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## Unexpected Partners: Candida and Tuberculosis in a Complex Case of Chronic Hepatitis B

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### ABSTRACT

This case report describes a 47-year-old male patient with insulin-dependent diabetes mellitus (IDDM), Hepatitis B (HBV) infection, and diagnosed with co-infections of pulmonary tuberculosis (TB) and pulmonary candidiasis. The patient had history of discomfort in right side of chest, facial puffiness, and intermittent fever. X ray showed pneumothorax, necessitating the placement of an intercostal drainage (ICD) tube. A week prior, the patient exhibited a history of significant alcohol consumption.

Diagnostic tests, including sputum analysis and bronchoalveolar lavage (BAL), confirmed an unusual dual infection by identifying the presence of Candida species and Acid-Fast Bacilli (AFB), indicative of tuberculosis. Co-infection among immunocompromised individuals with diabetes and chronic HBV is particularly rare. Pneumothorax and considerable lung damage resulted from the complex clinical history of concurrent tuberculosis and candidiasis. Granulomatous inflammation typically arises from pulmonary tuberculosis, while necrotising inflammation is associated with pulmonary candidiasis, an opportunistic infection. The patient's condition deteriorated due to the presence of these illnesses. This case highlights the challenges associated with identifying and treating co-infections in individuals with risk factors, including diabetes and chronic liver disease. Optimal outcomes are contingent upon timely detection and intervention. This case report outlines the complex interactions between fungal infections and tuberculosis, highlighting their implications for the prognosis, diagnosis, and treatment of immunocompromised individuals.

**Keywords:** acid-fast bacilli, pneumothorax, diabetes mellitus, candida, hepatitis B, and dual infection

## INTRODUCTION

Individuals with diabetes mellitus and hepatitis B (HBV) infection, frequently have compromised immune systems, which make them more prone to opportunistic infections. Immune function will be compromised by effects of diabetes on neutrophil activity, levels of cytokine, and cellular immunity<sup>1</sup>. On the other hand, chronic HBV infection compromises immunity even further, particularly in liver disease patients. As a result, co-infections increase the likelihood that these patient's clinical courses could worsen and they become more vulnerable to both common and unusual infections<sup>2</sup>. Individuals with diabetes have compromised immune system and hence are more prone for infectious agents like Mycobacterium tuberculosis, which causes tuberculosis (TB). Apart from granulomatous inflammation and tissue destruction, PTB can result in pneumothorax or cavitory disease. Conversely, in patients with impaired immune systems, Candida species—which are typically commensal organisms—can result in invasive infections such as pulmonary candidiasis<sup>6</sup>. Although pulmonary candidiasis is uncommon, people with long-term illnesses, especially those with diabetes or persistent HBV infection, where immune systems are already weakened, are at risk of developing the disease.

It is not common that pulmonary tuberculosis and candidiasis coexist, which indicates a significantly compromised immune system<sup>5</sup>. There is a possibility that one infection could overshadow the other and lead to delay in detection. When patients present with unusual symptoms, clinicians need to think about the likelihood of many infections.

In this case report, a 47-year-old man with diabetes mellitus and a history of persistent HBV infection is described as having an uncommon dual infection of Acid-Fast Bacilli (AFB) and Candida species in sputum and broncho-alveolar lavage (BAL). The difficulties in diagnosing the co-infections, and the importance of early detection and management are discussed.

## Case Study

A 47-year-old man arrived to the hospital complaining of sporadic fever and facial puffiness that had been present for four months. He had been diagnosed with chronic Hepatitis B infection one year earlier and insulin-dependent diabetic mellitus (IDDM) for four years. Low-grade, waxing and waning fever was reported, accompanied by general malaise and exhaustion. The patient also claimed having right-sided chest pain for two weeks, which got worse when he coughed and took heavy breaths. Remarkably, he acknowledged a history of frequent drinking, claiming to have drunk nonstop for a week before symptoms appeared.

The patient was undergoing insulin therapy for poorly managed diabetes mellitus, a condition for which his medical history was noteworthy. He had no past history of serious respiratory diseases or tuberculosis. He had a history of social drinking and sporadic smoking. No history of haemoptysis, night sweats, or weight loss during the time of admission.

## Clinical Examination

Physical examination, revealed peripheral pitting oedema, and facial puffiness. He was

afebrile and tachypenic A probable pneumothorax was indicated by the respiratory examination's findings of reduced breath sounds over the right haemithorax and hyperresonance on percussion. Abdominal and cardiovascular exams revealed nothing noteworthy.

A chest X-ray was taken in light of the respiratory symptoms, and the results showed a right-sided pneumothorax (Figure 1). After the rapid insertion of an intercostal drainage (ICD) tube to treat the pneumothorax, the patient experienced some relief from his chest pain.

### Diagnostic workup

Sputum samples were taken for additional analysis in order to look into the underlying aetiology of the pneumothorax and systemic symptoms. Acid fast bacilli was positive with Ziehl-Neelsen staining suggesting a possibility of pulmonary tuberculosis (TB). A more thorough diagnostic workup was necessary as the patient was diabetic and was a known case of chronic Hepatitis B infection.

A deeper respiratory sample was then obtained by bronchoalveolar lavage (BAL). The presence of AFB (Figure 4) in the BAL fluid was relevant for cytological testing, which confirmed pulmonary tuberculosis. Furthermore, the lavage fluid also revealed the presence of *Candida* species (Figures 2 and 3), which is an uncommon discovery in this particular clinical setting. Pulmonary candidiasis which was rare was identified as a co-existing opportunistic infection, in this immunocompromised patient.

A unusual co-infection of *Mycobacterium* TB and *Candida* species in the lungs was diagnosed cytologically in BAL

*Candida* is an opportunistic fungal infection found on mucosal surfaces but has the ability to infiltrate lung tissue in immunocompromised individuals. The BAL fluid showed pseudohyphae and budding yeast of *Candida* species. Presence of *Candida* and AFB in a immunocompromised patient made a poor prognosis.



Figure 1: Chest X-ray – Right non-homogenous opacities in right middle zone. Fibrocavity with surrounding infiltrate left mid and lower zone

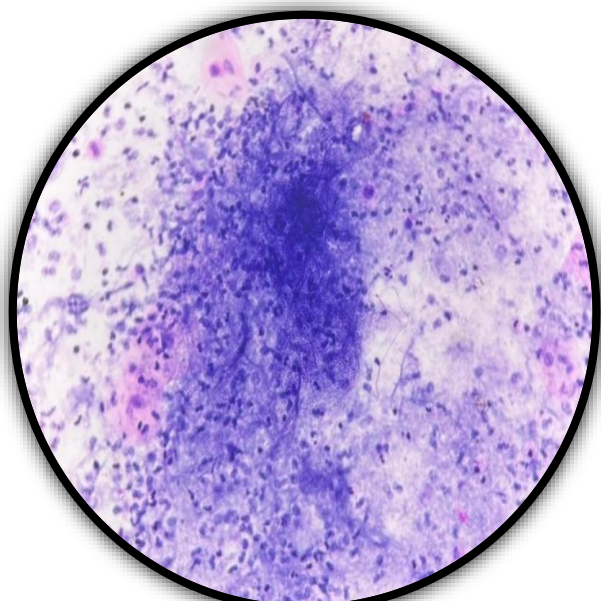


Figure 2 Cytology (H&E) of BAL – Spores with few hyphae with sheets of neutrophils and lymphocytes



Figure 3: PAS stain – Hyphal forms and few spores of candida

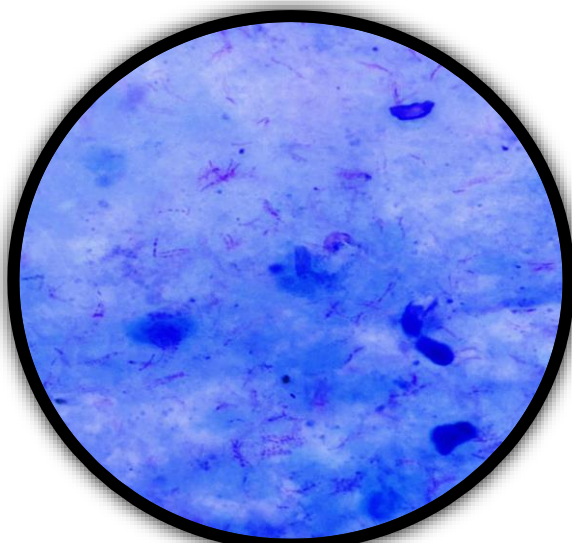


Figure 4: Ziehl Neelsen Staining - Acid fast bacilli seen

## CLINICAL COURSE AND MANAGEMENT

The patient was started on anti-tuberculosis therapy (ATT) following the AFB positive report. He was also on intravenous fluconazole medication as an antifungal for the co-existing candidiasis. His blood glucose levels periodically monitored and was administered with insulin.

The patient gradually improved during his hospital stay. After the pneumothorax subsided, the ICD tube was removed. He was discharged with a course of antifungal therapy and ATT, with follow-up appointments for assessing the treatment progression. However, the patient missed follow-up appointments and was on irregular medications and passed away after 3 months of discharge.

## DISCUSSION:

It is extremely uncommon for pulmonary tuberculosis and pulmonary candidiasis to coexist in an immunocompromised host. This poses a major diagnostic and treatment challenge<sup>4</sup>. In this instance, the patient's persistent HBV infection and poorly managed diabetes led to significant immunosuppression, which in turn made the environment conducive to opportunistic infections.

This case emphasises the early diagnosis and timely management is essential for the treatment of tuberculosis and candidiasis in a immunocompromised patients especially when the clinical presentation is unusual, as untreated cases can lead to worsened outcomes<sup>8</sup>.

Two separate infections were found to be coexisting in the pulmonary system of an immunocompromised host, according to the pathological assessment. Acid-Fast Bacilli (AFB) were detected in sputum samples, which is highly suggestive of a mycobacterial infection, most likely tuberculosis (TB). It is commonly known that granulomatous inflammation follows a distinct pattern in cases of tuberculosis in the lung<sup>5</sup>. Granulomas, which are organised collections of immune cells trying to contain the infection, are formed in this process. A characteristic feature of these granulomas is central caseation necrosis, in which the immune system destroys diseased cells, causing lung tissue to change into a cheese-like necrotic state<sup>9</sup>. TB may progress more quickly in immunocompromised patients, especially in those with underlying diabetes and long-term illnesses like Hepatitis B. Increased lung tissue destruction, cavitation (the creation of empty spaces in the lung), and serious problems including pneumothorax—a condition in which the lung cavities burst into the pleural space—are all possible outcomes of the infection's increased ability to spread throughout lung tissues.

Candida is a commensal organism present on mucosal surfaces however in immunocompromised individual they are pathogenic. Pulmonary candidiasis is a rare yet perilous outcome resulting from Candida infiltrating the lung parenchyma in individuals with a compromised immune system. Individuals on corticosteroids, prolonged antibiotic therapy, or those with pre-existing respiratory conditions are often associated with this sickness. Presence of pseudohyphae and budding yeast cells in BAL are the hallmark feature of

candida. These fungi which infiltrates lung tissue leads to necrosis and exacerbate lung injury which are presented clinically and radiologically.

Diabetes alongside of chronic viral hepatitis compromises the activities of immune system, including phagocytic ability and neutrophil chemotaxis and diminish the host response. However in such immunocompromised individuals concurrence of candida and AFB indicates intense tissue damage and lead to cavitation of lung, was the principal cause of the pneumothorax. Distinguishing between tuberculosis and pulmonary candidiasis based solely on symptoms or imaging data may prove difficult due to their analogous clinical presentations.

### **Review of the Literature on Dual Candida and AFB Infections**

When it comes to chronic HBV infection, there is currently a lack of information in the literature about concomitant infections between Acid-Fast Bacilli (AFB) and Candida species. This is especially pertinent when the HBV infection is chronic<sup>10</sup>. The vast majority of known cases are typically centred on isolated opportunistic infections that occur in individuals who have compromised immune systems, such as those who are afflicted with HIV, diabetes, or lung problems that have been present for a long period of time. Despite the fact that these studies provide insight into the unique pathogenic pathways and clinical presentations of infections caused by mycobacteria and fungi, there are very few papers that describe the co-occurrence of mycobacterial and fungal diseases in the same patient.

Histological examinations of pulmonary candidiasis typically reveal necrotising inflammation, along with the presence of yeast cells and pseudohyphae. Several types of immunosuppression, such as long-term corticosteroid medication, as well as pre-existing lung disorders, such as cancer or chronic obstructive pulmonary disease (COPD), are usually connected to these outcomes. The most important histological characteristics of candidiasis should be identified for the accurate diagnosis.

On the other hand, many studies state that presence of granulomatous inflammation histopathologically indicates the diagnosis of tuberculosis (TB) which is characterised by central caseation necrosis inside the lung tissues. There is currently a lack of understanding regarding the relationship between mycobacterial diseases such as tuberculosis and opportunistic fungal infections, particularly in people who simultaneously have diabetes and a persistent HBV infection. Additional studies are required to understand the relationship of the infection and their pathology to analyse the clinical outcomes in such immunocompromised patients.

In this case report, the pathological characteristics of concurrent Candida and AFB infection in a patient with diabetes and persistent HBV infection are discussed. This report makes a significant contribution to the little amount of research that has been accessible on the subject in the beginning. When deciding whether or not immunocompromised persons have a probability of having mixed infections, it is essential to take into account the greater likelihood of atypical presentations experienced by these individuals. In addition, this underlines how important it is to undertake complete pathological tests that can assist in

directing diagnosis and therapy. Such examinations are necessary since it is likely that these mixed illnesses could easily go unreported if they are not closely researched.

## CONCLUSION:

In conclusion, we highlight the complex pathophysiology behind multiple opportunistic infections in immunocompromised patients, especially of diabetes and chronic HBV. It explains the diagnostic difficulty faced by patients and pathologist when AFB and Candida are co-existing pulmonary system. It also underscores that these various infection types may result in significant complications, like pneumothorax.

It is possible to overlook numerous infections when one illness exhibits more prominent clinical indications, pathological testing is very important for accurate diagnosis and confirmation. In order to get better treatment outcomes, it is necessary for the early diagnosis of these multiple infections and use effective management strategies. A comprehensive approach to patient care is necessary for improving the health and recovery of immunocompromised patients.

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