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Original Research Article

Estimates of Serum Magnesium in Bronchial Asthma Patients of Telangana Population

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Abstract:

Background: Bronchial asthma is one of the most common respiratory diseases globally. The magnesium ion has an inhibitory action on smooth muscle contraction. Magnesium has been shown to relax bronchial smooth muscles and influence the function of respiratory muscles. Hypomagnesemia has been associated with diminished respiration and muscle power (movements).

Method: In every patient, 2 mL of venous blood was collected to investigate serum Magnesium, CBC and ESR Also, Sputum is collected for AFB and Grams stain.

Serum Magnesium was investigated by spectrophotomeric method. CBP and ESR were measured by Impedance and westergren method respectively. Chest x-ray and Spirometry was done for PEFR and FEV.

Results: The FEV1 in bronchial asthma patients was 45.85 (± 0.42) and 94.48 (± 1.30) in controlled; the t test was 80.1 and $p<0.001$. Serum magnesium in Bronchial asthma patients had 1.68 (± 0.13) and the control group had 2.28 (± 0.13); the t test was 41.3 and $p<0.41$ (p value was highly significant).

Conclusion: It is concluded that hypomagnesemia is more prevalent in bronchial asthma. This finding demands that the administration of magnesium will reduce the pathologies of asthma and relieve the patients by bronchodilating the bronchial vessels.

Keywords: Spirometry, Forced expiratory volume (FEV), Spectrophotmetry, Telangana.

Introduction

Magnesium is a ubiquitous element in nature, playing a role in many metabolic functions in humans, particularly those processes that entail the formation and utilisation of ATP [1]. As a cofactor of over 300 intracellular enzymic reactions utilizing high-energy phosphate bonds, magnesium has been implicated in smooth muscle contraction. In fact, magnesium is a cation with modulating effects on the contractile state of smooth muscle cells in various tissues. Hypomagnesiemia leads to contraction, and hypermagnesieumia leads to relaxation of smooth muscle cells [2]. The potential mechanisms for the direct relaxing effects of magnesium on bronchial smooth muscle include calcium channel blocking properties, inhibition of cholinergic neuromuscular transmission with decreased sensibility to the depolarizing action of acetylcholine, stabilization of mast cells and T-lymphocytes, and stimulation of nitric oxide and prostacyclin [3]. It is reported that the cellular mechanism responsible for the bronchodialation may involve bronchial smooth muscle relaxation, similar to the magnesium effect on vascular smooth muscle via calcium antagonism or some other mechanism. The relationship between non-specific bronchial reactivity and the level of magnesium both at the intracellular level and in the serum of asthmatic patients has to be ruled out [4].

Hence, an attempt was made to evaluate the estimation of serum magnesium in bronchial asthma patients in adults of different age groups.

Material and Methods

85 (eighty-five) patients with bronchial asthma regularly visited Faith Hospital Yakutpura, Hyderabad, Telangana-500023 were studied.

Inclusive Criteria: The patients were over 18 years old and clinically diagnosed with bronchial asthma, and they gave consent in writing. No asthma attack at least one week before the study was included in the study.

Exclusion Criteria: Patients who are smokers, pregnant, breast-feeding mothers, menopausal or postmenopausal, or have type II DM, bronchopulmonary malignancy. Immune-compromised patients were excluded from the study.

Method: The detailed history of every patient's occupation, duration of asthma, dietary habits, and previous medications were noted. A pulmonary function test was carried out using the spirometry peak expiration flow rate (PEFR), forced expiratory volume (FEV), and FEV/FVC of 25-75% recorded. 2 ml of venous blood was collected from each patient after taking the necessary median cubital vein aseptic precautions. After collecting the blood sample, it was allowed to clot. After half an hour, the blood was centrifuged to separate the serum from the clot. After centrifugation, the serum was stored at minus 20^{O} C in FPP end or F tubes until analysis was done. Serum magnesium was measured using the spectrophotomeric method; other investigations included chest x-rays, complete blood count (CBC), ESR (erythrocyte sedimentation rate), electrocardiography, and sputum for AFB and Gram stains was done for each patient.

The duration of the study was May 2022 to June 2023.

Statistical analysis:

The body mass index, spirometric values, and serum magnesium levels were compared in bronchial asthma patients and a controlled group with a t test, and significant results were noted.

The statistical analysis was carried out in SPSS software. The ratio of males and females was 2:1.

Observation and Results

Table 1: Comparison of Body Mass Index in the bronchial asthma and controlled groups: 24.55 (± 0.60) in the bronchial asthma group, 26.45 (± 0.63) in the controlled group; t test was 19.9 and p<0.001

Table 2: Comparison of FEV_1 between bronchial asthma and controlled groups: 45.85 (± 0.42) in the bronchial asthma patient group, 94.48 (± 1.30) in the controlled group; t test was 80.1% and p<0.001.

Table 3: Comparison of serum magnesium in bronchial asthma patients group and controlled groups: 1.68 (± 0.13) in bronchial asthma patients, 2.28 (± 0.03) in controlled group, t test was 41.3 and p<0.001.

Table 1: Comparison of BMI values between Bronchial asthma and controlled group

BMI	Bronchial Asthma (85)	Controls (80)	t test	p value
	24.55 (± 0.60)	26.45 (± 0.063)	19.9	P<0.001

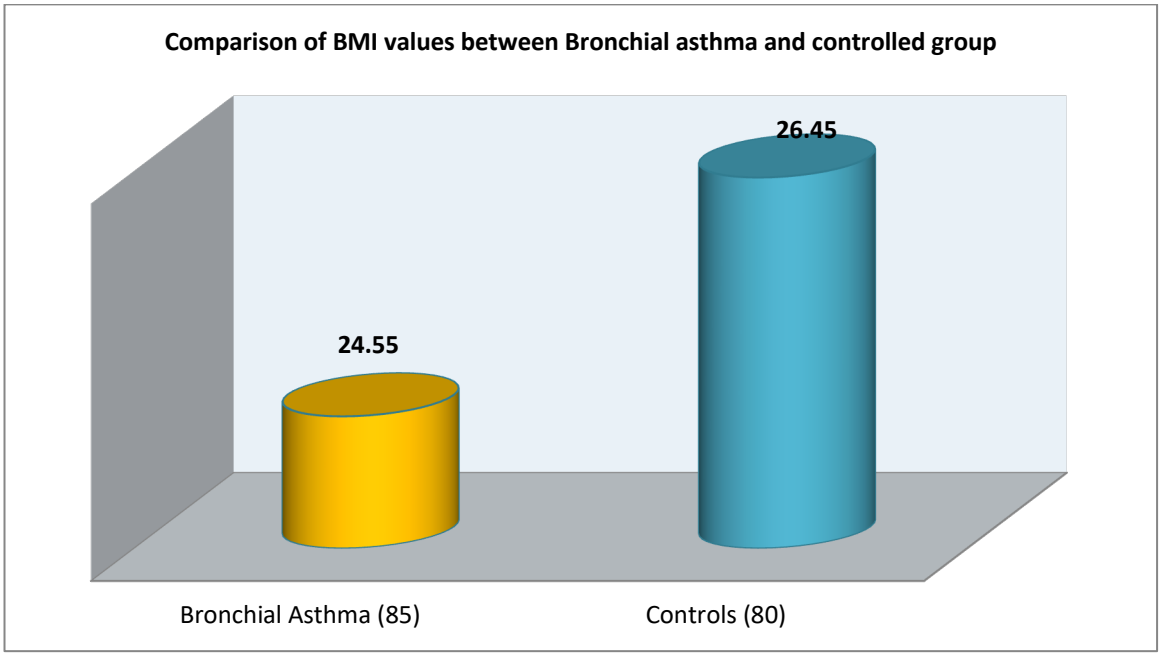

Figure 1: Comparison of BMI values between Bronchial asthma and controlled group

Table 2: Comparison of FEV_1 values between Bronchial asthma and controlled group

FEV1	Bronchial Asthma (85)	Controlled group (70)	t test	p value
	45.85 (± 0.42)	94.48 (± 1.30)	80.1	P<0.001

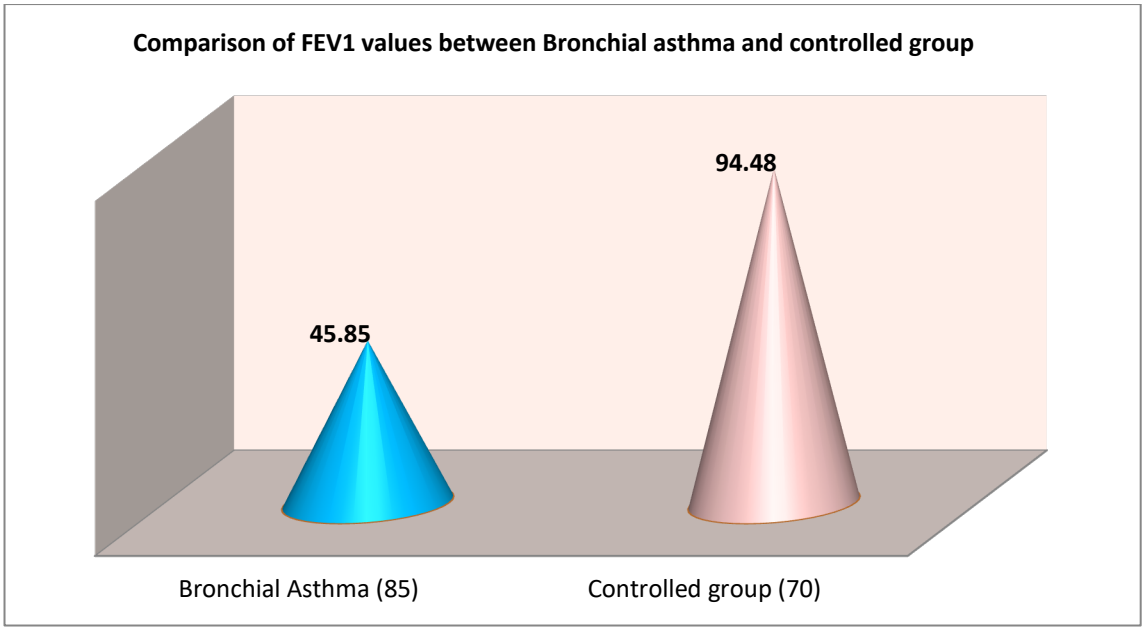

Figure 2: Comparison of FEV1 values between Bronchial asthma and controlled group

Table 3: Comparison of Serum Magnum values between Bronchial asthma and controlled group

Details	Bronchial Asthma (85)	Controlled group (80)	t test	p value
Serum magnum	1.68 (± 0.13)	2.28 (± 0.03)	41.3	P<0.001

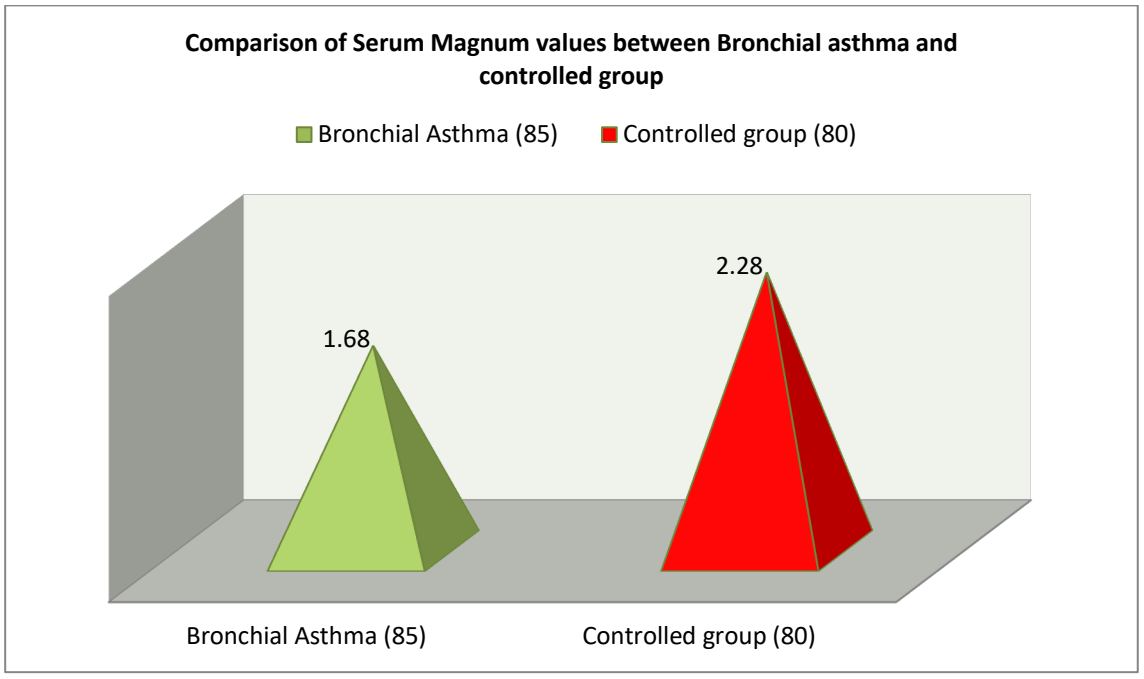

Figure 3: Comparison of Serum Magnum values between Bronchial asthma and controlled group

Discussion

In the present study of the level of serum magnesium among the Telangana population, 24.55 (± 0.60) in the bronchial asthma group and 26.45 (± 063) in the controlled group, the t test was 19.9 and p<0.001 (Table 1). In comparison of FEV1 study 45.85 (± 0.42) in Bronchial asthma group, 94.48 (± 1.30) in controlled group, t test was 80.1 and p<0.001 (Table 2) in comparison of serum magnesium 1.68 (± 0.13) in the bronchial asthma group and 2.28 (± 0.03) in the controlled group, the t test was 41.3 and p<0.001 (Table 3). These obtained values were more or less in agreement with previous studies [5,6].

Serum magnesium plays a vital role in the pathophysiology of allergic reactions, especially in bronchial asthma [7]. Contraction and dilation of myofibrillar proteins in smooth muscles of the

bronchi are due to the phosphorylation and de-phosphorylation processes, which include the enzymes myosin kinase and myosin phosphate. Myosin kinases are magnesium-dependent, and myosin phosphates are calcium-dependent enzymes. Since magnesium is involved in calcium transport across the cellular membrane, both enzymes are directly or indirectly influenced by magnesium (Serum Mg) level [8].

Hence, Serum Mg plays a vital role in the contraction and dilatation of the muscles of the bronchi-alveoli. Therefore, a reduction in serum mg level leads to hyperactivity in the bronchial alveoli. Thus, there will be an aggravation of respiratory movement usually observed in bronchial asthma, and there will also be a reduced FEV1 level (Table 2, 3). It was proved that IV Mangesium 2 gm is ideal to treat bronchial asthma. Mg is also used as a tocolytic agent for preterm labour, given the I.V. route up to 4-6 gram, but continuous infusion may cause major toxicity when serum mg is at 9 mg/dl and above, causing loss of reflexes, blurred vision, lethargy muscle weakness, and pulmonary edema [9]. In the case of hypermagnesieumia levels, hemodialysis was done to prevent high risks to renal function. Hence, nebulized Mg is proved more efficient to control or relive episodes of bronchial asthma as an adjacent dosage. Treatment of altered Mg++ status depends on the clinical setting and may include the addition of a potassium/mg++ sparing drug to an existing diuretic regimen.Serum Mg is a cofactor of over 300 intracellular enzymatic reactions utilizing high-energy phosphate bounds. Magnesium has been implicated in smooth muscle contraction. Apart from relaxing bronchial smooth muscle, it has calcium channel blocking properties, inhibition of cholinergic neuromuscular transmission with decreased sensibility to the depolarizing action of acetylcholine, stabilizing the mast cells and T-lymphocytes [10], stimulation of nitric oxide, and prostacyclin.

Summary and Conclusion

The present study of serum Mg in bronchial asthma patients among the Telangana population is quite helpful to physicians in treating bronchial asthma with serum Mg as an adjacent dosage for relaxation of hyperactive bronchial alveoli. This study suggests there is a strong relationship between intracellular Mg levels and methacholine bronchial reactivity. Hence, Mg level alterations may play a role in the pathogenesis of bronchial asthma. But this study demands further pathophysiological, genetic, biomolecular, and nutritional studies to shed more light on this subject because the exact intracellular action of serum Mg on the smooth musculature of the bronchoalveoli is still unclear.

Limitation of study

Due to the tertiary location of the research centre, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

This research paper has been approved by the Ethical committee of Faith Hospital Yakutpura, Hyderabad, Telangana-500033.

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