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Tuberculosis

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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 2013, the CDC (2015) estimated that approximately 9 million people were infected with *Mycobacterium tuberculosis* worldwide and approximately 1.5 million deaths were a result of TB. Tuberculosis is an airborne infection which can be spread through the air from an infected individuals cough, sneeze, or speech. Individuals 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. If the *Mycobacterium tuberculosis* becomes active in the individual, then they will develop signs and symptoms of the disease and will be able to spread the infection to others (CDC, 2015).

There have been many different drug therapies developed to help treat the diagnosis of TB. However, through genetic mutations, some forms of *Mycobacterium tuberculosis* have become drug-resistant (Trauner, Borrell, Reither, & Gagneux, 2014, p. 1063). Due to drug-resistant TB, treatment and control of TB has become compromised, especially in foreign countries where there is overcrowding, poor sanitation, and/or "inadequate or incomplete antimicrobial treatment" (Ameigh, Semler, Lebkuecher, & Scanlan, 2015, p. 27). As a result of the increased number of drug-resistant TB, surveillance and prevention along with proper education and drug administration and treatment are vital to help prevent the spread 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 on to help treat and prevent 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 take care of and treat Tuberculosis along 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 to others. Signs and symptoms of active TB include the following:

- Persistent cough
- Hemoptysis
- Weight loss
- Fatigue
- Fever
- Chills/ night sweats
- Chest pain or pain with breathing and/or 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).

Main symptoms of Pulmonary tuberculosis

Central

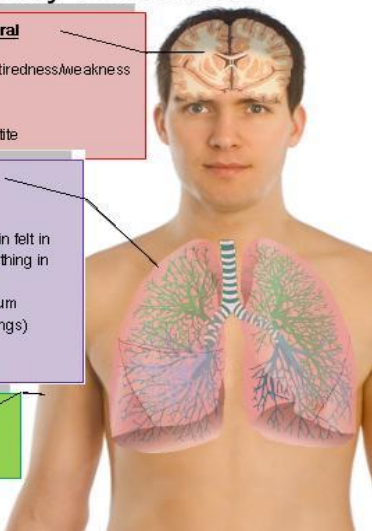
1. Generalized tiredness/weakness
2. Weight loss
3. Fever
4. Loss of appetite

Lungs

1. Coughing
2. Pleurisy (a sharp pain felt in the chest when breathing in deeply or coughing)
3. coughing up of sputum (material from the lungs) and/or blood
4. shortness of breath

Skin

1. Night sweats



Underlying Pathophysiology

Mycobacterium tuberculosis invades the host through airborne droplets that are inhaled 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 is activated (Knechel, 2009, p. 35). Phagocytosis then takes place and prevents the replication of the bacterium in the alveoli.

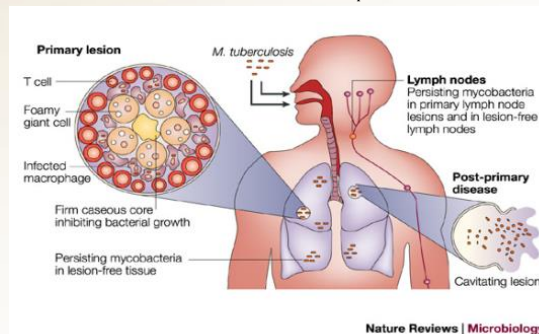
Once the macrophages engulf the bacterium, cell division and multiplication of the mycobacterium will continue slowly. The host will then release cytokines in the body which will attract T lymphocytes to the site of infection. *M tuberculosis* will then progress to either an active or latent stage depending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

Latent Stage TB:

- Host has an intact immune system.
- Accumulation of T lymphocytes and macrophages develop nodular-type lesions around the bacterium.
- Granulomas form, creating a harsh environment.
- Caseous necrotic sites form, preventing replication and spread of TB.

Active Stage TB:

- Host has a compromised immune system.
- Unable to successfully form granulomas around bacterium.
- Necrotic site undergoes liquefaction and fibrous wall loses structural integrity (Knechel, 2009, p. 36).
- Area of liquefaction and bacterium is able to enter the bronchus and blood vessels.
- Bacterium is able to replicate and spread within the host.



Significance of Pathophysiology

M tuberculosis can be easily spread through airborne droplets. Any individual that has had previous contact with another individual infected with active TB is at risk for developing TB. Once the individual is infected with TB, the bacterium can take the form of latent or active stage, depending on the quality of the host's defensive mechanisms. Even when the bacterium is in a latent stage, the bacteria can still become active, making the individual infectious to others. Due to TB being highly infectious, surveillance and early diagnosis are vital to prevention and eradication of TB.

Throughout time, *M tuberculosis* has also become drug resistant through genetic mutation. The extraordinary lipid barriers of the bacterium help aid in survival and make the bacterium resistant to certain antibiotics used to treat TB. Studies have argued that genetic mutation is caused by global areas with high rates of TB and drug therapy being inappropriately used or not completed (Trauner, Borrell, Reither, & Gagneux, 2014, p. 1063). Since *M tuberculosis* is highly capable of genetic mutation and drug resistance, emphasis must be directed towards proper antibiotic drug use to help eradicate the disease.

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 of acquiring TB. Individuals who are at an increased risk of acquiring TB include:

- Individuals with latent stage TB.
- Foreign-born individuals.
- Immunocompromised individuals (ex. HIV).
- Previous contact with an individual infected with active stage TB.

Once 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 QuantiFERON-TB test. Screening individuals who are at a higher risk of acquiring TB is vital to help treat and prevent the spread of disease.

APNs must also be able to correctly diagnosis 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 (Furlan, Silva, & Marcon, 2014, p. 68).

Once an individual is diagnosed with active TB, APNs must be able to educate their patient about Tuberculosis along with the proper treatment. Patients need to be educated on how to properly take and complete their antibiotics 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.

Conclusion

Tuberculosis is a highly infectious disease that is easily spread through airborne droplets. Those who are immunocompromised along with those in low socioeconomic states 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 have had previous contact with TB or at a higher risk of acquiring TB, early diagnosis and treatment can be implemented and hopefully eradication of Tuberculosis will be achieved.

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