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Evaluation of Spirometric Profile of Post-Pulmonary Tuberculosis Patients Attending In the Department of Respiratory Medicine in Agmc and Gbp Hospital

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ABSTRACT

Background: Tuberculosis, the disease caused by Mycobacterium tuberculosis, is recognized as a global public health problem. Post Tuberculosis sequelae are the anatomical and pathophysiological changes in the respiratory system which occurs secondary to complications of pulmonary TB, whether primary or secondary, even after completion of treatment and complete bacteriological cure. Accurate estimates of the frequency and the extent of the pulmonary impairment from tuberculosis are important to patients and clinicians. Hence, it is necessary to assess the extent of the pulmonary function abnormalities among patient who have successfully completed the treatment for pulmonary tuberculosis.

Objectives: To assess the type and grade of airway obstruction in patients who are successfully treated for pulmonary tuberculosis attending Respiratory Medicine department.

Methodology: Cross-sectional hospital based observational study was conducted for a period of one and a half years between February 2021 to July2022 in a tertiary care at Agartala Tripura. All the patients with past history of treated tuberculosis attending in the Department of Respiratory Medicine (OPD & IPD), Agartala Govt. Medical College & G.B.P. Hospital from February 2021 to July 2022 were included in the study fulfilling inclusion and exclusion criteria. During this period spirometry was performed among 152 patients.

Results: The study found that the predominant residual respiratory symptom was shortness of breath (146; 96.1%). This was followed in a descending order by cough (108; 71.1%), haemoptysis (23; 15.1%) and chest pain (58; 38.2%). Among 152 cases, 109 cases were found to have abnormal spirometric patterns. Different age group distribution between 32 different spirometric pattern was not significant ($p>0.05$). The different spirometric pattern found was involving 67 (44.08%) with obstructive pattern, 27(17.76%) with restrictive pattern, 15(9.87%) with mixed pattern and normal patterns found in 43(28.29%) patients. Majority of the patients 43 cases (64.18%) with obstructive spirometric pattern had severe obstruction. 4 (5.97%) cases had mild obstruction; 20(29.85%) cases had moderate obstruction. Among the recruited patients with abnormal spirometric pattern, 22(20.18%) cases showed significant bronchodilator reversibility (BDR) response and 87(79.82%) cases showed non-significant bronchodilator reversibility response.

Conclusion: The study found that pulmonary tuberculosis irrespective of duration of treatment and outcome of the disease does not correlate with the pulmonary function. It was also found that many of the post-pulmonary tuberculosis patients have persistent respiratory symptoms with obstructive lung disease being the most predominant lung function impairment.

Key Words: *Pulmonary tuberculosis, spirometric profile of TB patients, post pulmonary tuberculosis patients*

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INTRODUCTION

Tuberculosis, the disease caused by Mycobacterium tuberculosis, is recognized as a global public health problem and is the leading cause of mortality due to respiratory infection worldwide killing approximately 1.5 million people each year and its control has becomea challenge in recent decades [1]. As the infection spreads through inhalation of droplet nuclei containing mycobacterium tuberculosis, lung is the primary site of infection, and the most common organ involves in tuberculosis [2]. However, successful treatment of tuberculosis based on either documentation of bacteriological clearance of mycobacterium tuberculosis bacilli from the involved site or completion of the prescribed drugs does not assess structural and functional effects on the involved organ [3]. The overall prevalence of pulmonary impairment is much higher in patients treated for pulmonary tuberculosis than in general population [4]. Among treated and cured tuberculosis patient, some of the patients may develop respiratory sequelae characterized by chronic respiratory

symptoms including cough, sputum and dyspnea. These sequelae may persist even in individuals who have been properly treated for tuberculosis and should not be neglected as they have a negative impact on the individual's quality of life [5]. Accurate estimates of the frequency and the extent of the pulmonary impairment from tuberculosis are important to patients and clinicians. Pulmonary function test objectively quantifies lung function and impairment and are used to evaluate persons with chronic lung disease [6]. In addition, little is known about the relationship between the symptoms of tuberculosis, its spirometric changes due to pulmonary tuberculosis and decrease in the lung function of the patient who have completed treatment of tuberculosis. Hence, it is necessary to assess the extent of the pulmonary function abnormalities among patient who have successfully completed the treatment for pulmonary tuberculosis

AIMS & OBJECTS

1) To evaluate spirometric profile of post pulmonary tuberculosis treated patients.
2) To assess the type and grade of airway obstruction in patients who are successfully treated for pulmonary tuberculosis attending Respiratory Medicine department.

MATERIALS AND METHODS

The present study was the cross sectional hospital based observational study. The study was conducted in between February 2021 to July 2022 over a period of one and half years in Department of Respiratory Medicine (OPD & IPD), A.G.M.C & G.B.P. Hospital, Agartala, Tripura. Patients with past history of successful treatment of pulmonary tuberculosis, attending in the Department of Respiratory Medicine (OPD & IPD) of A.G.M.C & G.B.P. Hospital during the study period were included as cases.

Inclusion Criteria: Age 18 years and above, Patient who has given valid consent.

Exclusion Criteria: Active Pulmonary TB, Active hemoptysis, Age less than 18 years, Pregnant lady, Acute MI in last 1 month, Congestive Heart Failure, HIV infections, Patients with altered sensorium, Not willing to participate and those who were unable to do spirometry. During the study period, 152 patients were included in the study.

Study Tool: Case record performa, and a portable spirometer, SPIROWIN, Genesis Medical Systems Private Ltd.

Patients who had fulfilled the selection criteria was interviewed with a structured case record performa regarding present complaints with duration, personal history (occupation, smoking etc.). Details of past tuberculosis and its therapy was recorded according to patients' history and old documents, wherever available. General physical examination and system examination findings have been entered in the standard performa. Subsequently, spirometric evaluation was done.

Recommendation for Performing Spirometry:

- Spirometry was performed in sitting position.
- Effort was maximal, smooth, and cough free with an exhalation time of minimum 6 sec or preferably 12 secs.
- 2 sec volume plateau indicated end of test & reproducibility should be a FVC within 5% or 100ml in 3 acceptable tests.

Spirometric Measurement:

- The Spirometric recording was represented in 2 forms:

1) Graphic forms.
2) Absolute values. The flow is also recorded graphically - volume versus time: Spirogram or timed vitalograph - Flow rate versus volume: Flow volume curve/ loop

ABSOLUTE VALUES:

- Normal value of FVC = 80-120% of predicted value.
- Normal value of FEV1 = 80-120% of predicted value.
- Normal value of PEF = 80-100% of predicted value
- MEF75: refers to the maximum flow achievable when 75% of the FVC remains in the lungs

MEF 50: the maximum flow rate achievable when the lungs are half empty. These are a sign of early airflow obstruction (small airway disease)

SPIROMETRY PATTERNS:

- Normal
- Obstructive
- Restrictive
- Mixed (obstructive & restrictive)

INTERPRETATION OF SPIROMETRY:

	OBTRUCTIVE	RESTRICTIVE	MIXED
FEV_1/FVC	Reduced <70%	Normal>70%	Reduced<70%
FEV_1	Reduced <80%	Variable	Reduced <80%
FVC	Normal >80%	Reduced<80%	Reduced <80%

BRONCHODILATOR REVERSIBILITY TESTING:

1) Patient was asked to Withheld short acting bronchodilators for at least 4 hrs prior to test.
2) Bronchodilator reversibility (BDR) was defined as an improvement in FEV1 by at least 12% and 200 ml over pre-bronchodilator value.

BRONCHODILATOR	DOSE
Salbutamol	200-400microgrm
Terbutaline	500 microgrm
Ipratopium	160 microgrm

RESULTS

A total of 152 patients. were included in this study.

Table 1: Age distribution of patients studied:

		NUMBER	PERCENTAGE (%)
AGE GROUP (YEARS)	18-<30	16	10.5%
	30-<40	21	13.8%
	40-<50	34	22.3%
	50-<60	33	21.7%
	60-<70	32	21.0%
	>70	16	10.5%

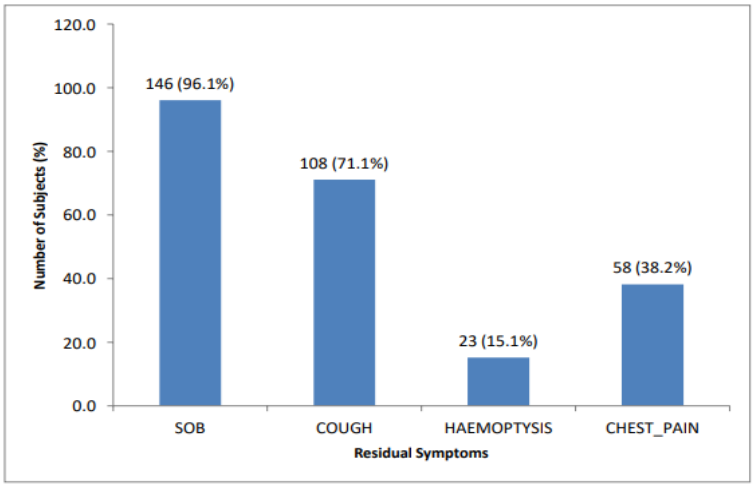
Most of the patients included in the study were between 40-<50 years old which constitute22.3%.Maximum age of patient included in the study was 80 years and minimum age of the patient was 22 years. Less than 30 years, 16subjects were involved, 30-<39 years age group 21 patients were involved, 34 patients were found between 40-<49 years age group, in 50-<59 years age group 33 patients were involved, between 60-<69 years age group 32 patients were involved, and in more than 70 years age 16 patients were found.

Table 2: Gender distribution of patients studied:

		NUMBER	PERCENTAGE (%)
SEX	MALE	85	55.9%
	FEMALE	67	44.1%

Majority of the patients is 85 (55.9%) participants w male and females comprised of 67(44.1%).

Figure 1: Bar chart illustrating the frequency and pattern of residual respiratory symptoms of the recruited subjects



The predominant residual respiratory symptom as demonstrated in Figure 1 was shortness of breath (146; 96.1%).

This was followed in a descending order by cough (108; 71.1%), haemoptysis (23; 15.1%) and chest pain (58; 38.2%)

Table 3: Age and sex distribution associated with spirometric patterns

AGE GROUP (YEARS)	SPIROMETRIC PATTERNS								
	OBSTRUCTIVE		RESTRICTIVE		MIXED		TOTAL		
	No.	%	No.	%	No.	%	No.	%	P Value
<30	4	66.66%	1	16.67%	1	16.67%	6	100.0%	
30-39	9	75.0%	2	16.67%	1	8.33%	12	100.0%	
40-49	16	64.0%	7	28.0%	2	8.0%	25	100.0%	
50-59	18	66.67%	5	18.52%	4	14.81%	27	100.0%	0.888
60-69	14	51.85%	9	33.33%	4	14.82%	27	100.0%	
>70	6	50.0%	3	25.0%	3	25.0%	12	100.0%	

Chi-Square/Fisher Exact Test

SEX	SPIROMETRIC PATTERNS								
	OBSTRUCTIVE		RESTRICTIVE		MIXED		TOTAL		
	No	%	No	%	No	%	No	%	P Value
MALE	37	58.73%	17	26.98%	9	14.29%	63	100.0%	0.776
FEMALE	30	65.22%	10	21.74%	6	13.04%	46	100.0%	

Chi-Square/Fisher Exact Test

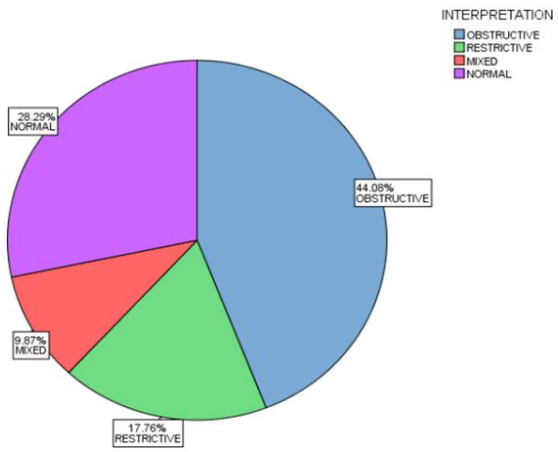
Among 152 cases, 109 cases were found to have abnormal spirometric patterns. Among 109 abnormal spirometric pattern cases, most of the patients were in-between 50- 59 years and 60-69 years age group (27 cases). Different age group distribution between 32 different spirometric pattern was not significant (p>0.05). Among 109 abnormal spirometric pattern cases, 63(57.8%) participants were male, and 46(42.2%) participants were female. There was no statistically significant difference (p>0.05) of gender distribution between different spirometric patterns.

Table 4: Distribution of different spirometric patterns

INTERPRETATION	NUMBER	PERCENTAGE (%)
OBSTRUCTIVE	67	44.08%
RESTRICTIVE	27	17.76%
MIXED	15	9.87%
NORMAL	43	28.29%

Table: 4 showing the different spirometric involving 67(44.08%) with obstructive pattern, 27(17.76%) with restrictive pattern, 15(9.87%) with mixed pattern and normal patterns found in 43(28.29%) patients.

Figure 2: Pie chart showing spirometric pattern among the recruited patients



Pie chart in the figure 2 shows that majority the patients have obstructive spirometric patterns in 44.08% patients followed by 17.76% patients having restrictive pattern, 9.87% patients having mixed pattern and 28.29% patients having normal spirometric findings

Table 5: Severity pattern of obstructive spirometric findings in recruited patients

OBSTRUCTION SEVERITY	NUMBER (CASES)	PERCENTAGE (%)
MILD OBSTRUCTIVE	4	5.97%
MODERATE OBSTRUCTIVE	20	29.85%
SEVERE OBSTRUCTIVE	43	64.18%

Table 5 shows the severity pattern of the obstructive spirometry. Majority of the patients 43 cases (64.18%) with obstructive spirometricpattern had severe obstruction. 4 (5.97%) cases had mild obstruction; 20(29.85%) cases had moderate obstruction

Table 6: Distribution of patients by bronchodilator reversibility response in spirometry

BRONCHODI-LATOR REVERSIBILITY RESPONSE	INTERPRETATION								
	OBSTRUCTIVE 67 cases		RESTRICTIVE 27 cases		MIXED 15 cases		Total 109 cases		
	No	%	No	%	No	%	No	%	P value
SIGNIFICANT REVERSIBILITY	18	81.82%	1	4.54%	3	13.64%	22	100.0%	0.041
NON-SIGNIFICANT REVERSIBILITY	49	56.32%	26	29.89%	12	13.79%	87	100.0%	

Chi-Square/Fisher Exact Test

Table 6 shows the bronchodilator reversibility response in different spirometric pattern. The patients with obstructive spirometry have 81.82% significant reversibility response to bronchodilator, 56.32% have non-significant response. Patients with restrictive spirometry have 4.54% with significant response and 29.89% with non significant response. Patients with mixed pattern have 13.64% with significant response and 13.79% with non-significant response. There was no statistically significant difference ($p>0.05$) between the different spirometric pattern.

DISCUSSION

In our study, it is observed that, among 152 total cases, male is 56% and female is 44%. Most of the cases were found to be within 50-70 years of age group. A study conducted by Baig et al 37 in post tuberculosis patients found that 76.5% were male. The age is ranged between 24 and 65 years with a mean of 56.4 years. Another study done by Menez et al [7] found that male female ratio was 0.65. Mean age was 56.6+/-11.9 years. Another study done by Lee et al 38 found that 57% of the study populations were male. So, the result of the age and gender in this study is simillar with other studies. The present study demonstrates a male predominance and older age group.

The study finding showed that shortness of breath is the most frequent symptoms, which is similar to the study conducted by Lee 40 et al and Hassan et al where the study conducted by Lee et al [8] in South Korea found that 80% of the post tuberculosis patients presented with shortness of breath, 24% of the patients presented with cough, 24% of the patients had expectorations and 19% of them had haemoptysis. The study conducted by Hassan et al 39 in Saudi Arabia

found that cough was present in 100%, production of sputum in 92.6%, shortness of breath in 83.3% and wheeze in 72.2%.

N our patient sample, obstructive (44%) impairment was the most common pattern, followed by restrictive (18%) and mixed (9.8%). In three large population studies, the authors Caballero et al [9], Lam et al [10] and Menezes et al [7] found a significant association between history of pulmonary tuberculosis and presence of airway obstruction according to spirometry. The findings are significant as found in Table no3.

In my study, obstructive (44%) spirometric pattern was the most common as many of the patients were smoker, even though it was excluded in my study. Probably it might have contributed to the present finding.

However, some reports found restrictive pattern to be the main form of spirometric abnormality as in the study conducted by Pasipanodya et al [11] observed that the prevalence of individual subtypes of impairment for obstructive, restrictive and mixed was 15%, 31%, 13% respectively describing the restrictive form as the most common.In the present study, significant bronchodilator reversibility response was found in 20% cases and 80% cases with non-significant response.

CONCLUSION

This study reported that many of the post-pulmonary tuberculosis patients have persistent respiratory symptoms with obstructive lung disease being the most predominant lung function impairment. The high prevalence of chronic respiratory symptoms and pulmonary dysfunction in post-tuberculosis patients indicates the necessity for further interventions to reduce social vulnerability of patients successfully treated for tuberculosis. Such pulmonary function impairment after treatment of tuberculosis is still under-recognised cause of chronic lung disease worldwide. Physicians should be aware of the long-term risk of developing airflow limitation in individuals with prior tuberculosis, irrespective of smoking status. Such patients commonly have obstructive ventilatory disorder, which further complicates the issue. This highlights the need for spirometric assessment and follow-up after treatment. Finally, it can also be said that early diagnosis and early intervention of pulmonary tuberculosis is important to minimize post- tuberculosis sequelae and the lung function abnormality and that will give a productive life to the patient.

The following are the limitation of the current study:

1) Number of the study subjects was less, probably because of COVID-19.
2) Risk factors particularly smoking was not excluded.
3) Some of the patients were not able to follow the instructions to perform the spirometry

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