

## Frequency of Aspergilloma in Clinically Diagnosed and Undiagnosed Patients of Cavitary Pulmonary Tuberculosis

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### ABSTRACT

**Objective:** To determine the frequency of aspergilloma in clinically diagnosed and undiagnosed patients of cavitary pulmonary tuberculosis.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** Armed Forces Institute of Radiology, and Imaging Rawalpindi Pakistan, from May to Oct 2019.

**Methodology:** Total of 236 patients with clinically diagnosed or having suspicion of cavitary pulmonary tuberculosis were included. High-resolution computed tomography showing a single or multiple well defined cavities within consolidation with cavities having aspergilloma, nodules with tree in bud configuration in upper lobes of lung or superior segments of lower lobes were recorded.

**Results:** Out of these 236 patients, 140(59.32%) were males and 96(40.68%) were females. The age of patients ranged from 18-70 years with mean age of 43.56±10.13 years. In our study, aspergilloma in clinically diagnosed and undiagnosed patients of cavitary pulmonary tuberculosis was found in 27(11.44%) patients.

**Conclusion:** This study revealed that incidence of aspergilloma in clinically diagnosed and undiagnosed patients of cavitary pulmonary tuberculosis is quite high.

**Keywords:** Aspergilloma, Mycobacterium tuberculosis, Pulmonary tuberculosis.

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### INTRODUCTION

Aspergillus genus consists of hundreds of fungal species ubiquitously present in nature, out of which nearly 60 species have the ability to cause infection in humans. They are capable of infecting multiple organs.<sup>1,2</sup> The spectrum of disease is highly variable ranging from asymptomatic simple colonization to massive sometimes fatal hemoptysis that can lead to death.<sup>3,4</sup> Aspergilloma has the tendency to develop in patients with structurally abnormal lung with pre-existing cavities.<sup>5</sup> Pulmonary tuberculosis, caused by mycobacterium tuberculosis, when bacilli are inhaled through respiratory route, is classically associated with pulmonary diseases and complications. Aspergilloma or saprophytic aspergillus is characterized by infection without surrounding tissue invasion.<sup>6</sup> Aspergilloma typically comprises of coalescent mass of fungal hyphae, its fibrin mixed with mucus secretion and post inflammatory debris found in residual cavity mostly secondarily to tuberculosis.<sup>7</sup> The

prevalence of aspergilloma is 11% in cavitary pulmonary tuberculosis.<sup>8</sup>

On HRCT chest, a high attenuation, mobile, intra cavitary fungal mass/ball with surrounding crescent shaped air representing air crescent sign is seen. The mobility of fungal mass represents monads sign, which is unique to aspergilloma.<sup>5,8</sup> The diagnosis of aspergilloma is often mixed with pulmonary tuberculosis in developing countries like in south East Asia due to high disease burden of tuberculosis similar clinical signs and symptoms like hemoptysis, malaise, weight loss, fever, cough and chest pain.<sup>9</sup> Therefore, diagnosis of aspergilloma cannot be established on clinical findings or initial chest x-rays alone. HRCT chest remains fundamental diagnostic tool and hence further treatment of patients with aspergilloma on background of cavitary pulmonary tuberculosis.<sup>10</sup>

The rationale of this study was to understand and differentiate the radiological manifestations and sequelae of pulmonary tuberculosis like aspergilloma that can mimic other pathologies and facilitate in early diagnosis and in preventing fatal complications like severe hemoptysis.

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**METHODOLOGY**

The cross-sectional study was conducted at Armed forces Institute of Radiology and Imaging, Rawalpindi Pakistan, from May to Oct 2019, after approval from Ethical Committee of Hospital vide (Certificate No.0006). Sample size was calculated with the help of WHO sample size calculator.

**Inclusion Criteria:** Patients aged 18-70 years, of either sex coming for HRCT from tertiary care hospitals or referred cases from periphery with clinically diagnosed or having suspicion of cavitary pulmonary tuberculosis were included.

**Exclusion Criteria:** Patients with or have suspicion of underlying lung pathology other than tuberculosis, HIV or those who are immunocompromized and hemoglobinopathies were excluded.

HRCT showing a single or multiple well defined cavities within a patch of consolidation with one or more of cavities having aspergilloma along with small soft tissue attenuation nodules with tree in bud configuration in upper lobes of lung or superior segments of lower lobes were recorded.

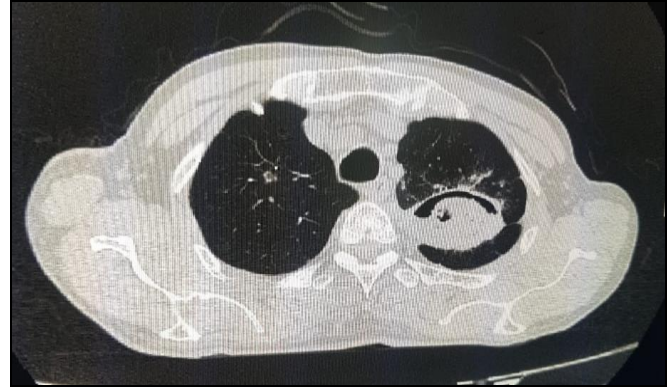
Statistical Package for Social Sciences (SPSS) version 21.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤0.05 was considered statistically significant.

**RESULTS**

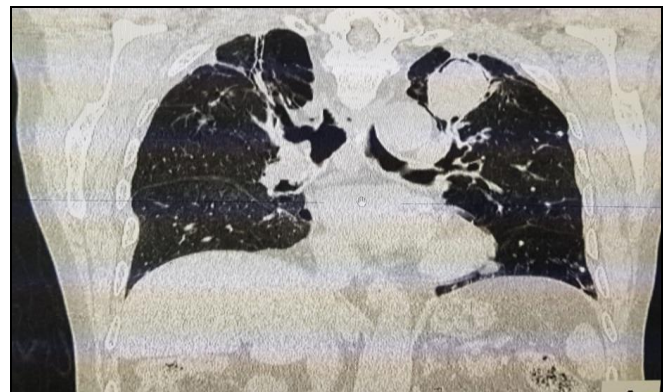
Total of 236 patients with clinically diagnosed or having suspicion of cavitary pulmonary tuberculosis were included. The mean age of the patients was 43.56±10.13 years. Most of the patients (64.83%) were found to be between 18-45 years of age. In our present study, frequency of aspergilloma in clinically diagnosed and undiagnosed patients of cavitary pulmonary tuberculosis was found in 27(11.44%) patients. Aspergilloma with respect to tuberculosis diagnosis is shown in Table-I. Figure-1 & 2 demonstrate aspergilloma in Tuberculous cavity.

**Table-I: Frequency of Aspergilloma with respect to Diagnosed Tuberculosis (n=236).**

Diagnosed Tuberculosis	Aspergilloma		<i>p</i> -value
	Yes	No	
Yes	22(9.3%)	131(55.5%)	0.054
No	05(2.1%)	78(33.0%)	



**Figure-1: Axial CT Chest demonstrating Aspergilloma in Left apical Tuberculous Cavity**



**Figure-2: Coronal CT Chest in another patient showing Aspergilloma in left upper lobe Tuberculous Cavity**

**DISCUSSION**

Tuberculosis is curable disease worldwide with disease burden of approximately 9 million new cases diagnosed each year, early diagnosis and management is desired to minimize the adverse effect of tuberculosis on health of individuals.<sup>11</sup> Lung functions are compromised by tuberculosis before and after the treatment and can usually represent as progressive lung dysfunction, continuous pulmonary symptoms and long term complications like development of pulmonary aspergillosis (CPA). Out of these long standing complications of pulmonary tuberculosis (PTB), CPA is found to be subtle, yet the most severe complication.<sup>12</sup> A previous study demonstrated that approx. 25% patients had detectable Aspergilloma antigen in blood sample. These patients also demonstrated both antigen and x-ray features of an aspergilloma in approx. 14% at 12 months and also in 22% of patients at 3-4 years of regular followup.<sup>13</sup> Pulmonary tuberculosis and CPA present clinically with similar symptomatology. Due to poor testing facilities for IgG antibodies (precipitins) against *Aspergillus fumigatus* in many places around the world had probably

revealed underdiagnoses of CPA at initial clinical presentation and also in following treatment for PTB. In one of such examples, a case series of people with respiratory illness with negative acid fast bacillus (AFB) sputum tests in sub-Saharan Africa, *Aspergillus fumigatus* was found to be commonly identified pathogen.<sup>14</sup>

The earlier studies revealed presence of aspergillous infection in post-TB populations. In one of such study *Aspergillus*-related antibodies were present in approx. 8.3% of 350 patients treated for pulmonary TB.<sup>15</sup> In a similar study Chest radiography plus serological surveys demonstrated CPA in 8.7% of 208 patients who had completed pulmonary TB treatment and 11.3% of 124 patents with active or treated TB.<sup>16</sup>

Chest radiography does not accurately describes the interior of aspergillous cavity. *Aspergillus* fungal infection growth is depicted along the walls of cavity which results in irregular appearance of inner margin of cavity on Chest CT scan. Fungal nodules along the cavity may detach from its wall. These detach nodules coalesce to form sponge like densities which represent fungal ball containing air. These coalescent nodule often detaches from wall and become mobile. CT scan is relatively sensitive than chest radiography in detecting aspergilloma nodules particularly in cases where nodule is small.<sup>16,17</sup> The nodules in aspergilloma can grow to amaximum of 5-50 mm in diameter and can be either single or multiple and can present with central cavitation. Nodules which are >3 cm can represent masses representing *Aspergillus* infection. The differential diagnosis includes primary or secondary carcinoma, coccidioidomycosis, cryptococcosis, and others. Biopsy and histopathology represent the definite diagnosis in such cases because many of these patients do not have elevated levels of IgG antibodies against *Aspergillus* species or positive sputum cultures samples.<sup>18</sup> Another study analyzed retrospective data of thoracic CT imaging in 36 patients who have been diagnosed with CPA during both baseline and 6 months following initiation of appropriate antifungal therapy. This showed a tremendous reduction in pulmonary cavity wall and/or pleural thickness with much improvement in clinical picture. Similarly, to some extend a correlation between resolution of an already identified aspergilloma after initiation of treatment and a reduction in cavity wall and/or pleural thickness and improvement in clinical picture was also well demonstrated. On the contrary development of Aspergilloma or pulmonary cavities

correlated poorly with clinical outcome.<sup>11</sup> These results helped radiologist to define the objective radiological criteria in routine clinical scenarios to establish therapeutic clinical response to treatment and facilitate patient monitoring.

### CONCLUSION

This study concluded frequency of aspergilloma in clinically diagnosed and undiagnosed patients of cavitatory pulmonary tuberculosis is quite high. We recommend that early and timely diagnosis of aspergilloma in clinically diagnosed and undiagnosed patients of cavitatory pulmonary tuberculosis should be taken into considerations which can mimic other pathologies and facilitate in early diagnosis and in preventing fatal complications like severe hemoptysis.

**Conflict of Interest:** None.

### Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AF: & AF: Conception, study design, drafting the manuscript, approval of the final version to be published.

MS: & MUK: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

MOA: & ARSB: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

HA: & HN: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Frequency of Aspergilloma

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