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A REVIEW ON TUBERCULOSIS

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ABSTRACT

Given that molecular evidence for tuberculosis (TB) dates back more than 17,000 years, TB is one of the oldest diseases known to man. TB is one of the top 10 infectious diseases that kill people globally, second only to HIV, and despite improved diagnostic and treatment methods, sadly, people continue to suffer from it. Global tuberculosis (TB) pandemic, according to the World Health Organization (WHO). Among those living with HIV, it is the main cause of death. Historically, India's battle against tuberculosis can be divided into three main phases: the pre-independence era, which occurred before the development of x-rays and chemotherapy; the post-independence era, which saw the establishment and implementation of national TB control initiatives; and the present era, which is marked by the continuous implementation of TB control initiatives with support from the WHO. As of right now, India's DOTS (directly observed therapy-short course) program is the second largest in terms of population coverage and the fastest-growing program globally in terms of patients started on treatment. As of right now, India's DOTS (directly observed therapy-short course) program is the second largest in terms of population coverage and the fastest growing program globally in terms of patients started on treatment. The spread of HIV infection, inadequate primary healthcare infrastructure in rural areas of many states, unregulated private health care that leads to the widespread and irrational use of first- and second-line anti-TB drugs, a lack of political will, and, most importantly, corrupt administration are the main obstacles to the control of tuberculosis in India.

Keywords: Mycobacterium tuberculosis, Bacterium, Latent Tuberculosis Infection (LTBI), MDR/XDR-TB**,** DOTS

INTRODUCTION

Tuberculosis (TB) is an infectious complaint produced by the bacterium Mycobacterium tuberculosis. With lung involvement substantially, it can also impact other corridors of the area like

feathers, chine, and the brain. TB is spread through the air when someone infected coughs or sneezes, which releases small drops harboring bacteria that are also gobbled by others [1,2].

Here are two main kinds of tuberculosis

1. Latent Tuberculosis Infection (LTBI)[3-4]

If you have been infected but aren't sick or coughing up mucus, then your body is in its latent phase as far as TB is concerned known as Latent Tuberculosis Infection (LTBI). But people with LTBI don't have active tuberculosis: they have the TB bacteria in their body, but no clinical symptoms.

Usually, the immune system can preserve these bacteria under domination. The immune system usually restrains bacteria such as TB which can multiply and cause damage if they are non kept in check by some force .

People with LTBI are not transmissible and cannot extend TB bacteria to others. However, if something happens that weakens the immune structure like contracting HIV or taking certain medications it may develop into full-blown disease [5].

2. Active Tuberculosis Disease [6]:

People should care once the bacteria multiply, for now they possess active tuberculosis:

Distinctive types of TB are given to us apart from those that affect the lungs too. Symptoms of pulmonary TB include a cough that takes for a lengthy period, chest pain, coughing up blood or mucus, fatigue, loss in weight, fever, and night sweats. This includes spinal TB with back pain and possibly urinary symptoms (for renal TB); but it could also lead to neurological symptoms (for TB meningitis). When a person with tuberculosis coughs, sneezes, or speaks, the disease can spread to other people through the air.

These two kinds of TB represent different stages of infection, with latent TB contagion being asymptomatic and non - contagious, while TB disease is symptomatic and contagious. Prompt diagnosis and cure of TB disease are essential to prevent its spread and avoid serious health consequences [7].

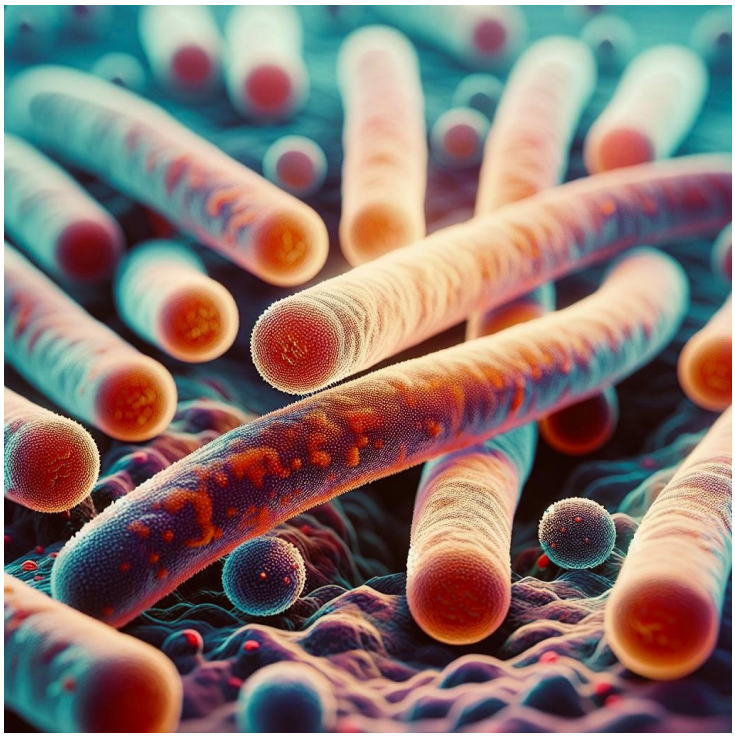

Fig. (1). Mycobacterium Tuberculosis Bacterium

Drug Resistance in TB

The progress of drug resistance against M. tuberculosis is a major problem with anti-TB drugs. Anti-TB drugs are a two-edged sword. While initially, they destroy the pathogenic bacteria but later develop resistance and become ineffective against the disease. Global surveillance of resistance against anti-TB drugs has become a major risk to tuberculosis limitation programs in many countries[3]. Drug resistance in tuberculosis is primarily a result of inadequate management of TB care, including inappropriate prescribing practices, poor drug quality or supply, and patient non-compliance. MDR/XDR-TB is a problem created by humans, with MDR-TB being caused by strains of M. tuberculosis resistant to rifampicin and isoniazid, and XDR-TB being even more resistant to multiple drugs beyond just those two [8]. The potential process of developing resistance to clinical drugs in tuberculosis has been outlined in Figure (2).

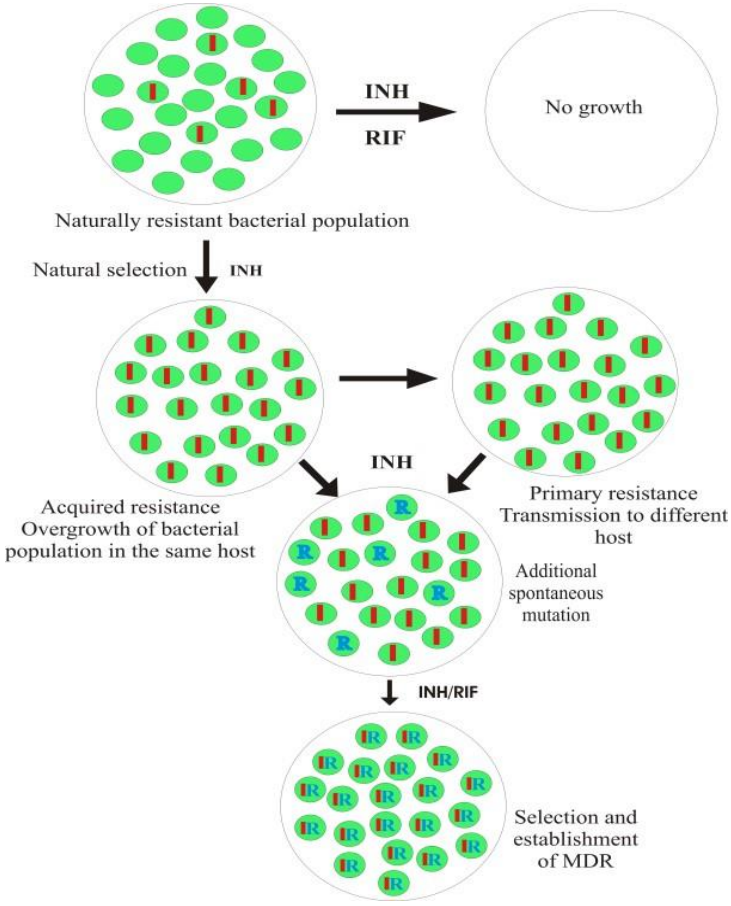

Fig. (2). Development of clinical drug resistance in TB.

Management of TB

Tuberculosis (TB) remains a significant global health challenge, causing considerable morbidity and mortality, especially in low- and middle-income countries. Effective management of TB involves a multifaceted approach that includes accurate diagnosis, appropriate treatment regimens, monitoring and managing drug resistance, addressing co-morbidities such as HIV, and ensuring adherence to treatment [9]. TB is a major contributor to illness worldwide, but there is not enough data on how it affects the quality of life and overall health [10]. Different methods of managing TB are illustrated in Figure 3. Antibiotics are the most successful tools in fighting against actively multiplying M. tuberculosis and are primarily utilized in treating TB. The unique structure and chemical makeup of the mycobacterium cell wall make it challenging for drugs to enter, complicating treatment. Some antibiotics show phenotypic drug resistance, which is not linked to genetic alterations but rather the current metabolic state of the bacteria [11]. Latent TB is typically

treated with one antibiotic, while active TB requires a combination of antibiotics to lower the threat of bacterial resistance.

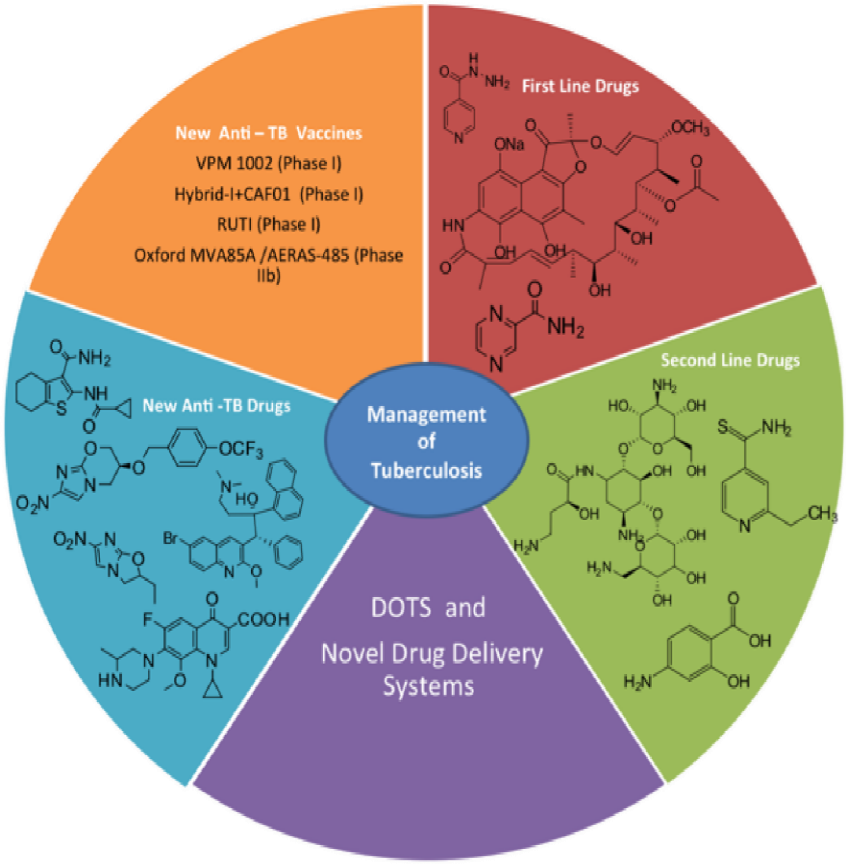

Fig. (3). Different approaches to the management of TB

Diagnosis of TB [12]

a. Clinical Evaluation:

Initial assessment involves a detailed medical history and physical examination, focusing on symptoms such as persistent cough, fever, night sweats, and weight loss.

b. Microbiological Tests:

Sputum Smear Microscopy: The traditional method, using Ziehl-Neelsen staining to detect acid-fast bacilli (AFB), is widely used but has limitations in sensitivity, especially in HIV co-infected patients.

Culture Methods: Mycobacterium tuberculosis can be cultured on solid or liquid media. Liquid culture systems like the BACTEC MGIT 960 are more sensitive and provide faster results.

Nucleic Acid Amplification Tests (NAATs): Tests such as the Xpert MTB/RIF assay offer rapid detection of TB and rifampicin resistance, significantly improving diagnostic speed and accuracy.

c. Radiological Imaging:

Chest X-rays and CT scans can reveal typical TB-related lung abnormalities, though these findings are not definitive without microbiological confirmation .

d. Immunological Tests:

Tuberculin Skin Test (TST): This test measures the delayed hypersensitivity reaction to purified protein derivative (PPD) but has limitations in distinguishing between latent and active TB.

Interferon-Gamma Release Assays (IGRAs): These blood tests, such as QuantiFERON-TB Gold, offer more specific detection of TB infection without cross-reactivity from BCG vaccination.

3. Management of Co-morbidities

a. TB/HIV Co-infection:

Integrated TB and HIV care is crucial. Antiretroviral therapy (ART) should be initiated as soon as possible in TB patients with HIV.

Drug-drug interactions, particularly with rifampicin, require careful management and potential adjustments in ART regimens.

b. Diabetes Mellitus:

Diabetes increases the risk of developing TB and complicates its management. Glycemic control and close monitoring of drug interactions are essential.

4. Monitoring and Follow-Up

a. Treatment Response:

Regular follow-up visits to monitor clinical, radiological, and microbiological responses to treatment.

Sputum cultures should be performed monthly during the intensive phase and periodically thereafter.

b. Adverse Drug Reactions:

Prompt identification and management of drug-induced hepatotoxicity, neuropathy, and other side effects.

Conclusion

It is still the most usual cause of death worldwide in the twenty-first century: tuberculosis. The high percentage of drug-resistant TB among newly diagnosed cases nationwide suggests that dangerously high levels of drug-resistant TB are being transmitted; this is a serious concern that requires attention. To combat extensively drug-resistant tuberculosis (XDRTB) and multidrug-resistant tuberculosis (MDR), all nations in the world should work together in a coordinated effort. Only some medications are accessible for the treatment of XDR-TB, which, when compared to those used to treat MDR-TB, are more costly and have more adverse effects. The issue gets worse as this illness and HIV continue to interact. Developing novel techniques to promptly identify and track drug-resistant tuberculosis is crucial, especially for individuals with HIV infection. Global initiatives to quantify resistance to second-line anti-tuberculosis medications are desperately needed. Accelerating current disease control measures will help address the drug-resistant tuberculosis epidemic, which seems to be spreading. It is important to monitor medication resistance as part of regular surveillance. The medications that are currently on the market to treat tuberculosis were accidentally found. Thus, there is a global need to create new and effective leads that could be developed into medications and cure multidrug-resistant tuberculosis. According to the most recent WHO and CDC guidelines, the use of first and second line anti-TB medications, the DOTS strategy, and innovative drug delivery methods may be beneficial for the whole management of tuberculosis. Therapeutic vaccinations must be added to the current treatment plans in order to reinforce them, particularly in developing nations. Novel vaccinations are being created to prevent latent tuberculosis infections. Around the world, a number of research and academic institutions are actively working to create new anti-TB medications. Many new compounds exist in various stages of the drug discovery pipeline as a result of the diligent work of researchers in this direction. Curing this socioeconomically significant condition requires both patients and physicians to adopt a scientific mindset and apply DOTS effectively.

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