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Evaluation and Comparison of Body Mass Index and Albumin Level in Patients with Active Tuberculosis and Latent Tuberculosis Infection

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ABSTRACT

Introduction: Limited data are available on the relationship between nutritional status and tuberculosis. The aim of this study was to evaluate and compare the body mass index (BMI) and serum albumin level in patients with active tuberculosis (ATB) and latent tuberculosis (LTB).
Materials and Methods: A cross-sectional study was conducted on 17 patients newly diagnosed with pulmonary TB who were referred in Iran, during September 2011 to March 2012 and 17 latent tuberculosis infection individuals. Standard method was performed to collect an early morning fasting blood sample for albumin (by the bromocresolgreen method). Also (BMI) was calculated as body weight divided by height squared (kg/m^2).
Results: One-sample Kolmogorov-Smirnov test was used to check normal distribution data The mean ± Standard deviation(SD) for albumin in the patients and controls were 3.62±0/56 and 4.68±0.25, respectively. BMI in the patients and controls were 19.46±2.79 and 25.4±3.46, respectively. The serum albumin level was significantly lower in the patient group, compared to the control group (P<0.001).BMI was significantly lower in the patient group, compared to the control group (P<0.001).
Conclusion: Our findings demonstrated that BMI and serum Albumin were significantly lower in the active tuberculosis patients than latent tuberculosis groups.

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Introduction

Tuberculosis is one of the most important infectious diseases with a high global mortality rate, particularly in developing countries. According to World Health Organization, one-third of the world population is infected with Mycobacterium tuberculosis, while only 5-10% of infected individuals develop active tuberculosis (ATB) with clinical symptoms (1-3).

Malnutrition is frequently reported in patients with pulmonary tuberculosis (4). Albumin facilitates the movement of various small molecules through the blood including bilirubin, calcium, progesterone and medicines. This protein plays an important role in restraining the blood fluid from

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leaking into tissues (5, 6). Considering its oncotic properties, albumin has been used in patients with cirrhosis and liver disease for the maintenance of vascular volume (7).

Considering the limited data on the nutritional status and serum albumin level in patients with ATB, we aimed to Evaluate BMI and serum Albumin serum albumin level in subjects with active tuberculosis (ATB) and latent tuberculosis (LTB).

Materials and Methods

The present cross-sectional study was conducted at Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran, during September 2011 and March 2012. The study population consisted of 17 patients with recently diagnosed pulmonary tuberculosis and 17 control subjects with LTB (with positive tuberculin skin test). The subjects were matched in terms of age and sex.

The diagnosis of tuberculosis was confirmed, based on positive microscopic findings for acid-fast bacillus in at least two early morning sputum specimens (8, 9) and positive *M. tuberculosis* culture on Löwenstein-Jensen medium after four weeks. The patient and control groups were interviewed, using a structured questionnaire including information related to the inclusion and exclusion criteria.

The exclusion criteria were as follows: 1) pregnancy, 2) acute or chronic liver diseases, 3) renal diseases, and 4) other active inflammatory conditions. Five ml blood samples were obtained from the subjects and serum samples were stored at -20 °C. Bromocresol green assay kit was applied to measure serum albumin level. Body mass index (BMI) was also calculated as body weight in kilograms divided by height in meters squared (kg/m^2).

Statistical Analysis

Normal distribution of the data was assessed by Kolmogorov-Smirnov test. Mean and standard deviation (SD) were calculated for reporting normally distributed data. Independent sample's ***t***-test was used to assess the differences between patient and control groups in terms of normally distributed parameters. Moreover, Pearson's correlation test was applied to calculate the correlation coefficients. SPSS version 20 (Chicago, USA) was used for all statistical analyses. *P*-value less than 0.05 were considered statistically significant.

The present study was approved by the ethic committee of Mashhad University of Medical Sciences, Mashhad, Iran. Informed consent forms were obtained from subjects before the start of the study.

Results

The mean age of the patients and control groups was 49.65±18.27 and 44.12±10.20 years (range: 20-70 years), respectively. There was no statistically significant (p value =0.697) difference between the two groups in terms of age or sex .The mean BMI in the patients and control groups was19.46±2.79 and 25.4±3.46 kg/m^2, respectively. BMI was significantly lower in the patient group, compared to the control group (P<0.001).

The mean albumin level in the patients and control groups was 3.62±0.56 and 4.68±0.25, respectively. The serum albumin level was significantly lower in the patient group, compared to the control group (P<0.001). According to Pearson correlation test a positive correlation observed between BMI and albumin. (P<0.01).

Discussion

Infection leads to a decline in serum albumin level in humans. Albumin is also required for the growth of *M. tuberculosis*. In the present study, subjects with the following conditions were excluded from the study: pregnancy, acute and chronic liver disease, renal diseases and other active inflammatory conditions**.** In our findings serum albumin level and BMI was significantly reduced in patients with ATB, compared to control subjects with LTB.

According to previous research, serum albumin, zinc and BMI were lower in patients with ATB, compared to healthy control subjects (4). The reported findings were consistent with previous research in England (10), India (11) and Japan (12). In ATB, the production of cytokines (e.g., interleukin-6 and tumor necrosis factor-α) and acute-phase proteins inhibits serum albumin production (13-15).

In the acute-phase response, leakage of transthyretin (prealbumin) and albumin through the vascular endothelium occurs and production of transthyretin by the liver is reduced (16). In a previous study, lipid, when bound to albumin, can be used as a source of carbon and promote the growth of *M. tuberculosis* (17).

In a recent study in India, BMI was significantly lower in patients with tuberculosis, compared to healthy control subjects (18). In fact, low BMI is a known risk factor for mortality (19). According to several studies, low BMI of patients with pulmonary tuberculosis may be due to anorexia, impaired absorption of nutrients or increased catabolism (4, 9, 19, 20). In recent studies, patients with pulmonary tuberculosis and human immunodeficiency virus (HIV) infection had significantly low zinc level, albumin

and BMI. Micronutrient supplementation for this group of patients improves their health, increases their weight and improves the efficacy of drug treatments (9, 21-23).

In conclusion, based on the obtained findings, BMI and serum albumin concentration in patients with ATB were lower, compared to control subjects with LTB.

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Conflicts of interest

The authors declare no conflicts of interest.

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