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A Multi-center Study on Bronchiectasis in Active Tuberculosis

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Abstract:

Background: *Bronchiectasis may be found in pulmonary tuberculosis (PTB) as a feature of a chronic inflammatory process and is usually considered chronic traction bronchiectasis associated with healed scars. However, bronchiectasis can occasionally be seen in active TB.* ***Aim of the study:*** *To evaluate the presence of bronchiectasis in chest radiographs as a feature of active TB.* ***Methods:*** *A total of 92 patients with active TB who had diagnostic chest X-rays were included in the study. Among them, 20 patients had active TB, as the gene expert was positive. The X-rays were reviewed, focusing on bronchiectasis within consolidations or inflammation. Cases with bronchiectasis beyond the consolidation or inflammatory change were excluded from the study to exclude pre-existing traction bronchiectasis. 3 out of the 20 patients with bronchiectasis had a previous history of TB and were excluded from the study.* ***Results:*** *In 17 (18.48%) of the 92 patients, bronchiectasis was present within consolidations or inflammation on chest radiographs.* ***Conclusion:*** *Bronchiectasis can be seen within active inflammation in one-fourth of active TB on chest x-rays.*

Keywords: *Infection, radiograph, lung, tuberculosis.*

Introduction:

Bronchiectasis is defined as an irreversible bronchial dilatation[1]. It has a variety of underlying causes, with a common etiology of chronic inflammation[2]. Bronchiectasis, a debilitating and often overlooked pulmonary condition, has garnered increasing attention in the context of active tuberculosis (TB). Bronchiectasis is the irreversible dilation and distortion of bronchial airways, leading to chronic and debilitating respiratory symptoms. On the other hand, active tuberculosis is a highly contagious bacterial infection primarily affecting the lungs, caused by Mycobacterium tuberculosis. It is common in all types of tuberculosis, especially in the post TB fibrosis stage. It may occur with active tuberculosis and become part of the tuberculous picture. It may also occur with inactive tuberculosis and present a distinct symptom complex. The relationship between bronchiectasis and active TB is a subject of growing interest in the field of respiratory medicine. As tuberculosis remains a global health concern, understanding the confluence of these two conditions becomes paramount for effective diagnosis, treatment, and prevention strategies. Several studies have highlighted the increased susceptibility of individuals with bronchiectasis to TB infection and the challenges posed by the coexistence of these diseases in clinical practice. It is easy to diagnose. It is a relatively benign disease; no special treatment is usually needed[3]. Studies have shown that patients with active tuberculosis and bronchiectasis often experience more severe symptoms and a poorer prognosis than those with just tuberculosis. This is due to the active tuberculosis infection and the irreversible airway damage caused by bronchiectasis. Treatment for bronchiectasis in the setting of active tuberculosis requires a multi-disciplinary approach. This typically includes

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using anti-tuberculosis drugs to control the tuberculosis infection and bronchodilators and antibiotics to manage the bronchiectasis. In some cases, surgery may also be necessary to remove infected or damaged tissue. High-resolution CT is the most accurate modality for diagnosis. Bronchiectasis typically presents with recurrent chest infections[2]. It frequently occurs in association with healed pulmonary tuberculosis (TB). Traction bronchiectasis can develop after the healing of active TB in the vicinity of scar tissues or bronchial obstruction. Thus, bronchiectasis is considered to be an irreversible manifestation of healed TB. The study aims to evaluate the presence of bronchiectasis in chest radiographs as a feature of active TB.

Methodology & materials:

This cross-sectional study spanned from April 2021 to March 2022 and involved examining 92 patients who had undergone chest X-rays with P/A views due to suspected pulmonary tuberculosis. The data for this study was gathered from tuberculosis screening centers across various Bangladesh districts, specifically those affiliated with the International Centre for Diarrheal Disease Research, Bangladesh (ICDDRB). Within this cohort, it was determined that 20 patients had active tuberculosis based on positive gene expert results. The X-ray analysis's primary focus was identifying bronchiectasis within areas of consolidation or inflammation in the patients. However, it is worth noting that three of the 20 patients who exhibited bronchiectasis had a prior history of tuberculosis and were subsequently excluded from the study. Patients of age ranging from 15 to 85 years, having a suspicion of pulmonary tuberculosis and were proved to have active TB in gene experts were included in the study. Patients who had a history of TB or pre-existing traction bronchiectasis or patients having bronchiectatic changes beyond the consolidation or inflammatory change were excluded from the study. The information was organized meticulously, with data thoughtfully presented in tables and graphs carefully chosen to complement their inherent characteristics. To ensure clarity, detailed explanations accompanied each table and graph. Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) software on a Windows platform.

Results:

From 92 patients, a cohort of 17 individuals was selected for participation and subsequent analysis within this research study. Bronchiectasis was present within consolidations or inflammation on chest radiographs in all 17 patients. The age distribution of the study subjects is delineated in Table 1, where it is evident that most patients fell within the age range of 26-35 years, constituting 23.53% of the total. Conversely, there was only one patient, or 5.88% of the cohort, aged 76-85 years. The mean age of the participants was 43.94 years, with a standard deviation of 17.22. In terms of gender, the study comprised predominantly males, making up 10 individuals or 58.82%, while the remaining 41.18% were females, as illustrated in Figure 1. Table 2 outlines the clinical presentations observed among the study participants, providing details on the frequency and percentage of each symptom. The most frequently reported symptom was Cough/Sputum, accounting for 52.94% of the cases. Following this, 2 patients (11.76%) presented with fever, one exhibited hemoptysis, and 5(29.41%) experienced other symptoms. Table 3 elucidates the diagnostic methods employed in the study, with the most prevalent approach being a combination of Culture, AFB (Acid-Fast Bacilli) testing, and PCR (Polymerase Chain Reaction), constituting 82.35% of cases. Nearby, AFB and PCR together represented 17.65% of cases. Table 4 shows the chest X-ray findings of the participants in the study. The most significant portion, accounting for 64.71%, displays potential signs of TB. Highly suggestive TB cases make up 29.41%, while 5.88% of patients are categorized as having non-TB abnormalities.

Table-I

Age distribution of the study population (N=17).

Age range (Years)	Frequency (n)	Percentage (%)
15-25	3	17.65
26-35	4	23.53
36-45	2	11.76
46-55	3	17.65
56-65	2	11.76
66-75	2	11.76
76-85	1	5.88
Mean±SD	43.94±17.22	

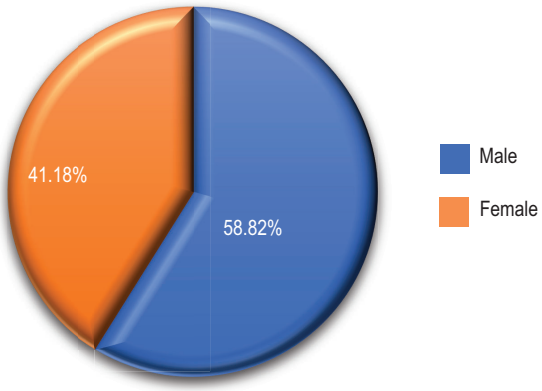

Fig.-1: *Gender distribution of the study population (N=17).*

Table II

Clinical presentation of the study population (N=17)

Clinical presentation	Frequency (n)	Percentage
Cough/Sputum	9	52.94
Fever	2	11.76
Hemoptysis	1	5.88
Others	5	29.41

Table III

Study diagnosis methods.

Diagnosis	Frequency (n)	Percentage (%)
Culture, AFB, and PCR	14	82.35
AFB and PCR	3	17.65

Table IV

Chest X-ray findings of the study population (N=92).

Chest x-ray radiology	Frequency (n)	Percentage (%)
TB Possible Signs	11	64.71
Non-TB Abnormality	1	5.88
Highly TB Suggestive	5	29.41

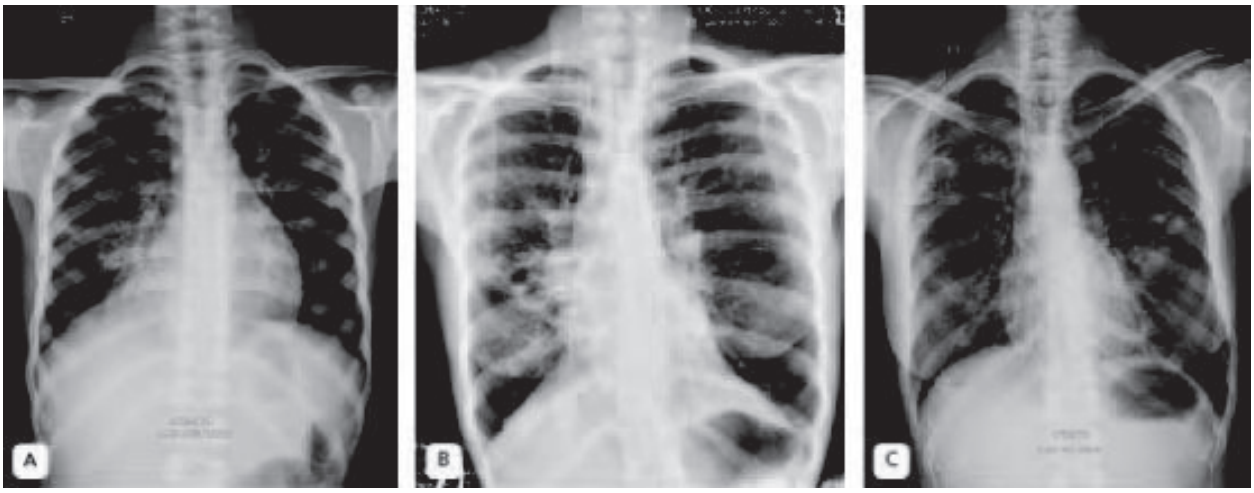

Fig-2: *Chest X-ray of patients with bronchiectasis in active TB*

Discussion:

Bronchiectasis frequently co-occurs with tuberculosis[4]. Among various causes of Bronchiectasis, the post-infectious type, particularly following TB, remains the leading etiology. Prior reports have indicated that the frequency of Bronchiectasis in TB patients ranges from 19% to 65%, with a higher incidence in the post TB fibrosis stage of the disease. Bronchiectasis commonly arises due to lung parenchyma destruction and fibrosis, leading to irreversible bronchial dilation[5]. Tracheobronchial lymph nodes affected by TB can cause bronchial obstruction, further contributing to Bronchiectasis[6]. Imaging is crucial in diagnosing Bronchiectasis, with CT scans being the preferred modality. Bronchiectasis can manifest in different forms, including cylindrical or varicose types.

Bronchial dilation may be observed with active TB, independent of traction bronchiectasis. Moreover, the presence of Bronchiectasis within an active lesion on CT scans can aid in the diagnosis of active TB, distinguishing it from conditions such as pneumonia. However, studies specifically focused on Bronchiectasis caused by active TB are limited. Therefore, some researchers aimed to assess the prevalence and characteristics of Bronchiectasis within active TB lesions by analyzing CT findings[7]. Due to the cost and limited availability of CT scans as a primary diagnostic tool for TB, we also investigated the prevalence and features of Bronchiectasis in active TB lesions using chest X-rays. Bronchiectasis indicators on X-rays include indistinct, thin, and ill-defined walls (not exceeding 2 cm in diameter), typically observed in segmental groups or clusters [8]. Our findings revealed that 3.26% of active TB patients had Bronchiectasis associated with active TB lesions, a prevalence lower than reported in other studies [9]. This discrepancy may be attributed to our focus on Bronchiectasis exclusively within active lesions, excluding cases with adjacent architectural distortion characteristic of traction bronchiectasis. In our cases, bronchiectasis likely results from the active inflammation and bronchial wall damage induced by TB, suggesting the presence of bronchial destruction due to active inflammation. This focal aneurysmal or cystic destruction seen in active TB lesions differs from cystic or varicose Bronchiectasis, characterized by alternating dilation and constriction in dilated airways. Cystic Bronchiectasis is the most severe and chronic form[1]. A study conducted at a Chinese hospital on adult patients diagnosed with Bronchiectasis revealed that the main causes were pulmonary TB (31.17%), bacterial infections, and pertussis[10]. The definitive diagnosis of Bronchiectasis typically requires iodized oil bronchography. However, suspicion of Bronchiectasis may arise in cases of active TB with more pronounced cough, sputum production, and hemoptysis than expected[3]. Tubercular tracheobronchial lymph nodes can lead to bronchial obstruction and subsequent bronchiectasis [6]. *Bronchiectasis* is a common complication following the primary TB infection and should be considered in cases of substantial roentgen shadows[8]. It often occurs alongside healed pulmonary TB. After the resolution of active TB, traction bronchiectasis can develop near scar tissue or bronchial obstructions, making Bronchiectasis an irreversible manifestation of healed TB[7, 9]. In cases of active TB, bronchial wall destruction can lead to bronchial dilation, which may be visible on imaging without any association with traction bronchiectasis[7]. While CT scans are the gold standard for diagnosing and classifying Bronchiectasis, their cost limits their applicability to the general population. Chest X-rays, on the other hand, are affordable and widely available, serving as the initial diagnostic tool for TB. In our ICDDRB TB centers, we employed X-rays to diagnose the presence of Bronchiectasis within active TB lesions. Specifically, cylindrical Bronchiectasis with focal erosion, detected within consolidation, is considered a characteristic feature of TB, setting it apart from other necrotic pneumonia cases. Given the absence of comparative studies, such investigations are essential to advance our understanding of this condition.

Limitations of the study: Our current investigation has limitations like many hospital-based studies. One important limitation of this study is that we relied on X-rays to diagnose bronchiectasis, where a CT scan is the modality of choice. The sample size of 17 participants may limit the generalizability of the findings to a broader population. The exclusion of patients with prior TB history may have introduced a selection bias, potentially underrepresenting the true association between bronchiectasis and active TB. The reliance on chest X-rays, a more accessible diagnostic tool, may have limitations in detecting subtle or early-stage bronchiectasis. Further research with larger and more diverse cohorts, including advanced imaging modalities, is warranted to enhance the robustness of our findings.

Conclusion and recommendations:

In conclusion, our study highlights the significant association between bronchiectasis and active tuberculosis, emphasizing the need for careful consideration in diagnosis and treatment. The coexistence of these conditions poses challenges, leading to more severe symptoms and a poorer prognosis. Our findings suggest that

bronchiectasis within active TB lesions, as observed in chest X-rays, is a relatively uncommon but essential manifestation, necessitating a multidisciplinary approach for effective management. Recommendations include incorporating bronchiectasis screening in TB patients, especially those with persistent symptoms. Combining imaging modalities, including chest X-rays, can enhance early detection. Further research is warranted to explore the nuances of bronchiectasis in active TB and its impact on patient outcomes, informing tailored therapeutic strategies. The study underscores the importance of vigilance in respiratory medicine to address the intricate interplay between bronchiectasis and active tuberculosis.

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