Twenty one (100%) patients, whose duration of illness was 11-20 years, were in hypokalemia condition and No patients were in normal condition. Twelve (100%) patients, whose duration of illness was greater than 20years, were in hypokalemia condition and No patients were in normal condition. The level of potassium among COPD patients was significantly associated with the duration of illness. [Table 3]

Table 1: Age group and gender wise distribution of study participants

Age group		Gender		Total
		Female	Male	
31-40	n	8	8	16
	%	28.60	17.40	21.60
41-50	n	9	14	23
	%	32.10	30.40	31.10
51-60	n	7	17	24
	%	25.00	37.00	32.40
>=61	n	4	7	11
	%	14.30	15.20	14.90
Total	n	28	46	74
	%	100.0	100.0	100.0
ChiSquarevalue:1.800			p value:0.615	

Table 2: Association of sodium level and duration of illness of COPD patients

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Duration of illness	Sodium Level				Total	
	Hyponatremia		Normal			
	n	%	n	%	n	%
<10 years	14	34.10	27	65.90	41	100.0
11-20 years	21	100.0	0	0.00	21	100.0
>20 years	12	100.0	0	0.00	12	100.0
Grand Total	47	63.50	27	36.50	74	100.0
Chi Square value: 34.216			P value<0.05*			

Figure 1. Clinical Symptoms

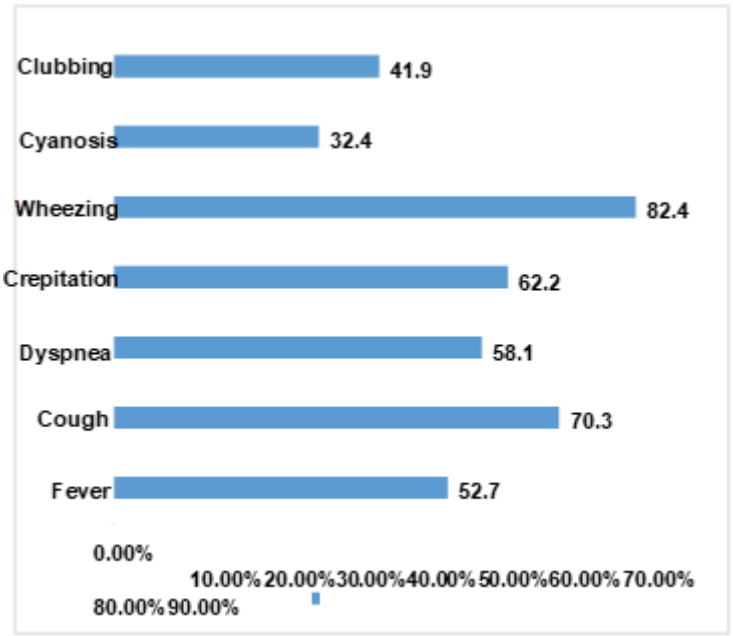

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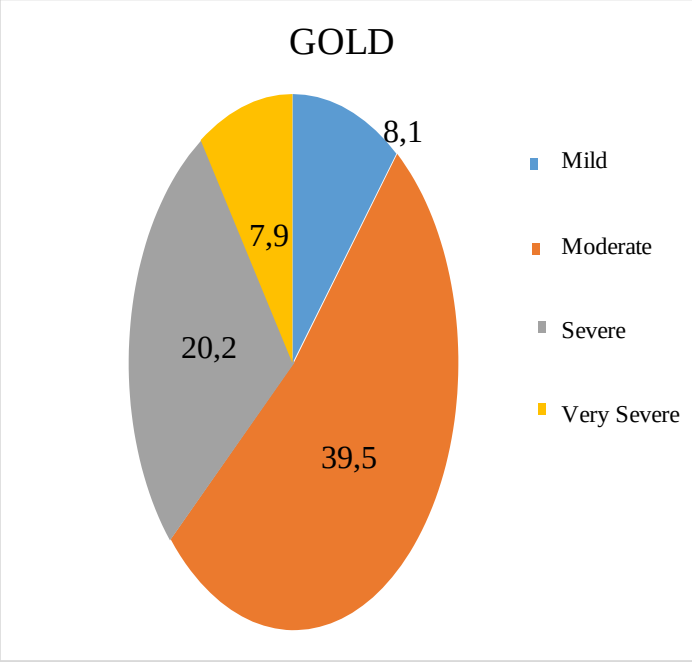
Table 3: Association of potassium level and duration of illness of COPD patients

Duration of illness	Potassium Level				Total	
	Hypokalemia		Normal			
	n	%	n	%	n	%
<10years	20	48.80	21	51.20	41	100.0
11-20years	21	100.0	0	0.00	21	100.0
>20years	12	100.0	0	0.00	12	100.0
Grand Total	53	71.60	21	28.40	74	100.0
Chi Square value:23.600			P value<0.05*			

Figure 2: Distribution of COPD patients according to GOLD staging



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Discussion:

In present study we included total 74 patients of COPD with acute exacerbation. Among them 47 (63.5%) had hyponatremia and 53(71%) had hypokalemia. Compared to our study hyponatremia was less frequently seen in Prospective observational research on patients hospitalized for AECOPD at the University Hospital Complex in Santiago de Compostela, Galicia, Spain. In study 602 individuals were recruited, and 65 incidences of moderate hyponatremia (10.8%) were reported (mean 131.6; SD 2.67). 9

In current study case fatality rate was 9.4% as 7 out of 74 patients died. 362(60%) of the patients had poor progress in study done by Garcia et al.: 18 patients (3%) died at admission, 327 (54.3%) had a protracted stay and 91 (15.1%) were readmitted within one month after release. 9 In patients with acute exacerbations of chronic obstructive pulmonary disease (AECOPD), prognostic factors include baseline disease severity, frequency and severity of exacerbations, age, various comorbidities, history of previous AECOPD admissions, severity of exacerbations, and a series of physiological and laboratory parameters such as lung function, respiratory rate at admission, hypoxemia, and hypercapnia.10

Although Roberto Chalela et al. research has shown that hyponatremia, particularly severe hyponatremia, is a predictor of poor prognosis in chronic obstructive pulmonary disease (COPD). 11

A few studies have investigated the prevalence and impact of hyponatremia on the prognosis in patients with AECOPD who require hospitalization. Serum sodium (131.1±5.63 Meq/lit) and potassium (3.2±0.44 Meq/lit) levels were significantly lower in participants with acute COPD exacerbation than in healthy person. Goli et al discovered significantly lower levels of serum sodium (132.6±5Meq/lit) and potassium (3.29±0.96Meq/lit) in subjects with acute COPD exacerbation than in healthy controls (Na+

=140.2±8Meq/lit and K+ = 4.51±0.02Meq/lit (p0.05). 12 Research conducted by Nalan Organ discovered Hypokalemia as a prevalent electrolyte disruption in COPD, which is similar to our findings.13Goli et al. found that blood K levels were lower in AECOPD patients than in normal persons, which is consistent with our findings.12

In our study level of sodium and potassium among COPD patients was significantly associated with the type of therapy. Similarly, research found that patients who needed mechanical breathing had considerably lower serum Na, K, levels. 14

Furthermore, considerably higher hypokalemia was seen in our AECOPD patients whose hospitalization culminated in death. One suspected cause of this electrolyte imbalance is the diuretic medication required for cor pulmonale, which occurs in late COPD. Furthermore, beta-agonists, which are used to treat both acute and chronic illness, activate Na+/K+ ATPase, promoting intracellular K and Mg absorption.15Another reason for the electrolyte imbalance mechanism might be the side effects of systemic corticosteroids, which are often used to treat attacks.16

Mortality is significantly associated with low sodium level in as per our study finding. Concurrently sodium threshold less than 129.7 mEq/L had the best discriminatory power for predicting mortality according Roberto Chalela et al. study. 11

Conclusion:

In conclusion, hypocalcemia and hypokalemia were shown to be associated with Acute exacerbation of COP mortality. In order to prevent mortality, these markers should be assessed, and electrolyte imbalances corrected in patients admitted to the hospital for an acute exacerbation. Furthermore, larger population-based prospective studies are required to evaluate the relationship between these blood biochemical markers and Acute exacerbation of COPD prognosis.

The level of sodium among COPD patients was significantly associated with the duration of illness and the age group. The level of sodium among COPD patients was significantly related to the type of therapy and the severity of the disease, according to a study. The level of sodium among COPD patients was significantly associated with outcome, but the level of potassium was not associated with mortality of patients.

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