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Prevalence of Hypomagnesaemia in Asthma Patients- A Cross-Sectional Study

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ABSTRACT

Aim: Magnesium intervenes in calcium transport mechanisms and intracellular phosphorylation reactions and so, it constitutes an important determinant of the contraction and relaxation state of bronchial smooth muscle. Present study was performed with an aim to know the prevalence of hypomagnesaemia in asthma patients.

Materials and Method: Sixty patients, who were attending department of respiratory medicine with steady asthma, were arbitrarily selected. They were evaluated clinically and their serum magnesium levels were calculated, than evaluated with the serum magnesium values of sixty non-asthmatic fit controls.

Results: Serum magnesium value among 1.5 and 2.5mg/dl was measured standard and every value underneath 1.5 mg/dl was measured as hypomagnesaemia. A total of 60 patients is evaluated with 60 fit persons. About 87.7% patients were establishing to have hypomagnesaemia and their serum magnesium value varies between 0.71 and 1.5 mg/dl. Remaining 12.3% patients had standard serum magnesium level.

Conclusion: Hypomagnesaemia is additional common in steady asthmatics than non-asthmatic Patients. Statistically significant association of hypomagnesaemia was observed with sternness of asthma. Future researches are desired by huge number of patients, and measuring Mg++ levels in RBC, WBC, or muscle cell in adding to serum Mg++ and this would be extremely obliging for evaluating the consequence of hypomagnesaemia in steady asthmatic patients.

Keywords: *Asthma, Control, Magnesium, Respiratory medicine, RBC*

INTRODUCTION

Magnesium is the fourth nearly all plentiful cation in Human body and the second nearly all intracellular cation. Total magnesium content is 24 gram (1000 mmol), maximum in bone and soft tissue.[1] Total plasma concentration is 1.8-2.4mg/dl. Cellular shift and urinary excretion balance magnesium.[2] Magnesium serves as a cofactor for more than 3000 enzyme reactions that involve adenosine triphosphate. Magnesium also regulates the movement of calcium into smooth muscle cells, which is involved in the maintenance of cardiac contractile strength and peripheral vascular tone.[3] Magnesium interferes in calcium transportation apparatus and intracellular phosphorylation reactions and it comprise a significant determinant of the reduction and recreation situation of bronchial smooth muscle.[4]

Hypomagnesaemia is defined as concentration of serum magnesium <1.8mg/dl. Hypomagnesaemia is the most common electrolyte disturbances in chronic and hospitalized patients, which is usually concomitant with other electrolyte disturbances.[5] Hypomagnesaemia was found to be a common disorder in patients with chronic asthma. Patients with low magnesium were found to have more severe asthma and higher incidence of asthma exacerbations and hospitalization.[6]

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Few earlier reports showed an association between magnesium deficiency and increased airway hyper reactivity, pulmonary vascular resistance, and ventricular arrhythmia. Magnesium absence is connected with augmented contractility of smooth muscle cells.[7] Contractility of bronchial smooth muscle is significant in patients with asthma and as a result, magnesium deficit could guide to bronchial smooth muscle contraction or not have of bronchial muscle relaxation.[8] The above present research was performed to assess the serum magnesium level in patients with bronchial asthma.

MATERIALS AND METHOD

This present cross-sectional study was performed in Patients presenting at the department of respiratory Medicine, for a time of four months. Allowing for, the mean of magnesium level among asthmatics 1.83±0.26 and normal patients 2.02±0.27. Total 120 cases and controls were preferred considering 95% confidence interval and sample size procedures Patients who were diagnosed as to have bronchial asthma on the foundation of clinical history; physical assessment and pulmonary spirometry were utilized as subject's usual fit persons with no asthma attack for at least one week prior to the establishment of the study.

Inclusion criteria for cases were: 60 persons of age over 18 years with recognized bronchial asthma and For control were: 60 fit individuals of age higher than 18 years with no asthma attack as a minimum for one week previous to the initiate of the research.

Exclusion criteria were: Subjects who were over the age of 18 years, smokers, pregnant women, metabolic disorders, Asthmatics, who had received bronchodilators inside 24 hours earlier to evaluation

Patient`s name, age, sex and period of the symptoms were recorded, and a thorough history was in use in every patients concerning the period of asthma symptoms, occurrence and harshness of the exacerbation, smoking history and previous medical history.

Spirometry: Pulmonary function test was completed prior to and twenty minutes following giving nebulized salbutamol 400 micro grams. Peak expiratory flow rate (PEFR), force expiratory volume in first second (FEV1) Forced vital capacity (FVC) and FEV1/FVC and FEV 25-75% was noted. An enhancement of 12% or additional in FEV1 was measured as criteria for the analysis of asthma.

Serum magnesium analysis: following essential aseptic safety measures from the median cubital vein, 2ml of venous blood was collect from each patient. The sample was then centrifuged to part the serum from the clot. After that the serum was store at minus 20° C in Eppendorf tubes till the investigation was done. Serum magnesium was calculated using ELISA kit.

Statistical analysis:

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. The variables were assessed for normality using the Kolmogorov-Smirnov test. Descriptive statistics were calculated. Means of both groups were compared by independent student t-test. Level of significance was set at p=0.05.

RESULTS

Serum magnesium value amid 1.5- 2.5mg/dl was measured normal and every value below 1.5 mg/dl was measured as hypomagnesaemia. A sum of 60 patients is compared with 60 fit persons. Around 87.7% patients were establishing to have hypomagnesaemia; rest 12.3% had usual serum magnesium level. The mean (SD) serum magnesium concentration in asthmatic patients was considerably lower than that obtained in the control ($p \leq 0.05$). Similarly mean (SD) Forced Expiratory Volume (FEV1 %) in asthmatic patients is drastically inferior to controls ($p \leq 0.05$) (Table 1).There was a linear association between serum magnesium level and FEV1. As the FEV1 reduced, there was also reduction in serum magnesium levels.

Table 1: comparison of FEV1 and Serum magnesium between cases and controls

Variables	Cases n=60 Mean (SD)	Controls n=60 Mean (SD)	p-value
FEV1 (%)	46.49	95.42	0.001
Serum magnesium (meq/lit)	1.76	2.31	0.0002

DISCUSSION

Magnesium has been originate to take part a role in the pathophysiology of allergic reactions particularly in asthma.[9] The reduction and recreation of the myofibrillar proteins in bronchial smooth muscle cells are due to the phosphorylation and dephosphorylation reactions which comprise the enzymes myosin kinase, and myosin phosphatase.[10] While magnesium is involved in calcium convey athwart the cellular membrane, both kinds of enzymes are unswervingly or not directly prejudiced by magnesium level. Such things of magnesium would be likely to result in rest of bronchial smooth muscle and decrease of the airway reactivity.[11] Present work describes that the asthmatic patients had a significantly inferior serum magnesium level in contrast to the control.[11] Present research also highlights the large prevalence of hypomagnesaemia and relationship of hypomagnesaemia with asthma as established by the association between FEV1 and serum magnesium.

Fedoseev *et al*, reveled hypomagnesaemia in patients among bronchial asthma and this irregular homeostasis of magnesium in asthmatics may be owing to hyper activation of free radical oxidation of cell membrane lipids.[12] The magnesium deficit in asthma may help the progress of calcium to in the smooth muscle cell leading to a potentiation of myosin phosphorylation and rendering the cell more contractile and hence rising bronchial hyper-reactivity. supplementary mechanisms includes enlarged production of acetylcholine in cholinergic nerve endings, enlarged histamine discharge from mast cell, enlarged manufacture of interleukin-1 & 6, degranulation of basophils, and improved production of IgE .

Reasons of magnesium deficit in asthma may be multi-factorial. It may be hereditarily resolute. However information states hypomagnesaemia as consequence of bronchodilators, diminished magnesium level was reported in the patients who were not with bronchodilators, corticosteroids or pulling out of the drugs.

Diet is a recently documented threat factor for asthma incidence. Present text about magnesium supplementation advocates that on national base magnesium should be additional to the water provisions of huge areas. It has been revealed to be of big precautionary benefit for disorders such as asthma.[11]

A continued increase in serum magnesium level enhances the bronchodilator outcome of salbutamol perhaps through enlarged resemblance for β-receptors. Therefore isotonic magnesium can be administered securely in patients with steady asthma also in an inhaled form, or as a vehicle salbutamol all the way through nebulizer.

CONCLUSION

Hypomagnesaemia is largely prevalent in steady asthmatics than non-asthmatic control. Statistically significant association has been observed of hypomagnesaemia with sternness of asthma. The reason of hypomagnesaemia in asthmatics and whether magnesium supplementation has a function in asthmatic inhabitants are significant pastures of additional research.

Ethical Clearance- Taken from institutional ethical committee of the institute and written informed consent was taken from the participants

Conflict of Interest: None declared.

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