ORIGINAL ARTICLE

A Hospital Based Prospective Study to Estimate and Compare Serum Magnesium Level Between Pulmonary Tuberculosis Patients and Normal Subjects

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ABSTRACT:
Background: Tuberculosis is considered as one of the most important infectious disease. It results in change in serum levels of many micronutrient in the immune system and metabolism. Since very scanty literature is available regarding serum Magnesium in Pulmonary Tuberculosis patients, and to compare with normal subjects and whatever results are available are having controversial reports. **Material & Methods:** This is a hospital-based study were conducted in 80 subjects aged between 30-70 year in Respiratory Medicine Department and T.B Clinic of PBM Hospital. 40 clinically diagnosed Pulmonary Tuberculosis patients will be represented as study group and 40 normal persons will be selected as control group, those living normal life physically fit. All the findings were recorded, tabulated and statistically analyzed and expressed in terms of mean, standard deviation etc.To analyze the data, t-test was employed wherever applicable to access the significance of difference among control and study subjects. **Results:**Our study showed that maximum no. of patients (30%) belongs to 41-50 yrs of age group in study group.The male to female ratio 1.5:1 in control group and 2.33:1 in study group. Maximum patients were low & middle socioeconomic class in both groups. Distribution of persons on the basis of their Smoking habits, 40% smokers in control group & 67.5% in study group.The Comparison of Mean Serum Magnesium Concentration (mg%) in highly significant (p <0.0001) in between two groups. **Conclusion:**We concluded that estimation of serum Magnesium can have an auxillary value in the early diagnosis and in monitoring the prognosis of subjects with pulmonary tuberculosis.

KeyWords: Pulmonary tuberculosis, Serum Magnesium, Control group, Trace elements

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INTRODUCTION

Tuberculosis (TB), one of the oldest disease known to affect humans, is major cause of death worldwide.If properly treated, tuberculosis caused by drug-susceptible strains is curable in virtually all cases. If untreated, the disease may be fatal within 5 years in 50-60 % of cases. Transmission usually takes place through the airborne spread of droplet nuclei produced by patients with infectious pulmonary tuberculosis (PTB).[1] Failure to diagnose pulmonary TB before a patient dies and delay in diagnosis have persisted as significant problems. Such delays have led to nosocomial TB infections with sensitive as well as multidrug resistant TB, unnecessary exposure of hospital personnel, treatment failure and more extensive disease.[2] Age is an important determinant of the risk of disease after infection. Among infected persons, the incidence of tuberculosis is highest during late adolescence and early adulthood. The most potent risk factor for tuberculosis among infected individuals is clearly HIV co-infection, which suppresses cellular immunity. Tuberculosis is considered as one of the most important infectious disease.It results in change in serum levels of many micronutrient in the immune system and metabolism.Magnesium acts as a cofactor for immunoglobin synthesis,immune cell adherence,antibody dependent cytolysis,IgM lymphocyte binding,T-cell,helper B-cell adherence and additional response.Pulmonary tuberculosis have lower serum magnesium concentration as compared to healthy controls.[3,4]

Epidemiological studies have linked higher intakes of magnesium with lower incidences of respiratory problem[5] Magnesium has been used to treat and improve lung function in some individuals of asthma. Recently there has been considerable interest generated in the possible importance of magnesium ions in the regulation of bronchial smooth muscle tone directly and indirectly.[6] Britton et al. demonstrated that a lower dietary magnesium intake was associated with impaired lung function, bronchial hyper-reactivity and an increased risk of wheezing.[7] Since very scanty literature is available regarding serum Magnesium in Pulmonary Tuberculosis patients,and to compare with normal subjects and whatever results are available are having controversial reports.

MATERIAL & METHODS:

This is a hospital based study were conducted in 80 subjects aged between 30-70 year in Respiratory Medicine Department and T.B Clinic of PBM Hospital. 40 clinically diagnosed Pulmonary Tuberculosis patients will be represented as study group and 40 normal persons will be selected as control group, thoseliving normal life physically fit.

Inclusion Criteria :

- Age range 30-70years.
- History of cough (more than two months), chest pain, low grade fever, sputum smear positive for AFB, Radiological positive findings.
- No history of heart disease, no history of hypertension and non diabetic

Exclusion Criteria :

- Smear negative cases.
- Extra-Pulmonary cases.
- Pulmonary tuberculosis with chronic hypertension, diabetes and heart disease.
- Patients on drugs containing magnesium in their constituentswill be excluded from the study.

COLLECTION OF SAMPLES

5ml blood from antecubital vein has withdrawn in a perfectly clean dry syringe and was transferred to a clean dry vial slowly by the side of the vial after removing the needle to avoid hemolysis. The blood was allowed to clot at room temperature for 30 minutes and then transferred to a centrifuge tube. The serum was separated by centrifugation at 3000 rpm for 10 minutes.

ESTIMATION OF SERUM MAGNESIUM

The serum serum magnesium were estimated by atomic absorption spectorphotometer (AA-7000) as described by Fernandez et al (1971),[8]in the department of Biochemistry, S.P. Medical College, Bikaner.

PRINCIPLE

In flame atomic absorption spectroscopy a liquid sample is aspirated and mixed as an aerosol with combustible gases (Air-C_2H_2 or C_2H_2-N_2O). The mixture is ignited in a flame of temperature ranging from 2100 to 2800.C (Depending on the fuel gas used). During combustion, atoms of the element of interest in the sample are reduced to the atomic state.

The liquid sample is nebulized (reduced to spray) by the support gas, fuel gas is mixed and burnt over the burner lead. The give droplets produced by the (nebulizer) which enter the flame and are volatilized. In oxygen supported flames, the elements are usually converted to their oxides. The light of Hollow Cathode lamp of preselected element is directed through this flame. The out coming radiation is collimated through a monochromator. The monochromator isolates the appropriate response live and direct it into a detector. Free, unexcited atoms of the element absorb light at characteristic wavelengths; this reduction of the light energy at the analytical wavelength is a measure of the amount of the element in the sample.

ESTIMATION OF SERUM MAGNESIUM :[9,10]

Standard and Sample Preparation

Standard Preparation

Stock Standard -I : Stock Standard solution of 1000ppm Mg concentration was available in the department of Biochemistry, Sardar Patel Medical College, Bikaner.

Stock Standard - II (100μgm of Magnesium /ml): 5 ml of stock standard I was diluted to 50ml with double distilled water.

Sample Preparation:

For the determination of magnesium the serum was diluted 1:50 with 0.1% (w/v) lanthanum (as chloride) diluent. The dilution ratio can be adjusted to insure that concentration fall within a suitable absorbance range.

Calculation:

AAS (AA-7000) instrument calculates the data of absorbance automatically and shows the exact concentration of serum magnesium.

Normal range of serum magnesium = 1.5 - 2.3 mg/dL[11]

All the findings were recorded, tabulated and statistically analyzed and expressed in terms of mean, standard deviation etc.

To analyze the data, t-test was employed wherever applicable to access the significance of difference among control and study subjects.

RESULTS:

Our study showed that maximum no. of patients (30%) belongs to 41-50 yrs of age group in study group and same no. (30%) in control group.The male to female ratio 1.5:1 in control group and 2.33:1 in study group. Maximum patients were low & middle socioeconomic class in both groups. Distribution of persons on the basis of their Smoking habits, 40% smokers in control group & 67.5% in study group (table 1). Table 2 show the mean±SD value of serum magnesium is 2.057±0.3228 in control group & mean value in study group is 1.332±0.1752. The Comparison of Mean Serum Magnesium Concentration (mg%) in highly significant (p <0.0001) in between two groups.

Table 1. Comparison of various parameters between Normal Healthy Persons (Control Group) and Pulmonary Tuberculosis patients (Study Group.

Parameters	Control Group (N=40)		Study Group (N=40)	
	Number	Percentage	Number	Percentage
Age group (yrs)				
31-40	17	42.5%	11	27.5%
41-50	12	30%	12	30%
51-60	07	17.5%	11	27.5%
61-70	04	10%	06	15%
Sex				
Male	24	60%	28	70%
Female	16	40%	12	30%
Socioeconomic Status				
Low Income Group	16	40%	25	62.5%
Middle Income Group	16	40%	12	30%
High Income Group	8	20%	03	7.5%
Smoking Habits				
Smoker	16	40%	27	67.5%
Non-Smoker	14	60%	13	32.5%

TABLE 2.Comparison of Mean Serum Magnesium Concentration (mg%) in Pulmonary Tuberculosis Patients(Study Group) with Normal subjects(Control Group).

Values	Normal subjects (Control Group)	Pulmonary Tuberculosis Patients (Study Group)
Mean	2.057	1.332
Range	1.360-2.860	1.070-1.620
SD	0.3228	0.1752
SE	0.0507	0.0243
DF	97	
T	12.57	
P	<0.0001	

DISCUSSION:

Our study showed that maximum no. of patients (30%) belongs to 41-50 yrs of age group in study group and same subjects 30% in control group. Biswajit das[4]founded 35% cases were seen in the age group of 30—39 years.Similar finding suggest by Hassan Ghulam[12] study done on 50 cases of pulmonary tuberculosis studied, 23 (46%) cases were in the age group of 30 to 39 years.A another study done by Colonel Khursheed Mu[8]founded the most frequent age group in , the present study was 31-40 years, consisting upon 50 (42.74%) patients.

Our study showed that the male to female ratio 1.5:1 in control group and 2.33:1 in study group.According to M.K. JAIN[13], male to female ratio was 7.3:1, which was higher with our results.

Distribution of persons on the basis of their Smoking habits, 40% smokers in control group & 67.5% in study group.The study by den Boon et al[14] in South Africa suggested that passive smoking may increase the risk of acquiring tuberculosis infection, given household infection to adult index case. The results were alarming as in developing countries with high burden of tuberculosis; there is rapid increase in smoking prevalence in household.

A prospective cohort study in Hong Kong by Leung et al[15] demonstrated a significant and independent association between passive smoking and pulmonary tuberculosis. Our study shows thatthe mean±SD value of serum magnesium is 2.057±0.3228 in control group & mean value in study group is 1.332±0.1752. The Comparison of Mean Serum Magnesium Concentration (mg%) in highly significant (p <0.0001) in between two groups.According to M.K. Jain[13],18 cases (45 %) had serum magnesium levels within normal limits while 22 cases (55%) had low serum magnesium concentrations. Twelve cases were in the range of 1.21 to 1.50 mg%, 9 cases in the range of 1.51 to 1.71 mg%, while only one case had less than 1.20 mg% of serum magnesium. Literature regarding serum magnesium values in cases of pulmonary tuberculosis is very meager. Podlesna (1972) has studied serum magnesium levels in cases of pulmonary tuberculosis but could not find any significant change. However, he found hypermagnesaemia in cases of pneumonia and advocated this investigation to differentiate pneumonia from pulmonary tuberculosis[13]. Biswajit das[4] observed that serum magnesium concentration were found to be markedly low in those cases who had far advanced disease (stage-3) [mean serum magnesium value1.25±0.080 meq/L] than in those with moderately advanced disease (stage-2) [mean serum magnesium value1.37± 0.084 meq/L] or with minimal disease (stage-1) [mean serum magnesium value 1.50 meq/L].

CONCLUSION:

We concluded that estimation of serum Magnesium can have an auxillary value in the early diagnosis and in monitoring the prognosis of subjects with pulmonary tuberculosis.

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