
Assessment of Body Mass Index & Nutritional Status in Pulmonary Tuberculosis Patients

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Abstract

Background: Pulmonary tuberculosis (PTB) is a chronic infectious disease which affects nutritional status of the patients.

The presence of poor nutritional status in pulmonary tuberculosis patients has been one of the most important determining factors in recommending adjuvant nutrient therapy to prevent oxidative stress and further complication.

The aim of the study: This study was designed to assess the nutritional status and body mass index (BMI) of pulmonary tuberculosis patients.

Patients and methods: During the period 1st of June 2010 to 30th of May 2011, a case-control study was done on 60 patients with active pulmonary tuberculosis who attending chest and respiratory disease institute in Baghdad, and 60 controls. Levels of total serum protein (TP), S. albumin (ALB.), S. globulin, S. triglyceride (TG), total serum cholesterol (TC), high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), and body mass index (BMI) were measured for both groups.

Results: The mean levels of TP (59.5 ± 0.8 g/dl), ALB (23.4 ± 1.8 g/dl), TC (138.7 ± 4.9 mg/dl), HDL (32.2 ± 4.0 mg/dl), LDL (86.5 ± 1.3 mg/dl) and TG (62.4 ± 1.3 mg/dl) were significantly lower while the level of globulin (36.2 ± 1.2 g/dl) was significantly higher in pulmonary tuberculosis patients when compared with controls (TP= 81.2 ± 4.5 g/dl; ALB= 50.0 ± 4.0 g/dl; TC = 213.5 ± 26.8 mg/dl; HDL = 57.4 ± 8.5 mg/dl; LDL = 161.1 ± 28.3 mg/dl; TG= 148.5 ± 37.1 mg/dl; globulin = 31.4 ± 1.7 g/dl respectively). ($P < 0.05$). The body mass index (16.9 ± 1.1 kg/m²) was significantly lower when compared with controls (BMI= 23.5 ± 2.1 kg/m²). ($P < 0.05$)

Conclusion: There is a significant degree of nutritional depletion and weight loss in PTB patients than in general population, BMI is considered to be a useful technique for assessment of nutritional state of pulmonary tuberculosis patients, The nutritional derangement could call for prompt nutritional intervention in the management of pulmonary tuberculosis patients.

Key Words: Assessment Pulmonary Tuberculosis, Body Mass Index, Nutritional State.

Introduction:

Tuberculosis (TB) is responsible for more than 1.5 million deaths every year ⁽¹⁾. Therefore, despite recent progress; Tuberculosis remains an important global public health problem ⁽²⁾.

Tuberculosis has been associated with malnutrition. Malnutrition appears to increase the risk of developing tuberculosis, particularly in animal models ⁽³⁾. However; cause and effect are difficult to distinguish because tuberculosis disease causes weight loss.

Nutritional state in tuberculosis:

Albumin has been reported low in pulmonary tuberculosis ⁽⁴⁾. Increased serum albumin after one week of drug therapy has been reported by Vissers *et al* ⁽⁵⁾.

Yamagishi *et al* 1999 and Yamanaka *et al* 2001 also reported that serum cholesterol was significantly lower in tuberculosis patients and got worse in homeless patients ⁽⁶⁾ ⁽⁷⁾. Weight loss and nutritional depletion are often seen in patients with tuberculosis at the time of tuberculosis diagnosis ⁽⁸⁾ ⁽⁹⁾. Body mass index (BMI) is a more accurate marker of nutritional status than weight because it also takes height into account. In a study among 1,717,655 Norwegians older than 14 yr. who were monitored for 8–19 yrs. after intake into a radiographic screening program, the relative risk of tuberculosis among persons in the lowest BMI category was more than fivefold higher than the

group in the highest BMI category, and it was independent of sex, age, and radiographic findings ⁽¹⁰⁾. Weight gain and other improvements in nutritional indicators after effective chemotherapy for tuberculosis have been reported ⁽¹¹⁾.

Patients and methods

A case control study was conducted over 12 month period from 1st of June 2010 to 30th of May 2011; 60 patients (34 male, 26 female) with active pulmonary tuberculosis. The patients were collected from the Chest and Respiratory Disease institute in Baghdad. Patients with other co-existing lung disease and patients suffering from other diseases and chronic illnesses like cardiac disease, chronic liver disease, renal failure or diabetes mellitus were excluded from this study.

Sixty healthy subjects (34 men, 26 women) those attending the outpatient clinic of Baghdad teaching hospital were recruited as control.

Total serum protein, S. albumin, S. globulin, total serum cholesterol, S. triglyceride, HDL, LDL was measured for both groups. Weight and height were measured for both cases and control in order to determine BMI.

Statistical Analysis

Chi square test for independence used to test the significance of association between discrete variables. t test for two independent samples used to test the significance of difference between two

normally distributed continuous samples, correlation was also considered. All P values used were asymptotic and two sided. Findings with P value less than 0.05 were considered significant.

Results:

The study sample composed of 60 cases of AFB positive pulmonary tuberculosis (57% are males and 43% females) with and 60 controls (57% males and 43% females).

The mean age of the cases was 46.8 ± 12.8 year and of controls was 49.5 ± 12.4 year and there was no significant difference in mean age of the two groups ($P > 0.05$, table 1)

The mean BMI of cases was ($16.9 \pm 1.1 \text{ kg/m}^2$) which was lower than BMI of controls ($23.5 \pm 2.1 \text{ kg/m}^2$) (figure 1) and this difference was significant ($P < 0.05$, table 1).

Table 1: Demographic characteristics and BMI of study sample.

Variables	Pulmonary TB N = 60	Control Group N = 60	P-Value
Age (year); Mean $\pm$ SD	46.8 ± 12.8	49.5 ± 12.4	0.244
Gender; n (%)			
Male	34 (56.7)	34 (56.7)	0.714
Female	26 (43.3)	26 (43.3)	
BMI (kg/m^2); Mean $\pm$ SD	16.9 ± 1.1	23.5 ± 2.1	0.000

TB; tuberculosis, N; number, P; P value, SD; standard deviation, %; percentage

Table 2: Mean levels of laboratory findings for the study sample.

Variables	Pulmonary TB N = 60	Control Group N = 60	P-Value
Serum Proteins; Mean $\pm$ SD			
Total Serum Proteins (g/L)	59.5 ± 0.8	81.2 ± 4.5	0.000
S. Albumin (g/L)	23.4 ± 1.8	50.0 ± 4.0	0.000
S. Globulin (g/L)	36.2 ± 1.2	31.4 ± 1.7	0.000
Lipid Profile; Mean $\pm$ SD			
Total Cholesterol (mg/dl)	138.7 ± 4.9	213.5 ± 26.8	0.000
S. Triglyceride (mg/dl)	62.4 ± 1.3	148.5 ± 37.1	0.000
HDL (mg/dl)	32.2 ± 4.0	57.4 ± 8.5	0.000
LDL (mg/dl)	86.5 ± 1.3	161.1 ± 28.3	0.000

TB; tuberculosis, N; number, P; P value, SD; standard deviation, %; percentage

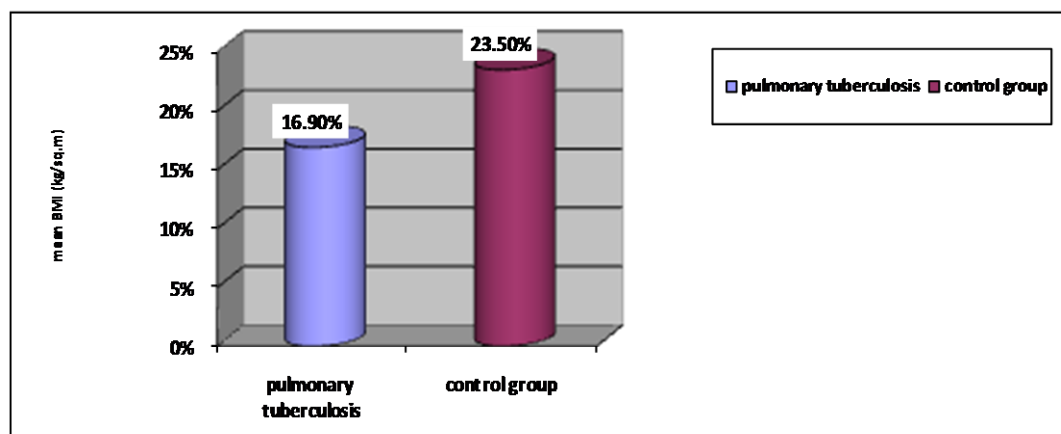


Figure 1: Mean body mass index of Patients and control.

The mean serum protein and serum albumin levels in cases were $59.5 \pm 0.8 \text{ gm/dl}$ and $23.4 \pm 1.8 \text{ gm/dl}$ respectively while in controls they were $81.2 \pm 4.5 \text{ gm/dl}$ and $50.0 \pm 4.0 \text{ gm/dl}$ respectively (figure 2).

Compared to controls; the lower levels of serum proteins and serum albumin in PTB patients were significant ($P < 0.05$, table 2).

In regard to the serum globulin; PTB patients significantly have higher mean serum globulin ($36.2 \pm 1.2 \text{ g/dl}$) than control ($31.4 \pm 1.7 \text{ g/dl}$) ($p < 0.05$, table 2, figure 2).

PTB patients significantly have lower mean plasma TC, TG, HDL & LDL than control ($p < 0.05$, table 2, figure 3).

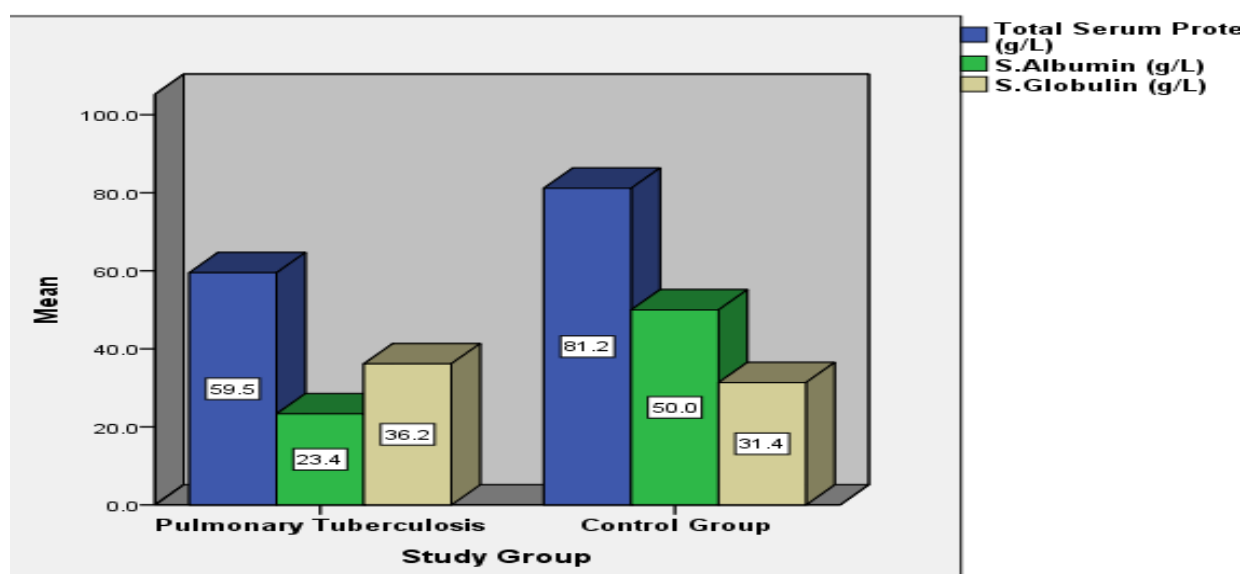


Figure 2: Mean levels of serum proteins for both study groups

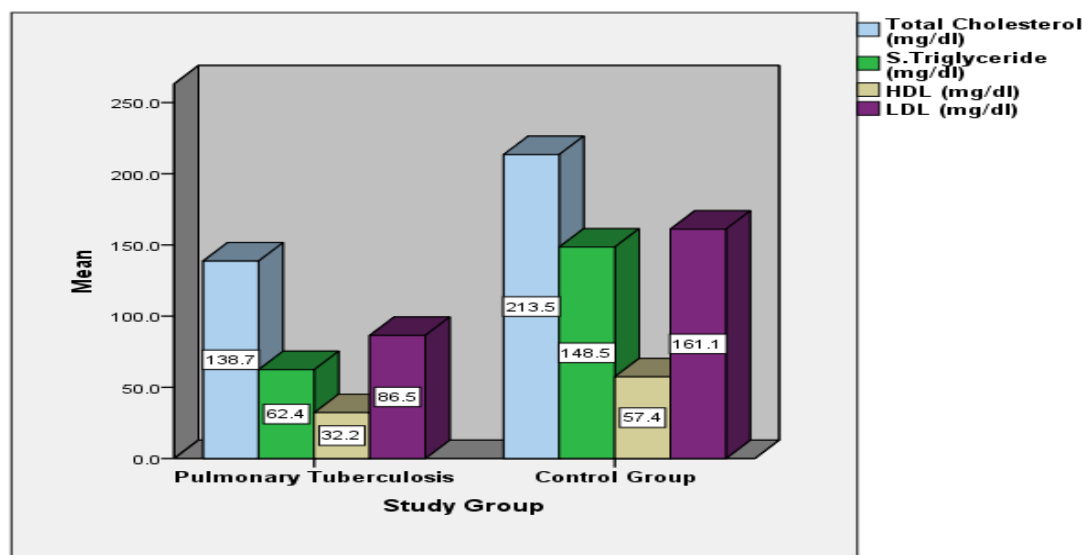


Figure 3: Mean levels of serum lipids for both study groups

Concerning the correlation between different study variables:

In the disease group, there was a significant direct correlation between the BMI and each of TSP, serum albumin, TC, TG and LDL ($P < 0.05$, table 3).

There was a significant inverse correlation between BMI and serum globulin ($P < 0.05$, table 3). There was no significant correlation between BMI and HDL ($P > 0.05$, table 3). patients with serum proteins and lipid profile.

Discussion:

The present study shows significantly lower levels of total protein and albumin in subjects with

pulmonary tuberculosis. Similar report was given by Yamagishi et al ⁽⁶⁾.

Albumin is a negative acute phase protein which the plasma value decreases during infection, injury or

Table 3: Correlation of BMI of AFB smears positive PTB Table

Variables	Spearman's Correlation Coefficient	P-Value
Serum Proteins (g/L)		
Total Serum Proteins	0.481	0.000
S. Albumin	0.569	0.000
S. Globulin	- 0.502	0.000
Lipid Profile (mg/dl)		
Total Cholesterol	0.501	0.000
S. Triglyceride	0.449	0.000
HDL	0.233	0.073
LDL	0.439	0.000
N; number, P; P value, SD; standard deviation, %; percent.		

stress possibly as a result of increased metabolic need for tissue repair and free radical neutralization⁽¹²⁾. Lower levels of total protein and albumin in this study might have been caused also by poor appetite, malnutrition and mal-absorption commonly observed in tuberculosis. The lower level of albumin may therefore be one of the complications associated with pulmonary tuberculosis. Significantly high level of globulin observed in tuberculosis in our study might have arisen from combination of elevation of different globulin fractions. Arinola and Igbi⁽¹³⁾ reported high levels of IgG and IgM in pulmonary tuberculosis. Lower levels of TC, TG, LDLC and HDLC were observed in this study. Piasecka et al⁽¹⁴⁾ and Krishna et al⁽¹⁵⁾ have reported high levels of lipid peroxidation in all categories of pulmonary tuberculosis patients, irrespective of treatment status and this might have caused reduction in the concentration of serum lipids as observed in our study. The lower levels of total cholesterol, HDLC, LDLC and TG observed in this study could be the result of impaired rate of lipid production and enhanced lipid catabolic rate associated with tuberculosis.

The result of this study shows lower BMI and nutritional profiles in pulmonary tuberculosis patients. These could be associated with heavy load of free radicals, oxidative stress and lipid peroxidation. Improved nutrition and supplementation with antioxidant therapy in the treatment of pulmonary tuberculosis may prevent the oxidative stress and further complications.

Conclusion:

There is a significant degree of nutritional depletion and weight loss in PTB patients than in general population. According to the results of this study, it is recommended that nutritional status of PTB patients should be considered during management of these patients.

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