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ORIGINAL ARTICLE

# Assessment of serum magnesium level in patients with bronchial asthma



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## KEYWORDS

Magnesium;  
Bronchial asthma;  
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**Abstract** *Background:* Asthma is one of the most common chronic diseases worldwide and has been increasing in prevalence over the last few decades. Magnesium ion has an inhibitory action on smooth muscle contraction, histamine release from mast cells and acetylcholine release from cholinergic nerve terminals. Magnesium has been shown to relax bronchial smooth muscles and influence the function of respiratory muscles. Hypomagnesemia have been associated with diminished respiratory muscle power.

*Aim:* To assess the serum Mg levels in bronchial asthma patients during stable and exacerbating clinical conditions.

*Subjects and methods:* 60 Subjects were enrolled, 40 patients diagnosed as bronchial asthma and 20 healthy individuals as a control group. The asthmatic patients were divided into group (I) chronic stable bronchial asthma and group (II) acute exacerbation of bronchial asthma.

*Results:* Serum Mg levels were significantly lower in asthmatic patients compared with healthy controls and significantly lower in asthmatic patients during exacerbation compared with stable asthmatics. There was a positive correlation between serum Mg levels and each of FEV1/FVC ratio and FEV1.

*Conclusion:* Hypomagnesemia was found in patients with chronic stable asthma and also in those with acute asthma exacerbation compared to control. Serum mg levels were significantly lower in asthmatic patients during exacerbations compared with stable asthmatics.

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## Introduction

Asthma is a disorder defined by its clinical, physiological and pathological characteristics. The predominant feature of the clinical history is episodic shortness of breath, particularly at night, often accompanied by cough [1]. Total body magnesium (Mg++) is about 25 g (1000 mmol). About 50% of it is in the bones, only 1% is in the extracellular fluid, and the rest is within the cells. Mg++ has several actions on rabbit

*Abbreviations:* BMI, Body mass index; FEV<sub>1</sub>, Forced expiratory volume in the 1st second; FVC, Forced vital capacity; LABA, Long Acting B2 Agonist; ICS, Inhaled Corticosteroids; SABA, Short Acting B2 Agonist

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bronchial airways including relaxation of airway smooth muscle, bronchodilation, anticholinergic effects, and stabilization of mast cells [2]. Epidemiological evidence suggests that a low dietary intake of magnesium is associated with impaired lung function, bronchial hyper-reactivity, and wheezing. It was found that a high magnesium intake is associated with improvement in symptom score, though not in objective measures of air flow or airway reactivity in stable asthmatic subjects [3]. Hence, the aim of this work is to assess the serum Mg levels in bronchial asthma patients (stable and during exacerbations), compared to those of healthy controls.

### Subjects and methods

This study was conducted at the El-Mahalla Chest Hospital during the period from September 2013 to September 2014, and included 40 adult patients with bronchial asthma, in addition to 20 age and sex matched healthy individuals as a control group. Patients were divided into two groups (each of 20 patients) based on history, clinical examination and pulmonary function test; Group (I): chronic stable bronchial asthma patients during their regular follow up in the outpatient clinic. Group (II): patients with acute exacerbation of bronchial asthma. The exclusion criteria were: patients on diuretic therapy, pregnancy, smoking, alcohol dependence, medical disorders affecting serum magnesium levels e.g. chronic kidney disease, diabetes mellitus, diarrhea. An informed consent and ethical approval from Menoufia University Hospital Ethics Committee were obtained from all participants before enrollment then, each participant underwent; detailed history taking, general and local chest examination, routine lab investigations including measurement of serum Mg levels.

### Measurement of pulmonary functions

All participants underwent spirometric testing at the Pulmonary Function Test Unit in the El-Mahalla Chest Hospital using a turbine spirometer "Chest Graph HI-105, Germany", based on a forced vital capacity maneuver, in which the participants were requested to exhale the maximal volume of air during a forced expiratory maneuver starting from a position of full inspiration and ending at complete expiration. Spirometric parameters compatible with airflow obstruction

are: reduced FEV<sub>1</sub>/FVC < 70% and FEV<sub>1</sub> < 80% of the reference value. The degree of reversibility in FEV<sub>1</sub> which indicates a diagnosis of asthma is generally accepted as 12% and 200 ml from the pre-bronchodilator value [4].

### Measurement of serum magnesium

Venous blood sample without any anticoagulant was taken from all participants, and then centrifugated for 10 min, the serum was taken for analysis by ELISA. The reference range is 1.8–2.6 mg/dl for total magnesium concentrations in adult male blood serum and 1.9–2.5 mg/dl in adult female blood serum [5].

### Statistical methodology

The data collected were tabulated and analyzed by SPSS (statistical package for the social science software) version 20. Quantitative data were expressed as mean and standard deviation (X + SD) and analyzed using student *t*-test for comparison of two groups of normally distributed variables. Qualitative data were expressed as number and percentage (No. & %) and analyzed using chi-square test. Person's correlation was used to study correlation between one qualitative variable and one quantitative variable or two quantitative variables of not normally distributed data. All these tests were used as tests of significance at *P* < 0.05.

### Results

As shown in Table 1 males constitute 80% of the patients and 75% of the control group with no statistically significant difference between both groups regarding sex. There were no statistically significant differences between patients and control regarding age and BMI. FEV<sub>1</sub>/FVC ratio and FEV<sub>1</sub> were highly statistically lower in patients compared to control subjects. Serum Mg levels were highly statistically lower in patients compared to control subjects.

As shown in Table 2 the number of medications, number of exacerbation/year and frequency of SABA/day were statistically higher in exacerbation compared to stable asthmatic group.

As shown in Table 3 FEV<sub>1</sub>/FVC ratio, FEV<sub>1</sub> were highly statistically lower in the exacerbation group compared to

**Table 1** Demographic and spirometric data and Mg levels of the study participants.

	Patients (n = 40)		Control (n = 20)		Statistical test	P value
	No.	%	No.	%		
<i>Gender</i>						
Male	32	80	15	75	$\chi^2 = 0.196$	0.658
Female	8	20	5	25		
Age	50.65 ± 8.66		45.85 ± 9.70		<i>t</i> = 1.944	0.057
BMI	26.81 ± 4.46		26.15 ± 4.91		<i>t</i> = 0.524	0.602
FEV <sub>1</sub> /FVC ratio	52.14 ± 9.71		86.68 ± 7.90		<i>t</i> = -13.781	<0.001*
FEV <sub>1</sub>	50.93 ± 13.45		89.57 ± 12.89		<i>t</i> = -10.632	<0.001*
Serum Mg	1.55 ± 0.34		2.12 ± 0.20		<i>t</i> = -8.010	<0.001*

BMI, Body mass index; FEV<sub>1</sub>, Forced expiratory volume in the 1st second; FVC, Forced vital capacity.

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