

A Study on Association Between Serum Magnesium And Acute Exacerbation of COPD

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Abstract

Background:The course of COPD is associated with exacerbations. There are many factors responsible for exacerbations. According to recent study one of the modifiable risk factor is hypomagnesemia. The purpose of this study is to confirm the association between serum magnesium levels and acute exacerbation of COPD.

Aims and objectives:To study the association of serum Magnesium level with acute exacerbation and also to know the relationship between Serum Magnesium levels and frequency of exacerbations.

Materials and Methods: The study was conducted among 100 COPD patients in Govt. Stanley Medical College hospital from March 2016 to August 2016. A detailed history was elicited, clinical examination and all required investigations were done in all cases. Patients with age above 40 years only included and patients associated with other conditions producing hypo or hypermagnesemia were excluded from this study.

Statistical methods:The data was analysed with the help of software such as SPSS16, Microsoft Excel 2016, MEDCALC and GENSTAT version 9.0.

Results: Magnesium was at low level in patients who presented with acute exacerbation, normal in stable COPD patients (P value – 0.002). And number of admissions also more in COPD patients with exacerbations.

Conclusion: Hypomagnesemia is seen in COPD patients with exacerbations. And also there was more frequent exacerbations found in patients with Hypomagnesemia. So Magnesium is one of the independent and modifiable risk factor for COPD exacerbation. Exacerbations are common in current smokers than ex smokers. So cessation of smoking will delay the decline in lung function.

Keywords:COPD, Exacerbation, Magnesium, Smokers, Anthonisen's criteria.

Date of Submission: 01 -09-2017

Date of acceptance: 30-09-2017

I. Introduction

COPD and Bronchial asthma are the most common causes of airflow obstruction in adults. Bronchial asthma is differentiated by the variability of obstruction and more than 25% of improvement after bronchodilator therapy. But in COPD, the airflow obstruction doesn't change markedly over months. COPD is a preventable non communicable disease characterised by airflow obstruction that is partially reversible due to chronic bronchitis and emphysema and it is generally progressive¹.The incidence is on increasing trend due to changing lifestyle, smoking and increasing urbanization. In developing countries, use of biomass for cooking causes COPD among non-smokers. Abnormal inflammatory response to noxious particles and gas resulting in COPD. There are many modifiable and non modifiable risk factors for COPD. Identification and correction of modifiable predictors may help in reduction of frequency of exacerbations. COPD is a leading cause of morbidity and mortality, so it is a major public health concern. Magnesium plays a role in airway smooth muscle relaxation and bronchodilation, stabilization of mast cells, neuro humoral mediator release and mucociliary clearance. Hypomagnesemia is associated with increased airway hyperreactivity and decreased muscle strength. Hypomagnesemia is one of the correctable risk factor². This study is to confirm the correlation between Hypomagnesemia and COPD exacerbation.

II. Aims And Objectives

The purpose of this study is to determine the association of serum Magnesium level with acute exacerbation. And also to know the relationship between Serum Magnesium levels and frequency of exacerbations.

III. Materials And Methods

Source of Data :The study was conducted among 100 COPD patients in Govt. Stanley Medical College hospital from March 2016 to August 2016.

Study Design : Case Control Study

Study population:

Cases : COPD patients who presented with exacerbation

Controls: Stable COPD patients who came for follow up

Inclusion Criteria: 1) COPD patients with and without exacerbation ,
2) Age > 40 years

Exclusion Criteria: 1) Patients with other respiratory diseases

2) Renal failure

3) Congestive heart failure

4) Ca lung

5) COPD patients admitted for other reasons

6) DM, SHT, CAD, CVA.

7) Drugs – H2 blockers, Antacids, PPIs, Diuretics, Digoxin.

8) Previous GI surgery

IV. Methodology

Patients who presented with exacerbation of COPD based on the criterion of Anthonisen's & stable COPD patients who came for follow up were included in the study. After obtaining informed consent, detailed history, examination, baseline investigations (CBC, RFT, Serum Electrolytes, ECG, Chest X ray), LFT & serum Mg²⁺ were sent. Retrospective analysis regarding frequency of exacerbation based on history and medical records will be noted. Later both groups were compared. The data was analysed with the help of software such as SPSS14, Microsoft Excel 2013, MEDCALC and GENSTAT version 9.0.

Case definition:

COPD acute exacerbation patients are selected based on ANTHONISEN'S CRITERIA³.

Cardinal symptoms:

Increased dyspnea,

Increased sputum production,

Increased sputum purulence

Supporting symptoms or signs:

Upper Respiratory tract infection in past 5 days,

Wheezing, Cough, Fever without an obvious source,

A 20% increase in Respiratory Rate or Heart Rate above baseline.

V. Discussion

The study was conducted in Stanley medical college hospital between March 2016 to August 2016. Aziz Gumus⁴ et al studied about 89 cases of COPD exacerbation. Patients were followed up at 3 monthly intervals for 1 year. There was significant positive correlation between serum Magnesium and COPD exacerbation. Suryprakash⁵ et al published an article which contained 100 COPD patients. A cross sectional study was conducted in 50 COPD patients at Kashmir by J.P.Singh⁶ et al. Hany S. Aziz⁷ et al conducted retrospective study in 100 COPD patients. All the above studies confirmed the association between low serum Magnesium levels and exacerbations of COPD. Serum Magnesium levels in Stable COPD & COPD with exacerbations

	Stable COPD		Exacerbation		P value
	Mean	SD	Mean	SD	
Serum Magnesium	1.774	0.26	1.590	0.31	0.002

Average serum Magnesium level in Stable COPD patients is 1.774 mg%, compared with exacerbation patients in them it is only around 1.590 mg%. P value < 0.002, statistically significant. So serum Magnesium is low in patients admitted with exacerbation. From this study we can know Hypomagnesemia is one of the risk factors for COPD exacerbation.

	Stable COPD		Exacerbation		P value
	Mean	SD	Mean	SD	
Serum Magnesium	1.774	0.26	1.590	0.31	0.002
No. of admissions/year	0.58	0.88	1.27	0.95	<0.001

In patients with serum Magnesium levels 1.774 an average frequency of admissions 0.58 per year, in contrast 1.27/year in patients with hypomagnesemia. When Magnesium level is around 1.792 mg% there is no previous admissions. So Hypomagnesemia increases the risk of exacerbations & frequency of exacerbations.

Smoking Status				
Group	Ex Smoker	Current Smoker	Non Smoker	Total
Stable Copd	34	12	4	50
Copd Exacerbation	23	21	6	50
Total	57	33	10	50

According to this table current smokers are more in Exacerbation group. So quitting smoking will delay the decline in lung function. COPD with exacerbations

No. of admissions/year	No. of patients	Mean Magnesium level(mg%)
0	13	1.792
1	17	1.706
2	15	1.440
3	5	1.120
		Average:1.590

When Magnesium level is around 1.792 mg% there is no previous admissions. As the Magnesium level decreases the no. of admissions also increases. This implies Hypomagnesemia not only risk factor for exacerbation it will also increases the no. of exacerbations in future. There is no significant change in the other variables like Age, Blood pressure, Blood sugar, S. K⁺ and S. Creatinine. They are comparable in both the control and study group.

VI. Summary

The study contained 100 cases of COPD patients out of which 50 were stable patients and 50 were presented with acute exacerbation. Most number of cases were in 4th to 6th decade. Among the 100 patients studied 4 people were female 2 in stable group, 2 in the exacerbation group. Because of smoking and exposure to outdoor air pollution are less common in females, they are less prone to develop COPD. Hypomagnesemia is associated with acute exacerbations of COPD. And also no. Of exacerbations are more in patients with low magnesium levels. According to this study exacerbations are common in current smokers than ex smokers. So cessation of smoking will delay the decline in lung function.

VII. Conclusion

COPD is a preventable chronic respiratory disease with increasing trend having modifiable and non-modifiable risk factors. The stages of COPD worsens with increasing age, continued smoking and exacerbations. The most common conditions predisposing to exacerbations are respiratory tract infections, air pollution, associated systemic illnesses. Recent studies showed that there is significant role for Magnesium in pulmonary disease. It is a case control study, in which we examined serum Mg²⁺ levels in a 50 stable patients who came for regular follow up and we also examined serum Mg²⁺ levels in another 50 COPD patients who came with symptoms suggestive of acute exacerbation, they are selected into exacerbation group based on the ANTHONIESEN criteria. On comparing the Magnesium values of the both groups we found that there is a significant differences in the serum Magnesium values. Average level of Magnesium in stable patients 1.77 mg%, exacerbation patients 1.59 mg%. Hypomagnesemia is seen in COPD patients with exacerbations. And also there was more frequent exacerbations found in Hypomagnesemia group. Hypomagnesemia is one of the modifiable risk factor. So by checking and correcting the Magnesium level at earlier stage we can reduce exacerbations.

VIII. Limitation of the study

But it is not an intervention study. By doing interventional studies we can prove the association and we can use Magnesium as a therapeutic agent.

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*Dr.S.M.Sujatha. "A Study on Association Between Serum Magnesium And Acute Exacerbation of COPD." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.9 (2017): 09-12