



Original Research Article

Significance of frequent spirometry test in treated pulmonary tuberculosis patients in tertiary care teaching hospital

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ABSTRACT

Introduction: Tuberculosis is one of the most important communicable disease, which poses a global public health threat and remains the leading cause of death among infectious diseases, especially in undeveloped and developing countries.

Materials and Methods : It was a prospective, observational, hospital based study conducted in the department of Respiratory Medicine, IPGMER SSKM Hospital, Kolkata from January 2020 to December 2020. A total of 80 cases, with history of adequately treated one episode of pulmonary tuberculosis, were included in this study.

Result: According to pulmonary function test results, 30(37.5%) patients had obstructive pattern and 11(13.8%) had restrictive pattern, in spirometry. Another 15(18.8%) patients had, mixed obstructive/restrictive pattern, while in rest 24 (30%) patients, spirometry test results were normal. The distribution of various pulmonary function test results among patients with obstructive pattern (N=30), ATT completion history was 7.57 ± 2.77 years back in average. Whereas average duration of symptoms in them was found to be 4.03 ± 1.96 years. For patients with restrictive pattern (N=11), these durations were 10.91 ± 2.51 years and 7.59 ± 2.35 years respectively. Patients with mixed pattern (N=15), both durations were 11.33 ± 3.50 years and 7.33 ± 2.94 years respectively. Whereas among patients with normal lung function (N=24), ATT completion duration was 2.83 ± 2.21 years and symptom onset duration was 0.63 ± 0.34 years.

Conclusions: There was emphatically found that duration of anti-tubercular treatment, duration of symptoms and pulmonary function abnormalities. Hence clinical suspicion, early diagnosis and early treatment strategy are required to prevent further deterioration of pulmonary function in treated Pulmonary tuberculosis (PTB) patients. So, frequent or annual spirometry is required in these patients.

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1. Introduction

Tuberculosis is the most important communicable disease, which represents a worldwide general problem and stays the main source of death among infectious diseases, particularly in undeveloped and developing countries.¹ Pulmonary tuberculosis (PTB) is the most common type of tuberculosis causing >85% of all tuberculosis cases.

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All over world, around 1.9 billion persons, that is almost 33% of total populace are assessed to be contaminated with mycobacterium tuberculosis.² It has been discovered that without therapy, TB has characteristic persistent irritation and has a death pace of half inside five years.³ Although standard anti-TB treatment is highly effective, but after completion of treatment for pulmonary TB, around 66% of patients were found to have pulmonary function abnormalities, with obstructive deformity being the principle abnormality.⁴

Airflow obstruction has numerous causes, Pulmonary TB, which can be a reason for this, has not been concentrated in detail, especially in non-smokers. Post tuberculosis pulmonary impairment debilitation has arisen as a particular clinical substance, which is practically vague from other forms.⁵ During the therapy period of dynamic PTB, lung function impairment is normally prohibitive, this may endure, resolve or become obstructive in nature.⁶ A connection between Pulmonary TB and the improvement of persistent wind current obstacle has been proposed in a report, autonomous of other commonest risk factors for instance smoking.^{7–13}

With the rising infection weight of pulmonary TB and COPD, it is imperative to learn about the idea of the connection among tuberculosis and the ensuing advancement of persistent wind current impediment. Non-smoking danger variables of COPD have all the earmarks of being particularly significant in non-industrial nations, where TB is probably going to represent countless these cases.

As in our area no such study has been carried out in recent past, we decided to conduct a prospective hospital based observational study, of one year duration. The study would include patients from local population, having recent or past history of one episode of pulmonary tuberculosis and completed adequate anti-tubercular therapy, non-smoker, attending out-patient department (OPD) for routine follow up with symptoms like cough, with or without expectoration, chronic exertional dyspnea, where other causes of chronic dyspnea should be ruled out.

2. Materials and Methods

It was a prospective, observational, hospital based study conducted in the department of Respiratory Medicine, IPGMER SSKM Hospital, Kolkata, India from January 2020 to December 2020 Approval of IEC were obtained and patients consent were received. A total of 80 cases, with history of adequately treated one episode of PTB were included in this study.

2.1. Inclusion criteria

1. Age – 18 to 70 years
2. Sex – both male and female
3. Patients with definite (recent or past) history of single episode Pulmonary Tuberculosis (PTB), who had been adequately treated (with optimum dose and 6 months duration) with standard anti-tubercular therapy (ATT).
4. Stable ambulatory patients, who presented with variable symptoms and sign:
5. With or without cough, with variable amount of expectoration.
6. With or without chronic exertional dyspnea.
7. With or without sign of auscultatory wheeze.

2.2. Exclusion criteria

1. Extrapulmonary TB, disseminated/miliary TB, tubercular pleural effusion.
2. Serious comorbid conditions – recent Myocardial infarction, congestive heart failure, recent bilateral pneumonia, acute exacerbation of bronchial asthma and Chronic Obstructive Pulmonary Disease, Interstitial Lung diseases, neoplastic diseases, Human Immunodeficiency Virus infection.
3. Current or past history of smoking (any type).
4. Sputum smear result for Acid Fast Bacilli (AFB) positive and/or unknown.
5. Patients not willing to give consent.
6. Pregnant females.

2.3. Methodology

After taking detail medical history, comorbid conditions and addiction, complete physical examination was done for each. Dyspnoea was graded according to modified MRC dyspnoea scale. Relevant routine investigations, sputum: AFB smear and culture, ECG, Chest X-Ray were done for each patient.

2.4. Spirometry

Pulmonary function was assessed via computerized spirometer in spirolab in medical college OPD. GOLD guidelines were followed for performing and result interpretation of spirometry. Three attempts were recorded after explaining technique to patients and best one was considered, if variation between two best readings was less than 5% or 150 ml.

2.5. Statistical methods

The statistical analysis has been performed using SPSS software version 20. The statistical analysis of quantitative data across the groups was done by using ANOVA one-way test followed by post-hoc test. The qualitative data was analysed using chi-square/Fisher-exact test. Correlation between the duration since the completion of anti-tubercular therapy and development of symptoms was carried out by Pearson correlation analysis. P-value <0.05 was considered to be statistically significant.

3. Results

A total number of 80 patients who fulfilled inclusion/exclusion criteria, were included in this study. The baseline demographic profile of all patients is depicted in Table 1.

In this present study, the mean age of population was 52.46±14.06 years, with male 52(65%) and female 28 (35%), respectively, with a sex ratio 1.86:1.

Table 1: Demographic profile of all patients

Demographic features	No. of patients (N=80)
Age (years)	52.46 ± 14.06
Sex:	
Male	52 (65%)
Female	28 (35%)
Addiction:	
None	53 (66.3%)
Tobacco chewing	18 (22.5%)
Alcohol	7 (8.8%)
Both	2 (2.5%)

Table 2: Clinical profile of all patients

Co-morbidity	No. of patients (N=80)
None	56 (70%)
BPH	2 (2.5%)
DM	5 (6.3%)
HTN	11 (13.8%)
OA	2 (2.5%)
DM & HTN	3 (3.8%)
HTN & BPH	1 (1.3%)

The most common associated co-morbidity found in this study population, was Hypertension (HTN) 11.14%, followed by Diabetes Mellitus (DM) 5.6%.

Table 3: Pulmonary function profile of all patients

Pulmonary function parameters	No. of patients (N=80)
FEV1 in L.	1.75 ± 0.84
FEV1%	69.34 ± 20.18
FVC in L.	2.43 ± 0.92
FVC%	76.96 ± 14.27
FEV1/FVC	0.69 ± 0.13
Pattern	
Normal	24 (30%)
Obstructive	30 (37.5%)
Restrictive	11 (13.8%)
Mixed	15 (18.8%)

According to pulmonary function test results, 30 (37.5%) patients had obstructive pattern and 11(13.8%) had restrictive pattern, in spirometry. Another 15 (18.8%) patients had, mixed obstructive/restrictive pattern, while in rest 24 (30%) patients, spirometry test results were normal. The distribution of various pulmonary function test results has been depicted in Table 3.

Among patients with obstructive pattern (N=30), ATT completion history was 7.57 ± 2.77 years back in average, whereas average duration of symptoms in them was found to be 4.03 ± 1.96 years.

For patients with restrictive pattern (N=11), these durations were 10.91 ± 2.51 years and 7.59 ± 2.35 years respectively. Patients with mixed pattern (N=15), both durations were 11.33 ± 3.50 years and 7.33 ± 2.94 years respectively.

Whereas among patients with normal lung function (N=24), ATT completion duration was 2.83 ± 2.21 years and symptom onset duration was 0.63 ± 0.34 years.

A strongly positive correlation was found with help of post hoc analysis, between duration of ATT completion and symptom duration with abnormalities in pulmonary function, depicted in Table 4.

A strongly positive correlation was found with a Pearson correlation value 0.858 and significant p value 0.0001, in comparison between duration of completion of ATT and development of symptoms. As the ATT completion duration increased, symptoms duration in years also found to be increased with abnormalities in lung function.

4. Discussion

In our study it was found that, among 80 patients who were included, 30(37.5%) had obstructive, 11(13.8%) had restrictive, 15(18.8%) had mixed obstructive/restrictive pattern and in 24(30%) patients, pulmonary function test was normal.

Patients with obstructive pattern were further classified according to GOLD guidelines¹⁴ as per severity stages. It was found, severe stage-III in 6(20%), moderate stage-II in 20(80%) patients.

Baig et al.,¹⁵ found that, 55.3% patients of their study population, had an obstructive ventilatory defect. Their inclusion criteria were similar with us. They included adults aged 18-65 years, having past history of pulmonary tuberculosis, had completed anti-tuberculosis therapy and then presented with chronic exertional dyspnea with or without cough.

In their study, 47 individuals were considered for analysis. Out of them, 76.5% (n=36) were males. The age in males ranged between 24 and 65 years with a mean of 56.4 years. In females, it ranged between 33 and 59 years with a mean of 44.2 years. Among those, 55.3% (n=26) were found to have an obstructive ventilatory defect of different degrees: severe stage-III in 69.2% (n=18), moderate stage-II in 23.0% (n=6) and mild stage-I in 5.9% (n=2).

The study conducted by Zakaria et al.,⁸ included 50 patients, with history of treated PTB and symptoms of chronic exertional dyspnea with or without cough. They had excluded all types of smokers, reactivation of PTB, acute exacerbation of asthma and other serious comorbidities. Thus their selection criteria were similar with us.

Their pulmonary function test showed, 22 patients (44%) with irreversible obstructive pattern denoting COPD, which they concluded can be sequel of PTB. Seven (14%) patients had restrictive ventilatory defect, and 3(6%) patients had mixed obstructive and restrictive pattern. Of those 22 patients with irreversible obstructive pattern (COPD), 11 patients (50%) had mild obstruction, 9 patients (40.9%) had moderate obstruction, and 2 patients (9.1%) had severe obstruction.

Table 4: Comparison of ATT taken and duration of symptoms in years with pulmonary Function

Parameters	Normal (N=24)	Obstructive (N=30)	Restrictive (N=11)	Mixed (N=15)	p-value
ATT taken (years)	2.83 ± 2.21	7.57 ± 2.77	10.91 ± 2.51	11.33 ± 3.50	0.0001*
Symptoms duration(years)	0.63 ± 0.34	4.03 ± 1.96	7.59 ± 2.35	7.33 ± 2.94	0.0001*

Table 5: Correlation between the duration since the completion of anti-tubercular therapy and development of symptoms

Parameter	Pearson Correlation	p-value
Completion of anti-tubercular therapy vs development of symptoms	0.858	0.0001*

They analyzed 1,384 subjects who participated in the nationwide Korean COPD survey. All subjects were older than 40 years and took the spirometry test and simple chest radiography. They defined the airflow obstruction as FEV1/FVC <0.7.

4.1. Duration of symptoms and completion of ATT in comparison to pulmonary function abnormalities

In this study, ATT completion duration in years and duration of symptoms in years, were compared with pulmonary function abnormalities. A statistically significant strong positive correlation was found (p value 0.0001), between airflow obstruction and completion of treatment and also between normal lung function and each other type of pulmonary function impairment.

Patients who had normal lung function (N=24), the duration of completion of ATT was 2.83 ± 2.21 years, whereas their symptoms developed within 0.63 ± 0.34 years. Thus, it was observed that, more recent history of ATT completion had normal lung function with shortest duration of symptom onset.

Patients with obstructive pattern (N=30), the duration of completion of ATT was 7.57 ± 2.77 years, whereas their symptoms duration was 4.03 ± 1.96 years. For patients having restrictive pattern (N=11), the average duration of treatment completion was 10.91 ± 2.51 years and their symptoms developed 7.59 ± 2.35 years back. Comparing both Normal vs. Obstructive and Normal vs. Restrictive, positive correlations were found which was statistically significant. Comparison between Obstructive and Restrictive pattern also gave a positive correlation between treatment completion duration and symptom onset duration.

Patients with mixed obstructive/restrictive pattern (N=15), the average duration of completion of ATT was 11.33 ± 3.50 years and their symptom duration average was 7.33 ± 2.94 years. There was no positive correlation found when mixed pattern was compared with Obstructive and Restrictive pattern separately. But positive correlation was significant when compared with patients with normal lung function.

There is not much of data available, on the movement of impediment after culmination of hostile to tubercular treatment. Plit et al,¹⁶ examined a hospitalized accomplice of patients during their first scene of tuberculosis (n=74). Throughout treatment, prohibitive imperfections turned out to be less predominant, while wind stream deterrent created in a few. The predominance of limitation declined from 57% at finding and beginning of treatment, to 24% after treatment finishing (generally at a half year). Interestingly, wind current hindrance expanded from 11% (n=8) at conclusion, to 28% (n=21) on treatment consummation. Consequently 62% of post-treatment wind current hindrance created while on treatment.¹⁷⁻²¹

5. Conclusions

Pulmonary Tuberculosis is most common form of Tuberculosis and a major public health concern, all over the world. But even after completing treatment for pulmonary TB, about two-thirds of patients found to have pulmonary function abnormalities, with obstructive defect being one of the main abnormalities. Timely diagnosis with help of spirometry is important to start prompt treatment in these patients. So all treated pulmonary tuberculosis patients may be suggested to undergo spirometry test more frequently and regularly, to avoid diagnosis or treatment delay.

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8. Conflict of Interest

The authors declare they have no conflict of interest.

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