

Original Research Article

Study of the post tuberculosis lung diseases and the impact of various patient and disease related factors on its occurrence

Jayasri Helen Gali, Harsha Vardhana Varma*, Aruna Kumari Badam

Department of Pulmonary Medicine, Apollo Institute of Medical Sciences and Research, Jubilee Hills, Hyderabad, Telangana, India

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*Correspondence:

Dr. Harsha Vardhana Varma,
E-mail: harsha.varmap@gmail.com

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ABSTRACT

Background: More than fifty percent of the cured cases of pulmonary tuberculosis develop some form of chronic pulmonary dysfunction. It can present with varying degrees of lung damage, ranging from minimum functional abnormalities to severe forms of dysfunction that can be an important cause of death. Objective of the study to identify the various Post Tuberculosis Lung Diseases (PTBLDs) and to study impact of the patient and disease related factors on its occurrence.

Methods: Cross-sectional, observational study was conducted in 134 adult, post tuberculosis patients, aged between 18-65 years, who have completed at least one year after the end of anti-tubercular treatment. All symptomatic post TB lung disease patients coming to the pulmonology out-patient clinic at the Apollo Institute of Medical sciences and Research were included in the study.

Results: Majority were more than 50 years (35.3%) and males (59.4%). Majority were from urban areas (70.7%), low social class (72.2%), and unskilled workers (56.4%). Most common symptom was cough in 74.4% cases. Majority of the cases had symptoms from one week to one month i.e. 47.4%. Only eight cases were found out to be very prompt in reporting their symptoms. 39 cases had some or the other co-morbidity. Current chest X-ray status was normal in only three cases. Mean FEV1 was 1.38 which increased to 1.52; mean FVC was 1.23 which increased to 1.58; mean FEV1/FVC was 67.37 which increased to 72.76 after giving the bronchodilator. 78(58.6%) cases had obstructive and 27(20.3%) had restrictive lung disease. In 30 cases the disease was reversible. Majority of the cases were of pulmonary fibrosis followed by bronchiectasis.

Conclusion: Further studies are needed to develop approaches for the prevention, care and treatment of patients with post TBLD.

Keywords: Bronchiectasis, Chronic obstructive pulmonary disease, Post TB lung disease, Pulmonary fibrosis, Tuberculosis

INTRODUCTION

Globally, one in every third person is infected with mycobacterium tuberculosis, with about ten million cases of tuberculosis every year. The cure rate with present multi drug anti-tubercular therapy is more than 85%, but up to fifty percent of the cured cases of pulmonary

tuberculosis develop chronic pulmonary dysfunction despite microbiologic cure.¹ The most commonly seen lung damage occurring after pulmonary tuberculosis treatment are pulmonary fibrosis, fibro-cavitary disease, bronchiectasis, COPD (Chronic obstructive pulmonary disease), aspergilloma, cor-pulmonale and lung cancer which can be put jointly termed as PTBLDs. The

strikingly heterogeneous presentation of PTBLDs can be related to the host-pathogen interactions and the diverse immunological events that follow.¹ Hence study of post tuberculosis lung diseases is important.

The PTLDs has a great deal of varied presentation. In some cases, it may go up to very severe form of the disease, it may affect the ventilatory function. There can be fibrosis, cavitation or a mix of these conditions.²

Worldwide it has been said that among all the deaths that occur due to non-communicable diseases, the fourth place is occupied by chronic respiratory diseases. This becomes a great public health problem. Among the important risk factors leading to these chronic respiratory diseases, tuberculosis is the most important risk factor. They affect the health services and overall health of the population.³

In low- and middle-income countries, pulmonary tuberculosis accounts for majority of the chronic respiratory diseases. Even after cure from tuberculosis, there are long term sequelae causing significant impact on the respiratory health of the person. There can be the formation of the granuloma, necrosis of the tissues, and liquefaction of the tissue and healing can be aberrant. Studies have shown that this association is significant. Those with pulmonary tuberculosis are at three times more at risk of developing such abnormalities compared to those without tuberculosis.^{4,5}

Our study aims to identify the various PTBLDs and the impact of different patient and disease related factors on its occurrence, which will identify the high-risk groups for PTBLDs. This study will also help in designing guidelines for early identification, counselling the patients and framing guidelines for treatment of PTBLDs, which will also overcome the unnecessary repeated courses of anti-tuberculosis treatment(ATT) for patients with residual functional or radiological lung damage.

METHODS

This was Cross-sectional, observational study with 134 adult post tuberculosis, patients aged between 18-65 years, who have completed at least one year after the anti-tubercular treatment conducted at Department of pulmonology at the Apollo Institute of Medical sciences and Research over a period of one year, after approval from the Institute Ethical Committee and after well informed consent was taken from patients included in the study.

Inclusion criteria

- All symptomatic post TB lung disease patients coming to the pulmonology out - patient clinic, at the Apollo Institute of Medical sciences and Research were included in the study
- All patients with post TB lung disease who have completed at least one year after the end of their anti-tubercular treatment

- Willingness to participate in the present study

Exclusion criteria

- All patients with active pulmonary tuberculosis with sputum smear positive were excluded from the day
- Extra pulmonary forms of tuberculosis, patients with co-existing co-morbidities like asthma, COPD, ILD, CVD
- Children below 18 years of age with PTBLD were also excluded from the study

The patients demographic details like age, sex, occupation, urban or rural residence, socioeconomic status were noted. Clinical history, Co-morbidities, smoking status was documented. History on various aspects of previous pulmonary tuberculosis, like duration of illness before initiation of ATT, total number of courses of ATT taken, sputum AFB smear status, compliance with ATT, whether any follow-up was advised on completion of ATT, total duration after completion of ATT course were taken in detail and documented in a pre-designed structured questionnaire.

Sputum AFB smear, CXR-PA view was done for all the patients; spirometry was done for all the patients with negative AFB smear status (total 134 patients). The radiological findings like pulmonary fibrosis, pleuro parenchymal, fibrocavitary disease, bronchiectasis, aspergilloma, pulmonary calcification were noted.

Spirometry was done for all 134 patients by pulmonologists with spirowin spirometry, based on the findings the patients were grouped as having obstructive, restrictive or mixed patterns. Reversibility testing was also done by spirometry and was documented.

Statistical analysis

All the results were entered in master chart for appropriate statistical analysis.

RESULTS

Table 1 shows distribution of study subjects as per the demographic characteristics. Majority of the study subjects were in the age group of more than 50 years i.e. 35.3%. The next most common age group affected was 20-29 years and 30-39 years with 20.3% and 19.5% of the cases respectively. Only 13 were seen in the age of less than 20 years of age. Males were more than the females.

The males were 59.4% and the females were 40.6%. Majority of the cases were from urban areas i.e. 70.7% and remaining 29.3% were from rural background. Majority of the cases were from low social class i.e. 72.2% and the remaining were from middle social class. Majority of the cases were unskilled workers i.e. 56.4% and 24.8% were either retired or unemployed.

Table 1: Distribution of study subjects as per the demographic characteristics.

Demographic characteristics		No.	%
Age	< 20	13	9.8
	20-29	27	20.3
	30-39	26	19.5
	40-49	20	15.1
	≥ 50	47	35.3
Sex	Male	79	59.4
	Female	54	40.6
Residence	Rural	39	29.3
	Urban	94	70.7
Social class	Low	96	72.2
	Middle	37	27.8
Occupation	Skilled	25	18.8
	Unskilled	75	56.4
	Not working/retired	33	24.8

Table 2: Distribution of study subjects as per the symptoms and duration of symptoms.

Parameters	No.	%	
Symptoms	Cough	99	74.4
	Fever	88	66.2
	Dyspnea	55	41.4
	Weight loss	16	12.1
	Hemoptysis	02	1.5
	Loss of appetite	02	1.5
	Chest pain	04	3.0
	Wheeze	03	2.3
Duration of symptoms	Knee pain	01	0.8
	Up to 1 week	8	6.0
	1 week to 1 month	63	47.4
	1 month to 1 year	58	43.6
	> 1 year	4	3.0

Table 2 shows distribution of study subjects as per the symptoms and duration of symptoms. The most common symptom was cough in 74.4% of the cases followed by fever in 66.2% of the cases.

Dyspnea was seen in 41.4% of the cases. Weight loss was present in 12.1% of the cases. Hemoptysis was seen in two cases. Loss of appetite was complained by two cases. Chest pain was revealed by four cases. Wheeze was present in three cases. Majority of the cases had symptoms from one week to one month i.e. 47.4%.

Four cases came to the hospital after one year of symptoms. 43.6% of the cases came to the hospital after one month of the symptoms but before one year of the symptoms. Only eight cases were found out to be very prompt in reporting their symptoms who reported before one week of onset of symptoms.

Table 3: Distribution of study subjects as per the addictions and exposure to biomass fuel.

Parameters	Number	%	
Smoking	Current smoker	17	12.8
	Ex-smoker	22	16.5
	Non smoker	94	70.7
Degree of smoking (pack years)	< 10	14	35.9
	10-20	21	53.8
	> 20	04	10.3
Exposure to biomass fuel	Yes	24	18.0
	No	109	82.0
Alcohol use	Regular	18	13.5
	Occasional	13	9.8
	Ex-user	19	14.3
	Non user	83	62.4
Co-morbidities	Yes	39	29.3
	No	94	70.7
Current X ray status	Normal	03	2.3
	Abnormal	130	97.7
HIV status	Non-reactive	127	95.5
	Reactive	06	6.5

Table 4: Distribution of study subjects as per the lung function test results.

Parameter	Mean	+2 SD
Pre FEV1	1.38	0.71
Post FEV1	1.52	0.75
Pre FVC	1.23	0.78
Post FVC	1.58	1.20
Pre FEV1/FVC	67.37	24.28
Post FEV1/FVC	72.76	27.89
PEFR	1.86	0.61
SPO2	96.05	2.57
Type of disease	Number	%
Obstructive	78	58.6
Restrictive	27	20.3
Mixed	16	12.0
Normal	12	9.0
Reversibility	Number	%
Yes	30	22.6
No	103	77.4

Table 3 shows distribution of study subjects as per the addictions and exposure to biomass fuel. There were 17 current smokers and 22 ex-smokers.

Remaining 94 were non-smokers. Out of total 39 current as well as ex-smokers, 35.9% had history of less than 10 pack years while 53.8% had 10-20 pack years of smoking. Only four cases reported that they had more than 20 pack years of smoking. Out of the total cases, 24 cases were exposed to the biomass fuel. 18 cases were regularly taking alcohol while 13 were occasional alcohol users. 19 were ex-users and majority i.e. 62.4% never

used alcohol in their life. Out of the total cases, 39 cases had some or the other co-morbidity. Majority i.e. 70.7% had no co-morbidities. Current chest X-ray status was found out to be normal in only three cases and remaining all cases had abnormal chest X-ray. Only six cases were found out to be having HIV.

Table 4 shows distribution of study subjects as per the lung function test results. The mean FEV1 was 1.38 which increased to 1.52 after giving the bronchodilator. The mean FVC was 1.23 which increased to 1.58 after giving the bronchodilator.

The mean FEV1/FVC was 67.37 which increased to 72.76 after giving the bronchodilator. The mean PEFr was found out to be 1.86. The mean SPO2 was found out to be 96.05. 78 cases were found to have obstructive lung disease. 27 cases were found to have restrictive lung disease. 16 cases were found to have mixed i.e. both the obstructive as well as the restrictive lung disease. 12 cases were found to have normal.

It was concluded that 30 cases i.e. 22.6% of the cases the disease was reversible but, in the majority, i.e. 77.4% of the cases, it was found that the disease was not reversible. All the 30 cases showing reversibility were having obstructive lung disease. 48 (36.1%) patients with obstructive lung disease did not have reversibility favouring diagnosis of post TB COPD.

Table 5: Distribution of study subjects as per type of post TB lung disease.

Type of post TB lung disease	No.	%
Aspergilloma	8	6.1
Bilateral extensive fibrosis	01	0.8
Bronchiectasis	32	24.1
Destroyed lung	4	3.0
Fibro cavity	23	17.2
Pulmonary Fibrosis	52	39.1
Pleuro parenchymal fibrosis	6	4.5
Normal	02	1.5
Old calcific lesions	04	3.0

Table 5 shows distribution of study subjects as per type of post TB lung disease. Majority of the cases had pulmonary fibrosis i.e. 39.1% of the cases were found to have the pulmonary fibrosis.

Bronchiectasis was the next most common condition found where 24.1% of the cases from the present study were found to have bronchiectasis. Eight cases were found to have aspergilloma. One case was found from the above table to have bilateral extensive fibrosis.

Four cases were found to have from the above table that they had destroyed lung. 17.2% of the cases had fibro cavity. Six cases had pleuro parenchymal fibrosis. Two were normal. Four had old calcific lesions.

Table 6: Distribution of study subjects as per past TB status.

Parameters		No.	%
Defaulter	Yes	16	12
	No	117	88
Duration of illness before ATT	>6 months	24	18
	<6 months	109	82
Sputum AFB smear status	Positive	114	85.7
	Negative	19	14.3
Sputum AFB smear status	1	102	76.7
	2	31	23.3
ATT initiated by	Specialist	125	94
	Others	08	06
Duration of ATT	<6 months	12	9.0
	6 months	66	49.6
	>6 months	55	41.4
Category of ATT	Newly diagnosed	91	68.4
	Previously treated	42	31.6
Compliance with ATT	Yes	123	92.5
	No	10	7.5
Follow up advised	Yes	36	27.1
	No	97	72.9

Table 6 shows distribution of study subjects as per past TB status. 16 cases were the defaulters while the 117 cases completed their regular course of the treatment. Duration of illness before ATT was more than six months in 24 cases while in 109 cases, it was less than six months. Sputum AFB smear status was positive in 114 cases while it was negative in 19 cases. Number of courses of ATT taken was one in 102 cases while it was two in 31 cases.

ATT was initiated by specialist in 125 cases while it was initiated by others in only eight cases. Duration of ATT was less than six months in 12 cases while it was six months in 66 cases, while it was more than six months in 55 cases. Category of ATT was newly diagnosed in 91 cases while it was previously treated in 42 cases. Compliance with ATT was seen in 123 cases while in 10 cases the compliance was not seen.

In 36 cases, the follow up was advised while in 97 cases, it was not advised.

DISCUSSION

Successful treatment of pulmonary tuberculosis with bacteriological clearance does not assess the residual structural and functional damage of the lung. These changes may herald the beginning of chronic respiratory diseases. The time of occurrence of post TB COPD is variable, but usually occurs within one year after treatment. We found that there was one case each of post TB fibrosis, pleural effusion with consolidation, pleural effusion with parenchymal fibrosis, aspergilloma, bilateral extensive fibrosis, fibro-cavity with

aspergilloma, pleural effusion. There two cases each of pleural thickenings, Normal, Pleuro-parenchymal fibrosis, fibro-cavity with destroyed lung, destroyed lung. There were three cases each of Pleuro parenchymal fibrosis. Majority of the cases were of pulmonary fibrosis followed by Bronchiectasis. Verma SK et al reported similar findings.⁶

Authors found that the mean FEV1 was 1.38 which increased to 1.52 after giving the bronchodilator. The mean FVC was 1.23 which increased to 1.58 after giving the bronchodilator. The mean FEV1/FVC was 67.37 which increased to 72.76 after giving the bronchodilator. The mean PEFr was found out to be 1.8+6. The mean SPO2 was found out to be 96.05. 78 cases were found to have obstructive lung disease. 27 cases were found to have restrictive lung disease. 16 cases were found to have mixed i.e. both the obstructive as well as the restrictive lung disease. 12 cases were found to have normal. It was concluded that 30 cases i.e. 22.6% of the cases the disease was reversible but, in the majority, i.e. 77.4% of the cases, it was found that the disease was not reversible. Menezes A et al, in The PLATINO study – large population- based multicenter study done in five Latin American countries. Shows that the overall prevalence of airflow obstruction (FEV1/FVC<0.7) was 30.7% among those with history of TB, compared with 13.9% among those without history. The association was stronger with FEV1 values than for FVC and, as a result FEV1/FVC showed a marked reduction suggestive of obstructive pattern.⁷

Authors found that the 78 cases (58.6%) were having obstructive type of lung disease while 27 (20.3%) had restrictive disease. Verma SK et al⁶ reported reversed findings which are in contrast to the findings of the present study. They reported that 37 (40.21%) had restrictive disease and 15 (16.3%) of the cases had obstructive disease.⁶

Authors found that out of the total 133 cases with post tuberculosis lung diseases, 22.6% had reversible lung disease based on the lung function tests and 77.4% had non reversible lung disease. Zakaria MW et al in their study found that 44% patients had non reversible lung disease. This reported figure is less than that what authors reported.⁸

Munda MK et al found that the history of TB was present in 61.1% of the patients with COPD. They also reported that the PTLDs were more prevalent in males compared to the females. This finding is in accordance with the finding of the present study. They also reported that more than half of the cases were regular smokers. Authors also found that a good number of such cases were smokers. The prevalence of COPD was 34% in the authors study.⁹ Baig IM et al found that majority of the cases were males. This finding is in accordance with the finding of the present study. The author also reported that the restrictive disease was seen in 29.7% of the cases. This finding is in

accordance with the finding of the present study where Authors found that the 20.3% had restrictive lung disease after exposure to tuberculosis.¹⁰

CONCLUSION

Exploring the long term complications that follow treatment of pulmonary TB is long overdue and will significantly contribute to the quality of care for TB patients. Further studies are needed to be done to develop approaches for the prevention, care and treatment of patients with PTBLDs. The global community cannot afford to ignore PTBLDs any further which is a huge public health burden. Further studies on genetics, immunopathogenesis and molecular biology are required for better understanding of this clinical condition which will point the way forward for therapeutic strategies in the management of PTBLD patients. The global incidence of tuberculosis is high, PTBLDs account significantly for CRDs, should be a part of national and WHO guidelines for tuberculosis management. Methodical identification, documentation, treatment and follow up of these PTBLDs at the earliest should be done without ignoring this major public health disease.

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