

The Epidemiology Of Tuberculosis

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Introduction

Often referred to as a transmissible or infectious disease, communicable diseases are the ones that are easily transmitted between living organisms, i.e., humans and animals. These diseases are caused by pathogens, including bacteria, viruses, and fungi. After getting infected by a particular pathogen, people may develop varying degrees of communicable disease. The infection mostly occurs by coming in direct contact with infected people, contaminated surfaces, or fluids such as blood and saliva. People may become infected by inhaling or ingesting the contaminant (Kandola, 2020). This paper aims to explore the epidemiology of a communicable disease, i.e., tuberculosis, while relating it to the epidemiologic triangle. The paper further describes the role of a national organization in resolving or reducing the impact of this disease.

Tuberculosis

Tuberculosis (TB) primarily affects the lungs and is a bacterial infection. Although primarily it is considered to be an infection of the lungs, the bacteria may attack other parts of the body, including the kidneys, brain, and spine. The latent tuberculosis infection does not cause any symptoms of the disease, while the TB disease occurs when observable symptoms are present. TB can prove to be fatal if proper treatment is not provided (CDC, 2021).

Causes

Tuberculosis is caused by a type of pathogenic bacterium named *Mycobacterium tuberculosis*.

Symptoms

Tuberculosis may show varied symptoms based on the part of the body infected. After the initial infection, symptoms sometimes take months or even years to appear, and in the case of latent TB, may not appear at all. In the case of active TB, various general symptoms may occur, which include diminished appetite and weight loss, night sweats, persistent high temperatures, and extreme fatigue. More specific symptoms of TB that infect the lungs include a continuous cough that persists for more than 3 weeks. Cough is usually accompanied by bloody phlegm and worsening breathlessness. Although less common, TB sometimes causes infection in other body parts, including the lymph nodes, bladder, bones and joints, and reproductive system, among others. This form of

infection is very common among people with a weakened immune system. The symptoms of such infection usually include persistent headache, abdominal pain, seizures, and persistently swollen glands (NHS, 2021).

Modes of Transmission

Although categorized as a contagious disease, TB does not spread easily from one person to another. The most common mode of transmission of TB is through the inhalation of aerosols, i.e., the tiny droplets from the sneeze or cough of an infected person (Kandola, 2020).

Complications

Different complications occur as a result of tuberculosis infection. These include damaged lungs and joints, an infection that harms the nervous system, including the brain, spinal cord, and nerves, and inflammation of the liver, kidney, and tissues surrounding the heart (WebMD, 2020). TB-related sepsis is regarded as a life-threatening condition. Most complications of TB are attributed to the vascular compromise and structural damages that are caused by the pathogenic bacterium (Maunank, Reed, & Caitlin, 2014).

Treatment

Preventive therapy, i.e., a daily dose of antibiotic for 6 – 9 months, is employed in case of latent TB. This treatment is aimed towards killing the germs that would cause disease later. In the case of active TB, patients are treated with a combination of various antibacterial medications. This treatment lasts from about 6 – 12 months. Isoniazid INH is administered in combination with three other drugs, i.e., pyrazinamide, rifampin, and ethambutol. Although treatment brings relief after a few weeks, the medication must be continued for the entire duration as prescribed by the physician. An incomplete course of treatment may result in drug-resistant TB (American Lung Association, 2021).

Demographic of Interest

Although all groups of people are at risk of this disease, adults in their most productive years are the most affected population. Approximately ninety-five per cent of all TB cases and deaths occur in developing countries. There are 18 times increased chance of infection in people suffering from HIV, while undernourished individuals are 3 times more vulnerable. Alcohol abuse and smoking increase the prevalence of the disease. Tuberculosis is prevalent in all parts of the world. The WHO South-East Asian region was the worst affected region in 2019, reporting 44% new cases. The WHO African region reported 25%, while the Western Pacific region reported 18% new cases. Most of the under-developed and developing countries are impacted by TB, and globally, it is a leading cause of

mortality resulting from an infectious disease (World Health Organization, 2020; CDC, 2021).

Reportability

The healthcare community must report the occurrence of certain diseases to their jurisdictions. Such diseases are termed reportable diseases. Tuberculosis, whether pulmonary or extrapulmonary, is a reportable disease. Anyone with the knowledge or reason of suspecting tuberculosis infection must inform the authorities within 24 hours. All concerned personnel, i.e., pharmacists, nurses, physicians, morticians, and hospital administrators, among others, shall report alleged or confirmed cases of TB to the department within 24 hours (CDC, 2021).

Social Determinants of Health and Tuberculosis

The environmental circumstances in which individuals are born and raised have an impact on wide-ranging aspects of health and functioning. These conditions are called social determinants of health, and they impact the overall quality-of-life outcomes and risks. The social determinants of health are groups under five domains, which comprise economic stability, access to quality education, access to quality health care, the social context, and the neighbourhood. Today, highly stratified societies result in unequal distribution of these determinants of health. Tuberculosis epidemiology is characterized by certain structural factors. The most important among these are socioeconomic inequality, increased population mobility, population growth, and urbanization. These factors result in unequal distribution of resources that may determine the progression of TB. These determinants include malnutrition and food insecurity, poor environmental conditions and housing, as well as other economic and cultural obstacles to accessing quality health care (Hargreaves et al., 2011).

The pathogenesis of tuberculosis is a four-stage process that includes being exposed to the infection, progression of the disease, late or incorrect diagnosis, and poor treatment. Each of these stages is impacted by the social determinants. Exposure to TB is more prevalent in poorly ventilated and overcrowded spaces, including workplaces, homes, and communities. The chances of disease progression are multiplied in populations affected by poverty, hunger, and malnutrition. Various economic barriers may hinder appropriate diagnosis and treatment. Other social factors, such as a fear of being stigmatized, may also hamper treatment (Baker, Das, Venugopal, & Howden-Chapman, 2008; Boccia et al., 2009).

Epidemiological Triangle and Tuberculosis

The epidemiological triangle, which is also referred to as the epidemiological triad, is a model used to address the three components that contribute to disease proliferation. These include an external agent, a vulnerable host, and the environment in which the two come together. Different diseases occur when these factors interact with one another; therefore, for effective regulation and prevention

of disease, it is important to analyze each of these factors.

The agent that causes TB is *Mycobacterium tuberculosis*, a gram-positive, non-motile, aerobic organism. Humans are the hosts of this bacterium. Certain host factors make humans increasingly susceptible to this disease. These include smoking, alcohol abuse, demographics such as age and gender, social factors such as access to education and health care, and conditions such as pregnancy. The environment includes living conditions, socioeconomic status, and other conditions, including humanitarian crises (Khan, 2019). The prevalence and spread of tuberculosis increase when the agent, i.e., the bacterium, finds favourable conditions to infect a host. Controlling one of the factors of this triangle may break the epidemiological triad and result in a diminished spread of the pathogen. For example, a healthier environment or favourable host factors such as quality health care may reduce the spread of disease across communities.

Special Considerations

In the United States, when an infected patient who has not yet completed the treatment for tuberculosis travels to another country, state officials must notify the corresponding personnel in the destination countries to ensure that treatment continues. The “Centers for Disease Control and Prevention” recognizes World TB Day, which is celebrated on March 24. The purpose of the day is to create awareness among the general community about the impact of this disease.

Role of Community Health Nurse

Community health nursing employs evidence-based research in practice to improve the overall well-being of the members of a community. Keeping the socio-economic and cultural aspects in view, community health nurses interact with people and educate them about making healthy life choices. Given the close interaction of these health workers with members of the community, their role is imperative in communicable disease control programs. The core functions of such programs include case finding, reporting, data collection and analysis, and follow-up. As these nurses travel to remote places where health care is difficult to access, they can ensure reporting of cases from populations that may be otherwise ignored (Northeastern State University, 2017).

Since the incidence of tuberculosis is high in developing countries, the involvement of community health workers in new case findings is increasingly important. Active collaboration with these community nurses can accelerate the process of active case finding. This can result in reducing infections and deaths, as well as preventing economic toll on individuals and the health care system. Clear goals and an integrated approach are important for successful case finding and reporting (Rinawat & Induniasih, 2020). Systematic data collection of communicable diseases such as tuberculosis, followed by an analysis of its prevalence across different variables, can provide clear outcomes for intervention and treatment. Accessibility of community health nurses to wider

demographics can also help maintain a follow-up. Proper planning of communicable disease control programs involving these community workers can provide more realistic data about disease prevalence and result in better preventive measures (Mona, 2015).

Importance of Demographics Data

Demographic data is extremely important to the health of any community. The wellness and healthcare needs of a community cannot be assessed in the absence of concrete data about its characteristics and size. It not only helps in understanding the population dynamics but also serves as a basis for forecasting the future. Effective planning can only be done when the need is correctly identified. Demographic data provides information about mortality, morbidity, fertility, population growth, and population movement. All this information is central to the health of the community through needs analysis, planning, and prevention (Grundy & Murphy, 2015).

National Agency for Tuberculosis

Up until the late 1990s, the involvement of the United States in global TB efforts was relatively limited. However, in 1988, the “U.S. Agency for International Development (USAID)” initiated the global program for TB control. The “Federal Tuberculosis (TB) Task Force” is also an authorized national organization that is set up under the Comprehensive TB Elimination Act, which outlines the strategy for combating and eliminating tuberculosis. The “Centers for Disease Control and Prevention (CDC)” is also a national organization that supports the US government’s efforts to control and prevent the spread of TB. It not only provides technical support and surveillance but also conducts operational and clinical research (CDC, 2021).

Global Implication

TB is a globally occurring ailment and a leading cause of death by infectious disease. Approximately a quarter of the global population is infected by *Mycobacterium tuberculosis*. Each year, millions of new cases are identified while millions lose their life to this disease. It is one of the important contributing factors to poverty, economic devastation, and sickness that affects not only families but also communities and, in some cases, the entire country. Women and children are most vulnerable to TB, and so are those infected with HIV/AIDS. One of the rising concerns regarding the treatment of TB is its increasing resistance to the available medication. This means that while the infections increase, their treatment is becoming difficult. Over the past year, approximately half a million cases of drug-resistant tuberculosis have surfaced (The TB Alliance, 2021).

Methods of Treatment in Other Cultures

The suggested treatment of tuberculosis is the administration of antibiotics for a certain period; however, in different cultures, alternative methods of treatment are also employed. In some Asian countries, it is believed that certain home remedies and intake of food rich in vitamins A, C, E, and B complex can accelerate recovery. The use of garlic, mint, and black pepper is also prescribed, along with increased intake of zinc and protein-rich food (Birla, 2021). Similarly, in Africa, traditional healers use the leaves of plants “*Clausena anisata*, *Haemanthus albiflos*, and *Artemisia afra*” for the treatment of TB (Lawal, Grierson, & Afolayan, 2014).

Tuberculosis as an Endemic

For certain regions of the world, tuberculosis is considered to be endemic. These include Africa, Asia, Latin America, Eastern Europe, and Russia. The prevalence of TB infection in these regions is high. However, the greatest number of TB cases in the world are reported from India. The country is burdened by more than a quarter of the world’s TB cases and multidrug-resistant TB. Approximately 3 million people in India were infected by TB in 2016, while 435,000 died from it.

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