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Research Article

Prevalence of Fungi as Opportunistic Pathogens in Active and Post-Treated Pulmonary Tuberculosis Cases - A Comparative Study

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Abstract

Tuberculosis is one of the leading causes of death all over the world. The course of infection and treatment makes the patient vulnerable to opportunistic fungal infections, which is mostly misdiagnosed. A total of 100 samples were screened (50 Active and 50 Post-treated pulmonary tuberculosis (PTB) cases), in which 55% opportunistic fungal pathogens were detected. The prevalence of opportunistic fungal infection was 58% amongst the active PTB cases and 52% in post-treated cases of pulmonary TB. *Candida* species (40%) were the most common isolates in active PTB cases and in post treated PTB cases *Aspergillus* spp. (34%) species was more common. The coexistence of fungi with tubercle bacilli complicates a patient's condition by adding more damaging and fatal dimensions to it.

Keywords: *Opportunistic Fungal Infection; Pulmonary Mycoses; Candidiasis; Aspergillosis*

Introduction

Tuberculosis (TB), which is one of the oldest diseases known to affect the mankind, is a major cause of death worldwide. It causes ill-health in millions of people annually and in 2015 it was one of the top 10 causes of death worldwide, ranking above HIV/AIDS as one of the leading causes of death from an infectious disease [1]. In 2015, there were an estimated 10.4 million new (incident) TB cases worldwide. In India, 1 person dies every minute and 500,000 people die per year from TB. One fourth of the global incident TB cases occur in India annually [2].

Chronic nature of tubercular infection along with prolonged chemotherapy with or without corticosteroids severely affects patient's immune system, predisposing him to acquire super infection by opportunistic fungi. Due to immune deficiency or suppression in tuberculosis, these patients are vulnerable to opportunistic fungal infections [3].

Post-TB Complications may lead to persisting pulmonary damage in patients whose infection has been considered cured on clinical grounds. Chronic impairment of lung functions, bronchiectasis, aspergilloma, and chronic pulmonary aspergillosis (CPA) have been associated with TB [5]. CPA may manifest as simple aspergilloma (fungal ball) or chronic cavity aspergillosis. Fungal infection of lung is slowly making its presence felt in India [4]. An urgent need for proper diagnosis of tuberculosis patients is required for an effective treatment. The present study was done to compare the prevalence of fungal pathogens causing opportunistic infections in active pulmonary tuberculosis and post-treated tuberculosis patients.

Materials and Methods

A Cross-sectional study of one year duration (January 2015-December 2015) was conducted on patients who were clinically diagnosed cases of Pulmonary Tuberculosis (Group 1) attending Out-Patient Department and In-Patient Department of TB and Chest Diseases and RNTCP lab at KLE'S Dr. Prabhakar Kore charitable Hospital and MRC and on post treated cases of pulmonary tuberculosis having respiratory symptoms (Group 2) at District Hospital, Belagavi. Fifty sputum samples were taken from each group and samples were processed in Bio-safety cabinet II, adhering to Universal safety precautions in the Department of Microbiology, J.N. Medical College, Belagavi.

The samples were subjected to KOH mount to detect fungal elements and Grams staining was performed for budding yeast cells. All the samples were cultured on Sabouraud's dextrose agar (SDA) and SDA with antibiotics. All the yeasts isolated as pure cultures were characterized to species level using different tests according to standard diagnostic criteria [6,7]. The criteria included morphological and cultural characteristics, Germ tube experiment and tests for carbohydrate assimilation and fermentation. The molds isolated were subjected to LPCB mount and reported according to their distinct morphology.

Results

A total of 100 patients suffering from Pulmonary Tuberculosis and Post-treated cases of Pulmonary-TB with respiratory symptoms were undertaken for the present study. The mean age group in the present study was 40 ± 10 years. Out of 50 participants in each group, in Group 1, 74%were males and 26% were females while in group 2, 72%were males and 28% were females. Of the 100 patients, 55% were positive for opportunistic fungal infection. Amongst them, 58% were in group 1 and 52% were in group 2 (Figure 1). In group 1, 44% of males and 14% of females had opportunistic fungal infections. And in group 2, 38% males and 14% females showed opportunistic fungal infection. 31% isolates were yeasts (*Candida, Cryptococcus* and *Rhodotorula glutinis*) and 24% isolates were molds (*Aspergillus* spp.).

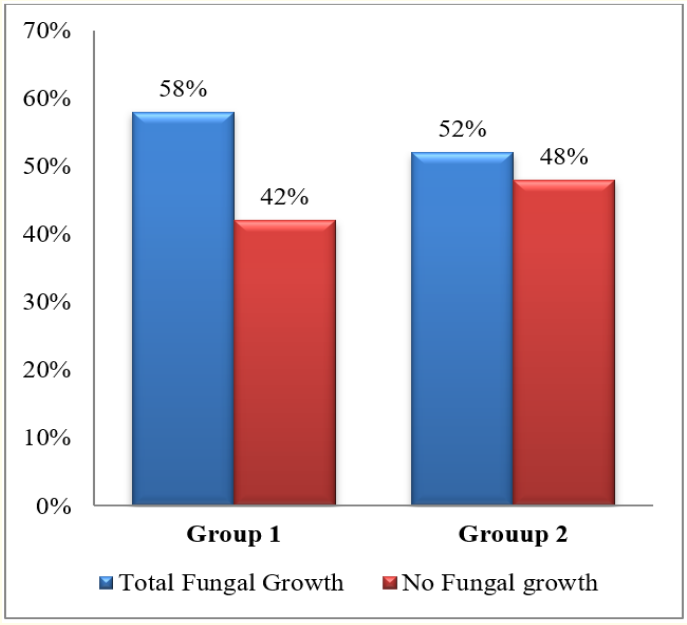

Figure 1: Distribution of opportunistic fungal prevalence in both the groups.

Isolates	Group 1		Group 2	
	Frequency	Percent	Frequency	Percent
Candida albicans	8	16%	4	8%
C. dubliniensis	0	0%	1	2%
C. glabrata	1	2%	0	0%
C. guilliermondii	1	2%	1	2%
C. krusei	5	10%	1	2%
C. parapsilosis	3	6%	1	2%
C. tropicalis	2	4%	1	2%
Aspergillus fumigatus	3	6%	3	6%
A. niger	2	4%	9	18%
A. flavus	2	4%	5	10%
Cryptococcus albidus var albidus	1	2%	0	0%
Rhodotorula glutinis	1	2%	0	0%

Table 1: *Distribution of fungal isolates in both the groups.*

Table 1 shows distribution of fungal isolates in both the groups. The isolates obtained in the present study were as follows: In Group 1: *C. albicans* were 16% (8), *C. glabrata* were 2% (1), *C. guilliermondii* were 2% (1), *C. krusei* were 10% (5), *C. parapsilosis* were 6% (3), *C. tropicalis* were 4% (2), *A. fumigatus* were 6%(3), *A. niger* were 4% (2), *A. flavus* were 4% (2), *Cryptococcus albidus var albidus* were 2% (1) and *Rhodotorula glutinis* were 2% (1).

In Group 2: *C. albicans* were 8% (4), *C. dubliniensis* were 2% (1), *C. guilliermondii* were 2% (1), *C. krusei* were 2% (1), *C. parapsilosis* were 2% (1), *C. tropicalis* were *2*% (1), *A. fumigatus* were *6*% (3), *A. niger* were 18% (9), and *A. flavus* were 10% (5).

Discussion

Pulmonary TB is a chronic destructive disease of the lungs. Cessation, necrosis and fibrosis of the lungs tend to lead to the formation of cavities and bronchiolectatic dilatations in them. These destroyed areas of the lungs will no doubt continue to remain in the body even after the tubercle bacilli has been totally eliminated. The cavities form an ideal culture environment for the growth of tubercle bacilli and many other organisms including fungi by providing plenty of oxygen and necrotic tissue material.

In our study, prevalence of opportunistic fungal infections in active TB cases was found to be 58%. In a similar study done by Chadeganipour., *et al*. [8] in 2000,the prevalence was found to be 68.75%. 46.5% opportunistic fungal infections was found in active TB cases in the study done by Mwaura., *et al*. [9] in 2013 in Kenya and Shesh Rao., *et al*. [10] detected 49% fungal infection in his study conducted in 2015 in Jabalpur. But a study conducted by Shome., *et al*. [11] in 1976, the prevalence of opportunistic fungal infections was found to be only 18%. The specimens used by Shome., *et al*. comprised of sputum and bronchial aspirations. No doubt, the bronchial aspirations are likely to be more specific for pulmonary pathology than sputum. This might explain the difference between our results and that of Shome., *et al*.

In our study, prevalence of opportunistic fungal infections in post treated TB cases was found to be 52%. Similar result of 53% was reported by Jain., *et al*. in 1982 at Allahabad, Bansod and Rai [12] reported 46% in 2008. 62% fungal isolates were obtained in a study conducted by Kalyani., *et al*. [13] in 2016 at Vishakhapatnam, and 49% was obtained by Yadu., *et al*. [14] in 2016.

In group 1 out of 50 samples, the majority of isolates were *Candida* species (40%), out of which *C. albicans* were predominant (40%), followed by *C. krusei* (25%), *C. parapsilosis* (15%), *C. tropicalis* (10%), *C. glabrata* (5%), *C. guilliermondii* (5%). The *Aspergillus sp.* obtained in total were 14% out of which *A. fumigatus* were 10%, followed by *A. niger* 28.5% and *A. flavus* 28.5%. Other isolates were *Cryptococcus albidus var albidus* 2% and *Rhodotorula glutinis* 2%.

In group 2 out of 50 samples studied, the majority of isolates were *Aspergillus* species (34%), out of which *Aspergillus niger* were predominant with 52.9%, followed by *Aspergillus flavus* 29.4% and *Aspergillus fumigatus* 17.6%. Other isolates were *Candida* species 18% in which *C. albicans* was 44.4%, followed by 11.1% of each *C. dubliniensis*, *C. guilliermondii*, *C. krusei*, *C. parapsilosis* and *C. tropicalis.*

Shome., *et al.* [11], reported 50.97% *Candida* and Sobti., *et al.* reported *Aspergillus* species in 40% cases. In the study done by Kali., *et al.* [15], prevalence of *Candida* were found 40%, out of 30 isolates in their study 50% were *C. albicans* followed by *C. tropicalis* were 20%, *C. glabrata* were 20%, *C. parapsilosis* were 6.7% *and C. krusei* were 3.3%. According to Khanna., *et al.* [16], *Candida* were in 26.36% out which 62% were *Candida albicans* and *Aspergillus* in 10% cases, Babita., *et al.* [17] in 2016 reported *Candida albicans* 44.4%, *Aspergillus niger* 33.3%, *Aspergillus fumigatus* 16.5% and *Aspergillus flavus* 5.5%.

Conclusion

There is a high prevalence of fungal infections in active TB and post treated PTB cases. *Candida* and *Aspergillus* species are the common causative agents. These secondary fungal infections are associated with persistence of respiratory symptoms, in spite of successful completion of anti-tuberculous drug therapy. Hence, adequate measures need to be taken for the early identification and treatment of these opportunistic infections, which are associated with high rates of morbidity and mortality.

Conflict of Interest

None.

Financial Support

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