

Study of Pulmonary Function Impairment by Spirometry in Treated Cases of Pulmonary Tuberculosis

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Abstract: Tuberculosis (TB) is a major cause of death worldwide. About two thirds of patients develop impaired pulmonary function after completion of pulmonary tuberculosis treatment. Post tubercular impairment can manifest as reversible or irreversible obstructive airway disease, mixed defect or as pure restrictive defects. Cavitation, extensive fibrosis, bulla formation and bronchiectasis implicated in the genesis of airway obstruction caused by the destroyed lung due to pulmonary tuberculosis. Only a few studies have been done to identify this entity, but all the studies have definitely concluded that such an entity exists. Objective of this study is to determine the frequency of airway obstruction in treated patients of tuberculosis in the hospital.

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I. Introduction

Chronic obstructive pulmonary disease (COPD) and tuberculosis are among the world's first ten most prevalent diseases, the main burden of the later being in the developing countries, in the form of pulmonary tuberculosis. In the global burden of disease, COPD and tuberculosis have been ranked as sixth and eighth respectively, in terms of disability and death in low and middle income communities world wide.^[1]

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 fibrocavitary lung disease. Some patients experience significant hypoxemia with pulmonary hypertension and ventilatory defects.^[2-5] High prevalence of obstructive lung disease is seen in cured pulmonary TB patients.^[6] Studies of pulmonary function in individuals with pulmonary tuberculosis demonstrated variable patterns and severity of impairment. Pulmonary function studies can show restrictive, obstructive, or mixed patterns and range from normal to severe impairment. These findings are currently incompletely characterized.^[7]

Although COPD is commonly thought of as an older person's disease associated with cigarette smoke exposure, there is increased awareness of non-smoking-related risk factors that also contribute to its development.^[8-11]

II. Methods

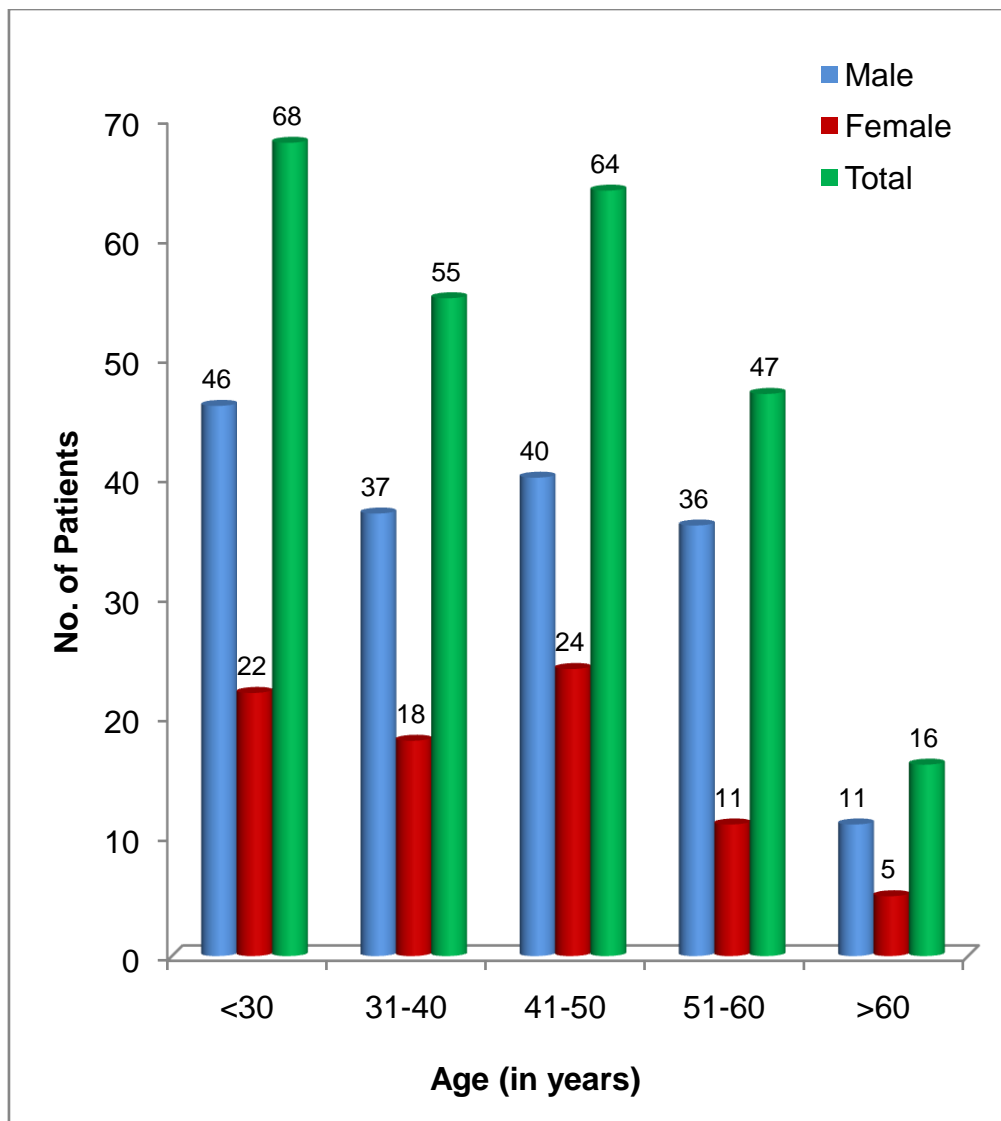
This is a cross-sectional study, where 250 patients who had completed pulmonary tuberculosis treatment, presenting to department of Chest and TB, Government Medical College Patiala will be studied. All the patients aged 18-65 years and having history of PTB -sputum positive or a sputum negative patient with symptoms, signs and radiological findings suggestive of pulmonary TB and having completed anti-tuberculosis treatment were included in the study. Patients with history of current or previous smoking or occupational exposure to dust or chemicals, diagnosed cases of asthma or COPD, interstitial lung disease, bronchiectasis, co-morbid illnesses such as ischemic heart disease, heart failure, severe anemia, spirometry contraindicated such as recent eye or upper abdominal surgery and those with active tuberculosis were excluded. Clinical history of the patient was taken and sputum for AFB and x-ray chest PA View were done to assess active tuberculosis. Spirometry was done both pre-post medications with short acting bronchodilator. Spirometric values were recorded as FVC, FEV1 and FEV1/FVC.

III. Statistical Analysis

The observations thus obtained were statistically analyzed. The results were presented in the form of graphs and tables. The statistical analysis was done using chi-square test. P-value was calculated and p-value <0.05 was considered significant and P-value <0.01 was considered highly significance.

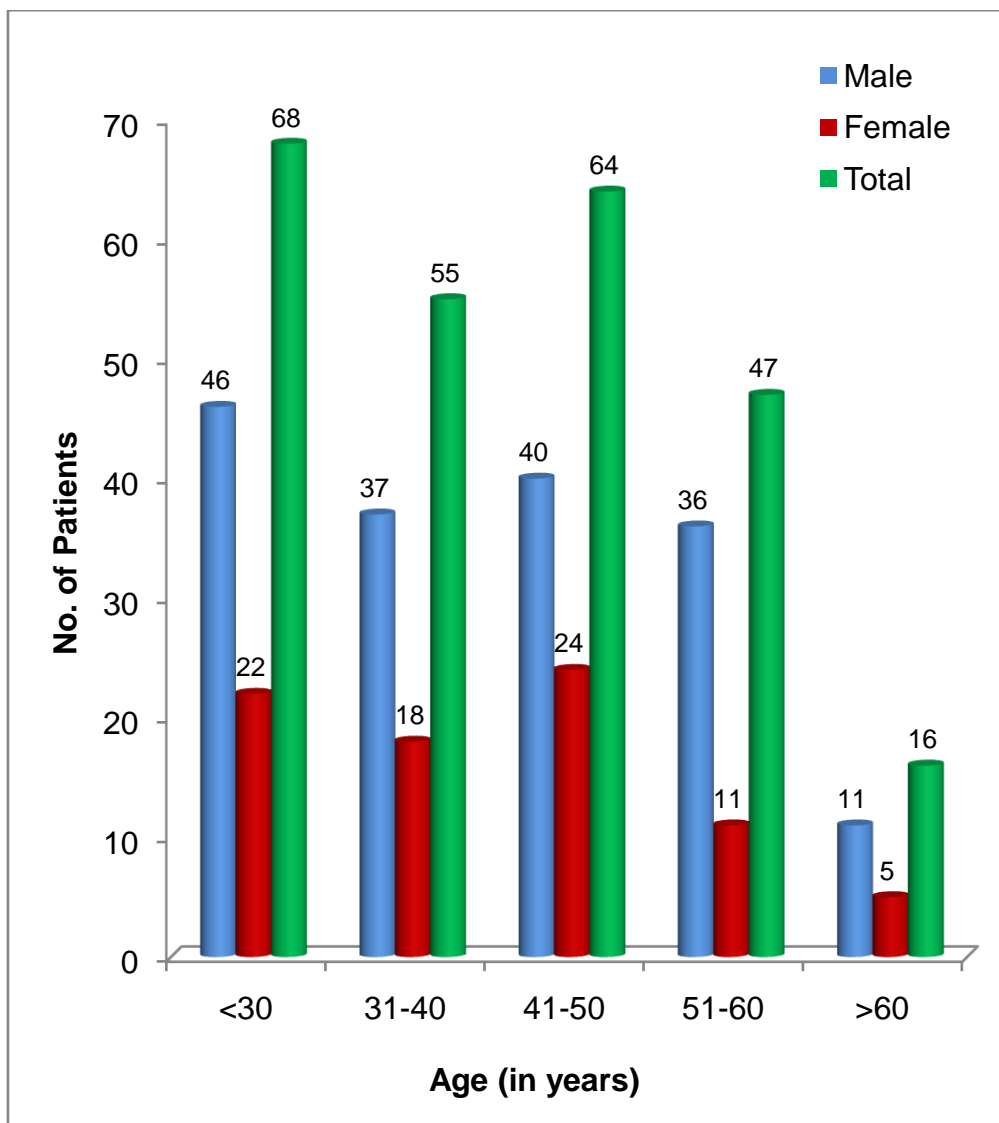
IV. Results

Out of 250 patients included in the study, 27.2% of the patients were in the age group of <30 years, 22% of patients were in the age group of 31-40 years, 25.6% of patients were in the age group of 41-50 years, 18.8% were in age group of 51-60 years and 6.4% were in the age group of 60 years and above.



In this study the age – specific incidence of patients presenting with complain of cough and breathlessness having a history of taken anti-tubercular therapy to be highest in the age groups of < 30 yrs and 41 –50 yrs and incidence reduced after 60yrs. Pulmonary function impairment in treated cases of pulmonary tuberculosis was found in 170 (68%) of males and 80 (32%) of females.

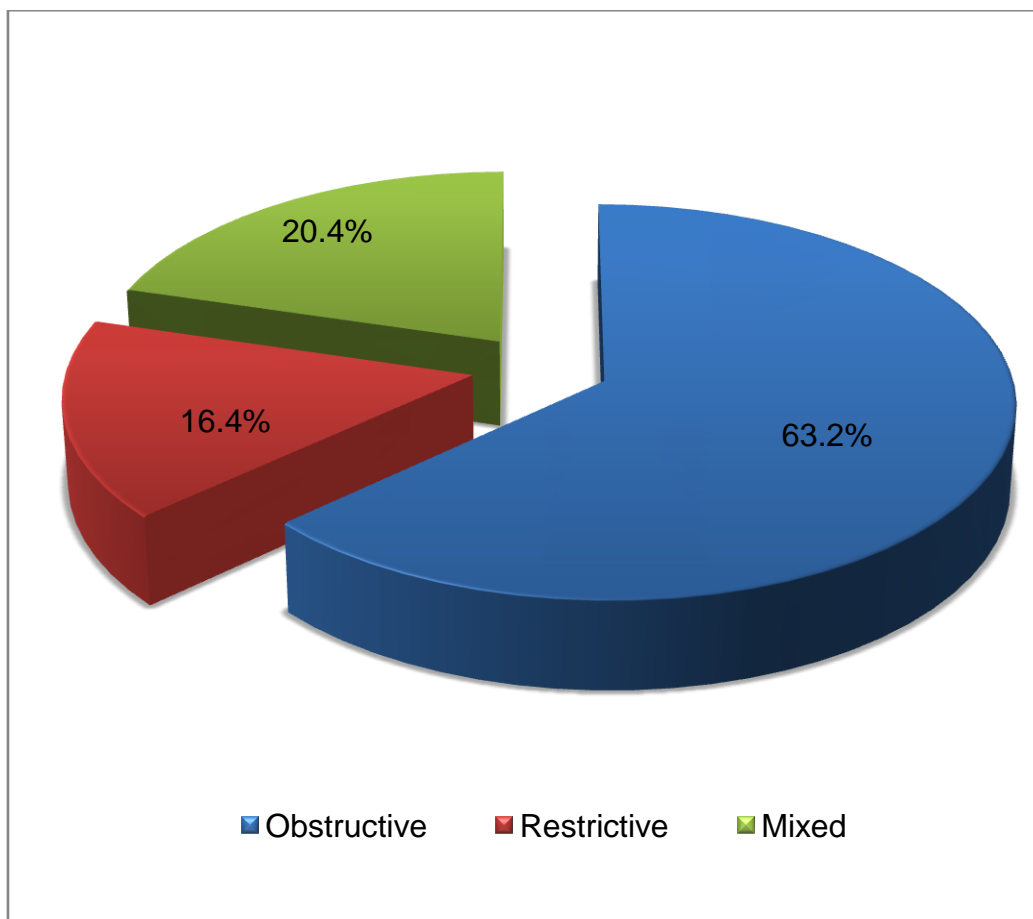
The study clearly shows that the incidence is more in males than females. Of the total 170 male patients included in the study, maximum number of male patients were in the age group of <30 years and similarly of the total 80 female patients included in the study maximum number of female patients were present in the group of 41-50 years.



DISTRIBUTION OF AGE AND GENDER

Age (in years)	GENDER				Total	
	Male		Female		No. of Patients	%age
	No. of Patients	%age	No. of Patients	%age		
<30	46	13.33%	22	8.33%	68	21.7%
31-40	37	15.0%	18	8.33%	55	23.3%
41-50	40	16.67%	24	10.0%	64	26.7%
51-60	36	15.0%	11	10.0%	47	25.0%
>60	11	3.33%	5	0.0%	16	3.3%
TOTAL	170	63.33	80	36.66	250	100%
Chi Square	2.507					
p-value	0.643					
Significance	NS					

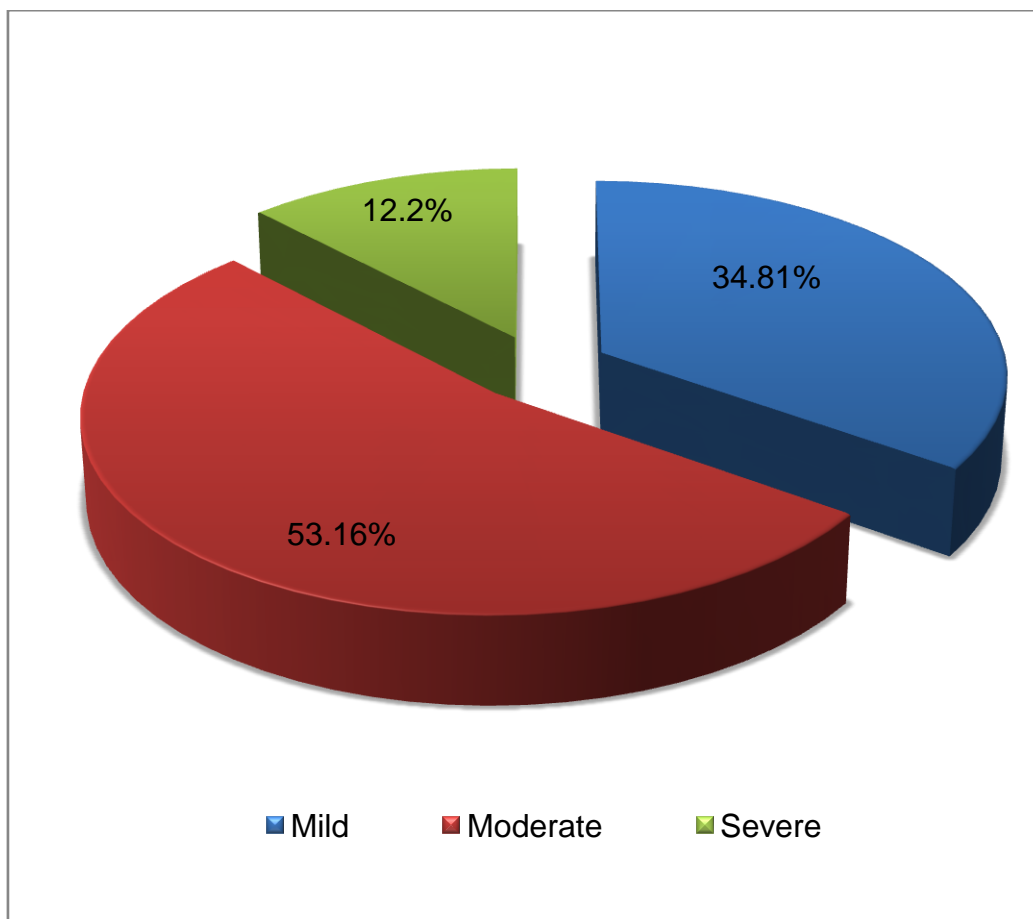
On calculation the p-value came out to be 0.643, thus making the comparison statistically non-significant. This shows that age has no correlation with gender of the patients studied in this study.



TYPE OF PULMONARY IMPAIRMENT

Type of Impairment	No. of Patients (%)
Obstructive	158 (63.2)
Restrictive	41 (16.4)
Mixed	51 (20.4)
Total	250

Obstructive impairment was seen in 158 (63.2%) patients, 51(20.4%) patients presented with mixed impairment and 41(16.4%) patients had restrictive Impairment.



Among 250 cases of obstruction, 55(34.81%) showed mild, 84(53.16%) showed moderate and severe degree of obstructive impairment was found in 19(12.2%) of the cases.

V. Discussion

In this study pulmonary function impairment found in 68% of male and 32% of females with male to female ratio 2.1:1. This fact is in concordance with other studies mentioned above. In study by Sailaja et al^[12] (2015) conducted a prospective observational study-conducted from Jan 2014 to Dec 2014. age-adjusted incidence of pulmonary impairment in post tubercular patients was considerably higher in men than women. Hence present study is in concordance with the study conducted by Sailaja et al^[12] (2015).

In the study by Sarpal et al^[13] (2017) study in India, it was observed that the incidence was considerably higher in males than in females. In study done by Aggarwal et al^[14] (2016) it was observed that incidence of pulmonary impairment was higher in males as compared to females. Similar results were found in studies done by Mathew et al^[15] (2016) and Baig et al^[16] (2010). Study by Sailaja et al^[12] (2015) studied that in 62.5% Obstructive, 16.07% Restrictive and 21.42% Mixed abnormality detected. Obstructive, Restrictive and mixed type pattern are seen in treated pulmonary Tuberculosis patients, but Obstructive pattern of various degrees is more common. Mathew et al^[15] (2016) conducted a study and concluded that most of the patients 68% showed a Restrictive pattern in spirometry, 13.3% showed an obstructive pattern and 18.7% showed a mixed pattern. Aggarwal et al^[14] (2016) studied that 52.7% were found to have an obstructive ventilatory defect of different degrees. 13.8% were found to have a restrictive pattern and 16.6% revealed a mixed pattern. In this study 16.6% had normal lung function. In present study, obstructive pattern was seen in 63.2% patients, 16.4% patients presented with restrictive pattern and 20.4% patients had mixed pattern of pulmonary impairment. Hence present study is in concordance with the study conducted by Sailaja et al^[12] (2015). Severity of

pulmonary impairment is assessed in all patients with obstructive pattern. In present study it is observed that 34.81% patients had mild pulmonary impairment, moderate impairment was found in 53.16% and severe pulmonary impairment was the finding in 12.2% of the patients. Similarly in the study by Sailaja et al^[12] (2015) it was observed that 34.28% showed mild, 51.42% cases showed Moderate and 14.28% cases showed severe obstruction. In another study by Aggarwal et al^[14] (2016) it was observed that severe obstructive pattern was found in 63.1%, moderate in 21.5% and mild in 15.7%. In the study conducted by Baig et al^[16] (2010) it was observed that severe obstructive pattern was found in 69.2%, moderate in 23.0% and mild in 5.9% of the patients.

VI. Conclusion

Pulmonary impairment accounts for a substantial proportion of all cases of tuberculosis who has completed the course of anti-tubercular treatment. In patients with obstructive pattern, maximum percentage as per age group was in the age group of <30 years. Maximum percentage for patients with restrictive pattern as per age group was in the age group <30 years. So it is important to assess the pulmonary function impairment in treated cases of pulmonary tuberculosis presenting with dyspnea so as to decrease the morbidity associated with pulmonary function impairment. In patients with mixed pattern, the maximum percentage is in the age group of >60 years.

Tuberculosis being a chronic disease, assessing its impact on the society in the form of post treatment morbidity pattern is quite important in dealing the management strategies of the tuberculosis. Spectrum of disease outcome in case of tuberculosis varies with the age of the patient. Further studies of this problem needs to be done systematically from other centers so that a better insight into this common problem can be obtained. Pulmonary tuberculosis causes significant impairment of lung function of all three types but mainly as obstructive abnormality due to lung destruction and inflammation. So early diagnosis and treatment of Tuberculosis decreases the post tuberculosis impairment.

As post Tubercular fibrosis is considered a risk factor for COPD, we can reduce the prevalence of COPD by controlling tuberculosis. Chronic functional effects of extensive post-tuberculosis lung scarring manifested mainly as a COPD like syndrome, which showed same patterns of pulmonary function abnormalities on spirometry. In view of the fact that smokers and other possible causes had been excluded, this study finds pulmonary tuberculosis as an independent etiological factor for chronic obstructive pulmonary disease.

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