



## Research Article

# Role of Serum Magnesium in children with asthma

Somashekar AR<sup>1\*</sup>, Ramakrishnan KG<sup>2</sup> and Dr. Vanitha Gowda<sup>3</sup><sup>1</sup>Professor & Head of Pediatrics Department, Ramaiah Medical College, Bangalore, India<sup>2</sup>MBBS Intern, Ramaiah Medical College, Bangalore, India<sup>3</sup>Professor of Biochemistry, Ramaiah Medical College, Bangalore, India

**\*Address for Correspondence:** Somashekar AR, Professor & Head of Pediatrics Department, Ramaiah Medical College, Bangalore- 560054, India, Email: s\_arshekar2002@yahoo.com

**Submitted:** 12 February 2018

**Approved:** 22 February 2018

**Published:** 23 February 2018

**Copyright:** © 2018 Somashekar AR, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited



## Abstract

**Objective:** To determine the association between serum magnesium level and asthma, by establishing the difference in serum magnesium level between children with asthma and controls.

**Method:** Serum magnesium levels of 44 children with acute asthma and 44 controls of the age group of 6-16 years was determined and statistically compared. Lung function tests (FEV1%) were done and correlated with serum magnesium levels using Pearson's comparison coefficient.

**Results:** The mean serum magnesium value of cases (1.9136±0.44) is lower than the controls (2.0042±0.26), with 32 cases showing a deficiency of serum magnesium. Pearson's correlation coefficient, reveals positive correlation between FEV1% with serum magnesium levels,  $r=0.819$ ,  $P<0.001$ .

**Conclusion:** This study reveals that the serum magnesium levels, even if in normal range, are statistically lower amongst asthmatics. It also brings out the relationship between magnesium levels and lung function tests, showing an improvement in the latter with increase in the former.

## Introduction

Asthma is a chronic disease of the airways which requires maintenance of long term control. In addition to the given standard treatments, mineral-supplementation therapies, such as magnesium, are being tried to maintain asthma control. Improvement in bronchial responsiveness and quality of life were reported with oral magnesium therapy in patients with asthma [1,2]. The basis of which lies on the important role that magnesium plays in the activity of smooth muscles. Magnesium is the cofactor of more than 300 enzymes and is involved in many physiological functions including protein synthesis, intracellular signal distribution and enzyme catalysis [3]. Since it is the natural antagonist of calcium, it brings about smooth muscle relaxation [4]. In addition, magnesium suppresses the excitability of muscle fibers by reduction of acetylcholine secretion from motor nerve terminals. It also inhibits production of inflammatory mediators by helping stabilization of T-cells and inhibiting mast cell degranulation. Further, it reduces the severity of inflammation in asthma by stimulating nitric oxide and prostacyclin syntheses [5]. The above actions of magnesium suggests a possible role of magnesium deficiency and poor asthma control.

However studies conducted to establish this relationship have yielded conflicting results. Therefore, there is a need for a study to assess whether magnesium deficiency exists in asthmatic children.

## Aims and Objectives

To determine the association between serum magnesium level and asthma, by establishing the difference between the serum magnesium level of asthmatic children and healthy controls.

## Materials and Methods

This case control study was conducted over a period of 6 months in Ramaiah teaching hospital on a sample of 88 children aged between 6 to 16 years, 44 cases and 44 controls. The cases were children with established asthma visiting the outpatient department and the controls were healthy age and sex matched children. Children with co-existing cardio-pulmonary co morbidities and nutritional deficiencies were excluded from the study.

Informed consent was taken from all the care givers of the patients. Spirometry was performed to determine asthma control. 0.5 mL of heparinized whole blood samples of patients with broncho constriction and healthy children who met the inclusion criteria was drawn before using any medication and was immediately sent to the laboratory. Serum magnesium levels were quantified by colorimetric method with chlorophosphonazo.

Frequency distribution, percentage distribution, mean  $\pm$  SD, Pearson's comparison co-efficient was calculated with 95% confidence intervals for the comparison of the findings of case and control groups.

## Results

The data hence collected was systematically tabulated and analyzed with SPSS software. The descriptive statistics for the case and control group. The over all levels of serum magnesium is lower in the case group with the mean among the cases  $1.9136 \pm 0.44$  and  $2.0042 \pm 0.26$  among the controls. Further, 32% of the cases had lower than normal values of serum Magnesium.

On calculation of Pearson's correlation coefficient, the FEV1% of the cases were found to have a positive correlation with serum magnesium levels,  $r=0.819$ ,  $P<0.001$ . This implies that with rise in FEV1%, the serum magnesium levels rise.

## Discussion

This study explores the possibility of low serum magnesium level being a factor in the pathogenesis of asthma and its role in maintaining adequate control to prevent exacerbations. Serum magnesium levels of 32 % of cases were lower than normal as opposed to 0% in the control group. Even though, majority of the cases had magnesium levels within the normal range, the mean serum magnesium levels of the case group is statistically lower than that compared to the control group. Pearson's correlation suggests a statistically significant positive relationship between serum magnesium levels and FEV%, a finding unique to this study. This suggests that with increase in the serum magnesium levels, lung function tests improve. This stratifies the possible role of magnesium in attaining asthma control.

This study is limited by the small sample size. A larger sample size would help draw more statistically accurate conclusion. Moreover, follow up with a direct observation of improvement in disease with increase in serum magnesium levels, would add further value to the aforementioned results.

The findings of this study is similar to that in the study conducted by Haury et al., who reported significantly lower level of serum magnesium in asthmatics compared to healthy subjects [6]. This is also in concordance to the findings of the studies conducted by Siebes KD et al., Mohammed NS et al., and Ahmed AA et al. [7-9]. Nevin et al., also concluded that the mean serum magnesium levels are lower like the current study [10]. However the study conducted by karkish KS et al., found no such co relation [11]. Other similar studies conducted on adults also report no significant co-relation [12,13].

Hence, this study shows that serum magnesium can be an indicator of asthma

control and lower levels show poor controls. Further, the findings of the study can be used to study the role of magnesium supplementation therapy in long term treatment of asthma.

## Conclusion

This study reveals that the serum magnesium levels even if in normal range are statistically lower amongst asthmatics. It also brings out the relationship between magnesium levels and lung function tests, showing an improvement in the latter with increase in the former.

## References

1. Gontijo-Amaral C, Ribeiro MA, Gontijo LS, Condino-Neto A, Ribeiro JD. Oral magnesium supplementation in asthmatic children: a double-blind randomized placebo-controlled trial. *Eur J Clin Nutr.* 2007; 61: 54-60. **Ref.:** <https://goo.gl/MnD145>
2. Bede O, Surányi A, Pintér K, Szilávik M, Gyurkovits K. Urinary magnesium excretion in asthmatic children receiving magnesium supplementation: a randomized, placebo-controlled, double-blind study. *Magnes Res.* 2003; 16: 262-270. **Ref.:** <https://goo.gl/8MNEfL>
3. Reinhart RA. Magnesium metabolism. A review with special reference to the relationship between intracellular content and serum levels. *Arch Intern Med.* 1988; 148: 2415-2420. **Ref.:** <https://goo.gl/WyPp9B>
4. Dominguez LJ, Barbagallo M, Di Lorenzo G, Drago A, Scola S, et al. Bronchial reactivity and intracellular magnesium: a possible mechanism for the bronchodilating effects of magnesium in asthma. *Clin Sci (Lond).* 1998; 95: 137-142. **Ref.:** <https://goo.gl/hQYRGs>
5. Faweett W, Haxby EJ, Male DA. Magnesium physiology and pharmacology. *Br J Anaesth.* 1999; 83: 302-320. **Ref.:** <https://goo.gl/PzJ7vG>
6. Haury VG. Blood serum magnesium in bronchial asthma and its treatment by the administration of magnesium sulfate. *J Lab Clin Med.* 1940; 26: 340-344. **Ref.:** <https://goo.gl/18o7zX>
7. Sibes KD, Arup KH, Indranath G, Samirendra KS, Anirban D, et al. Serum magnesium and stable asthma: Is there a link?. *Lung India.* 2010; 27: 205-208. **Ref.:** <https://goo.gl/XEgmSL>
8. Mohammed NS, Brahma RM, Ruchi G, Bhavita P, Mitu C. Serum magnesium and vitamin D as indicators of asthma. *Pulm Med.* 2016; 2016: 1643717. **Ref.:** <https://goo.gl/YfwMXU>
9. Ahamed AA, Ramadan MB, Maha y, Rania EF. Assessment of serum magnesium level in patients with bronchial asthma. *Egyptian Journal of chest disease and Tuberculosis.* 2015; 64: 535-539. **Ref.:** <https://goo.gl/24B4nd>
10. Hatipoğlu N, Hatipoğlu H, Türel O, Aydoğmuş C, Engerek N, et al. Serum Magnesium Concentration in Children with Asthma. *Eurasian J Pulmonol.* 2014; 16: 36-39. **Ref.:** <https://goo.gl/nHrk3P>
11. Kakish KS. Serum magnesium levels in asthmatic children during and between exacerbations. *Arch Pediatr Adolesc Med.* 2001; 155: 181-183. **Ref.:** <https://goo.gl/SZuSLH>
12. deValk HW, Kok PT, Struyvenberg A, Haalboom JR, Kreukniet J, et al. Extra cellular and intra cellular magnesium concentrations in asthmatic patients. *Eur Respir J.* 1993; 6: 1122-1125. **Ref.:** <https://goo.gl/K1xznQ>
13. Falkner D, Glauser J, Allen M. Serum magnesium levels in asthmatic patients during acute exacerbations of asthma. *Am J Emerg Med.* 1992; 10: 1-3. **Ref.:** <https://goo.gl/zNiGMG>