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# Correlation Of Serum Calcium Level with Gold Criteria in Chronic Obstructive Pulmonary Disease Patients in A Tertiary Care Centre Tamaka Kolar

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## ABSTRACT

### Introduction

Patients with acute exacerbation of chronic obstructive pulmonary disease (COPD) are at increased risk for morbidity and mortality compare to non-exacerbators. Electrolyte imbalances with calcium is most often reported in these patients. Correlation between serum calcium levels and GOLD (Global Initiative for Chronic Obstructive Lung Disease) criteria remains unclear.

### Aims and objectives

This study aims to correlate serum calcium levels in acute exacerbation of COPD patients with GOLD criteria.

### Materials and Methods

Forty-eight (48) patients with acute exacerbation of COPD were included in the study. Serum calcium levels were defined as per recent guidelines.Statistical analysis was performed using SPSS version 22.

### Results

A total of 48 patients were included in which majority of people were between the ages 61and 70. The mean serum calcium levels were lower in patients with acute exacerbation of chronic obstructive pulmonary disease in which very low serum calcium level correlated with severe grade of GOLD criteria(viceversa) with significant p value of <0.05.

### Conclusion

Our study indicated that hypocalcemia was associated with an elevated risk of COPD exacerbation.Hypocalcemia was correlated with GOLD criteria, the low the serum calcium level the severe the GOLD criteria.

***Keywords:*** *acute exacerbation, chronic obstructive pulmonary disease (COPD), GOLD (Global Initiative for Chronic Obstructive Lung Disease) criteria, Serum calcium level.*

## 1. 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"(1)

Chronic obstructive pulmonary disease (COPD) is a leading cause of chronic morbidity and mortality worldwide. Based on the Global Burden of Disease Study, COPD incidence and mortality rates in 2019 were 200.49/100,000 and 42.52/100,000 persons, respectively(2).

Exacerbations of chronic obstructive pulmonary disease (COPD) impose a substantial burden on health-care systems worldwide; they are a major cause of morbidity, mortality, and reduced health status(3). Exacerbations are also important outcome measures in COPD, and thus a reduction in their frequency is a key target for intervention.

Calcium, the single most abundant mineral in the human body, exists primarily in the bone as hydroxyapatite and only a small fraction is dissolved in body fluids as ions(4). Traditionally, calcium has been well-known for its effects on bone health(5), but calcium ions in body fluids also play an essential role in many physiological functions. Numerous studies have shown that calcium ions are involved in physiological processes such as cell signaling(6) , muscle contraction(7) , and neurotransmission(8). The dynamic balance of calcium ion concentrations between intracellular and extracellular fluids is regulated by calcium channels in the cell membrane(9) , When this homeostasis is deregulated, it can lead to the development of a variety of diseases(10)

Every year, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommendations undergo updates to ensure that they are aligned with the latest developments and innovations. The important objective of the GOLD is to raise awareness about the impact of COPD and assist in its prevention and management across the globe. The GOLD report, which was initially released in 2001, offers scientifically backed guidance on COPD diagnosis, stable disease management, handling of exacerbations, and comorbidities(11).

All though it is correctable, it should be correlated with GOLD criteria to prevent further exacerbations and to avoid morbidity and mortality.

## 2. AIMS AND OBJECTIVES:

1. To measure serum calcium levels in patients with chronic obstructive pulmonary disease.
2. To correlate serum calcium levels with GOLD criteria in chronic obstructive pulmonary disease.

## 3. MATERIALS AND METHODS:

It was a prospective study conducted in the department of general medicine,sri Devaraj urs medical college and research centre kolar during period of October 2024 to December 2024.All consecutive patients with previously diagnosed as COPD who came with exacerbation to emergency department were included.Patients who had pneumonia, tuberculosis, neoplastic etiologies, and hepatic, cardiac, and renal diseases were excluded.

Patients who diagnosed as acute exacerbation of COPD who previously diagnosed as COPD came with increased respiratory systems (cough with or without expectoration,breathlessness) that require hospital admission.

**Sample size** - Using the above values at 95% Confidence level a sample size of 43 subjects will be included in the study. Considering 10% Nonresponse a sample size of $43 + 4.3 \approx 48$ subjects will be included in the study.

**Statistical Methods:** Data will be entered into Microsoft excel data sheet and will be analyzed using SPSS 22 version software.Categorical data will be represented in the form of Frequencies and proportions.

Chi-square will be used as test of significance. Continuous data will be represented as mean and standard deviation. Independent t test will be used as test of significance to identify the mean difference. P value <0.05 will be considered as statistically significant.

## 4. RESULTS:

**Table 1: Age Distribution of subjects with Acute Exacerbation of COPD**

| AGE IN YEARS | NUMBER | PERCENTAGE |
|---|---|---|
| 41-50 | 3 | 6.25 % |
| 51-60 | 8 | 16.6 % |
| 61-70 | 26 | 54.1% |

| | | |
|---|---|---|
| >70 | 11 | 22.9 % |
| TOTAL | 48 | 100 % |

**Table 2: Sex Distribution of subjects with Acute Exacerbation of COPD**

| SEX | NUMBER | PERCENTAGE |
|---|---|---|
| MALE | 39 | 81.2% |
| FEMALE | 9 | 18.8% |

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

| | FEMALE | | MALE | | TOTAL | |
|---|---|---|---|---|---|---|
| FEV1 | NO. | % | NO. | % | NO. | % |
| >80 % | 1 | 11.1 % | 3 | 7.6 % | 4 | 8.3 % |
| 50-80 % | 2 | 22.2 % | 8 | 20.5 % | 10 | 20.8 % |
| 30-50 % | 2 | 22.2 % | 18 | 46.1 % | 20 | 41.6 % |
| <30 % | 4 | 44.4 % | 10 | 25.6 % | 14 | 29.1 % |
| TOTAL | 9 | 100% | 39 | 100 % | 48 | 100 % |

**Table 4: corrected Serum Calcium Levels in Acute Exacerbation of COPD subjects with GOLD criteria**

| | | **GOLD A** | **GOLD B** | **GOLD C** | **GOLD D** | **Total** |
|---|---|---|---|---|---|---|
| Corrected serum calcium levels (mg/dl) | Mild hypocalcemia (8-8.8 mg/dl) | **7** | **10** | | | **17** |
| | Moderate hypocalcemia (7-8 mg/dl) | | **13** | **9** | | **22** |
| | Severe hypocalcemia (<7 mg/dl) | | | **3** | **6** | **9** |
| | Total | **7** | **23** | **12** | **6** | **48** |

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

| **GOLD(Global Initiative for Chronic Obstructive Lung Disease) STAGING** | **SERUM CALCIUM LEVELS** | |
|---|---|---|
| | **MEAN** | **SD** |
| **A** | **8.42** | **0.274** |
| **B** | **7.99** | **0.687** |
| **C** | **7.29** | **0.351** |
| **D** | **6.77** | **0.122** |
| **P VALUE-<0.05** | | |

| SIGNIFICANT |
|---|

## 5. DISCUSSION:

This study is conducted to determine whether serum calcium levels correlate with GOLD criteria for chronic obstructive pulmonary disease(COPD).Mean serum calcium levels were significantly lower in acute exacerbation of COPD patients and which also correlated with GOLD criteria.Our findings are in accordance with previous study Xinglin Wan et al 2023 reported that serum calcium may have a potential impact on the progression of COPD but they reported as hypercalcemia which is contrary to our study which showed hypocalcemia.

Majority of the subjects belongs to age group 61-70 with male predominace of 82 %.

Serum calcium levels were correlated with GOLD criteria with subjects in GOLD A -7 patients,GOLD B -23 patients,GOLD C-12 patients,GOLD D -6 patients which shows majority of the patients are in GOLD B group.Serum calcium levels were assessed.Hypocalcemia was seen majority of the patients in which mild hypocalcemia was seen in 17 patients,moderate hypocalcemia was seen in 22 patients.Severe hypocalcemia was seen in 9 patients.

Serum calcium levels were correlated with GOLD criteria according to severity of hypocalcemia with GOLD staging,patients with severe hypocalcemia were with severe stages of GOLD,viceversa and with significant p value <0.05.

Our study has potential strengths, first the prospective design .Second ,to minimize underlying errors and validated methods were utilized to measure serum calcium level.However several limitaions should be acknowledged.First ,single measurement of serum calcium level may not reflecting long term levels.second ,small sample size.

## 6. CONCLUSION:

This analysis demonstrated a link between acute exacerbations of chronic obstructive pulmonary disease (COPD) along with serum calcium levels which shows lower the calcium levels, higher the severity of GOLD (Global Initiative for Chronic Obstructive Lung Disease) staging. Hypocalcemia is associated with an elevated risk of COPD exacerbations and implicates that serum calcium may have significant impact on the progression of COPD.

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