Impact of pulmonary tuberculosis sequelae on the functional status

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Introduction

Patients who have completed a course of treatment for pulmonary tuberculosis (TB) are frequently left with respiratory disability due to impairment in pulmonary function caused primarily by to fibro-cavitary lung disease. Some patients experience significant hypoxemia with pulmonary hypertension and ventilatory defects [1-4]. High prevalence of obstructive lung disease is seen in cured pulmonary TB patients [5]. Pulmonary tuberculosis (TB) can lead to parenchymal destruction of lung tissue by up regulation of several proteases and dysregulation of protease control [6]. The histopathological abnormalities in cured TB patients include fibrosis, bronchiectasis and bronchial stenosis that can cause pulmonary function abnormalities [7]. Some previous studies have evaluated changes inpulmonary function after pulmonary TB treatment and stated that 48.7% to 76% of patient's had pulmonary function abnormalities after completing pulmonary TB treatment [8-11]. Some studies in past have shown obstructive defects as the main abnormality in cured TB patients, but recently studies have shown that functional abnormalities of lungs could be obstructive, restrictive, or mixed defects [9-11]. The impairment in pulmonary function after completing pulmonary TB treatment is related to long-term respiratory symptoms, which affect quality of life [3,12].

India accounts for 26% of global TB burden [13]. Post tubercular impairment can manifest as obstructive airway disease, mixed defect, or as pure restrictive defect [14]. It is important to identify patients with pulmonary function deterioration after the completion of pulmonary TB treatment. However, little is known about the trends in the changes in pulmonary function associated with pulmonary function deterioration. Therefore, we conducted a study to investigate the trends of the changes in pulmonary function in patients with pulmonary tuberculosis after the completion of treatment.

Material & Methods

Present study was carried out in the Department of Pulmonology, Dr. SN Medical College, Jodhpur (India) from January 2014 to January 2015. Eighty cured pulmonary TB patients who has taken full course of anti-tubercular therapy (ATT) (age between 18-60 years) were included and divided into 2 group. Group I patients who taken one time ATT for 6 months and group II patients who take ≥2time ATT. Informed consent was taken from all patients. The study was approved by the Ethics committee.

Chest radiographs, performed at the end of treatment, were analysed by a radiologist and a pulmonologist. Information was collected through a standardized form with demographic data (age, sex, race, BMI), clinical data, medication and smoking habits. Spirometry was done for assessment of lung function using RMS Medspiror Spirometer [15]. Finally, the physical-functional condition was assessed by 6MWT using the guidelines of the American Thoracic Society (ATS) [16].

All patients included were cured pulmonary TB with negative sputum microscopy and chest X-ray normal or showing inactive lesions. Patients with history of bronchial asthma, interstitial lung diseases, cardiac diseases, anaemia or occupational lung diseases were excluded.

The results were expressed as mean and standard deviation for data with normal distribution. For the analysis of categorical variables the chi-square was used and for the analysis of continuous variables the *t*-test.

Results

Among 80 patients, 42 were included in group I and 38 in group II. A greater number of men were included. There was no statistically significant difference in baseline features (Gender, smoking history, BMI) between both in comparison groups (Table 1). Most common symptom was dyspnea followed by cough with expectoration, chest pain, fever and haemoptysis as shown in (Table 2). Dyspnea (mMRC) was more frequent in group II patients as compared to group I patients (Table 3). Spirometry could not be performed in 9 patients due to massive haemoptysis. Commonest pattern of ventilatory defect among old pulmonary TB sequelae patients was mixed, followed by obstructive. Group II showed more patients with mixed ventilatory impairment as compared to group I. ($p=0.1$) Patients in group II showed lower values of FEV1 %, FVC% and FEV1/FVC. Significantly ($p<0.01$) higher rate of normal spirometry was noted among group I patients (Table 4). Patients in group II showed greater functional impairment, as the average distance walked in 6MWT was 78.21 meter lower than group I. ($p<0.001$) (Table 5). There was no statistically significant difference between both the study groups in relation to other parameters (SpO_2, HR, Borg Scale) of 6MWT (Table 6). Calcification, cavity, fibrosis, bullae and fungal ball

were observed more frequently among group II patients whereas ring shadows were more common among group I patients (Table 7).

Table 1: Baseline comparison of groups

Baseline features		Group I (n=42)	Group II (n=38)	Test applied	P value
Mean age (y)		49.59±13.98	53.31±13.09	"t" test	0.3
Gender	Male	36	35	Chi square	0.5
	Female	6	3		
Smoking	Smokers	24	25	Chi square	0.5
	Non smokers	18	13		
Mean weight (Kg)		55.35±9.02	58.13±6.88	"t" test	0.2
Mean height (cm)		162.38±8.81	159.54±26.87	"t" test	0.6
Mean BMI (Kg/m^2)		20.89±2.24	21.58±1.90	"t" test	0.2

Table 2: Presenting clinical features

Clinical features	No. of patients	Percentage
Dyspnea	75	93.75
Cough with expectoration	42	52.5
Chest pain	10	12.5
Fever	26	32.5
Hemoptysis	24	30
Other	12	15

Table 3: Comparison of dyspnoea between groups

mMRC grade of dyspnoea	Group I (n=42)	Group II (n=38)	P value
No. dyspnoea	4	1	0.2
I	19	14	0.3
II	13	16	0.5
III	4	5	0.7
IV	2	2	0.9

Table 4: Comparison of ventilatory impairment between groups

Spirometry interpretation	Group I (n=42)	Group II (n=38)	P value
Normal	13	1	**<0.01**
Obstructive	11	14	
Restrictive	1	0	
Mixed	13	18	0.1
Total	38	33	

Table 5: Comparison of 6MWT between groups

	Group I (n=42)	Group II (n=38)	Difference	P value
6MWD (meter)	377.02±82.49	298.81±59.00	78.21	**<0.001**

Table 6: Comparison of 6MWT parameters

	Pre		post	
	Group I	Group II	Group I	Group II
spo2	97.59±1.24	97.39±1.34	97.23±1.22	97.10±1.20
HR	85.16±14.00	84.68±10.30	90.28±14.48	90.10±11.40
BORG scale	5.76±0.98	6.21±0.99	7.04±0.93	7.44±0.68

Table 7: Comparison of various residual lesions between groups

Residual lesion	Group I (n=42)	Group II (n=38)	P value
Calcification	19	22	0.3
Cavity	18	19	0.7
Fibrosis	15	19	0.2
Ring shadows	23	21	0.9
Bullous area	10	11	0.07
Fungal ball	6	10	0.2

Discussion

The present study demonstrates a significant increase in functional limitations in patients with pulmonary TB sequelae, who had undergone multiple treatments compared to patients cured in the first treatment. Changes in lung function and large residual lesions are not a common findings in patients with TB who are diagnosed early and whose treatment is appropriate and uneventful.

Group II showed more patients with mixed ventilatory impairment on Spirometry, as compared to group I but this finding could not achieve statistically significant level (p=0.1). The mean values of FEV1/FVC ratio, FEV1 (%) and FVC (%) were lower in group II as compared to group I. This difference was statistically significant. However, there was no statistically significant difference in absolute values of FEV1 (L) and FVC (L) between both groups. Di Naso et al. [18] observed similar findings that the group which had patients who had taken multiple time ATT (group II) showed significantly lower values in FVC, FEV1, MIP, MEP and distance covered in 6MWT.

Moreover, in patients with severe chronic obstructive pulmonary disease, a performance of less than 300m distance walked during the test represents a mortality rate twice as high [19]. In the present study, patients in group II walked on average 298.81±59.0 m while the patients of group I walked on an average 377.02±82.49m. Patients in group II showed a greater functional impairment as the average distance walked in 6MWT was over 78.21 m lower, and from this we can hypothesize that they have a higher risk of early mortality.

Conclusions

Significant number of treated and cured TB patients suffer from clinical, radiological and functional post treatment sequelae leading to significant morbidity because microbiological cure is just the beginning not the end of their illness. Treatment protocols involving use of bronchodilators and pulmonary rehabilitation should be integral part of DOTS programme and will improve the impact of national programme in the community and quality of life of patients with functional TB sequelae.

Conflicts of interest: None declared

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