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Original Article

Status of serum zinc level in patient with pulmonary tuberculosis

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Abstract

Background: Tuberculosis is an infectious disease caused by the bacillus Mycobacterium tuberculosis. Bangladesh ranks 6th among 22 highest burden TB countries in the world. Micronutrient deficiency is common in pulmonary tuberculosis but still poorly documented. Zinc is essential for immune function, deficiency of zinc lead to impaired immunity and thereby increases susceptibility to infections such as tuberculosis. Several studies in abroad have demonstrated that the serum zinc level is decreased during active pulmonary tuberculosis. The aim of this study is to determine serum zinc levels in pulmonary tuberculosis patients.

Objective: To assess the serum zinc level in pulmonary tuberculosis patient and healthy individual.

Methods: A descriptive, cross sectional study was conducted from January 2016 to December 2016 among 50 pulmonary tuberculosis patients attending at Respiratory Medicine Department of the Dhaka Medical College Hospital and 50 healthy individuals, after obtaining requisite consent from the patients. Data were collected through the interviewing of the patients. The collected data were entered into the computer and analyzed by using SPSS (version 20.1) to assess the serum zinc level in pulmonary tuberculosis patients and healthy individuals. The study was approved by the institutional ethical committee.

Results: In a pool of 50 tuberculosis patients and 50 healthy individuals, serum zinc (μmol/l) (mean ± SD) level was significantly lower ($p < 0.001$) in pulmonary tuberculosis without treatment (8.9 ± 2.1) than normal individuals (15.6 ± 4.8).

Conclusion: Serum zinc level was significantly lower ($p < 0.001$) in pulmonary tuberculosis patients without treatment. Zinc rich food and zinc supplementation may be helpful to improve the immune status of TB patients.

Keywords: Tuberculosis patient, Serum zinc level.

Introduction

Tuberculosis (TB) is a major public health problem in Bangladesh. Bangladesh ranks 6th globally in terms of the burden of TB on the population. According to the World Health Organization, around 3,50,000 Bangladeshi developed TB in 2013 and around 80,000 die from TB every year, which accounts for just under 9% of the deaths in Bangladesh every year. Hence, every hour, nine people die of TB in Bangladesh, despite an effective treatment being available.[1] Tuberculosis is caused by two organisms namely mycobacterium tuberculosis and mycobacterium bovis. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). It is characterized by persistent cough, difficulty in breathing, coughing up blood, generalized weakness, loss of appetite, night sweats, fever, chills, unintentional weight loss etc. In 17th and 18th centuries, tuberculosis caused up to 25% of all deaths in Asia.[2] Malnutrition is frequently observed in patients with pulmonary tuberculosis, but their nutritional status especially of micro nutrients, is still poorly documented. Among the micro nutrients, zinc is essential for human growth, development and immune function, deficiency of this micro nutrient impairs overall immune function and resistance to infection.[3] A study in Uganda demonstrated that poor zinc status is common among adults with pulmonary tuberculosis.[4]

Materials & method

A cross sectional study was conducted in the Department of Biochemistry, Dhaka Medical College, Dhaka in collaboration with Department of Respiratory Medicine, DMC from January 2016 to December 2016.

According to selection criteria 100 subjects were selected age ranged from 20 to 60 years and equally divided into two groups. Group-A was newly diagnosed pulmonary tuberculosis patients before receiving treatment in the TB center of Department of Respiratory Medicine, Dhaka Medical College Hospital and Group-B was apparently healthy volunteers. The study protocol was approved by IEC of Dhaka Medical College Hospital. There are no violations of moral and ethical norms during preparation of this research. Purposive sampling was adopted for collecting data. The interviews were held directly in the corridor just outside the Outpatient Department. The relevant information was entered into the predesigned proforma. The collected data were entered into the computer and analyzed by using SPSS (version 20.1). Data were expressed as mean ± SD. The statistical analysis was done by ANOVA and Chi Square test.

Result

Table-I: Age and sex of study subjects in different groups (N = 100)

Parameter	Group		p-value
	Group A (n=50)	Group B (n=50)	
Age (years)	36.5 ± 9.28	37.2 ± 7.5	0.719 a
Gender			
Male n (%)	28 (56.0)	26 (52.0)	0.722 b
Female n (%)	22 (44.0)	24 (48.0)	

Group-A: Pulmonary TB patients without treatment, Group-B: Healthy individuals

Level of significance $p < 0.05$, Data are express as mean ± SD

a = ANOVA test was done, b = Chi-square test was done

Table-I shows that age (mean ± SD) and gender of pulmonary TB patients without treatment and healthy individuals. Study subjects were age & gender matched.

Table-II: Blood pressure of study subjects in different groups (N= 100)

Parameter	Group		p-value
	Group A (n=50)	Group B (n=50)	
Systolic BP (mm of Hg)	121.8 ± 17.5	120.3 ± 16.7	0.885
Diastolic BP (mm of Hg)	79.5 ± 14.5	78.1 ± 12.3	0.798

Group-A: Pulmonary TB patients without treatment, Group-B: Healthy individuals

Level of significance $p < 0.05$, Data are express as mean ± SD, ANOVA test was done

Table-II shows mean ± SD of systolic BP and diastolic BP, there was no significant difference of SBP and DBP in between groups.

Table-III: BMI of the study subjects in different groups (N=100)

Parameter	Group		p-value
	Group A (n=50)	Group B (n=50)	
BMI (kg/m²)	18.5 ± 2.8	23.4 ± 3.5	< 0.05

Group-A: Pulmonary TB patients without treatment, Group-B: Healthy individuals

Level of significance $p < 0.05$, Data are express as mean ± SD, ANOVA test was done

Table-III shows Mean ± SD of BMI was significantly lower in pulmonary TB patients without treatment and normal healthy individuals.

Table-IV: Serum zinc level of the study subjects in different groups (n=100)

Parameter	Group		p-value
	Group A (n=50)	Group B (n=50)	
Serum zinc (µmol/l)	8.9 ± 2.1	15.6 ± 4.8	< 0.001

Group-A: Pulmonary TB patients without treatment, Group-B: Healthy individuals

Level of significance $p < 0.05$, Data are express as mean ± SD, ANOVA test was done

Table-IV shows serum zinc level in study subjects. Serum zinc level was significantly lower in pulmonary TB patients without treatment than normal healthy individuals.

Discussion

This cross sectional study was done on pulmonary tuberculosis patients in the Department of Biochemistry, Dhaka Medical College, Dhaka during the period of January 2016 to December 2016. A total of 100 subjects were selected according to the selection criteria. Among them, 50 pulmonary TB patients without treatment were included in group A and 50 apparently healthy individuals were included in group B. Serum zinc (µmol/l), BMI (kg/m²) and blood pressure (mm-Hg) was measured. According to this study, mean± SD value of BMI in group A and group B were 18.5 ± 2.8 and 23.4 ± 3.5 kg/m² respectively. Mean BMI was significantly lower in pulmonary TB patients without treatment than that of normal healthy individuals. This finding was consistent with the cohort study which was included 1557 study subjects where the aim was to find out the association of body mass index with timing of

death during tuberculosis treatment. They concluded that for tuberculosis patients, body mass index less than 18.5 kg/m² is an independent predictor for early mortality within the first 8 weeks of treatment.[5]

A case-control study was done to assess the body mass index and nutritional status in pulmonary tuberculosis patients.[6] In this study 60 patients with active pulmonary tuberculosis and 60 controls was selected for study subjects. They concluded that there is a significant degree of nutritional depletion and weight loss in PTB patients than in general population.[6] There are some other studies have been done regarding BMI and PTB patients.[2] A cross-sectional study was done on 319 PTB patients[2] and another retrospective cohort study which includes 1090 TB patients was done.[7] In both studies BMI was found significantly low in PTB patients. All of these observations establish that there was a significant degree of nutritional depletion and weight loss occurred in PTB patients. BMI is considered to be a useful technique for assessment of nutritional state of PTB. According to our study, mean ± SD of serum zinc level was 8.9 ± 2.1 and 15.6 ± 4.8 µmol/l respectively in pulmonary tuberculosis patients without treatment (Group A) and healthy individuals (Group B). Mean serum zinc level was significantly lower ($p < 0.001$) in group A than that of group B. A case-control study was done to evaluate the nutritional status of patients with active pulmonary tuberculosis and compared the values with those of healthy controls.[8] In this study, 41 out-patients aged 15–55 years with untreated active pulmonary TB were compared with 41 healthy controls selected from neighbors of the patients and matched for age and sex. They found poor nutritional status and significantly low serum zinc levels in tuberculosis patients compared to control.[8] This findings is consistent with the results of our study.

Conclusion

Assessment of serum zinc level helps to find out the nutritional status and progress of tuberculosis. In our study, Serum zinc level was significantly lower ($p <0.001$) in pulmonary tuberculosis patients without treatment than healthy individuals. Our study concludes that estimation of the zinc level could be used as a valuable laboratory tool to assess the effectiveness of the ongoing anti-tubercular therapy. We suggest that, in view of the poor nutritional status in patients of pulmonary TB, zinc supplementation be a mandatory constituent of the treatment protocol.

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Conflict of Interest

Authors declare no conflict of Interest.

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