7-29-2019

Tuberculosis

Jessica Puri
puri1@otterbein.edu

Tuberculosis

Jessica Puri, RN, BSN
Otterbein University, Westerville, Ohio

Introduction

Tuberculosis (TB) is a disease that claims the lives of millions each year. TB is an airborne disease spread by inhaling droplets of tubercle bacillus, once penetrated in the alveoli, colonization of droplets can multiply leading to tuberculosis infection (Katanekwa & Dahlback, 2016, p. 9). According to the World Health Organization, TB is ranked as one of the top leading causes of death (WHO, 2018). While TB was discovered over two thousand years ago by Hippocrates, this disease continues to claim lives each year (Katanekwa & Dahlback, 2016, p.9)

Risk Factors

TB is more prevalent in under developed countries. According to Katanekwa and Dahlback (2016), "overcrowded clinics, high patient load, and staff shortage increases the risk of developing occupational TB infection in the developing countries" (p. 11). The following are additional risk factors that make an individual more susceptible to developing TB disease

- Sharing living quarters with an individual who has active TB disease
- Over crowded living quarters
- Individuals with weakened immune systems(HIV, diabetes metilius, cancer)

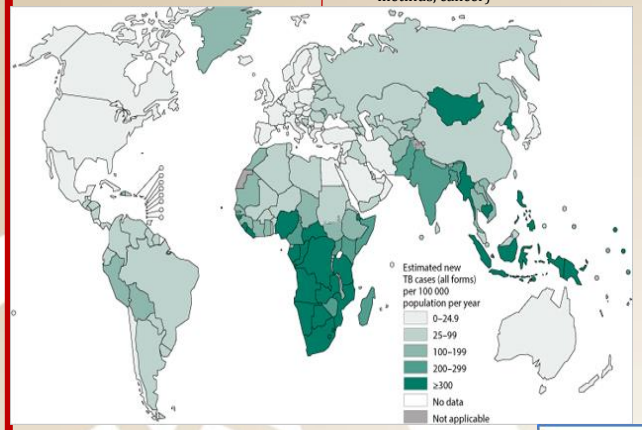

Figure 1. Incidence Rate of TB in 2016 (CDC, 2019)

Sign and Symptoms

There are 2 types of TB related conditions, latent TB infection and active TB disease.

Latent TB Infection

- Not contagious
- Asymptomatic- patient exhibits no symptoms of active TB disease
- Negative Sputum culture
- Normal chest radiograph
- May have a positive skin test or blood test

Latent TB can transition to active TB disease if the immune system is weakened. According to World Health Organization, an individual with human immunodeficiency virus (HIV) is at the greatest risk for activating latent TB (WHO, 2019).

Active TB Disease

- Highly contagious
- Persistent cough lasting > 3 weeks
- Loss of appetite
- Fatigue
- Weakness
- Weight loss
- Night sweats
- Fever
- Chest pain
- Coughing up blood or purulent sputum
- Abnormal chest radiograph
- Positive TB skin test or blood test

TB most commonly develops in the lungs. However, TB can attack the brain, kidneys, bone, and spine (Parmer, Allen, & Walton, 2017, p. 26) .

Underlying Pathophysiology

TB is spread through the air from person to person. "When a person with infectious tuberculosis disease coughs, speaks, or sings, tiny particles containing *M. tuberculosis* are expelled into the air, and are suspended into the air for up to several hours (Parmer, Allen, & Walton, 2017, p. 26). Afterwards, if a person inhales those droplets, that person may or may not be exposed to TB. According to Parmer, Allen, & Walton (2017), latent TB infection occurs when an individual inhales droplet of nuclei containing the microorganism tubercle bacilli (p. 27). After exposure, particulates of tubercle bacilli that survive the alveoli multiply and spread through the blood stream. Afterwards, the immune system of a healthy individual fights off the infection, thus inhibiting the bacteria from multiplying and that same individual is categorized as having latent TB infection. However, after exposure, if the immune system cannot stop the spread of tubercle bacilli from multiplying, the individual is considered to have active TB disease. Once an individual is suspected of having TB disease, further testing can confirm diagnosis.

Diagnostic Testing

- The most common form of diagnostic testing is skin test. Small amount of fluid called tuberculin is injected intradermally on to the skin. After 48-72 hours, if the injected site is raised or has induration, the skin test is considered positive for exposure to TB. Skin test is not indicative of active TB (American Lung Association, 2019).
- Sputum Culture- lab technicians utilize microscopy to visualize for presence of TB strains
  - Microscopy cannot detect drug resistance strains (WHO, 2019)
- Blood test- Research has shown the XPERT-MTB/RIF assay is the best option to obtain prompt results (WHO, 2019)
  - Results are available within 2 hours
  - Assay can detect presence of TB and drug resistance to rifampicin (WHO, 2019)

Significance of Pathophysiology

- "The Center for Disease Control and Prevention estimates that about 13 million people living in the United States have latent TB infection, of which 85% lead to active TB disease each year" (Parmer, Allen, & Walton, 2017,p. 27).
- "In 2017, 10 million people fell ill with TB, 1.6 million of those people died of the disease" (WHO, 2019)
- TB Disease is extremely contagious, proper measures must be taken to prevent the spread of infection
- The first line of treatment for TB disease is rifampicin. However, noncompliance and misuse of this medication has led to drug resistance.
- "Multidrug-resistant TB (MDR-TB) remains a public health crisis and a health security threat. WHO estimates that there were 558 000 new cases of TB with resistance to rifampicin – the most effective first-line drug, of which - 82% had MDR-TB" (WHO, 2019)

Treatment

"Between the year 2000 and 2017 an estimated 54 million lives were saved through TB diagnosis and treatment" (WHO, 2019)

Latent TB
Daily dose of isoniazid
Treatment last 6-9 months (CDC, 2016)

Active TB Disease
The most common treatment for active TB is isoniazid INH plus three other drugs—rifampin, pyrazinamide, and ethambutol.
Treatment last 6-12 months(CDC, 2016)

Nursing Implications

- Nearly four million cases of TB go undiagnosed each year (Fauci, 2018, p. 1315).
- According to Kurniatwati et al. (2016), five factors that play a role in TB compliance
  - knowledge about medication
  - self-discipline about medication and management
  - ability in countering the adverse effects of medication
  - regularity in control and monitoring
  - the ability in evaluating the result of treatment (p. 103)
  - Non-compliance to TB treatment is a primary contributor to multi-drug resistance TB
- Education is an important step in prevention of active TB disease.
- Helping patients recognize risk factors associated with infectious TB, understanding the symptoms of TB , and getting screened can help stop the spread of active TB
- Furthermore, nurses must emphasize the importance of adhering to treatment plans.
- Knowledge gaps have led to development of multi-drug resistant strains that hinder treatment of TB.

Conclusion

In summary, TB is a highly contagious airborne disease that affects millions around the world. Early diagnosis and prompt treatment are pivotal steps to stop the spread of TB and help eradicate TB. As a future nurse practitioner, understanding the pathogenesis of TB can help tip the scale to eliminate this deadly disease.

Presentation of Case/ Process

TB remains a global health concern due to its prevalence. While this disease is curable, TB continues to rank as a leading cause of death worldwide. As a future nurse practitioner it is imperative to understand the pathogenesis of TB, mode of transmission, signs and symptoms to aid in early diagnosis and treatment. Ultimately, primary preventive efforts must be enforced to eradicate this deadly disease.

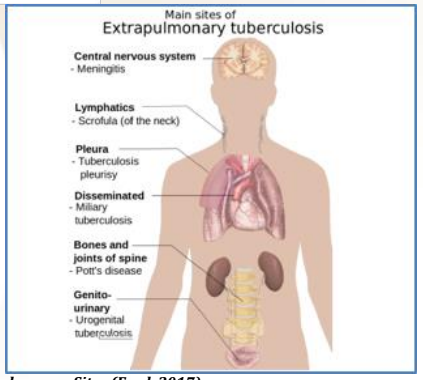

Figure 2. Extrapulmonary Sites (Ford, 2017)

References

Center for Disease Control and Prevention. (2016). Tuberculosis. Retrieved July 10, 2015, from http://www.cdc.gov/tb/default.htm

Fauci, S.A. (2018). Addressing the tuberculosis epidemic: 21st century research for an ancient disease. *Jama, 320*(13), 1315. doi:10.1001/jama.2018.12852

Ford, D. (2017) *Heartland NTBC. Retrieved from https://www.heartlandntbc.org/assets/training/archive/tbnucama_20170307_1315.pdf*

Katanekwa, S. N., & Dahlback, E. (2016). Prevention of tuberculosis cross infection; in the process of nursing care. *Asian Journal of Medical Sciences, 7*(3), 9-14. doi:10.3126/ajms.v7i3.13499

Kurniawati, N. D., Bakar, A., Mhas, E., Ulfiana, E., Hidayati, L., Endang, H., . . . Kristiawati, K. (2016). Knowledge-management-based-nursing care model improves patient adherence to tuberculosis treatment. *Jurnal Ners*, 11(*1*), 99-105

Parmer, J., Allen, L., & Walton, W. (2017). CE: Tuberculosis: A new screening recommendation and an expanded approach to elimination in the united states. *American Journal of Nursing,* 117(*8*), 24-34. doi:10.1097/01.NAJ.0000521946.45448.90

World Health Organization. (2019). Tuberculosis key facts. Retrieved July 18, 2019 from https://www.who.int/en/news-room/fact-sheets/detail/tuberculosis

Additional Sources

Ameigh, R. A., Semler, J. R., Lebkuecher, A. F., & Scanlan, P. M. (2015). CLINICAL PRACTICE. tuberculosis infection control: An interdisciplinary perspective. *Clinical Laboratory Science, 28*(1), 27-34. Retrieved from http://ezproxy.otterbein.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=103786202&site=eds-live&scope=site

American Lung Association. (2019). Tuberculosis. Retrieved from https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/tuberculosis/tuberculosis-symptoms.html

Kannabus, A. (2018). Information about tuberculosis. *Global Health Education.* Retrieved from https://www.tbfacts.org/tb-statistics/

McMillen, C. W. (2015). Discovering tuberculosis : A global history, 1900 to the present. *Yale University Press.* Retrieved from http://ezproxy.otterbein.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=cat02013a&AN=ott.b4276382&site=eds-live&scope=site http://proxy.opal-libraries.org/login?url=https://dx.doi.org/10.12987/yale/9780300190298.001.0001

Rogers, B., Kennedy, M., Wiselka, M., Morris, T., & Venkatraman, N. (2018). Current recommended management of tuberculosis. Prescriber, 29(10), 18-22. doi:10.1002/psb.1709

Rossoni, R., de Fátima, A. L., Martins Sales, C. M., & Caniçali Primo, C. (2016). Protocol of nursing for patient with tuberculosis. *Journal of Nursing UFPE / Revista De Enfermagem UFPE, 10*(2), 464-474. doi:10.5205/reuol.8557-74661-1-SM1002201612

OTTERBEIN UNIVERSITY