

## Prevalence of Pulmonary Tuberculosis and Fungal Infection in Presumptive Tuberculosis Patients (PTB) Attending a Tertiary Care Centre in Eastern Bihar: A Hospital Based Prospective Observational Study.

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Conflict of interest: Nil

### Abstract:

**Aims:** The aim of the present study was to find the prevalence of pulmonary tuberculosis and fungal infection in clinically suspected cases of tuberculosis attending Katihar Medical College and Hospital, Katihar, Bihar. **Methods:** All the sputum samples of presumptive pulmonary tuberculosis patients received in the department of Microbiology for the presence of M. tuberculosis and fungal coinfections. Early morning sputum samples were collected from the study participants and stored in sterile, leak-proof, wide-mouth containers. ZN staining of the sputum smears were done for detection of acid-fast bacilli and Gram staining for detection of fungal elements. Culture of unprocessed sputum was done on Sabouraud's Dextrose Agar (SDA). A routine examination of the culture plates was done to rule out any fungal growth on every alternate day for two weeks, after which the plates were discarded, if there was no fungal growth.

**Results:** The male: female ratio of presumptive pulmonary tuberculosis cases was 2.2:1. Positive MTB was 75(19.2%), the number of fungal elements was 27 (7%) and number of both pathogens together were found in 19 (5%) patients. Out of the 75 positive MTB patients, 53(71%) and 22(29%) were diagnosed in male and female patients respectively. Among the 27 fungal isolates, 17(63%) in males and 10(37%) in females were isolated. Among the 27 (7%) out of 390 PTB patients, fungal elements were found. From among these 27, 18(67%) are moulds and 9(33%) were found to be yeasts. The moulds were identified as *Aspergillus fumigatus* in 14 cases and *Aspergillus niger* in 4 cases on the basis of colony morphology and LPCB staining. 9 yeasts were identified as *Candida albicans* by Grams staining and Vitek 2 compact system. Mean age was 41 years. Age group of 41-60 years has the highest rate of tubercular infection of 45.6%.

**Conclusions:** Tuberculosis remains a global threat despite effort to eradicate the diseases and TB co-infection with fungus may complicate infection and treatment. The most predisposed age groups to both infections were ages 20-40 years, the most active segment of the economy. Screening for TB should be conducted concomitantly with mycosis for better treatment. Although the prevalence rates of all the co-infections were low and statistically not significant. Being chronic in nature and with confusing clinical and radiological findings, these fungal infections are misdiagnosed as reactivation of tuberculosis. Hence, the increasing rate of morbidity and mortality can decrease if adequate measures are taken for the diagnosis at an early stage and appropriate treatment of the mycosis.

**Keywords:** Pulmonary tuberculosis, Fungal infection, Presumptive tuberculosis, Prevalence.

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### Introduction

Both pulmonary tuberculosis and fungal infection of lungs present with similar symptoms. They have chronic cough, fever and decreased appetite. Radiologically both have similar picture. Only laboratory investigation remains the main tool to differentiate pulmonary tuberculosis from fungal

infections. The true burden of these fungal infections still remains underdiagnosed [1].

Early diagnosis of fungal infection leads to early cure and unnecessary ATT. Extensive use of antibiotics and steroids has resulted in increasing trends of these fungal infections globally. Many

factors are implicated in the recent surge in the fungal infections but the most important cause remain pulmonary tuberculosis, HIV/ AIDS, and immunosuppressive drugs [2].

The fungi and their spores colonise the lung parenchyma by various modes such as inhalation, blood route or by reactivation of dormant infections. In many cases, missed fungal pulmonary infection due to lack of specific clinical manifestation causes a high rate of morbidity and mortality [3]. A study illustrated that up to 1 million people recovering from tuberculosis developed pulmonary fungal co-infection annually and were mostly misdiagnosed as cases of relapsed PTB [4]. However, at present some clinicians do not pay enough attention to this problem [5]. Therefore related studies on fungal co-infection with PTB and pulmonary fungal infections are needed so that these patients may benefit from targeted antifungal agents promptly [6]. The aim of the present study was to find the prevalence of pulmonary tuberculosis and fungal infection in clinically suspected cases of tuberculosis attending Katihar Medical College and Hospital, Katihar, Bihar.

#### Material and Methods

This was a prospective observational hospital-based study. This was conducted in the tertiary care centre in eastern Bihar.

**Inclusion criteria:** All the sputum samples of presumptive pulmonary tuberculosis patients received in the department of Microbiology.

#### Exclusion Criteria:

1. Samples of insufficient quantity
2. Inappropriately collected samples

#### 3. Patients already on ATT

All the sputum samples meeting the inclusion and exclusion criteria, received in our department during the study period were included. 390 sputum samples of presumptive pulmonary tuberculosis patients received in the department of Microbiology from August 2022 to July 2023 were evaluated.

The study subjects were divided into four categories based on age: 1-20 year, 21- 40 years, 41-60 years and >60 years.

**Processing of Clinical Samples:** Early morning sputum samples were collected from the study participants and stored in sterile, leak-proof, wide-mouth containers.

ZN staining of the sputum smears were done for detection of acid- fast bacilli and Gram staining for detection of fungal elements.

Culture of unprocessed sputum was done on Sabouraud's Dextrose Agar (SDA). A routine examination of the culture plates was done to rule out any fungal growth on every alternate day for two weeks, after which the plates were discarded, if there was no fungal growth.

**Identification:** Identification of moulds was based on their macroscopic and microscopic features. Macroscopically, the physical characteristic, texture, pigmentation and rate of growth of culture were seen. For microscopic features of moulds, staining with Lactophenol Cotton Blue (LPCB) was done.

#### Results

Out of 390 patients, 269 patients were males (68%) and 121 (32%) were females. Male to female ratio is 2.2:1.

**Table 1: Gender wise distribution of presumptive tubercular patients.**

Gender	Numbers=390	Percentage %
Male	269	68%
Female	121	32%

After analysis and evaluation of 390 presumptive tuberculosis patients (PTB), the number of positive MTB was 75(19.2%), the number of fungal elements is 27 (7%) and number of both pathogens together were found in 19 (5%) patients.

Out of the 75 positive MTB patients, 53(71%) and 22(29%) were diagnosed in male and female patients respectively.

Among the 27 fungal isolates, 17(63%) in males and 10(37%) in females were isolated.

**Table 2: Gender wise distribution of pulmonary tuberculosis patients.**

Gender	Numbers=390	Percentage %
Male	53	13.6%
Female	22	5.6%
Total	75	19.2%

**Table 3: Gender wise distribution of patients with fungal lung infection.**

Gender	Numbers=390	Percentage %
Male	17	4.4%
Female	10	2.6%
Total	27	7%

Among the 27 (7%) out of 390 PTB patients in which fungal elements were found, 18(67%) were moulds and 9(33%) were found to be yeasts. The moulds were identified as *Aspergillus fumigatus* in 14 cases and *Aspergillus niger* in 4 cases on the basis of colony morphology and LPCB staining. 9 yeasts were identified as *Candida albicans* by Grams staining and Vitek 2 compact system.

**Table 4: Showing the fungi isolated.**

Fungi isolated	Numbers=390	Percentage %
<i>Aspergillus fumigatus</i>	14	3.6%
<i>Aspergillus niger</i>	4	1%
Total	27	6.9 %

In only 19 of these 390 cases, both fungi and acid fast bacilli were found to co-exist.

**Table 5: Showing the acid-fast bacilli and fungi.**

Co-existing M. tb and fungi	Numbers=390	Percentage %
M. tb with <i>Aspergillus fumigatus</i>	9	2.3%
M. tb with <i>Aspergillus niger</i>	3	0.77%
M. tb with <i>Candida albican</i>	7	1.8%
Total (M. tb with Fungi)	19	4.9%

Mean age of patients was 41 years. Age group of 41-60 years was the highest rate of tubercular infection of 45.6%. It shows that middle-aged groups patients were more prone to infection.

**Table 6: Age wise distribution of pulmonary tuberculosis patients.**

Age	Numbers	Percentage
1-20 years	5	8.7%
21-40 years	20	35%
41-60 years	26	45.6%
>60 years	6	10.5%

We tallied our laboratory findings with CBNAAT, which were done in Sadar hospital of Katihar. With CBNAAT, MTB was detected in 22% in patients who are taking anti-tubercular treatment.

During one year, 390 samples were tested using CBNAAT/TRUENAAT and 86 samples came out to be MTB positive.

**Table 7: Age wise distributions of MTB positive patients**

Age	No of MTB-detected	% of MTB positive patients
0-20 years	17	4.4%
21-40	32	8.2%
41-60	24	6.1%
61-Above	13	3.3%
	86	22%

**Table 8: Gender wise distributions of MTB detected patients.**

Gender	MTB detected	%
Male	58	14.9%
Female	28	7.1%

## Discussions

Pulmonary fungal infection with *Aspergillus* occurs most commonly in individuals in the middle age group as compare to elderly people and is reported to be more common in male patients [7,8].

The results of our study was consistent with the findings of other researchers like Kosmidis C et al. [7] and Kohno S et al. [8] as the incidence of fungal mycosis was higher in the age group of 35 years and older than in much younger individuals, with males having more cases among them than their female counterparts. Various studies, however, concluded that people in their third and fourth decades were mostly associated with these fungal infections [9,10].

The prevalence of opportunistic fungal infections has increased, which normally incapable of causing disease in healthy persons. While they are potential pathogens in immunocompromised individuals, patients with underlying diseases, broad consumption of antibiotics, impairments of immunity in pulmonary tuberculosis patients [11]. In this study, as mentioned in the results section, *A. fumigatus*, *A. niger* and *C. albicans* are the pathogens recovered from the sputum samples.

In line of our findings, in the study conducted by Osman MN and et al., in Egypt, in 2012, *A. fumigatus* was reported as the most frequent *Aspergillus* spp. followed by *A. niger* and *A. flavus*, while other fungal spp. were no detected [12]. Other

studies from all over the world reported the *Aspergillus* spp., as the predominant fungi in patients suspected of pulmonary tuberculosis [13-15]. The leading *Aspergillus* spp., detected from sputum in this study was *A. fumigatus*. In the study conducted at Patna medical college hospital, Bihar, in 2011 to 2012, 75 sputum sample were collected from patients suspected of tuberculosis. Their results indicated that the *Candida albicans* was isolated in 44.4% followed by *A. niger* with a prevalence of 33.3% [16]. The correlation between co-existence of candida infections and pulmonary tuberculosis has increased concern during recent years [17]. In our study, the co-infection of TB with fungal infection were found in only 19(5%) patients.

### Conclusions

Tuberculosis remains a global threat despite effort to eradicate the diseases and TB co-infection with fungus may complicate infection and treatment. The most predisposed age groups to both infections were ages 20-40 years, the most active segment of the economy. Screening for TB should be conducted concomitantly with mycosis for better treatment. Although the prevalence rates of all the co-infections were low and statistically not significant. Being chronic in nature and with confusing clinical and radiological findings, these fungal infections are misdiagnosed as reactivation of tuberculosis. Hence, the increasing rate of morbidity and mortality can decrease if adequate measures are taken for the diagnosis at an early stage and appropriate treatment of the mycosis.

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