



TUBERCULOSIS: A GLOBAL THREAT

Health Science

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ABSTRACT

Tuberculosis (TB) is an airborne bacterial infection caused by the organism *Mycobacterium tuberculosis* (tubercle bacilli bacteria) that primarily affects the lungs, although other organs and tissues may be involved. It remains a leading cause of death in the world and is ranked higher than AIDS/ HIV+ as a leading cause of death from an *infectious disease*. As per the statistics from 2015 1.8 million people died from TB that is almost 5000 deaths a day due to this disease. Tuberculosis remains a major killer across Antibiotic-resistant strain of the bacteria is passed across the globe it becomes difficult to wipe the disease from the face of the earth.

Early diagnosis of the disease can also help in stopping the spread of the disease, the quick diagnostics tools can help in this regard, and the cost of further spending will be justified with the amount saved in the treatment of the disease in future.

KEYWORDS

Tuberculosis, Drug resistance, Prevention and control.

Introduction and Epidemiology:

Tuberculosis (TB) is an airborne bacterial infection caused by the organism *Mycobacterium tuberculosis* (tubercle bacilli bacteria) that primarily affects the lungs, although other organs and tissues may be involved (1). It remains a leading cause of death in the world and is ranked higher than AIDS/ HIV+ as a leading cause of death from an *infectious disease* (2). As per the statistics from 2015 1.8 million people died from TB that is almost 5000 deaths a day due to this disease (3).

Over 10.4 Million people were reported ill from TB, that is over 28,000 cases reported per day (4). 60% of these cases are reported in 6 main countries; namely India, China, Indonesia, South Africa, and Nigeria (4) (See Appendix, fig 1). Although TB is not considered a big problem in the United States; it is a deadly disease and is as much big of a threat as Zika or Ebola to the United States (4,5). Tuberculosis remains a major killer across Antibiotic-resistant strain of the bacteria is passed across the globe it becomes difficult to wipe the disease from the face of the earth (6,7).

Cause of the disease: When a person with active pulmonary TB coughs, sneezes, sings, or even talks, the tubercle bacilli may spread through the air (8,9). If another person breathes in these tubercle bacilli from the air and these tubercle bacilli will reach the alveoli of that person (9). They will become infected with tuberculosis.

Agent, Host, and Environment: Tuberculosis can be of 2 types, latent or active. Someone who is infected with TB has the *Mycobacterium tuberculosis*, in their body (1,2,10). The body's immune system is protecting them from the germs, and they are not sick. This is referred to as latent TB (11, 12).

Someone with TB disease is sick and can spread the disease to other people (13). A person with TB disease needs to see a doctor as soon as possible. This is referred to as active TB. It is not easy to become infected with tuberculosis (14). Usually, a person has to be close to someone with TB disease for a long period of time. TB is usually spread between family members, close friends, and people who work or live together (15). TB is spread most easily in closed space. People with clinically active TB will often but not always display symptoms and can spread the disease to others (14,16).

Pathogenesis of Tuberculosis: When a person breathes in *Mycobacterium tuberculosis*, the bacteria can settle in the alveoli of the lungs by phagocytizing alveolar macrophages (1,17). Alveolar macrophages will try to kill entering bacteria in response to innate immunity of the body (17,18). If bacteria win the fight against alveolar macrophages, it begins to grow and replicate (17,19). From there, they can move through the blood and lymphatics to other parts of the body, such as the kidney, spine, and brain (19) (see appendix, fig 3).

Drug-resistant Tuberculosis: The first way is that people who are sick with tuberculosis fail to take a full course of antibiotics, and the bacteria develop a resistance to drugs that would otherwise knock it out (20). The second way is that a person is infected with a strain of the bacteria that's resistant to antibiotics, to begin with. (Extensively drug-resistant TB, sometimes called "totally drug-resistant TB," is an even more severe category of multi-drug resistant TB) (21).

Drug-resistant tuberculosis in the United States is still quite rare. There were 91 such cases in the U.S. in 2014, according to the Centers for Disease Control and Prevention. But foreign-born people in the United States are much more likely to have drug-resistant tuberculosis than those born in the United States; 88 percent of the U.S. cases of antibiotic-resistant tuberculosis in 2014 were among foreign-born patients. These figures are meaningful especially in a country where immigrants face deep discrimination from wide swaths of the population (22).

Disease prevention and control:

So far, several initiatives have been taken by the United Nations (UN) and World Health Organization (WHO) around the world to STOP the spread of this deadly disease (21). TB was target 6C of the Millennium Development Goal (MDG 6) set by the World Health Organization; which was to halt and reverse the spread of disease like TB and Malaria. In the report published in October 2015, it was reported that MDG target was achieved on a worldwide basis, in each of the regions identified and 16 out of the 22 high burden countries identified by WHO before setting the targets (23). The mortality rate fell by 47% between 1990 and 2015. It was also able to achieve a target of more than 50% reduction in Region Americas, Eastern Mediterranean, South East Asia region and the Western Pacific region (24). This was a huge achievement and thus in 2016 MDGs have been superseded by the Sustainable Development Goals (SDG). The Key Word STOP has been replaced with END, and targets have been placed to end the disease by 2035. The "End Global Epidemic" has been defined as 10 new cases for every 100,000 population (26).

Challenges: One of the major challenges faced by the WHO in ending this epidemic is the poor education of the patient. Regimens for treating TB disease have an intensive phase of 2 months, followed by a continuation phase of either 4 or 7 months (27). Lack of effective vaccine and long and expensive drug regimen made it the primary difficulty for low and people. Thus, keeping a track of the patients suffering from this disease is very important, because of financial hardships these patients can stop taking their daily medicine once they start feeling better, which can result in relapse (28).

Leaving the regimen midway point in the treatment can also result in mutation of the TB bacteria to a drug-resistant bacterium which we won't be able to get rid of with the current vaccines (29).

It is not necessary that a patient suffering from tuberculosis always show the classical symptoms of TB thus many times on the basis of clinical diagnosis results into miss- diagnoses (30). Since the patient is not treated for the right disease, he/she can continue to spread the disease in the entire community (31).

Proposals: In order to overcome the challenges faced by the UN the first step is education. The countries which are under the burden of TB need to be educated the ill- effects of the disease and should be motivated to take the medicine regularly along with a proper diet which can help them resist the bacteria. This will also help in tackling the drug-resistant bacteria creation.

The second step is to invest more in R&D and prepare more effective vaccines which can shorten the timeline of the treatment. This will help not only track the patient's schedule for medicine but will also help in keeping the patients themselves on the right track.

Early diagnosis of the disease can also help in stopping the spread of the disease, the quick diagnostics tools can help in this regard, the cost of further spending will be justified with the amount saved in the treatment of the disease in future.

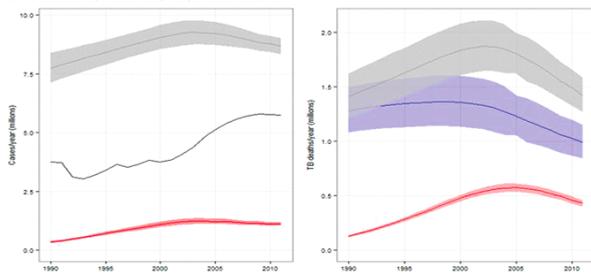


Fig 1: Global TB trend.

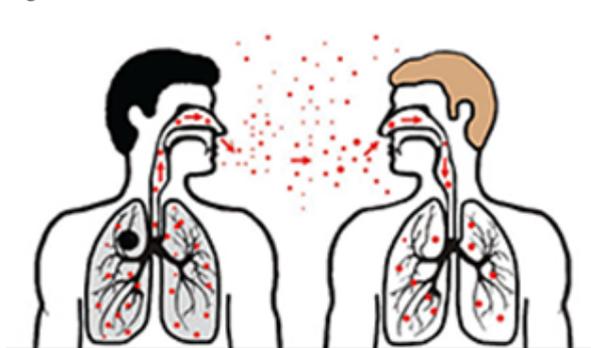


Fig 2: Spread of TB

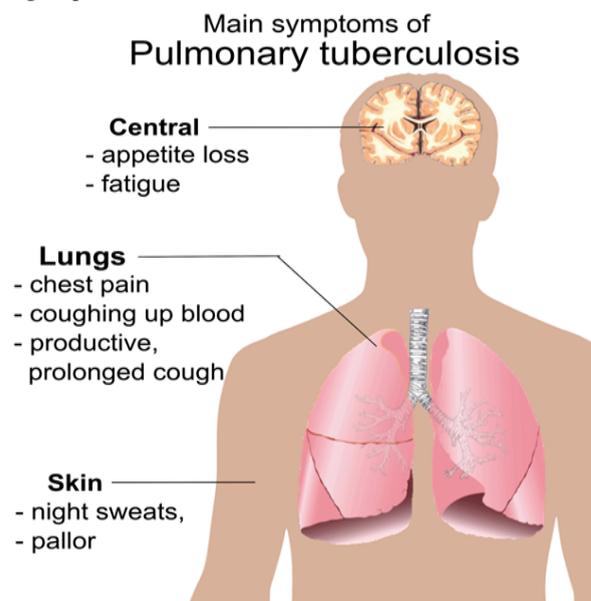


Fig 3: Main Symptoms

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