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RESEARCH ARTICLE

Nutritional status in sputum positive and sputum negative cases of pulmonary tuberculosis

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ABSTRACT

Background: In a developing country like India, tuberculosis (TB) and malnutrition, both the problems are of prime concern. There is an increase in the occurrence of sputum negative TB in regions having high human immunodeficiency virus prevalence. Furthermore, it seems that nutritional status may predict clinical outcome in TB. **Aims and Objectives:** To determine nutritional status in sputum smear positive and sputum smear-negative cases of pulmonary TB (PTB). **Methods and Materials:** A total of 54 male patients, diagnosed with PTB by an expert physician, based on sputum smear microscopy and radiography were recruited for study. They were divided into sputum smear-positive pulmonary tuberculosis (SPPT) and sputum smear-negative pulmonary tuberculosis (SNPT) group. Age, medical history (cough, fever, anorexia, weight loss, and hemoptysis), weight, height, body mass index, hemoglobin, and serum protein were recorded and compared in both groups. **Results:** About 62.96% of patients were smear positive and 37.03% were smear negative. Cough, fever, anorexia, and weight loss were more common in SPPT patients than in SNPT group, but it was not statistically significant except cough ($P < 0.05$). Nearly, 38% of SPPT patients were severely underweight and almost 30% of SNPT were severely underweight. **Conclusions:** It appears that undernutrition among SPPT and SNPT patients of PTB is a result of preexisting chronic undernutrition as well as concurrent active infection, which increases the severity of weight loss. As a result, nutritional support is of prime importance for the patient and must be given during treatment phase.

KEY WORDS: Pulmonary; Tuberculosis; Nutrition; Sputum; Smear

INTRODUCTION

The World Health Organization (WHO) Global tuberculosis (TB) Report states that, India alone has one-fourth cases of TB out of the total patients worldwide.[1] An increase in occurrence of human immunodeficiency virus (HIV) infection in the last two decades of the 20th century has globally affected the incidence of pulmonary TB (PTB), and the cases are increasing since then.[2] Diagnosis of PTB is based on the detection of acid-fast bacilli (AFB) in the sputum from the patient, but in many incidences, sputum of patients of PTB is negative for AFB, making the diagnosis difficult.[3] The patients who are positive for AFB in sputum examination have high bacterial load in the lung lesion, on the contrary patients with sputum smear-negative for AFB have low bacterial load. Smear-negative cases do not require the same intensity and duration of therapy as smear-positive cases.[4] It has been reported in some studies that there is an increased occurrence of sputum negative TB in regions having high HIV prevalence.[5] Furthermore, one-fifth of tubercular transmission has been reported to be due to sputum negative cases of TB though smear-positive patients are more infectious.[6]

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In a developing country like India, TB and malnutrition, both the problems are of prime concern and undernourishment has very often been associated with an exceptional increase in the cases of TB.[7] Normal functioning of the body systems and normal immune response against infections depends on normal nutritional status. Furthermore, cell-mediated immunity plays an important role in defense against TB.[8] Determination of nutritional status in patients of PTB has lot of significance. It seems that nutritional status may predict response to treatment in TB. Effective management of TB requires the assessment of nutritional status, as many complications of disease can be prevented or modified by simultaneous administration of nutritional supplements.[9] Therefore, it becomes essential to find how nutrition and TB may be related in sputum smear-positive cases with high bacterial load and sputum smear-negative cases of TB with low bacterial load, as there is very little data comparing nutrition in these two groups.

MATERIALS AND METHODS

This is a cross-sectional study which intends to compare the nutritional status between sputum smear positive and sputum smear negative newly diagnosed cases of PTB.

Selection of Patients

A total of 54 male patients in the age group of 20–50 years, attending outpatient or admitted in TB and chest ward of hospital, following the inclusion criteria were selected for the study. A written informed consent was taken from all patients. This study was approved by the Research Ethics Committee of the Institute.

Diagnosis of PTB was made by an expert physician and was based on sputum smear microscopy and radiography.[10] The patients were categorized into two groups sputum smear-positive pulmonary tuberculosis (SPPT) and sputum smear-negative pulmonary tuberculosis (SNPT). Diagnosis of SPPT was made if microscopic examination of one or more direct smears of sputum was positive for AFB on Ziehl–Neelsen staining. Diagnosis of SNPT was made if a patient with symptoms suggestive of pulmonary TB had two smear examinations negative for AFB but had X-ray chest compatible with pulmonary TB as examined by expert.[11] The patients with extrapulmonary TB, other systemic disorders, and any chronic illness were excluded from study.

Methods

In all patients, following parameters were recorded:

- Age (years)
- Medical history (cough, fever, anorexia, weight loss, and hemoptysis)
- Weight (kg)
- Height (meters)
- Body mass index (BMI) (kg/m2)
- Hemoglobin (g/dl)
- Serum protein (g/dl).

Using the weight and height, BMI was calculated and patients were classified into categories based on the BMI cutoffs for weight categories as recommended by the WHO.[12] All patients were provided treatment as per directly observed therapy.

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences, version 16.0. Data were presented as mean ± standard deviation (SD), number of cases. Fisher exact test was used to compare categorical data. $P < 0.05$ was considered to be statistically significant.

RESULT

A total of 54 male patients diagnosed with PTB were selected for the study. Of these patients, 34 (62.96%) were smear positive and 20 (37.03%) were smear negative. The demographic and clinical details of the two groups are shown in Table 1. The anthropometric assessment and investigations are represented in Table 2. Distribution of sputum positive and sputum negative cases of PTB among various categories of BMI is represented in Figure 1. Finally, the percent cases in each BMI category are depicted in Figure 2.

DISCUSSION

This study was done to assess the nutritional status in sputum smear positive and sputum smear-negative cases of PTB. We recruited 54 adult male patients of PTB and divided them into two groups of sputum SPPT and sputum SNPT on the basis

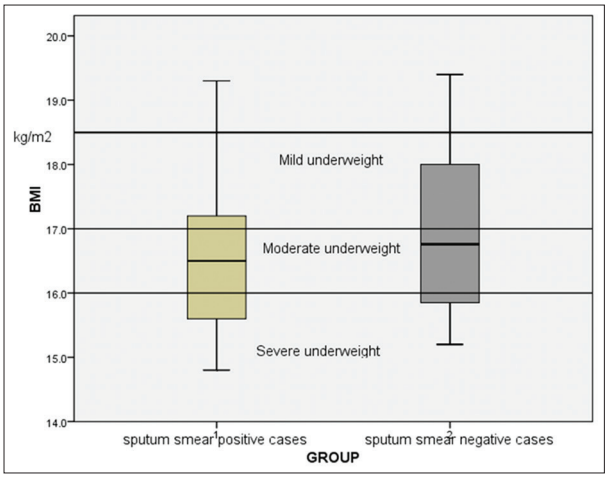

Figure 1: Distribution of sputum positive and sputum negative cases of pulmonary tuberculosis according to body mass index

Table 1: Demographic and clinical history in sputum positive and sputum negative PTB patients

Parameters	SPPT (*n*=34)	SNPT (n=20)	*P* value
Age (y) mean±SD	39.53±6.23	39.80±7.03	0.884
Cough* number of patients (%)	27 (79.4)	10 (50)	0.035
Fever number of patients (%)	24 (70)	10 (50)	0.154
Anorexia number of patients (%)	24 (70.5)	10 (50)	0.154
History of weight loss number of patients (%)	20 (58.8)	9 (45)	0.401
Hemoptysis number of patients (%)	4 (11.7)	0 (0)	0.284

*Significant at $P<0.05$. PTB: Pulmonary tuberculosis, SD: Standard deviation, SPPT: Smear-positive pulmonary tuberculosis, SNPT: Smear-negative pulmonary tuberculosis

Table 2: Anthropometric assessment and investigations in sputum positive and sputum negative PTB patients

Parameters	Mean±SD		*P* value
	SPPT (*n*=34)	SNPT (*n*=20)	
Weight (kg)	43.82±3.4	44.90±4.4	0.322
Height (cm)	162.4±3.2	162.2±3.0	0.762
BMI (kg/m^2)	16.55±1.03	16.99±1.3	0.171
Hemoglobin (g/dl)	10.85±2.27	11.19±1.21	0.468
Serum protein (g/dl)	5.75±0.83	6.26±1.24	0.076

PTB: Pulmonary tuberculosis, BMI: Body mass index, SPPT: Smear-positive pulmonary tuberculosis, SD: Standard deviation, SNPT: Smear-negative pulmonary tuberculosis

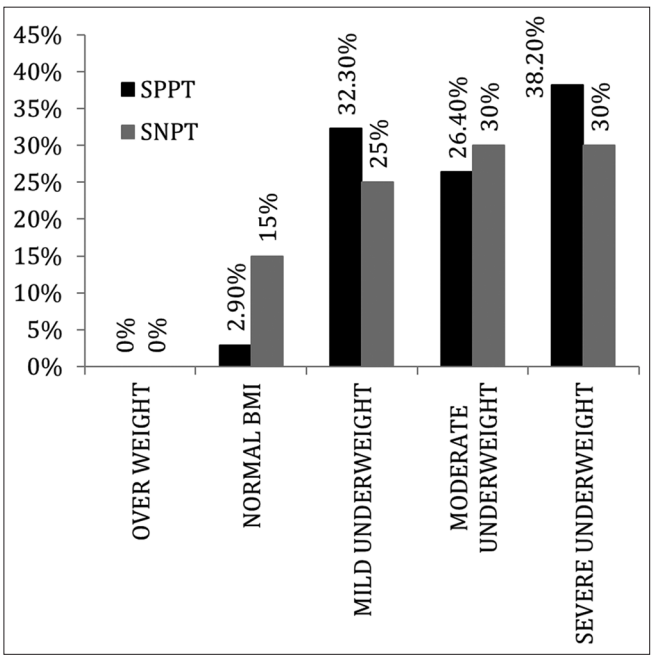

Figure 2: Percent cases in each body mass index category

of sputum smear microscopy and radiography. Of 54 patients of PTB, almost 63% were sputum smear positive and 37% were sputum smear negative. Mean ± (SD) age in years of patients in SPPT group was 39.53 ± 6.23 and that in SNPT group was 39.80 ± 7.03. In SPPT group, 79.4% had cough, 70% had fever, 70.5% had anorexia, 58.8% had a history of weight loss, and 11.7% had hemoptysis, whereas in SNPT group, 50% had cough, fever, anorexia, 45% had a history of weight loss, and none had hemoptysis. Mean value of BMI, hemoglobin, and serum protein in SPPT and SNPT groups was found to be 16.55, 10.85, 5.75 and 16.99, 11.19, 6.26, respectively.

Other studies have also found similar prevalence of smear positive and negative cases.[13,14] Few have found more prevalence of smear-negative cases as compared to smear-positive cases.[15] We did not find any statistically significant difference between the two groups with reference to their age, as also reported in other study.[15] Regarding symptoms, although all the symptoms were more common in SPPT patients than in SNPT group, it was not statistically significant except cough ($P < 0.05$). This may have been because of higher disease burden among smear-positive patients. Hemoptysis was least common symptom, though it was more frequent in SPPT patients as compared to SNPT cases. There was no statistically significant difference between the two groups with respect to weight, height and BMI, hemoglobin, and serum protein, but most of the patients in both groups were underweight. Nearly, 38% of smear-positive patients were severely underweight, and among sputum negative patients, almost 30% of them were severely underweight. Studies have reported significant difference in BMI among TB and healthy controls and malnutrition has previously also been observed in patients of PTB, as shown by reductions in the level of visceral proteins, anthropometric profile and micronutrient status and serum albumin.[16-19] It is stated in some research that malnutrition predisposes to infection by decreasing body's immune response leading to the impaired interaction between T-lymphocytes and macrophages.[20] Previous work shows that weight and nutritional status are important parameters to predict the treatment outcome and survival among the patients and those losing weight in the 1st month of treatment should be observed closely.[21-23]

There are a few limitations to this study. This is a cross-sectional study. Prospective studies with long-term follow-up and monitoring the effect of nutritional status on response to the treatment and culture conversion will give a close insight into this aspect.

CONCLUSION

It appears that undernutrition among SPPT and SNPT patients of PTB is a result of preexisting chronic undernutrition as well as concurrent active infection, which increases the severity of weight loss. As a result, nutritional support is of prime importance for the patient and must be given during treatment phase.

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