Diseasess

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Disease Process of Pulmonary Tuberculosis

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Disease Process of Pulmonary Tuberculosis

Tuberculosis still poses significant health burdens for different countries worldwide. Globally, the disease causes millions of death and morbidity across all age groups. The impacts of tuberculosis on individuals, communities, and the healthcare systems can be overwhelming for all people regardless of whether they have the disease. Thus, it is essential for all healthcare workers, including nurses, to have sufficient up-to-date knowledge regarding the condition and its management protocols. With reference to an actual tuberculosis patient I am currently managing, this paper discusses the disease process of pulmonary tuberculosis, including its epidemiology, pathophysiology, treatment, and nursing care process. The paper also includes a brief description of the patient, etiology, risk factors, clinical features, and prognosis of the disease.

Actual Tuberculosis Patient

I work part-time in a tuberculosis clinic, and I am currently following-up on a patient on treatment for pulmonary tuberculosis. The patient had come for medical consultation for an unremitting productive cough. The thirty-six years old patient had taken several over-the-counter medications and cough syrups for the cough, but none was working. On further evaluation, he had been experiencing occasional night sweats, chest pains, and breathing difficulties, especially when lifting moderately heavy objects upstairs. However, he denied experiencing other typical tuberculosis symptoms such as fever, weight loss, and contact with a tuberculosis patient. After his sputum test results and chest radiograph came back positive for Mycobacterium tuberculosis infection, he started anti-tuberculosis treatment. Currently, he is on his second phase of treatment, and he reports significant improvement, especially with the cough and the chest pain.

Pathophysiology

Disease Name and Description

Pulmonary tuberculosis is a common respiratory infectious disease in most, if not all, healthcare facilities across the world. It affects the respiratory system, with primary infection occurring on the lung parenchyma (World Health Organization (WHO), 2020). Pulmonary tuberculosis is a highly infectious airborne disease caused by bacteria. The infection is primarily acquired through inhalation of infected air droplets. However, other forms of transmission, such as contact or transfusion with infected blood or body fluids, are thought to be possible (WHO, 2020). Upon inhalation, the bacteria are transmitted through the airways into the lung alveoli, after which they invade the lung tissue and initiate an immune response that determines the disease process. In those with strong immunity, the infection is usually contained, and thus an individual is said to have latent tuberculosis infection. In cases of low immunity, the bacteria multiply, causing active tuberculosis disease.

Epidemics and Significance of Tuberculosis

Although the global incidence of tuberculosis is declining, the disease still causes millions of death worldwide. According to WHO (2020), the disease caused approximately 1.4 million deaths in 2019, making it one of the top causes of death worldwide. The same year, 10 million people developed tuberculosis, with 8.2 million constituting adults and 1.2 million representing children (WHO, 2020). If not controlled, the disease will kill approximately 28 million people by 2030, and it will cost the world economy about 1 trillion U.S dollars (Burki, 2017). Because of these costs, the WHO implemented the End TB Strategy to end the disease (WHO, 2020). Simultaneously, ending the tuberculosis epidemic is one of the United Nation's Sustainable Development Goals (SDGs).

Etiology

Pulmonary tuberculosis can present as an acute or chronic disease depending on the individual's immune system. It is primarily caused by an acid-fast aerobic bacterium called *Mycobacterium tuberculosis* (Glaziou et al., 2018). The microorganism is sensitive to heat and ultraviolet light and cannot survive for long under direct sunlight (Gordon & Parish, 2018). Moreover, it is a slow-growing bacterium, and therefore patients may take a long period to develop the typical clinical features of the disease (Gordon & Parish, 2018; WHO, 2020). Other causes of tuberculosis among humans include *Mycobacterium africanum*, *Mycobacterium bovis*, and *Mycobacterium microti,* among other species (Glaziou et al., 2018). To get the disease, individuals must inhale air droplets infected with either of these microorganisms. With my patient, the sputum test results were positive for M. tuberculosis infection. It is the commonest cause of pulmonary tuberculosis in most individuals.

Risk Factors and Related Demographics

Several factors increase the risks of acquiring or inhaling the bacteria that cause tuberculosis. Some of the factors include having close contact with people suffering from active tuberculosis disease, poor ventilation, overcrowding, smoking, alcohol use, and other forms of substance abuse (Glaziou et al., 2018). Additionally, individuals with inadequate healthcare, such as those living below the national poverty level, the minority groups, and the homeless, have increased risks of acquiring the infection (Centers for Disease Control and Prevention (CDC), 2020). There are also high risks of infection among those with other diseases because of reduced immunity. For instance, infection with the human immunodeficiency virus (HIV) is positively associated with tuberculosis. Besides the general risk factors, the percentage of tuberculosis

cases is often high among Hispanics, Latin Americans, and African Americans (CDC, 2020). In 2019, 88% of Tuberculosis cases reported in the U.S occurred among racial and ethnic minority groups (CDC, 2020).

Clinical Features

Clinical manifestations of tuberculosis vary from one individual to another depending on their immunity. After an incubation period of about four to eight weeks, an individual may develop non-specific symptoms such as fatigue, weight loss, anorexia, low-grade fever, and night sweats (Van Aswegen & Roos, 2017). Later on, the patients often develop a productive cough that may persist beyond three weeks despite treatment with usual antibiotics. In advanced disease, the patients may cough out blood-stained sputum (Van Aswegen & Roos, 2017). Notably, the patients may also complain of chest pains, exhaustion, and shortness of breath (Van Aswegen & Roos, 2017). My patient's history was positive for prolonged productive cough, breathing problems, night sweats, and exhaustion during moderately intense exercise.

Disease Progression and Physiological Changes

The progression of tuberculosis infection into active tuberculosis disease largely depends on the integrity of the host immunity. Upon inhalation of the M. tuberculosis bacilli (tubercle bacilli), individuals can develop either latent infection, active primary tuberculosis diseases, or active secondary disease later in life (Médecins Sans Frontières 2017). However, those with strong immunity may clear the tubercle bacilli out of the body without developing any form of tuberculosis disease (Médecins Sans Frontières 2017). In all cases, the disease process starts with the body initiating inflammatory immune reactions against the inhaled bacteria. Approximately five to ten microns of tubercle bacilli is enough to trigger an immune response in an individual.

Consequently, phagocytes and TB-specific lymphocytes are released to engulf and clear off the infection.

In latent tuberculosis infection, macrophages and destroyed cells and tissues form a mass known as a granuloma, which keeps the bacteria contained for an extended period. However, in low immune cases, the bacteria multiply within the lungs to cause active primary disease. The damage to the lungs interferes with respiration by reducing the total surface area for gaseous exchanges. This makes individuals develop increased respiratory rates in an attempt to compensate for oxygen insufficiency. My patient had a respiratory rate of 25 breaths per minute, which is higher for a person of his age.

Systemic Changes and Complications

The progression of latent tuberculosis infection to tuberculosis disease can occur at any time and may take as long as several years later. In advanced stages, the phagocytized bacteria may proliferate inside the alveolar macrophages, making them burst and release tubercle bacilli into the bloodstream and the lymphatic system (Van Aswegen & Roos, 2017). The blood may then transport the bacteria to other parts of the body such as kidneys, spine, lymph nodes, and bones resulting in extra-pulmonary tuberculosis (Van Aswegen & Roos, 2017). Locally, secondary diseases such as bronchitis, bronchiectasis, atelectasis, and pneumothorax may occur, especially if treatment is delayed.

Usual Treatment

Tuberculosis is usually treated with anti-tuberculosis medications. Currently, the first-line treatment involves the administration of isoniazid, rifampin, ethambutol, and pyrazinamide (Médecins Sans Frontières 2017). The four drugs are taken daily for two months in the initiation phase. Afterward, the patient takes isoniazid and rifampin for another four months in the

continuous phase (Médecins Sans Frontières 2017). Currently, my patient is in the first month of the continuous phase and takes rifampin and isoniazid tablets daily. In advanced disease, surgery is often recommended to treat various complications such as pneumothorax and pulmonary carcinoma.

Prognosis

The prognosis of tuberculosis depends on numerous factors such as age, co-existing infections or diseases, smoking, use of alcohol, malnutrition, and acquisition of multi-drug resistant tuberculosis (Médecins Sans Frontières 2017). If diagnosed and treated early with effective tuberculosis medications, the prognosis of the disease is good for most patients. The fatality ratio for those with adequate treatment is between two to three percent under normal conditions (Médecins Sans Frontières 2017). However, without treatment, tuberculosis is fatal. After only five years without treatment, 50 to 60% of individuals die while 20-25% are cured spontaneously (Médecins Sans Frontières 2017). Thus, adequate early treatment reduces the death rate by significant proportions.

Nursing Process

Successful management of patients suffering from tuberculosis requires an accurate and appropriate nursing care process. The nursing care process usually starts with patient assessment, followed by the formulation of nursing diagnoses, developing a nursing care plan, implementing appropriate interventions identified on the plan, and evaluating treatment goals and objectives. Following are the essential steps of the nursing care process when dealing with patients suffering from tuberculosis.

Nursing Assessment

In tuberculosis, nursing assessment comprises three parts; assessing patient's history, clinical features through physical examination, and laboratory results (Temoteo et al., 2019). The history often involves assessing for the duration of the classic symptoms of tuberculosis, the presence of blood in sputum, the intensity of the chest pain, where it is radiating, and the level of exhaustion based on the mild, moderate, and intense exercises (Temoteo et al., 2019). After this, the nurse should assess the patient's past and present medical history and noting positive findings. Lastly, the nurse should examine for extra-pulmonary tuberculosis clinical features to rule out any possibility of distance infections.

Physical examination starts by assessing vital signs such as temperature, respiratory rate, and heart rate to note significant deviations from the expected values. The patient's current weight is also measured and compared with the previous ones to assess weight loss. Afterward, a full body examination is necessary, with a primary focus on the respiratory, cardiovascular, and nervous systems. Evaluating these systems helps with ruling out other causes of cough such as heart failure and tuberculous meningitis.

For laboratory assessment, sputum is usually collected for laboratory tests to confirm the presence of M. tuberculosis (Temoteo et al., 2019). Imaging usually starts by taking a chest radiograph before advancing to other imaging techniques. With my patient, his assessment was positive for a prolonged productive cough, night sweats, chest pain, exercise intolerance, and diminished breath sounds on the right lung. His chest radiograph showed massive consolidation on the right lung's upper lobe and multiple opacities distributed through the lung tissue. His sputum was positive for M. tuberculosis after a Gene Xpert molecular test was conducted.

Nursing Diagnoses

Tuberculosis patients often present with multiple nursing diagnoses. Upon assessment, two actual physiological nursing diagnoses I made included impaired airway clearance and ineffective gaseous exchange resulting from increased production of thick, viscous secretions along the airways. He was coughing out thick greenish phlegm, which probably was blocking his upper airways, causing difficulties in breathing and shortness of breath during moderate exercise. Moreover, the patient also had ineffective gaseous exchange because of lung damage. The presence of consolidation and opacities reduces the total lung surface area used in gas exchange. Thus, the lungs have to work beyond their capacity to expel extra carbon IV oxide gas accumulating in the body. This was evidenced by the increased respiratory rate, reduced oxygen saturation, and the presence of crepitation on auscultation.

Simultaneously, the patient had several psychosocial nursing diagnoses. Some of them included deficient knowledge and activity intolerance. The diagnosis of deficient knowledge arose when the patient did not know the typical symptoms of tuberculosis. He treated the cough with over-the-counter medication for a long time before coming for a medical consult in a healthcare facility. If he knew that could be tuberculosis, he probably would have visited the facility early. Notably, his inability to tolerate moderate exercises affected his everyday life, including social activities such as going to the gym and riding a bicycle with friends. He also complained of poor performance during sex, which caused him much worry and anxiety with regard to his four-year marriage. Other diagnoses for the patient include risk for spread of infection and risk for tuberculosis-related complications.

Nursing Planning

After the initial assessment and formulation of nursing diagnosis, my plan was to promote airway clearance, initiate tuberculosis medications, stress adherence to the drugs, and

prevent the spread of infections to other society members, including myself. Additionally, I had to ensure the patient maintain moderate activity and adequate nutrition to promote the metabolism and clearance of anti-tuberculosis drugs. The plan also included regular monitoring of vital signs, screening for complications, and maintaining oxygen saturation at ninety percent and above. My last objective was to encourage family members and those in contact with the patient to go for tuberculosis testing.

Nursing Interventions

Interventions for tuberculosis patients remain similar throughout the world. Because he was treated as an outpatient, some of the independent nursing interventions I provided included advising on the importance of self-isolation, teaching him how to cough and dispose of used tissue, and educating him on the general feature of tuberculosis and its communicability. Another independent intervention included monitoring the adverse effects of tuberculosis medications. Currently, the patient has not complained of any symptoms that may suggest drug reactions or intolerance. The primary dependent intervention included ensuring the patient adheres to tuberculosis medications prescribed by the physician (Temoteo et al., 2019). He was started on a six-month course of tuberculosis medications. He is currently using first-line tuberculosis medications, which constitute isoniazid, rifampin, pyrazinamide, and ethambutol. The four drugs were taken for four months, after which ethambutol and pyrazinamide were dropped.

Nursing Evaluation

Nursing evaluation involves assessing whether the goals or objects of management are being met. According to the set nursing objectives, my patient currently understands the nature of tuberculosis. He is always put on a face mask whenever coming for drug refills to avoid spreading the infection to others. Notably, he has completed the initial phase of treatment and

recently started the continuation phase with rifampin and isoniazid for the next four months. His symptoms, particularly the cough, have improved significantly. Moreover, he has not complained of any symptoms that may suggest complications, his vital signs are normal, and he has gained moderate weight. Thus, I am confident I am meeting my management objectives in my nursing care.

Conclusion

In brief, tuberculosis is a serious infectious disease that affects a significant proportion of the world's population. The overall burden associated with the disease can be overwhelming not only to the patients but also to their families and society. Thus, it is vital for healthcare workers, including nurses, to have a broad knowledge of tuberculosis, its progression, complications, treatment, and prognosis. Having up-to-date knowledge about the disease can help with the early detection, diagnosis, and treatment of tuberculosis. Early initiation of anti-tuberculous therapy can be the first step towards the End TB Strategy initiative.

References

Burki, T. K. (2018). The global cost of tuberculosis. *The Lancet Respiratory Medicine*, *6*(1), 13. https://www.thelancet.com/pdfs/journals/lanres/PIIS2213-2600(17)30468-X.pdf

Centers for Disease Control and Prevention. (2020). *Health Disparities in TB*.Centers for Disease Control and Prevention. https://www.cdc.gov/tb/topic/populations/healthdisparities/default.htm

Glaziou, P., Floyd, K., & Raviglione, M. C. (2018, June). Global epidemiology of tuberculosis. In *Seminars in respiratory and critical care medicine* (Vol. 39, No. 03, pp. 271-285). Thieme Medical Publishers.

Gordon, S. V., & Parish, T. (2018). Microbe Profile: Mycobacterium tuberculosis: Humanity's deadly microbial foe. *Microbiology*, *164*(4), 437-439.

Médecins Sans Frontières. (2017). *Tuberculosis: Practical guide for clinicians, nurses, laboratory technicians and medical auxiliaries*. Médecins Sans Frontières. https://medicalguidelines.msf.org/viewport/TUB/latest/tuberculosis-20321086.html

Temoteo, R. C. D. A., Carvalho, J. B. L. D., Lira, A. L. B. D. C., Lima, M. A. D., & Sousa, Y. G. D. (2019). Nursing in adherence to treatment of tuberculosis and health technologies in the context of primary care. *Escola Anna Nery*, *23*(3).

Van Aswegen, H., & Roos, R. (2017). Physical impairments and activity limitations experienced by people with tuberculosis: a scoping review protocol. *JBI Evidence Synthesis*, *15*(1), 49-54.

World Health Organization. (2020). *Tuberculosis*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/tuberculosis

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