



## FUNCTIONAL EVALUATION IN PULMONARY TUBERCULOSIS SEQUELAE PATIENTS IN RELATION TO DURATI

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**ABSTRACT** **Introduction:** Pulmonary Tuberculosis can cause chronic impairment of lung function even after completion of anti-TB treatment. Several factors predict the deterioration of pulmonary function in treated cases. The time course for change in pulmonary function and risk factors have not been well studied so far as we have limited resources for the management of restrictive and mixed pattern of impairment it is essential that for patients with significant respiratory symptoms and multiple risk factors, periodical assessment of pulmonary function should be done to monitor the progress of lung function. Aim of our study is to find the association between Number of Episodes of TB Treatment and pattern of lung damage thereafter. Also To assess the progression of damage of lung tissue and its association with Time Duration After Completion of Treatment **Method:** This study was done as a cross – sectional study in 120 patients both male & female (male-81 and female – 39) attending Thoracic Medicine outpatient department at chengalpattu Medical College were selected for the study. Easy On PC Spirometry was used for analysing. Percentage of the Predicted values of FEV<sub>1</sub>, FVC, FEV<sub>1</sub> / FVC, FEF<sub>25%</sub> -75% were taken for analysis. **Conclusion:** The present study shows that because of the marked residual changes in the Lung caused by Tuberculosis infection, there occurs a considerable and significant decline in Lung function in post treatment period. In this study the pattern of impairment of lung function noticed was restrictive pattern, mixed pattern and the extent of impairment increases as lag time, number of episodes of treatment and duration after treatment increases.

**KEYWORDS :** Tuberculosis, Spirometry, Treatment.

### INTRODUCTION

Tuberculosis among much other chronic illness is still one of the major causes of morbidity and mortality affecting human beings since immemorial time. Pulmonary TB seems to have never disappeared in India since Robert Koch identified the causative agent in 1882.<sup>1</sup> Even today, we get patients affected by Pulmonary TB with all the effective control and preventive measures taken over the years. Not only the medical implication but also the social and economic impact of TB has been enormous.

According to Global Tuberculosis report 2014 the prevalence of Pulmonary TB worldwide is around 9 million and in India the incidence is 2.2 million and prevalence is 2.8 million cases.<sup>2</sup>

There are many studies which focused on the pathophysiology, diagnosis, and treatment of Pulmonary TB but only a few studies were done so far on the after effects of PT infection in lungs. In the few studies that are being done on evaluation of Lung functions in PT Sequelae patients there are concrete evidences stating that there is permanent functional deterioration in these patients. Many studies say that the obstructive pattern of lung damage is the commonest finding. But recent studies say that there are more number of patients with restrictive and mixed pattern of damage.<sup>3</sup>

According to previous studies the changes are more pronounced during 13- 18 months after completion of anti-TB treatment In our area where people seek medical help at a very late stage, there is involvement of both bronchi & parenchyma leading to extensive damage of both. It is important to identify patients with deterioration of pulmonary function after the completion of treatment because it affects the quality of life of the patients to a great extent. This evaluation can be done by an easy and accessible technique called spirometry. Hence based on this aim of our study is to find the association between Number of Episodes of TB Treatment and pattern of lung damage thereafter. Also To assess the progression of damage of lung tissue and its association with Time Duration After Completion of Treatment

### MATERIAL & METHODOLOGY

This study was done as a cross – sectional study in 120 patients both male & female (male-81 and female – 39) attending Thoracic Medicine outpatient department at Chengalpattu Medical College were selected for the study. Both male & female aged 30 -60 years, released from treatment 18 months prior to the study and within 5 years after completion of treatment and there was cessation of smoking after

diagnosis of Pulmonary TB were included in study, whereas patients with active pulmonary TB, extra pulmonary TB, MDR TB, HIV positive, with Severe respiratory distress, bed ridden, pregnancy, Diabetes mellitus, Recent myocardial infarction, Cardiac disease like unstable angina, were excluded from study.

Easy On PC Spirometry was used for analysing, Institutional Ethics committee approval was obtained before starting of study, Informed consent was obtained on the day of recording Subject was advised to avoid full meals 2 hours prior to the test, Alcohol consumption 4 hours prior to the test, Short acting bronchodilators 6 hours prior to the test Long-acting bronchodilators 12 hours prior to the test. Percentage of the Predicted values of FEV<sub>1</sub>, FVC, FEV<sub>1</sub> / FVC, FEF<sub>25%</sub> -75% were taken for analysis.

The pattern of lung function impairment was assessed from spirometry results using percentage of the predicted values of FEV<sub>1</sub>/FVC, FVC<sup>4</sup> Severity of restrictive impairment of lung function was assessed using percentage of predicted values of FVC.<sup>5</sup> Mild restriction – 60 to 80%, Moderate restriction – 45 to 59%, Severe restriction - <45% Statistical analysis was done by using SPSS 22.0 version. Anthropometric measurements and lung function parameters were analysed by arithmetic mean and standard deviation. The mean value of lung function parameters in each pattern of lung function impairment was analysed by ANOVA and Chi square test.

The mean value of lung function parameters were correlated with number of episodes of TB treatment, time duration after treatment (months) and lag time in days (time duration between onset of symptom and diagnosis) by Spearman's rho analysis.

### RESULTS

In our study 120 subjects (male -81, female – 39) who had completed tuberculosis treatment 18 months before the study and within 5 years of completion of treatment were participated in the study.

In our study population maximum number of patients belongs to age group 51 – 60 (n=53). Minimum number of patients belongs to age group 30 – 40. (n=32). Among the 120 subjects participated in this study 67.5% were male subjects, and 32.5% were female subjects. Male : female ratio in this study was around 2:1.

**TABLE 1: Relationship between Duration after Treatment and pattern of Lung Function Impairment**

Parameter	Pattern of damage	N	Mean ± S.D	Minimum	Maximum	F	Sig
DURATION AFTER TREATMENT (MONTHS)	Normal study	13	43.15 ± 13.02	24	60	7.144	0.000 *
	Mild restriction	40	34.18 ± 11.0	18	60		
	Moderate restriction	32	37.12 ± 13.55	19	60		
	Severe restriction	14	41 ± 16.60	18	60		
	Mixed pattern	21	51.43 ± 10.25	24	60		
	Total	120	39.75 ± 13.79	18	60		

Statistically significant variation was seen between each pattern of damage and duration after treatment ( $P < 0.01$ ). As duration after treatment increases severity of lung function impairment increases. Few subjects ( $n=13$ ) showed normal study as duration after treatment increases. Analysis was done by ANOVA. In our study most of them have taken single episode of treatment.

**TABLE 2: Relationship between No. of episodes of Anti-TB treatment and pattern of Lung Function Impairment**

No of Episodes	Normal Study	Mild Restriction	Moderate Restriction	Severe Restriction	Mixed	Total	Chi sq	P value
1	13	34	21	4	5	77	42.1	0.000
2	0	6	11	8	13	38		
3	0	0	0	2	3	5		
Total	13	40	32	14	21	120		

The table shows as number of episodes of Anti-TB treatment increases the severity of damage increases. This was statistically analysed by chi square test. P value is highly significant ( $P < 0.01$ ). We also did Rho spearman's analysis for every parameters. Significant negative correlation between FVC, and No. of episodes of treatment, duration after treatment and lag time was found ( $P < 0.01$ ). As number of episodes increase there is decrease in FVC value. Also, FVC decreases as duration after treatment increases. As time duration between onset of symptoms and diagnosis of tuberculosis increases there is significant decrease in FVC parameter.

Similar correlation was done for FEV<sub>1</sub>. Negative correlation between FEV<sub>1</sub> and No. of episodes of treatment, duration after treatment and lag time was found. Correlation was significant ( $P < 0.01$ ). Analysis done by Spearman's rho analysis. Negative correlation was observed between FEV<sub>1</sub> and number of episodes of anti-TB treatment. Higher percentage of subjects had taken single episode of anti-TB treatment. Negative correlation was observed between FEV<sub>1</sub> and duration after completion of Anti-TB treatment. The negative correlation is less compared to number of episodes of treatment. Negative correlation was observed between FEV<sub>1</sub> and lag time. As lag time increases there is decrease in FEV<sub>1</sub> parameter. Distribution outside the confidence limit is minimal.

Similar correlation was done for FEV<sub>1</sub>/FVC. Spearman's rho analysis shows there is significant negative correlation between FEV<sub>1</sub> / FVC and No. of Episodes of Treatment, Duration After Treatment and Lag Time ( $P < 0.01$ ). Negative correlation was observed between FEV<sub>1</sub> / FVC and number of episodes of anti-TB treatment. Correlation line is less steep compared to correlation between FVC, FEV<sub>1</sub> and number of episodes of anti-TB treatment. Negative correlation was observed between FEV<sub>1</sub> / FVC and duration after Anti-TB treatment. Negative correlation was observed between FEV<sub>1</sub> / FVC and lag time. Distribution outside confidence limit is minimal.

Also analysis was done for FEF<sub>25-75%</sub>. Spearman's rho analysis shows there is significant negative correlation between FEF<sub>25-75%</sub> and No. of Episodes of Treatment, Duration After Treatment and Lag Time ( $P < 0.01$ ). Negative correlation was observed between FEF<sub>25-75%</sub> and number of episodes of Anti-TB treatment. Higher percentage of subjects had taken single episode of anti-TB treatment. Negative correlation was observed between FEF<sub>25-75%</sub> and duration after Anti-TB treatment. Negative correlation was observed between FEF<sub>25-75%</sub> and lag time.

## DISCUSSION:

Tuberculosis is a worldwide public health problem with higher morbidity and mortality among all chronic infections. India alone accounts for 24% of global burden of Tuberculosis.<sup>2</sup>

Pulmonary Tuberculosis affects almost all parts of the respiratory system including bronchi, bronchioles, lung parenchyma and lymph nodes. The pathogenesis involved is an inflammatory process causing upregulation of several proteases like matrix metalloproteinases and dysregulation of protease control which causes lung remodeling.<sup>3</sup>

Histopathological abnormalities occur even after successful treatment of the disease causing sequelae changes in the lungs which can be in the form of fibrosis, cavity formation, bronchial and bronchiolar obstruction, bronchiectasis etc. These sequelae changes in the respiratory tract can cause obstructive, restrictive or mixed pattern of lung function impairment.<sup>3</sup>

Many studies have shown that the common pattern of lung function impairment in pulmonary TB sequelae patients was obstructive in nature. But the recent studies have shown that restrictive pattern and mixed pattern are most commonly observed rather than obstructive pattern in these patients.<sup>3,6</sup>

In the present study the age group of selected subjects was between 30 – 60 years but it was observed that more number of patients fall in the age group of 51 - 60 years (44%) compared to 26% who belonged to age group 30-40 years. This may be because normally there is gradual decline in pulmonary function after the age of 30 years.

More number of male patients participated in the present study compared to female patients (Male-81, Female-39). There is evidence in global TB report 2014 which states that 60% of new cases reported every year belong to male gender.<sup>2</sup>

## DURATION AFTER TREATMENT AND LUNG FUNCTION IMPAIRMENT

In the present study there was negative correlation between pulmonary function parameters and duration after treatment. There is controversial evidence in studies regarding the relationship between duration after completion of treatment and decline of lung function. Some studies say that the nadir of pulmonary function impairment occurs at around 18 months after completion of treatment and as duration after treatment increases thereafter the severity of damage also increases.<sup>3</sup> Vargha .G also confirms this in a fifteen year follow up study on both obstructive and non-obstructive Pulmonary Tuberculosis patients in which they have noted that there is considerable decline of Lung function year after year after completion of treatment.<sup>8</sup>

According to Mohammed Al-Hajjaj that lung function improves as duration after treatment increases because of continuous healing process.<sup>9</sup> This was also observed in the present study in a minor group (only 13 subjects) who had normal study pattern in Spirometry even though the mean duration after treatment for them was around 43 months compared to subjects who had severe restriction whose mean duration after treatment was around 41 months only.

Negative correlation was observed between decline in Lung function parameters and number of episodes of TB treatment in this study. This is consistent with Eva Hnizdo et al who had quantified the loss of lung function and their relation with number of episodes of Tuberculosis treatment. They say that the increase in number of episodes of treatment corresponded with increase in loss of lung function.<sup>10</sup>

## CONCLUSION

The present study shows that because of the marked residual changes in the Lung caused by Tuberculosis infection, there occurs a considerable and significant decline in Lung function in post treatment period. This study again like many other studies stresses that even after successful completion of anti-Tuberculosis treatment, a regular periodical assessment of pulmonary functions with simple and feasible method like Spirometry and addition of Pulmonary Rehabilitation Program along with Anti Tuberculosis treatment is necessary to improve the Quality of Life of the individuals affected by Pulmonary Tuberculosis to a greater extent which helps them to lead a symptomless, comfortable and fruitful life in future.

**REFERENCES:**

1. Lucia Maria, Macedo Ramos et al. Functional profile of patients with Tuberculosis sequelae in a university hospital. *J. bras pneumol. sao Paulo* 2006 jan / feb ; vol 32 no.1
2. GlobalTuberculosisreport2014–www.who.int/tb/publications/global-report/en
3. Kuei – pin chung, Jung- Yueh chen et al. Trends and predictors of changes in pulmonary function after treatment for pulmonary tuberculosis. *Clinics* 2011; 66(4) : 549-556
4. Dr.Jyotsna joshi. Spirometry in practice . A real life approach. Mumbai. cipla ltd
5. Dr.Rupak singla et al. Spirometry in clinical practice. 1st edition. New Delhi. Ijcp group 2007.
6. Jotam G Pasipanodya, Scott JN McNabb et al. Pulmonary impairment after Tuberculosis and its contribution to TB burden. *BMC public health* 2010 ; 10:259
7. Dr.Jyotsna joshi. Spirometry in practice . A real life approach. Mumbai. cipla ltd
8. Vargha.G et al. Fifteen year follow up of lung function in obstructive and nonobstructive pulmonary tuberculosis. *Acta med hung* 1983; 40 (4) :271-
9. Eun Joo Lee, Sang Yeub Lee et al. Routine Pulmonary Function test can estimate the extent of tuberculous destroyed lung. *Scientific World Journal* 2012: 835031
10. Eva Hnizdo, Tanusha singh et al . Chronic Pulmonary Function Impairment caused by initial and recurrent Pulmonary Tuberculosis following treatment. *Thorax* 2000; 55 : 32-38