

Symptoms, Challenges and Preventive Management of Tuberculosis

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DESCRIPTION

Tuberculosis (TB) is a harmful infectious disease that has plagued humanity for centuries. It is caused by the bacterium *Mycobacterium tuberculosis* and primarily affects the lungs, although it can also target other parts of the body. TB has been a persistent global health concern, and its impact on society, particularly in resource-limited regions, cannot be overstated. In this comprehensive exploration of TB, we will delve into its history, transmission, symptoms, diagnosis, treatment, and the efforts made to control and eradicate this ancient and persistent scourge.

Historical perspective

The history of TB is intertwined with the history of humanity itself. Evidence of TB has been found in ancient human remains dating back thousands of years, including Egyptian mummies and pre-Columbian skeletons. The disease has left its mark on literature, art, and music, often referred to as the "White Plague" or "Consumption" due to the characteristic wasting away of those afflicted. TB was particularly prevalent in the 18th and 19th centuries in Europe and North America, leading to sanatoriums and the development of institutions dedicated to the treatment of TB patients.

Transmission and pathogenesis

TB is primarily transmitted through the air when an infectious individual expels droplets containing *Mycobacterium tuberculosis* into the environment. Close contact with an infected person, especially in crowded and poorly ventilated spaces, increases the risk of transmission. Once inhaled, the bacteria may establish infection in the lungs and begin to multiply, initiating an immune response. In many cases, the immune system can control the infection and prevent its progression to active disease, leading to a condition called Latent TB infection (LTBI). However, when the immune system is weakened, as is often the case in individuals with conditions like HIV/AIDS, diabetes, or malnutrition, the bacteria can reactivate, causing active TB disease.

Symptoms and clinical presentation

The clinical presentation of TB can vary widely, and it can affect not only the lungs but also other organs such as the kidneys, bones, and central nervous system. Pulmonary TB, which primarily involves the lungs, is the most common form of the disease. Common symptoms of pulmonary TB include persistent cough, chest pain, coughing up blood, fatigue, weight loss, night sweats, and fever. Extrapulmonary TB can lead to a diverse range of symptoms depending on the affected organ system. For example, TB of the bones and joints can cause joint pain and deformities, while TB of the central nervous system can result in headaches, confusion, and even coma.

Diagnosis

Accurate and timely diagnosis of TB is crucial for effective treatment and control of the disease. The diagnostic process often involves a combination of clinical evaluation, radiological imaging, and laboratory tests. One of the key diagnostic tools for TB is the tuberculin skin test, which assesses an individual's immune response to TB proteins. Another important diagnostic method is the Interferon-Gamma Release Assay (IGRA), which measures the production of specific immune proteins in response to TB antigens. Additionally, chest X-rays and sputum tests, including Acid-Fast Bacilli (AFB) staining and culture, are used to confirm the presence of active TB in the lungs.

Treatment and drug resistance

The treatment of TB is a complex and lengthy process that typically involves a combination of antibiotics taken over several months. The most commonly used drugs for TB treatment include isoniazid, rifampicin, ethambutol, and pyrazinamide. Patients are usually prescribed a combination of these drugs to reduce the risk of developing drug resistance.

One of the greatest challenges in TB treatment is the emergence of drug-resistant strains of *Mycobacterium tuberculosis*. Multidrug-resistant TB (MDR-TB) is defined as resistance to at least isoniazid and rifampicin, the two most potent anti-TB drugs. Extensively drug-resistant TB (XDR-TB) goes a step further, showing

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resistance to additional second-line drugs. The management of drug-resistant TB is more complex and often requires longer treatment regimens with less effective and more toxic drugs.

Challenges and future outlook

Despite significant progress in TB control over the past century, challenges remain on the path to eradication. Drug-resistant TB strains pose a formidable threat, requiring innovative treatment approaches and surveillance efforts. Moreover, the COVID-19 pandemic has disrupted TB diagnosis and treatment services in many parts of the world, potentially leading to an increase in TB cases. The socioeconomic factors that contribute to TB, such as

poverty and inadequate healthcare infrastructure, are deeply entrenched and difficult to address. Additionally, the long and complex treatment regimens for TB can lead to patient non-compliance and treatment failure. In conclusion, tuberculosis remains a global health challenge that requires continued dedication, research, and resources to combat effectively. Progress has been made, but the battle against TB is far from over. With a coordinated international effort, increased funding, and the development of new tools and strategies, we can move closer to the goal of eradicating this ancient and persistent disease, relieving the suffering it inflicts on millions of people worldwide.