

The Etiology, Pathogenesis, And Clinical Manifestations Of Tuberculosis

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Introduction

Tuberculosis is an infectious or communicable disease that is easily [transmitted between living organisms](#). Like most communicable diseases, tuberculosis is also caused by a pathogen, and once infected, the person may develop different degrees of this disease. This research paper aims to explore the aetiology, pathogenesis, and clinical manifestations of tuberculosis. The paper further describes the labs and diagnostic tests for the disease, its complications, and the treatment implications. Lastly, the paper sheds light on the ethical issues related to the disease concerning the Christian worldview.

Etiology

Tuberculosis (TB) is a bacterial infection that chiefly impacts the lungs. It is primarily caused by a pathogenic bacterium called *Mycobacterium tuberculosis*, which is a non-motile, gram-positive, aerobic organism. Many other types of mycobacteria are also capable of causing the infection. Among these is *Mycobacterium Bovis*, which is regarded as a cattle disease; however, it remains a probable cause of human infection around the world (Kanipe & Palmer, 2020). Tuberculosis becomes increasingly prevalent when the causal agent, i.e., the bacterium, gets favourable conditions to infect the host.

Pathogenesis

Tuberculosis is a successful human pathogen that has been coevolving with humans for thousands of years. Although it infects many species, it is transmissible only among humans and does not have any reservoir within the environment. As a result, its survival is dependent upon inter-person transmission. This evolution has helped the bacteria to adapt to the immune system and induce lesions, which increase its transmissibility. Primarily, TB affects the lungs; however, in some cases, the pathogen may attack other body parts such as the spine, brain, and kidneys. The two types of TB include latent TB infection, which does not manifest any symptoms, and active TB, which leads to the development of observable symptoms. After the aerosol transmission, which is the chief mode of infection, the nuclei of the droplet (tubercle bacillus) access the alveoli. The alveolar macrophages are equipped to get rid of the invading microorganisms, and they engulf the bacteria. Infection is caused when the tubercle bacillus survives the impact of the alveolar macrophages and accesses the

lymphatic system or invades the bloodstream. The disease is characterized by the formation of granulomas, which are small areas of inflammation. The granuloma contains a centre filled with infected macrophages that are covered by foamy macrophages, lymphocytes, and mononuclear phagocytes. This fibrous capsule releases the bacteria into the air passages. The infected macrophages may spread to the lungs, kidneys, lymph nodes, etc. (Hunter, 2020).

Clinical Manifestations

An infection of *Mycobacterium tuberculosis* may manifest different symptoms in different people. The symptoms also vary depending on the body part infected. After contracting the pathogen, the observable symptoms may not appear for months or even years. In the case of latent TB, the symptoms may not appear at all. Various symptoms may develop in the case of active TB. The general clinical manifestations range from a decrease in appetite and weight loss to persistent high temperatures accompanied by night sweats. Extreme fatigue is also a symptom of the disease. Other specific symptoms of pulmonary tuberculosis include a persistent cough that lasts for more than 3 weeks. Bloody phlegm and progressively worsening breathlessness may also accompany the cough. Although the prevalence of TB infecting other body parts is relatively low, it may cause infection in the bladder, the lymph nodes, the reproductive system, bones, and joints, among others. The infection of other body parts is more prevalent in people who have a weak immune system. These infections manifest through abdominal pains, continuous headaches, swollen and painful glands, and seizures (CDC, 2018).

Labs And Diagnostic Tests

Two types of tests are typically administered to detect the presence of TB pathogens in the body. These include the TB blood test and the TB skin test called the “Mantoux tuberculin skin test”. A positive result of either test proves the presence of a TB infection. However, the test does not specify the presence of latent or active tuberculosis. Other diagnostic tests that are administered include sputum tests and chest X-rays. Once an infection is established, other tests are employed to detect latent TB or the TB disease. Active TB is diagnosed through patient history, a thorough physical exam, an x-ray, and other diagnostic tests. The disease is indicated if “acid-fast-bacilli” are detected on the sputum smear. The chest radiograph is analyzed for abnormalities and lesions on the lungs that may suggest the possibility of a pulmonary TB infection (CDCTB, 2018).

Complications

As a globally occurring sickness, TB is considered a leading cause of fatalities by any communicable disease. The prevalence of TB is so widespread that about a quarter of the world’s population is infected by *M. tuberculosis*, with millions of new cases being reported every year. Various

complications are associated with tuberculosis infection, which may be chronic or acute. TB primarily targets the lungs. The chronic complications of pulmonary TB range from mild scarring of the lung tissue to widespread bronchiectasis and destruction of the fibro-cavitary. Infecting the nervous system may result in acute complications and harm the brain, nerves, and spinal cord. Stroke, hydrocephalus, and tuberculomas are some major complications. The inflammation of the pericardium is another chronic complication. Moreover, TB-related sepsis is considered to be a fatal condition. Most complications of TB are credited to vascular degeneration and damage to bodily structures resulting from the pathogenic bacterium. Among the metabolic complications, hypercalcemia is quite prevalent. This is indicated through osteoporosis, acute kidney injury, constipation, and nephrolithiasis. It can affect several organ systems and result in complications such as residual blindness, intestinal obstruction, ureteral strictures, lymphocutaneous fistulas, and haemorrhages, among others (Shah & Reed, 2016).

Treatment Implications

The treatment of tuberculosis is majorly in the form of preventive therapy. This includes the administration of a regular dose of antibiotic, which is continued for 6 – 9 months in cases of latent TB. This treatment aims to kill the pathogen that causes propagates the development of the disease. For active tuberculosis, a combination of several antibacterial medications is used. The duration of treatment for active TB is about 6 – 12 months. Three drugs, namely rifampin, ethambutol, and pyrazinamide, are administered in combination with Isoniazid INH. The positive impact of the treatment is observed within a few weeks as patients feel some relief from the symptoms. However, the entire course of treatment, as advised by the physician, must be completed. If the treatment plan is not completely implemented, it may result in the development of drug-resistant TB (American Lung Association, 2021).

There are some alternative treatments for tuberculosis that are practised in other cultures. These include dietary and plant-based treatments. In some countries of Asia, home remedies and a diet rich in vitamins A, B-complex, C, and E are believed to accelerate recovery. Similarly, increased intake of mint, garlic, and black pepper is believed to have positive results. Food rich in protein and zinc may also help alleviate tuberculosis symptoms. The traditional healers of Africa rely on plant-based cures. They use the leaves of plants such as *Artemisia Afra* and *Clausena anisate* for the treatment of TB (Lawal et al., 2015).

Conclusion

Apart from demographics such as gender and age, the chief contributing factor for this disease is social factors. These include the problems stemming from an economic divide, which include poor living conditions, inequitable access to health care and education, and humanitarian crises. Ethically, it is the right of every individual to be provided with healthy living conditions as well as equal

opportunities for quality health care. Educating communities about the spread and control of the disease is also a moral obligation of the health departments (Khan, 2017). On an individual level, this ethical issue can be addressed by educating the people within our community circles. On the larger level, the duty lies with the government department to reduce the societal divide. The worldview of Christians about suffering and sickness is that it is not created by God and that its existence is relative. Regarding illness as a mere illusion, the religious belief entails that it can be corrected, healed, or even stopped altogether through prayer. However, people must have strong faith for true healing to take place. The worldview of sickness from a Christian perspective disregards the use of medical tools. The issue of societal equality and the provision of health care can be addressed through this perspective. As belief and faith are chiefly responsible for healing, the provision of this healing environment for all individuals within the society should be emphasized to promote its benefits in recovery. It is also important that the patient's viewpoint is respected and that an individualized plan of care is ensured. Such individual care is the moral responsibility of the health care professional and an important element of the treatment plan. It can help maintain equity and treat patients as per their needs (Pfeiffer, 2018).

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