Association of Tuberculosis and Biochemical Nutritional Status A Case-Control Study

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Abstract—*Pulmonary tuberculosis is a very infectious disease and is a public health problem specially in developing country like India. Association between tuberculosis and nutritional status is assumed by various authors at time to time. So this present study was aimed to where there is any association between tuberculosis and nutritional status of individual. For study purpose 40 newly diagnosed tuberculosis taken in one group (Group A), 30 cases of relapse cases of tuberculosis in group 'B' and 30 matched healthy controls in group 'C'. Protein and micronutrient levels of each of the subject were assessed and compared group wisely. Significance of difference was inferred by Unparied 't' Test. It was found in this study that Protein, Albumin, Alkaline Phosphatase and Vitamine D were significantly lowered in Tubercular cases than controls. So it can be concluded that tuberculosis is more common in nutritionally deficit individuals.*

Keywords: Tuberculosis, Nutritional Status, Protein Level, Macronutrient Level.

I. INTRODUCTION

Tuberculosis is a very infectious disease caused by Mycobacterium Tuberculosis. One third of word population is infected with tuberculosis and there is addition of 1% every year,[1] making tuberculosis a global health issue. Tuberculosis (TB) is associated with poverty, overcrowding, alcoholism stress, drug addiction and malnutrition that are prevalent in developing world. [2]

India is the highest TB burden country having 2.2 million cases from 8.7 million cases throughout the world.[2]

Although causative agent of tuberculosis is Mycobacterium Tuberculosis but nutrition has strong association with this diseases. On one hand malnourished are more vulnerable to tuberculosis and tuberculosis further causes nutritional deficiencies by decreasing appetite and increasing catabolism.[3] So malnutrition and tuberculosis are synergistically associated with each other.

Among various methods of nutritional assessment, biochemical assessment is one to estimate the level of protein and micro and macronutrients. Since tuberculosis infection is associated with compramized cell mediated immunity so Calcium (Ca) and Phosphorus (P) status provide additional information for effective management of tuberculosis as these macronutrients have important role in immune system.[4,5]

So this present study was conducted to find out difference in nutritional status of tuberculosis cases by biochemical assessment is one to estimate the level of protein and micro and macronutrients.

II. METHODOLOGY

This case control study was conducted in Institute of Respiratory Diseases in association with Department of Biochemistry, S.M.S. Medical College, Jaipur (Rajasthan) India. For this study 40 newly diagnosed tuberculosis cases were taken in one group (Group A) and 30 relapse cases of tuberculosis in group 'B'. For control 30 matched healthy individuals were taken in group 'C'.

Group A – Newly diagnosed tubercular cases

Group B – Relapse tubercular cases i.e. cases were presented with tubercular symptoms/radiological /microbiological evidences after leveled cured after taking complete treatment.

Group C – Matched healthy control

For diagnosis of tuberculosis either of following criteria was taken:-

1. Positive culture for Mycobacterium Tuberculosis (MBT)
2. Smear (2 consecutive) positive MBT
3. Chest X ray showing tubercular lesion
4. Patients showing improvement in 2 criteria's with antitubercular treatment.

Patients suffering from drug resistant TB, Extra pulmonary TB, cases with other diseases and complicated cases were excluded from study.

None of subject in either of case or control should be on Calcium supplement.

2.1 Sample Collection and Biochemical Examination

After overnight fasting, venous bloob was drwan from cubital vein of each subjects by using aseptic technique in plain vial.

Total protein was measured by Accurex Biuret Method, Total Calcium by Accurex Arsanozo III Method, Total Phosphorus by Accurex Phosphomolydate UV Method and Alkaline Phosphatase (ALP) by Kinetic Method. These biochemical parameters were estimated on Clinical Chemistry RANDOX IMOLA 3 Autoanalyzer.

2.2 Statistical Analysis

Statistical analysis was done using unpaired 't' test to compare Biochemical parameters between cases and control

III. RESULTS

Age and sex wise all the three studied groups were well comparable having no significant difference with male predominance and mean age between 43.07 years in group 'B' to 48.53 years in group 'A' (Table 1)

Table 1
General Characteristics of Study Subjects

Characteristics	Group A (N=40)	Group B (N=30)	Group C (N=30)	P-value
Males/Females	30:10	20:10	22:8	0.063 **NS**
Age (Mean ±SD) in years	48.53 ± 19.58	43.07 ±18.7	45.13 ± 14.08	0.44 **NS**
BMI (Mean ±SD)Kg/m2	14.6 ± 2.2	17.1 ± 2.8	26.8 ± 3.01	< 0.001 **S**
Residence wise (Rural: Urban)	35 :5	23: 7	10:20	< 0.001 **S**
Smoking status (Yes : No)	32:8	20:10	8:22	< 0.001 **S**
Alcohol Intake (Yes : No)	21: 19	15 :15	3 :27	< 0.001 **S**
Sputum Status (+ve : -Ve)	10:30	15:15	30:0	< 0.001 **S**

Group A = Newly Diagnosed cases
Group B = Relapsed cases **Group C = Control**

Mean Body Mass Index (BMI) was found significantly less in cases groups than control i.e. 14.6 in group 'A' v/s 26.8 and 17.1 in group 'B' v/s 26.8. (Table 1)

Residence wise also it was observed that in cases group rural population was more whereas in control group urban population was more than their counter parts. This difference in proportion of subjects as per residence wise in cases group and control group was found significant. (Table 1)

In cases group proportion of subjects with alcohol intake as well as smokers were significantly more than the control group. (Table 1)

Sputum positivity was found 25% in Group 'A', 50% in group 'B' and 0% in group 'C'. This variation in sputum positivity in cases and control also found significant. (Table 1)

When Biochemical parameters were assessed and compared of these three groups it was found that although SGOT, SGPT, Phophtase were without significant difference in all the three groups but total Protein, Albumin, Alk. Phosphatase and Vitamine D was found significantly less in newly diagnosed cases (group 'A') than other groups. (Table 2)

Table 2
Comparison of Biochemical parameters in three groups

S.No	Biochemical Parameter	Group A (Newly diagnosed	Group B (Relapsed)	Group C (Control)	Significance (at P<0.05))		
					I vs III	II vs III	I vs II
1	**Total Protein (g/I)**	6.679 ± 0.53	7.363 ± 0.89	7.908 ± 0.75	**S**	**NS**	**S**
2	**Albumin (g/l)**	3.076 ± 0.64	4.020 ± 1.03	4.523 ± 056	**S**	**NS**	**S**
3	**SGOT (U/L)**	38.76 ±14.6	36.00 ± 18.7	28.31 ± 13.0	**NS**	**NS**	**NS**
4	**SGOT (U/L)**	22.3 ± 10.1	27.14 ± 15.5	25.36 ± 14.4	**NS**	**NS**	**NS**
5	**Serum Phosphate (mg/dI)**	4.632 ± 1.21	4.56 ± 0.671	4.360 ± 0.54	**NS**	**NS**	**NS**
6	**Total calcium (mg/dI)**	8.640 ± 0.882	8.100 ± 0.51	8.154 ± 0.54	**NS**	**NS**	**S**
7	**Lonic calcium (mg/dI)**	4.729 ± 0.52	4.149 ± 0.44	4.028 ± 0.24	**NS**	**NS**	**S**
8	**Corrected TCa (mg/dI)**	8.869 +- 0.98	7.662 ± 0.93	7.100 ± 0.45	**S**	**S**	**S**
9	**Alk. Phosphatase U/L**	261.4 ± 105.5	190.2 ± 57.0	185.6 ± 31.8	**S**	**NS**	**S**
10	**Vitamin D (ng/ml)**	16.1 ± 7.2	23.8 ± 11.0	30.02 ± 6.7	**S**	**NS**	**S**
11	**Parathyroid Hormone (pg/ml)**	27.8 ± 15.7	38.6 ± 16.3	42.0 ± 7.7	**S**	**S**	**S**

It was also found that Corrected TCa (mg/dI) and Parathyroid hormone were significantly more in cases group with maximum in newly diagnosed followed by relapse cases and controls. (Table 2)

Regarding Total Calcium and Lonic Calcium, it was observed that both were significantly less in newly diagnosed cases than relapse cases otherwise there was no significant difference between cases and controls. (Table 2)

IV. DISCUSSION

General characteristics of study population of the all the three groups viz newly diagnosed tuberculosis, relapse cases of tuberculosis and healthy mathed control were well comparable on the basis of age and sex.

In this study, Mean Body Mass Index (BMI) was found significantly less in cases groups than control and in cases group proportion of subjects with alcohol intake as well as smokers were significantly more than the control group.

Nutrition is the most important factor affecting susceptibility to any infection and disease outcome. BMI is much better indicator of nutritional status than weight alone because it takes height into account.[9] It has been well documented that PTB is associated with severe chachexia, weight loss and generalized weakness. All these factors beside low economic status of our study population causing nutritional depletion are all responsible for low BMI in cases than in controls significant difference was observed in smoking and alcoholic habits of Group A and B patients when compared to controls ($p<0.001$). Since smoking adversely affects lung function and reduces its vital capacity cases of PTB disease and relapse are more common in smokers than non smokers.

When Biochemical parameters were assessed and compared of these three groups it was found that although SGOT, SGPT, Phophtase were without significant difference in all the three groups but total protein, albumin, Alk. Phosphatase and Vitamine D was found significantly less in newly diagnosed cases (group 'A') than other groups.

Difference in Total protein and albumin level between Group A and Group B was not significant. Reduced Total protein found in this study might be due to pre-existing under nutrition, malabsorption in TB infection, increased catabolism and anorexia in PTB cases. Further, low albumin and high globulin level are Known complications of PTB observed in various studies.[9,10,11] Albumin is an important component of plasma antioxidant activity and is a negative acute phase protein which decreases during any inflammatory condition. Injury or in stress as a result of increased metabolic need for tissue repair and free and radical utilization.[11] Further leakage of albumin through vascular endothelium and reduced hepatic synthesis is are the factors combined with under nutrition and loss of appetite associated with PTB results in low albumin level in patients (both newly diagnosed and relapse) than in controls.[12]

V. CONCLUSION

It can be concluded from this study that Protein, Albumin, Alkaline Phosphatase and Vitamine D were found significantly less in newly diagnosed tubercular cases than controls. So it can be concluded that tuberculosis is more common in nutritionally deficit individuals.

CONFLICT

None declared till date.

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