Serum magnesium level in acute exacerbation of the chronic obstructive pulmonary disease

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ABSTRACT

In this hospital based Case Control study, the patient population consisted of 100 patients of COPD admitted as an acute exacerbation, maximum number of patients of acute exacerbation 45% was in the age of 61-70 years, mean age was 66.44 ± 8.19 years. 74 patients were males, 71% of COPD patients were chronic smokers, 45 (45%) patients were in stage II, and 72% of patients of COPD exacerbation had hypomagnesaemia. In the control group, 99% of patients had normomagnesaemia. The incidence of hypomagnesaemia was 78% with acute exacerbation. The correlation of serum magnesium levels in exacerbation patients moreover, serum magnesium level stable COPD patients was significantly important. There was a significant correlation between hypomagnesaemia and GOLD staging in stage II and stage III, with a non-significant correlation between hypomagnesaemia and stage I and stage IV. The study concludes that COPD exacerbation is associated with hypomagnesaemia. Further studies are needed to find out the correlation between the staging of COPD and serum magnesium levels, and the effect of magnesium therapy in COPD exacerbation patients with hypomagnesaemia. Also, further studies are needed to find out possible aetiology of hypomagnesaemia in COPD exacerbation.

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INTRODUCTION

The chronic obstructive pneumonic disease is a lung pain depicted by ceaseless check of lung wind recurring pattern that meddles with ordinary breathing and isn’t reversible. COPD isn’t just a smoker’s cough yet an under analyzed, dangerous lung affliction (Alter et al., 2000). Persistent obstructive respiratory illness (COPD) is driving purpose behind terrorliness and mortality around the globe. Starting at now situated as the fifth driving explanation behind death worldwide and foreseen third up to 2020, it addresses a critical general prosperity challenge that is both preventable and treatable. The heaviness of COPD is reached out to increase in coming to an exceptionally lengthy time span due to continued with an introduction to COPD peril factors and the developing of the world’s population (Bhatt et al., 2008). As shown by WHO measures, 65 million people have moderate to outrageous (COPD). More than 3 million people kicked the pail of COPD in 2005, which identifies with 5% of all passing globally (Pauwels et al., 2001).

The general addition in COPD transcendence renders affliction exacerbating an unyieldingly focusing on wonder for clinicians, patients, clinical consideration affiliations, and society overall. In like manner, there is a mounting enthusiasm for arranging ideal COPD therapy approaches just as in thwarting its escalations (Behera, 2008). Magnesium (Mg+2)
is an intracellular movement which is related with the rule of bronchial tone, shaft cell release, neuromuscular activity and respiratory muscle function (Emelyanov et al., 1999). Hypomagnesaemia has been involved in unending asthma, and it has been speculated that grant intracellular magnesium center may propel aeronautics course hyperresponsiveness in asthmatic patients (Perry, 2008).

Consistent obstructive pneumonic disease addresses a front of perpetual bronchitis and emphysema. Since magnesium is connected with muscle tone, accordingly, a decrease in magnesium in level in COPD patients tends to a factor which is abnormal as far as possible as low magnesium level affects muscle fatigue. A making get-together of confirmation prescribes that Mg+2 lack adds to accelerations of asthma and, as flawlessness, that Mg+2 is significant in encouraging bronchospasm in these patients (Bunker and Clayton, 1989). Dismissing the way that the particular instrument of this activity is dull, it has been suggested that Mg+2 acknowledge a limit in the upkeep of flight course patency through relaxing up of bronchial smooth muscle 16.

COPD addresses a front of unending bronchitis and emphysema, and patients with COPD have a portion of asthmatic bronchitis. Bronchospasm is a contributing segment in their slightness to clear deliveries. This may accomplish diminished aspiratory gas trade with results, for example, diminished individual satisfaction and rehashed hospitalization (Alter et al., 2000). In like way, Mg+2 may have a limit in keeping up sickness adequacy in COPD patients. That notwithstanding, the relationship between serum Mg+2 levels and result as to sickness flares in COPD patients has not been, up until this point, all around investigated. Low plasma magnesium fixation is a particular marker of feeble magnesium status. So the reason for this assessment is to explore the expected association between COPD intensifying and serum magnesium levels.

MATERIALS AND METHODS

Study Design
Hospital based Case Control Study.

Sample Size
A total of 100 cases and 100 controls were enrolled in the study from Tertiary Care Centre, after meeting inclusion and exclusion criteria.

Source of data
The study was conducted in the Department of Internal Medicine, at Tertiary care center, Karad, prospectively for one and half years from Jan 2013 to Jun 2014.

Inclusion Criteria
Case group
The case bunch included subjects who gave an intensification of COPD requiring hospitalization in the branch of interior medication.

Control group
The same cases served as controls when they attended the outpatient department with stable COPD for a routine check-up one month after hospital discharge.

Exclusion criteria
1. Gastrointestinal disease: Malabsorption syndrome, ulcer disease, pancreatitis and severe diarrhoea.
2. Pregnancy and lactation.
3. Hormonal disease: diabetes mellitus, hypothyroidism, hyperthyroidism
4. Renal failure.
5. Drugs: thiazide diuretics, loop diuretics.
6. Malignancy
7. Alcoholism.

A. Patients with pulmonary embolism and pneumothorax.
B. Patients with acute exacerbation of bronchiectasis.

Statistical Analysis
Descriptive statistics such as mean, SD and percentage were used. Comparison between groups was made by unpaired t-test. Correlation between variables was done by Pearson's correlation coefficient (r).

RESULTS AND DISCUSSION

Age distribution
In Table 1 gathering of 100 patients, the most significant number of patients of intense intensification were found in the age gathering of 61-70 years for example (45 patients) 45%, trailed by age gathering of 71-80 years 26% and age gathering of 51-60 years 21%, 6% and 2% patients were available in age gatherings of under 50 years or more 80 years separately. In this investigation, a mean period of
patients was 66.44 ± 8.19 years with least age 45 years and most extreme 82 years.

**Sex distribution**

In Table 2, 74 patients were males, and 26 patients were females, with a male-female ratio of 2.85:1.

**Table 2: Sex distribution.**

| Sex   | Frequency | Percentage |
|-------|-----------|------------|
| Female | 26        | 26.0 %     |
| Male   | 74        | 74.0 %     |
| Total  | 100       | 100.0 %    |

**Distribution according to smoking habit**

Table 3 reveals that 71% of COPD patients were chronic smokers; 29% of patients were non-smokers among the patients studied.

**Table 3: Distribution of COPD patients according to their habit of smoking.**

| Frequency | Percentage |
|-----------|------------|
| Non-Smoker | 29        | 29.0 %     |
| Smoker     | 71        | 71.0 %     |
| Total      | 100       | 100.0 %    |

**Distribution of patients according to COPD staging according to GOLD’s classification**

In Table 4, 1% of patients were in stage I, 45% of patients were in stage II, 40% of patients were in stage III, and 14% patients were in stage IV.

**Table 4: Distribution of COPD patients according to stages of COPD.**

| Stages of COPD | Frequency | Percentage |
|----------------|-----------|------------|
| Stage 1        | 1         | 1.0 %      |
| Stage 2        | 45        | 45.0 %     |
| Stage 3        | 40        | 40.0 %     |
| Stage 4        | 14        | 14.0 %     |
| Total          | 100       | 100.0 %    |

**Distribution of COPD patients according to serum magnesium level in exacerbation**

In this examination, 72% of patients of COPD intensifications had hypomagnesaemia, and 28% of patients of COPD intensifications had normomagnesaemia.

**Distribution of COPD patients according to serum magnesium level in stable COPD patients (control group)**

In this examination, 1% patient of stable COPD (control) had hypomagnesaemia, and 99% of patients of stable COPD had normomagnesaemia.

**Comparison of serum magnesium level between stable COPD patients(control) and exacerbation of COPD patients (cases)**

The frequency of hypomagnesaemia was present in 78% of patients with intense worsening of COPD (case) when contrasted with 1% patients with Stable COPD (control), with the mean serum magnesium of 1.58 ± 0.3 mg/dl in intense fuel of COPD (case) when contrasted with mean serum magnesium of 2.15 ± 0.29 mg/dl in Stable COPD (control). This distinction of mean estimations of serum magnesium in COPD fuel and stable COPD patients was critical with p estimation of < 0.0001.

**Pearson’s Correlation coefficient (r) of serum magnesium level of exacerbation of COPD patients with serum magnesium level in stable COPD patients**

The correlation of serum magnesium levels in exacerbation patients, and serum magnesium level stable COPD patients were highly significant.

**Baseline parameters in cases with hypomagnesaemia and Normomagnesaemia**

There was no significant correlation present between hypomagnesaemia and parameters like Age, Gender and Habit.

**Assocation of stages of COPD with hypomagnesaemia and Normomagnesaemia**

In the study, there was a significant correlation between hypomagnesaemia and GOLD staging in stage II and stage III (p=0.001 and p=0.006 respectively). There is creating regard for serum magnesium level in pneumonic diseases. A noteworthy aspect of the drive for affirmation of magnesium as both peril factor and likely therapeutic expert in patients with COPD begins from modestly dug incapacity of magnesium in the therapy of exceptional asthma (Song and Chang, 2012). Magnesium disturbance is a well-known abnormality seen in patients (Shah et al., 2010). Results from writing portrayed recurrence of hypomagnesaemia in
10-60% among emergency clinic treated patients, particularly in persistent who were restoratively treated in escalated care units as indicated by concentrate by (Zafar et al., 2014).

In this investigation, the age appropriation of patients was between 40-82 years. The mean age of the patients in our examination was 66.44±8.19 years. The most extraordinary amounts of patients were in the age get-together of 60-69 years (45%), followed by age get-together of 71-80 years (26%) and age social event of 51-60 years (21%). When appeared differently to focus by (Singh et al., 2012) flow of patients were between 40-76 years with mean age 60±6.5 years and the most extraordinary number of patients were in the age social occasion of 60-69 years (48%). As differentiation with by (Shah et al., 2010) mean age of the patients was 62.3±8.2 years. There were males predominant in this study, out of 100 patients, 74 were males, and 26 were females with a male-female ratio of 2.85:1. In this study, 72 patients were having a habit of tobacco smoking for more than ten years, which state that tobacco smoking was the main etiological factor for COPD.

This is in concordance with study by (Jindal et al., 2006) which states that smoking is a most familiar etiological factor for COPD. Rest of the non-smokers predominantly female indoor pollution secondary to use of biomass and coals as their primary source of energy for cooking, heating and other household needs was an etiological factor for COPD. Above observations were as accordance to studies done earlier risk for obstructive airway disease among women and (Abbey et al., 1998) stating long term particulate and other air pollutants and lung function in non-smokers. In our study, the maximum numbers of patients with exacerbation were having predominant stage II and stage III according to GOLD staging criteria for COPD (Pauwels et al., 2001).

In this study, about 83.3% of the patients with hypomagnesaemia were having stage II, and stage III disease and 16.7% were in stage IV. In the study, 88% of hypomagnesaemia patients were having stage II and stage III, while S. Rjjab study, 92.3% of hypomagnesaemia patients were in stage II and stage III. In our study there was significant correlation was present between hypomagnesaemia and GOLD staging II and stage III (p=0.001 and p=0.0006 respectively), When diverged from concentrate by (Singh et al., 2012) 88% of the patients with hypomagnesaemia were having stage II and stage III ailment (15/17) when appeared differently with 54.6% with average magnesium level in stage II and III. In our study, it was shown that there was no significant correlation between hypomagnesaemia and stage IV, and none other studies, studied stage IV and serum magnesium level correlation, so need further study for staging and hypomagnesaemia correlation.

The mean serum magnesium of patients with acute exacerbation of COPD was 1.58±0.3 mg/dl (0.6494mmol/l) and serum magnesium in patient with stable COPD was 2.15±0.29 mg/dl (0.8836 mmol/L) with mean difference 0.57 mg/dl and p-value <0.0001. This showed a significant correlation between hypomagnesaemia and COPD exacerbation. This observation was understudies conducted by (Singh et al., 2012). Prevalence of hypomagnesaemia at one month of follow up was 1%. Our patient did not receive any replacement therapy for reduced serum magnesium level. This can be explained by either correction of hypoxia, treatment of infection or avoidance of drugs precipitating hypomagnesaemia would correct hypomagnesaemia.

The frequent use of methylxanthines, \( \beta_2 \)-agonist inhalers and \( \beta_2 \)-agonist oral preparation has been described as a cause of Magnesium depletion and hypomagnesaemia. Hypomagnesaemia in patients with the acute pulmonary disease has also been related to a result of severe infections, inappropriate secretion of antidiuretic hormone (ADH), antibiotic administration (aminoglycosides) etc. as stated by (Knutsen et al., 1994). In this study, there was no significant correlation of serum magnesium level with habits, age and gender of patients. This is following studies by (Shah et al., 2010).

CONCLUSIONS

The study concluded that COPD exacerbation is associated with hypomagnesaemia. Further studies are needed to find out the correlation between the staging of COPD and serum magnesium levels, and the effect of magnesium therapy in COPD exacerbation patients with hypomagnesaemia. Also, further studies are needed to find out possible aetiology of hypomagnesaemia in COPD exacerbation.

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**Conflict of Interest**

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