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Recommended Citation
Mackey, Lindsay, "Tuberculosis" (2015). Master of Science in Nursing (MSN) Student Scholarship. 103.
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Tuberculosis
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Introduction
Tuberculosis (TB) is an infectious bacterial disease caused by Mycobacterium tuberculosis and mostly affects the lungs and sometimes other organs such as the kidneys, spine, and brain (Center for Disease Control and Prevention, 2015). In 2015, the CDC (2015) reported that approximately 9 million people were infected with Mycobacterium tuberculosis, and approximately 1.5 million deaths were a result of TB. Tuberculosis is an airborne infection which can be spread through the air from infected individuals cough, sneeze, or speak. Individuals who are infected with TB can either have latent or active stage. Latent TB is when an individual becomes infected with Mycobacterium tuberculosis but the body is able to control and prevent spread of the infection. Individuals with latent TB are not infectious and cannot spread the infection to others. Other groups who are at risk for developing TB are those who have previously been infected with active TB. There have been many different types of drugs developed to help treat the diagnosis of TB. However, through genetic mutations, some strains of Mycobacterium tuberculosis have become drug-resistant (Trauner, Borrell, Reither, & Gagneux, 2014, p. 1063). Due to the development of drug-resistant TB treatment and control of TB has become complicated, especially in foreign countries where TB is more prevalent (Centers for Disease Control and Prevention, 2013). The extraordinary lipid barriers of the bacterium help aid in survival and drug resistance, emphasis must be directed towards proper antibiotic drug use to prevent replication and spread of the bacterium (Knechel, 2009, p. 36).

Main symptoms of Pulmonary tuberculosis

- **Cough**
- **Fever**
- **Night sweats**

Lungs
- **Coughing**
- **Peeing**
- **Sputum**
- **Blood**

Significance of Pathophysiology
If tuberculosis can be easily spread through airborne droplets. Any individual that has had previous contact with another individual infected with active TB is at a risk for developing TB. Once an individual is infected with TB, the bacterium can take the form of latent or active stage depending on the quality of the host defense and drug resistance (Koutsky, Kreiswirth, Shashkina, & Ahuja, 2002). Even when the bacterium is in a latent stage, the body cannot be cured and can remain in a dormant state. Due to the developing latent disease, surveillance and early diagnosis are vital to prevent and eradication of TB.

Significance

Due to the development of drug-resistant TB and the chance of TB becoming more prevalent in the health care setting, Advance Practice nurses (APNS) must be able to recognize and detect TB early to help prevent and treat the spread of Tuberculosis. In the health care field, staff must be able to understand the pathophysiology of TB along with the signs and symptoms, risk factors, treatment and prevention. Even though TB is more prevalent in foreign countries, health care personnel need to be prepared to treat and care for those with tuberculosis with keeping themselves and the community safe from spread of the disease.

Signs and Symptoms

When the human’s immune system is able to control and prevent the spread of TB within the body, the disease is in an inactive state known as the latent stage. The individual is not contagious at this time and will not exhibit any signs and symptoms of the disease. However, there is still a possibility that the Mycobacterium tuberculosis can eventually become active and the individual will develop signs and symptoms of TB along with becoming contagious. Signs and symptoms of active TB include the following:

- **Cough**
- **Heaviness of chest**
- **Fatigue**
- **Cough night sweats**
- **Chest pain or pain with breathing and coughing**

Even though TB mainly affects the lungs, there is a possibility that the infection can spread to other vital organs such as, spine, brain, or kidneys. Signs and symptoms of TB can vary according to the organ that is infected (Mayo Clinic, 2015).

Underlying Pathophysiology

Mycobacterium tuberculosis invades the host through airborne droplets that are infected by an individual. Mucus within the respiratory system entraps the bacterium which aids in the removal of the infection. Bacterium that is able to bypass the mucus then reaches the alveoli where macrophages engulf the bacterium and the complement system makes antibodies (Koutsky, 2009, p. 3x). Phagocytes then takes place and prevents the replication of the bacterium in the alveoli.

Once the macrophages engulf the bacterium, cell division and multiplication of the mycobacterium tuberculosis will continue slowly. The host will then release cytokines in the body which will attract T lymphocytes to the site of infection. If tuberculosis still progresses to either an active or latent stage depending on the quality of the host defense mechanisms.

Latent stage of TB

- **Host has an intact immune system.**
- **Accumulation of T lymphocytes and macrophages attacks the bacterium.**
- **Granuloma forms at the point of infection.**
- **Caseous necrotic site forms, preventing replication and spread of bacteria.**

As tuberculosis progresses in the host, the macrophages release cytokines which cause the immune system to recruit T lymphocytes to the site of infection. In addition, cytokines recruit additional immune cells to the site of infection which aid in the immune response (Koutsky, 2009, p. 3x). The immune system is able to recognize the bacterium and destroy the bacterium. As the immune system is able to recognize the Mycobacterium tuberculosis, the host is no longer contagious (Mayo Clinic, 2016).

Active stage of TB

- **Host has a compromised immune system.**
- **Bacterium successfully forms granulomas around bacterium.**
- **Necrotic site and loose connective tissue and fibrous wall and loose structural integrity (Koutsky, 2009, p. 3x).**
- **Area of liquefaction and bacterium is able to enter the bronchus and blood stream.**
- **Bacterium is able to replicate and spread within the host.**

Conclusion
Tuberculosis is a highly infectious disease that is easily spread through airborne droplets. Those who are immunocompromised along with those who are at a higher risk are at a higher risk of developing Tuberculosis and being in an active stage of TB. Many times symptoms of TB may be mistaken for other respiratory diseases and treatment is delayed and compromised resulting in an increase chance of spreading the disease to others. Since TB is highly contagious and hard to control, surveillance is vital in preventing the spread of TB. By screening all individuals who are at a higher risk of acquiring TB, early diagnosis and treatment can be implemented and hopefully eradication of Tuberculosis will be achieved.

Nursing Implications

Even though the number of Tuberculosis cases has decreased in the United States, Advanced Practice Nurses (APNS) still need to be educated and familiar with TB. Treatment, prevention, and education are vital to help prevent the spread of TB and potentially eliminate the disease completely. One nursing implication for nursing care is being able to recognize individuals who are at an increased risk for acquiring TB. Individuals who are at an increased risk for acquiring TB include:

- **Individuals with latent stage TB.**
- **Immunocompromised individuals (e.g. HIV).**
- **Previous contacts with active stage TB.**

If an individual is recognized as being at high risk for acquiring TB, they should be screened for TB through a Tuberculin skin test, chest x-ray, or a QuantFERON® TB test. Screening individuals who are at a higher risk of spreading TB is vital to help treat and prevent the spread of disease.

APNs must also be able to diagnose individuals with active TB. In some instances, infected individuals sought help from healthcare services but were misdiagnosed. By delaying diagnosis of TB, there is a chance of the individuals condition worsening and an increase chance of spreading the disease to the community (Furman, Silver, & Marcon, 2016, p. 68). Once an individual is diagnosed with active TB, APNs must be able to educate their patients about Tuberculosis along with the proper treatment. Patients need to be educated on how to properly take and complete their medications as directed. With appropriate drug administration, the risk of drug-resistant TB will be decreased and the spread of infection will be eliminated. Prompt diagnosis along with early treatment is vital in treating and managing TB.

References


Additional Sources


