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Frequency of Bronchiectasis in Tuberculosis Patients: A Study from a Tertiary Care Hospital

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A B S T R A C T

Introduction: Tuberculosis (TB) is one of the leading killers among the infectious disease. Despite enormous efforts by the health care authorities its prevalence and related complications cause significant morbidity and mortality globally. Almost one quarter of the human population is infected with Mycobacterium tuberculosis (MTB).

Objective: To determine the frequency of bronchiectasis in tuberculosis patients.

Methodology: We conducted a descriptive, cross-sectional study in Pulmonology Ward of Ayub Teaching Hospital Abbottabad from November 2021 to May 2022. Patients of both genders having age between 16 to 80 years with active or past TB were included. The diagnosis of TB was made by detection of MTB in sputum via microscopy, Gene Xpert or culture. The Bronchiectasis (cases) included those patients with findings of signet ring appearance or cylindrical/saccular dilatation of the bronchi affecting at least three lung segments on HRCT chest.

Results: One hundred and seventeen patients were studied. The mean age of all TB patients was 52.8%± 7.3 years. Among all studied patients 51.3% (n=60) were male and 48.7% (n=57) were female patients. The difference in age and gender distribution was not significant in TB patients. The frequency of bronchiectasis in TB patients was 49.6% (n=58) which was found to be statistically significant ($p<0.03$).

Conclusion: This finding underscores the chronic morbidity associated with TB, even after successful treatment. The significant prevalence of bronchiectasis (49.6%) in TB patients indicates the need for routine follow-up and high-resolution imaging in individuals with a history of TB to ensure early diagnosis and management of bronchiectasis.

Keywords: Tuberculosis; Bronchiectasis; Frequency

Introduction

Tuberculosis (TB) is one of the old infectious diseases in humans. It has remained a serious killer for so many centuries. The disease is caused by Mycobacterium tuberculosis (MTB), which mainly affects the lungs but other organs like lymph nodes, peritoneum, meninges, joints, genito-urinary system, pleural membranes, adrenal glands and so many other parts of the body may be involved.[1] Even in the current days, TB is considered one of the top ten causes of death globally. It has been estimated that around one quarter of the world's population suffers from TB infection .[2] According to the World Health Organization (WHO) report, globally there were an estimated 10.6 million new TB cases and 1.3 million deaths in 2022 due to TB. The disease is more prevalent in low-income countries and hence its control is a big challenge.[3]

Pathologically, TB causes necrotizing granulomatous inflammation in the affected organs.[4] The infection disseminates in the community by inhaling the contaminated aerosols produced by patients with active pulmonary disease.[5]

Patients with TB infection are usually at greater risk of acquiring re-infection and also have greater mortality. A recent meta-analysis demonstrated that TB patients who were successfully treated still had three times more chances of death as compared to the general population or to matched controls.[6] The higher rate of mortality in post-TB patients has been attributed to some permanent lung damage caused by TB infection but is not fully understood. Pulmonary involvement due to TB may occur in a wide majority of patients and range from a simple radiological finding to severe pleuro-parenchymal destruction. The resultant damage may be responsible for severe physiological impairment in some cases. Some of these patients may progress to respiratory failure and even death.[7]

Bronchiectasis is one of the common pulmonary complications of TB. Various studies have demonstrated different rates of prevalence ranging from 35% to 86%.[8] Bronchiectasis is a form of lung damage with permanent destruction of bronchi leading to bronchial dilation that results from the destruction of elastic and muscular components of the bronchial walls.[9] Patients with bronchiectasis typically demonstrate airflow obstruction and recurrent episodes of purulent sputum production with or without hemoptysis. The gold standard test for the confirmation of the diagnosis is high-resolution computed tomography (HRCT) scan of the chest. The scan should preferably be done when the patient is stable in order to have good picture of the lung parenchyma and bronchi.[10]

The prevalence of bronchiectasis has been investigated by only a few researchers. In a study done by Jin J, et al in China the prevalence of bronchiectasis in previously treated PTB patient was found to be 64.4%.[11] Another study of 405 TB patients in Malawi demonstrated bronchiectasis in 44% of their patients.[12]

The aim of this study is to find out the frequency of bronchiectasis in patient presenting with TB in our population. We had very little local data in Pakistan regarding this major problem. Bronchiectasis is associated with increased risk of morbidities in post TB patients. By treating TB at its earliest stage will result in decrease in cases of bronchiectasis and in this way, we will endeavor to reduce the TB related complications including bronchiectasis both at national level and globally.

Objectives

To determine the frequency of bronchiectasis in tuberculosis patients.

Methodology

A descriptive, cross-sectional study was conducted in Pulmonology Department of Ayub Teaching Hospital Abbottabad over six months duration ranging from November 2021 to May 2022. Sample size of 117 was calculated by using WHO software of sample size determination with the following assumption: Expected frequency of bronchiectasis in tuberculosis patients is 44%,[12] with 95% confidence level and absolute precision of 9%. Consecutive convenient sampling technique was used for data collection. Patients of both genders and age between 16 to 80 years with active or past TB admitted in Pulmonology Department Ayub Teaching Hospital Abbottabad were include in this study. Patients of Mycobacterium other than tuberculosis (MOTT), HIV, Cystic fibrosis regardless of duration and patients taking oral corticosteroids or immunosuppressive drugs were excluded

Permission from hospital ethical committee was taken. All admitted cases with active or past tuberculosis were enrolled. The purpose of the study was explained to the patients and informed written consent was taken. All patients were inquired about their clinical history and relevant physical examination was performed.

Spirometry and HRCT chest was done in all study participants. Such observations were done under supervision of an expert pulmonologist and radiologist, fellows of CPSP. All the received data including name age, gender, weight, spirometry and address was recorded on a proforma.

Data were entered into SPSS version 16.0 for analysis. Age and weight of the patients were described as Mean ± Standard deviation. Categorical variables like gender, spirometry and bronchiectasis were calculated as frequencies and percentages. Bronchiectasis was stratified among age and gender. Post stratification chi square test was applied at 5% level of significance. Data

was presented in tables and charts.

Results

This study was conducted at the Department of Pulmonology, Ayub Teaching Hospital Abbottabad. There was total 117 study participants. Sixty (51.3%) study participants were males and 57 (48.7%) were females (Figure 1).

Mean weight of study participants was 42.8±7.1 kg. Mean age of study participants was 52.8±7.3 years. There were 24.8% patients in age range 16-40 years, 44.4% patients in age range 41-60 years and 30.8% patients in age range 61-80 years. Bronchiectasis was found in 58 (49.6%) patients. Among those were 31 males and 27 females. In frequency distribution of age with respect to bronchiectasis. This finding is statistically significant at p=0.03 out of total 117 patients (Table 1).

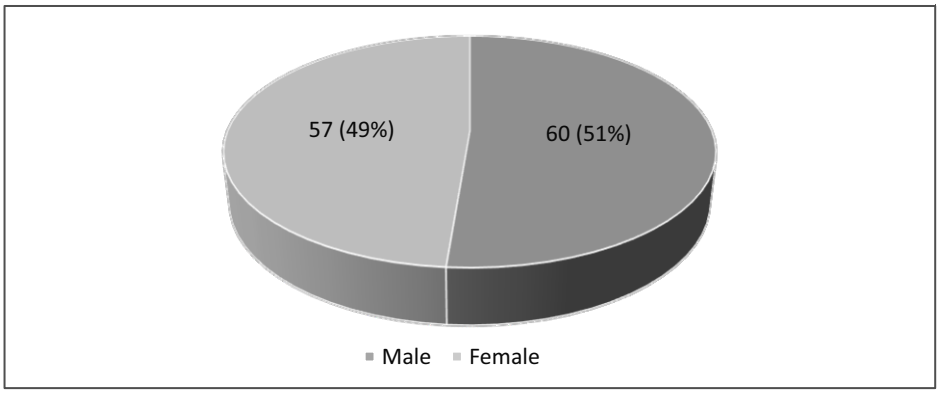

Figure 1. Gender base distribution of study cases

In frequency distribution of gender with respect to bronchiectasis it was found that 31(26.5%) male patients and 27(23.1%) female patients had bronchiectasis. This finding is statistically not significant at p=0.235 out of total 117 patients (Table 2).

Spirometry results revealed that 29.9% of the study participants had an FEV1 between 50-79%, while 30.8% had an FEV1 below 30% (Table 3).

Discussion

In our study, 117 pulmonary TB patients were studied. The mean age of those patients was 52.8±7.3 years. Malik et al. demonstrated in their study that most of their patients had ages between 18 and 65 years.[13] Their findings are consistent with our study. Yang et al. reported more prevalence of post TB bronchiectasis in patients older than 40 years age.[14] We also observed bronchiectasis to be more prevalent in older individuals, hence our findings are consistent with those studies. The possible reason for this might be the poor socioeconomic status and late presentation of TB patient to the primary care physician, resulting in significant damage to the lungs prior to presentation.[15]

In our study 26.5% male and 23.1% female patients had bronchiectasis; the prevalence remained slightly more in male population. This difference is statistically significant and might be because other factors may be involved that need further workup, and those factors may have some protective mechanism. A study by Al-Harbi et al demonstrated more prevalence of post TB bronchiectasis in female population; the female patients constituted 61%

Table 1. Frequency distribution of age with respect to bronchiectasis

Age group (years)	Bronchiectasis		Total	P-value
	Yes	No		
16-40	10 (8.5%)	19 (16.3%)	29 (24.8%)	0.03
41-60	27 (23.1%)	25 (21.3%)	52 (44.4%)	
61-80	21 (18.0%)	15 (12.8%)	36 (30.8%)	
Total	58 (49.6%)	59 (50.4%)	117 (100%)	

Table 2. Frequency distribution of gender with respect to bronchiectasis

Gender	Bronchiectasis		Total	P-value
	Yes	No		
Male	31 (26.5%)	29 (24.8%)	60 (51.3%)	0.03
Female	27 (23.1%)	30 (25.6%)	57 (48.7%)	
Total	58 (49.6%)	59 (50.4%)	117 (100%)	

of their study population.[16]

Researchers have compared the burden of symptoms in patients with post TB bronchiectasis with non bronchiectatic post TB patients. They reported that there was no significant difference in dyspnea and sputum production among the two groups but post TB patients had significantly more cough and limitation of physical activity and lower BMI.[17] We didn't study these parameters in our study population.

In our study bronchiectasis was found in 49.6% (n=58) of TB patients. Many international studies have reported different findings.[11] A recent study reported that 74% of TB patients had bronchiectasis on the basis of HRCT scans after TB treatment.[16] In a study done by Jin J, et al in China prevalence of bronchiectasis in previously treated PTB patient was found to be 50.6%. They have also studied the lobar involvement and have demonstrated that middle/lingular and lower lobes were more frequently involved compared to upper lobes.[11] The higher prevalence in some studies might be due to their patients selection. They might have included more severe cases in their study due to the referral centre status of their health care facility. Another reason might be the difference in the defining criteria of bronchiectasis on the basis of HRCT findings which might have caused overestimation of post-TB bronchiectasis in those studies.

We demonstrated low level of FEV1 in majority of our patients on spirometric examination. These findings suggest the possible role of bronchodilators in these patients as a treatment option. Various studies have reported different levels of FEV1 in post TB bronchiectasis patients. Al-Harbi et al compared the post TB bronchiectasis patients with bronchiectasis caused by other reasons and demonstrated more severe pulmonary dysfunction in their post TB patients. They also reported that patients with post TB bronchiectasis had lower predicted FEV1%, had more acute exacerbations, more frequent hospitalizations and had more extensive lung involvement. The likelihood of cystic disease was also more frequently observed in post TB bronchiectasis patients.[16]

Our study has several limitations. Firstly, our study patients were from a subspecialty unit of a tertiary care hospital. As there is no strict referral system at our institute and many of post TB patients receive treatment at general medicine department as well that is why we had no open access to all affected individuals. Secondly, the method of sampling was consecutive convenient one which may also have selection bias. Thirdly, many patients with several co-morbidities were excluded from the study. This resulted in gross loss of bronchiectasis patients and the sample was not true representative of the whole post TB bronchiectasis patient population. Fourthly, in TB patients preexisting bronchiectasis was not taken into account in our study, hence we were unable to demarcate the TB related bronchiectasis from preexisting bronchiectasis. Fifthly, casual effect of TB on the development of bronchiectasis couldn't be established

Table 3. Spirometry distribution in TB patients

Parameter level	Frequency	Percent
FEV1: 50%-79%	35	29.9
FEV1: 30%-49%	46	39.3
FEV1: < 30%	36	30.8
Total	117	100.0

due to cross sectional design of our study.

Conclusion

Bronchiectasis is common in patients with TB in both male and female population. Almost all of these patients have significant airflow limitation on pulmonary function testing. Large scale randomized control studies are recommended to look for the effect of TB in causing bronchiectasis and any possible role of chemotherapy in controlling the ongoing damage due to this condition.

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