



A STUDY OF SPIROMETRY IN POST-PULMONARY TUBERCULOSIS SEQUELAE PATIENTS

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ABSTRACT

OBJECTIVES AND PURPOSE: Tb is an infectious disease caused by the bacillus *Mycobacterium tuberculosis* which usually affects the lungs. This infection leads to bronchial and parenchymal structural changes which include bronchovascular distortions, bronchiectasis, emphysema, and fibrosis and fibro-bronchiectasis. The aim of the study was to assess the lung functions in symptomatic post tuberculosis patients by using spirometry.

MATERIAL AND METHODS: The study was conducted in the Department of Respiratory Medicine, LG hospital Ahmedabad after taking approval from ethical committee. The study duration was from July-2020 and October-2020. Data was collected from patients who presented with symptoms after completion of their treatment for tuberculosis after informed consent was obtained wherever necessary.

RESULTS: All the patients enrolled in study had symptoms even after completion of antitubercular treatment and among these breathlessness was the most common presenting symptoms (96%) followed by cough (57.5%). 45%(n=18) of the patients presented within 1 to 5 years of completing antitubercular treatment. Fibro-bronchiectasis followed by fibrosis was the most common finding on chest x-ray. Maximum number of patient had mixed pattern (40%) in their spirometry followed by obstructive pattern (30%).

CONCLUSION: Significant number of patient develops post tuberculosis sequelae after completion of anti-tubercular treatment like fibro-bronchiectasis, fibrosis, bronchiectasis, fibro-cavitary, destroyed lung. Most of the patients had abnormal lung function (mixed >obstructive>restrictive) in their spirometry.

KEYWORDS : tuberculosis, post tuberculosis sequelae, lung function, spirometry.

INTRODUCTION

Tuberculosis (TB), is a communicable disease that is a major cause of ill health, one of the top 10 causes of death worldwide and leading cause of death from a single infectious agent called *mycobacterium tuberculosis*.⁽¹⁾ Regardless of new treatment, there are pulmonary sequelae and decrease in pulmonary function capacity (Decrease in FVC and FEV1) following pulmonary tuberculosis.

Post-pulmonary tuberculosis patients may have limited exercise tolerance and significant disability which may affect daily activities.⁽²⁾ Pulmonary sequelae that are characterized by impairments in the bronchial and parenchymal structure.⁽²⁾ These structural changes include bronchovascular distortions, bronchiectasis, emphysema, and fibrosis and fibro-bronchiectasis.⁽³⁾

AIMS AND OBJECTIVES

1. To assess lung function by spirometric pattern analysis in previously treated pulmonary tuberculosis cases.

MATERIAL AND METHODS:-

A prospective study, carried out in the department of pulmonary medicine of LG hospital, Ahmedabad, between July-2020 and October-2020 after approval from institutional Review Board.

Inclusion Criteria

1. Pulmonary tuberculosis adult cases that has completed anti-TB treatment as per the standard guidelines of RNTCP/NTEP for at least 6 months and declared cured presenting to OPD/IPD with symptoms were included in the study.

2. Post-pulmonary tuberculosis sequelae like fibrothorax, bronchiectasis, fibro-cavitary lesions, destroyed lung etc.
3. Patients who will give consent for study.

Exclusion Criteria

1. Age < 18 or >75 year of age.
2. Pregnant and lactating women.
3. Cases with a history of smoking active or past to avoid interference with spirometry analysis.
4. Cases who failed to fulfill acceptability and reproducibility criteria of spirometry will be excluded from the study.
5. Cases of active pulmonary tuberculosis, chronic obstructive pulmonary disease, bronchial asthma, cardiac hepatic and renal insufficiency.

Patients who fulfilled our selection criteria were interviewed with present complaints with duration, personal history (occupation, smoking etc.). Detail of past TB and its therapy was recorded according to patient's history and old documents. General examination, vital signs including saturation of oxygen measured by pulse oximetry (SpO₂) and detailed respiratory system examination findings were documented. Chest X-ray (Postero-anterior view) was done and findings like fibrosis, fibro-cavitary, bronchiectasis, and destroyed lung noted. Sputum AFB and routine blood investigation (CBC, RFT, LFT, CRP, and SERUM PROTEINE etc) were done. USG-chest and HRC T-thorax were done whenever indicated. Spirometry performed according to ATS/ERS guidelines by using Medisoft Hypair (made in Italy) computerized spirometer and ERS covid-19 safety guidelines were followed during procedure.⁽⁴⁾ All patients were instructed not to use any bronchodilator on the preceding night and on

day of procedure. Calibration was done before performing spirometry. The subjects were asked to take maximal inspiration and blow into the mouthpiece as rapidly as possible for about 6 seconds. A minimum of 3 and maximum 8 Forced vital capacity (FVC) maneuvers were performed and the best maneuver was selected and accepted. Following lung function variables like FEV₁, FVC, FEV₁/FVC ratio, peak expiratory flow rate (PEFR), forced expiratory flow rate (PEF_{25-75%}) was recorded before and fifteen minutes after administration of 400 microgram salbutamol using pressurized metered-dose inhaler (pMDI) with small-volume spacer device. Various spirometric patterns defined as following and spirometric findings were analyzed.⁽⁶⁾

1. Obstructive pattern: - An FEV₁/FVC ratio of <70% and FVC of >80% predicted. However significant bronchodilator reversibility is defined as a 12% and greater than 200ml increase in FEV₁.
2. Restrictive pattern:-An FEV₁/FVC ratio of >70% and FVC of <80% predicted.
3. Mixed pattern: - An FEV₁/FVC ratio of <70% and FVC of <80% of predicted and decreased FEV₁.

All the data were recorded in Microsoft excel sheet and analyzed.

RESULTS

Table-1:- Demographic Profile

MEAN AGE IN YEARS	45.97 ± 13.03 YEARS
MALE : FEMALE	1 : 1

In this study maximum numbers of patients were in the age group of 21-60 years (45% from age group of 21-40years and 45% from the age group of 40-60 years). It was also observed that there were only 10% of patients in the age group of >60years. The mean age of patients was 45.97 ± 13.03 years. (table-1)

Table-2 Symptomatology In Post Tb Sequeale Patients

SYMPTOMS	NUMBER OF PATIENTS
BREATHLESSNESS	36 (90%)
COUGH	23 (57.5%)
SPUTUM PRODUCTION	19 (47.5%)
CHEST PAIN	05 (12.5%)
HEMOPTYSIS	01 (2.5%)

In this study most common presenting symptom was breathlessness in 90% (n=36) of the patients followed by cough in 57.5% (n=23), sputum production in 47.5% (n=19), chest pain in 12.5% (n=05) and hemoptysis in 2.5% (n=1) of patients. (Table-2)

Table-3 Duration Between Completion Of Akt And Developmet Of Symptoms

DURATION	NUMBER OF PATIENTS
6 to 12 month	3(7.5%)
1 to 5 years	18(45%)
6 to 10 years	10(25%)
11 to 15 years	2(5%)
16 to 20 years	3(7.5%)
21 to 25 years	2(5%)
25 to 40 years	2(5%)

A 45% (n=18) of patients presented within 1 to 5 year of completion of AKT followed by 25% (n=10) of the patients presented within 6 to 10 years of completing AKT greater than 22.5% (n=9) patients presented between 11 to 40 years of completion of AKT and 7.5% (n=3) of patients presented in 6 to 12 month of completing treatment.

Table-4 Spirometric Pattern In Post Tb Sequeale Patients

SPIROMETRIC FINDINGS	PERCENTAGE
NORMAL	20%

OBSTRUCTIVE PATTERN WITHOUT REVERSIBILITY	22.5%
OBSTRUCTIVE PATTERN WITH REVERSIBILITY	7.5%
RESTRICTIVE PATTERN	10%
MIXED DEFECT	40%

In this study 40% patient had mixed pattern on their spirometry followed by obstructive pattern in 30% of the patient among them 7.5% patients shows significant reversibility and restriction in 10% of the patient. 20% of the patient had normal spirometric results. (Table-4)

Table-5 Post Tubercular Spirometric Pattern Co-relation With Chest Xray Findings (n=40)

CXR FINDINGS	OBSTRUCTIVE	RESTRICTIVE	MIXED	NORMAL
NORMAL	00	00	2(12.5%)	5(71.42%)
FIBROSIS	3(25%)	2(50%)	4(25%)	2(18.18%)
BRONCHIECTASIS	1(8.3%)	00	2(12.5%)	00
FIBRO-BRE	4(33.33%)	2(50%)	5(31.25%)	1(8.33%)
FIBROCAVITARY	3(25%)	00	3(18.75%)	00
DESTROYED LUNG	1 (8.3%)	00	00	00
TOTAL	12	04	16	08

Amongst obstructive spirometric pattern (n=12/30%) associated with most common abnormal chest x-ray finding was fibro-bronchiectasis (n=4/33.3%) followed by fibrocavitary (n=3/25%), fibrosis (n=3/25%), bronchiectasis (n=1/8.3%), and destroyed lung (n=1/8.3%). Restrictive pattern was most commonly observed in fibrosis (n=2/50%) and fibro-bronchiectasis (n=2/50%). Mixed pattern was most commonly associated with fibro-bronchiectasis (n=5/31.25%) followed by fibrosis (n=4/25%) fibrocavitary lesion (n=3/18.75) and bronchiectasis (n=2/12.5%). (Table-5)

DISCUSSION:

Among the total of 40 study subjects maximum number of patients was in the age group of 21-60 years. It also seen that there were only 10% of patients in the age group of >60years. The mean age of patients was 45.97 ± 13.03 years. This is because people in this age group (21-60 years) are more active than people in age group >60 years. A study conducted by **choi, CJ et al**⁽⁸⁾ in South Korea had similar age distribution.

In this study it was observed that 50% of patients were male and 50% of patients were female.

In present study we observed that mixed pattern (40%) most common abnormal spirometric pattern likely due to fibrosis co-existing with airflow obstruction followed by obstructive pattern in 30% of the patient and restriction in 10% of the patient. A 20% of the patient had normal spirometric results.

A study conducted by **macedo et al.**⁽⁷⁾ which includes 50 patients; 17(34%) had mixed, 12(24%) had obstructive and 9(18%) had restrictive abnormal pattern. 12(24%) patient had normal spirometric pattern. Study also includes smokers among smokers; the mean number of pack years was 14.8. However study did not observe any significant difference between smokers and non-smoker in terms of lung function. The findings of this study correlates with present study.

A study conducted by **SK Verma et al.**⁽⁸⁾ includes 92 patients found that only 15(16.3%) patients had obstructive airway disease. 21(22.80%) patients had mixed obstructive with restrictive disorder. Restrictive pattern was seen in 37(40.21%) patients.

Another large study conducted by Plit et al. ⁽⁹⁾ showed that in 500 symptomatic individuals 150 (30%), 210(42%), 90(18%), 50(10%) had normal, obstructive, mixed, and restrictive pattern in their spirometry respectively.

In patients with restrictive pattern and having complain of cough and shortness of breath, treated with reassurance and pulmonary rehabilitation whereas in patients with mixed or obstructive pattern treated with bronchodilator therapy and pulmonary rehabilitation. A proper guideline is required to keep follow up and to assess lung functions in this group of patients as they are usually misdiagnosed as recurrence of pulmonary tuberculosis based on chest radiogram even if with good quality sputum reports are negative.

CONCLUSION

Significant number of patient develops post tuberculosis sequelae after completion of anti-tubercular treatment like fibro-bronchiectasis, fibrosis, bronchiectasis, fibro-cavitory, destroyed lung. Most of the patients had abnormal lung function (mixed >obstructive>restrictive) in their spirometry. Early diagnosis and treatment, can improve their quality of life.

Limitation Of Study

The entire study is done on small scale, for proper analysis and conclusion large scale study are required.

Conflict Of Interest: None

Aknowledment: None

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