

TB SCENARIO & PUBLIC HEALTH

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Tuberculosis is a major public health problem world over and it is India's worst scourge. In the words of Charles Dickens "it is the disease medicine never cured, wealth warded off, or poverty could boast exemption from.... Which sometimes moves in giant strides & sometimes at tardy sluggish pace, but slow or quick... is never sure and certain". India bears 28.4% of the entire world's burden of Tuberculosis. Every year 22 lakh persons contract Tuberculosis, but only half of them seek medical care. One Indian dies of Tuberculosis every 3 minutes! Tuberculosis is not only a medical malady but an economic disaster too it perpetuates poverty and poverty begets Tuberculosis. In view of the enormity of the problem let us leaf through the pages of history.

Robert Koch was the scientist who first evolved the concept of Koch's postulate for which he was awarded Nobel prize in 1905. He also found out the causative organism of tuberculosis and declared his discovery through an article in a scientific journal in 24th of March 1882. That is why every year this day observed as World Tuberculosis Day.

Tubercular decay has been found in the spines of Egyptian mummies. Tuberculosis has been present in humans since antiquity. The earliest unambiguous detection of Mycobacterium tuberculosis, the causative organism of the disease, is found in the remains of bison dated 18,000 years before the present. Whether tuberculosis originated in cattle and then transferred to humans, or diverged from a common ancestor infecting a different species, is currently unclear. However, it is clear that *M. tuberculosis* is not directly descended from *M. bovis*, which seems to have evolved relatively recently.

Skeletal remains from a Neolithic Settlement in the Eastern Mediterranean show prehistoric humans (7000 BC) had TB, and tubercular decay has been found in the spines of mummies from 3000–2400 BC. Phthisis is a Greek term for tuberculosis; around 460 BC, Hippocrates identified phthisis as the most widespread disease of the times involving coughing up blood and fever, which was almost always fatal. In South America, the earliest evidence of tuberculosis is associated with the Paracas-Caverna culture (circa 750 BC to circa 100 AD). Skeletal remains from prehistoric North America indicate that the disease was so common that "virtually every member of these late prehistoric communities had primary exposure to tuberculosis. Now let us evaluate the problem and it's depth in various parts of the world presently.

- TB is the leading infectious killer of people with HIV/AIDS
- Worldwide, a third of people with HIV also suffer from TB
- TB is second to HIV/AIDS as the leading infectious cause of death of adults worldwide
- TB is among the three greatest causes of death of women aged 15-44
- One third of the world's population carry the bacterium that causes TB

ORIGINAL ARTICLE

- TB will rob the world's poorest countries of an estimated \$1 to \$3 trillion over the next 10 years
- In some countries, loss of productivity attributable to TB approaches 7% of GDP

TB kills someone approximately every 20 seconds — nearly 4,700 people every day, or 1.7 million in 2009 alone, according to the latest estimates from the World Health Organization (WHO). TB is second only to HIV as the leading infectious killer of adults worldwide. It is among the three greatest causes of death of women aged 15-44 and is the leading infectious cause of death among people with HIV/AIDS.

TB is global. The WHO estimates that two billion people — one third of the world's population — are infected with *Mycobacterium tuberculosis* (M.tb), the bacillus that causes the disease. M.tb's unique cell wall, which has a waxy coating primarily composed of mycolic acids, allows the bacillus to lie dormant for many years. The body's immune system may restrain the disease, but it does not destroy it. While some people with this latent infection will never develop active TB, five to 10 percent of carriers will become sick in their lifetime. Once active, TB attacks the respiratory system and other organs, destroying body tissue. The disease is contagious, spreading through the air by coughing, sneezing, or even talking. An estimated nine million new active cases develop each year.

At any given moment, more than 13 million people around the world are suffering from an active infection.

Despite enormous advances in provision of services in recent years, TB's deadly synergy with HIV/AIDS and a surge in drug-resistant strains are threatening to destabilize gains in TB control. While incidence is stable or falling in many regions of the world, global rates of new infections are still rising in many endemic areas where TB goes hand-in-hand with HIV/AIDS and the effects of poverty. Clinical symptoms –

Evening rise of temperature is the most remarkable symptom which is subsided by night sweating. There may be associated cough, loss of weight and appetite and increasing degree of tiredness. Patient may sometimes complain about various manifestations related to abdomen like irregularity of bowel habits (Diarrhea, constipation etc.). Infection of other organs causes a wide range of symptoms. Diagnosis relies on radiology (commonly chest X-rays), a tuberculin skin test, blood tests, as well as microscopic examination and microbiological culture of bodily fluids. Treatment is difficult and requires long courses of multiple antibiotics. Contacts are also screened and treated if necessary. Antibiotic resistance is a growing problem in (extensively) multi-drug-resistant tuberculosis. Prevention relies on screening programs and vaccination, usually with *Bacillus Calmette-Guérin* vaccine.

TUBERCULOSIS: is a common and in some cases deadly infectious disease caused by various strains of mycobacteria, usually *Mycobacterium tuberculosis* in humans. Tuberculosis usually attacks the lungs but can also affect other parts of the body. It is spread through the air when people who have active MTB infection cough, sneeze, or spit. Most infections in humans result in an asymptomatic, latent infection, and about one in ten latent infections eventually progresses to active disease, which, if left untreated, kills more than 50% of its victims.

One third of the world's population is thought to be infected with *M. tuberculosis*, and new infections occur at a rate of about one per second. The proportion of people who become sick with tuberculosis each year is stable or falling worldwide but, because of population growth, the absolute number of new cases is still increasing. In 2007 there were an estimated

ORIGINAL ARTICLE

13.7 million chronic active cases, 9.3 million new cases, and 1.8 million deaths, mostly in developing countries. In addition, more people in the developed world contract tuberculosis because their immune systems are more likely to be compromised due to higher exposure to immunosuppressive drugs, substance abuse, or AIDS. The distribution of tuberculosis is not uniform across the globe; about 80% of the population in many Asian and African countries test positive in tuberculin tests, while only 5–10% of the US population test positive.

PREVENTION: TB prevention and control takes two parallel approaches. In the first, people with TB and their contacts are identified and then treated. Identification of infections often involves testing high-risk groups for TB. In the second approach, children are vaccinated to protect them from TB. No vaccine is available that provides reliable protection for adults. However, in tropical areas where the levels of other species of mycobacteria are high, exposure to nontuberculous mycobacteria gives some protection against TB.

The World Health Organization (WHO) declared TB a global health emergency in 1993, and the Stop TB Partnership developed a Global Plan to Stop Tuberculosis that aims to save 14 million lives between 2006 and 2015. Since humans are the only host of *Mycobacterium tuberculosis*, eradication would be possible. This goal would be helped greatly by an effective vaccine.

VACCINES: Many countries use Bacillus Calmette-Guérin (BCG) vaccine as part of their TB control programmes, especially for infants. According to the WHO, this is the most often used vaccine worldwide, with 85% of infants in 172 countries immunized in 1993. One country that notably does not widely administer BCG is the United States, where TB is rather uncommon. BCG was the first vaccine for TB. From 1905, Albert Calmette and Camille Guérin worked at the Institute Pasteur de Lille and the Pasteur Institute in France developing BCG, administering the first human trials in 1921. However, deaths due to flawed manufacturing processes created public resistance to BCG, delaying mass vaccinations until after World War II. The protective efficacy of BCG for preventing serious forms of TB (e.g. meningitis) in children is greater than 80%; its protective efficacy for preventing pulmonary TB in adolescents and adults is variable, ranging from 0 to 80%.

In South Africa, the country with the highest prevalence of TB, BCG is given to all children under age three. However, BCG is less effective in areas where mycobacteria are less prevalent; therefore BCG is not given to the entire population in these countries. In the USA, for example, BCG vaccine is not recommended except for people who meet specific criteria:^[11]

- Infants or children with negative skin test results who are continually exposed to untreated or ineffectively treated patients or will be continually exposed to multidrug-resistant TB.
- Healthcare workers considered on an individual basis in settings in which a high percentage of MDR-TB patients has been found, transmission of MDR-TB is likely, and TB control precautions have been implemented and were not successful.

BCG provides some protection against severe forms of pediatric TB, but has been shown to be unreliable against adult pulmonary TB, which accounts for most of the disease burden worldwide. Currently, there are more cases of TB on the planet than at any other time in history

and most agree there is an urgent need for a newer, more effective vaccine that would prevent all forms of TB—including drug resistant strains—in all age groups and among people with HIV. January 2011: Statens Serum Institute in Denmark has announced in the journal Nature Medicine that a new vaccine can fight tuberculosis **before** and **after** infection. It has been applied in mice successfully.

TREATMENT: In good old days sanatorium stay was the only method of treatment. It was advised for a prolonged period up to two years. Even in Shillong, the erstwhile capital of Assam one sanatorium was there near the Ward's Lake which has been presently converted in to a luxury hotel and restaurant. Presently effective modes of therapy are available.

Treatment for TB uses antibiotics to kill the bacteria. Totally efficacious TB treatment is difficult, due to the unusual structure and chemical composition of the mycobacterial cell wall, which makes many antibiotics ineffective and hinders the entry of drugs. The two antibiotics most commonly used are isoniazid and rifampicin. However, instead of the short course of antibiotics typically used to cure other bacterial infections, TB requires much longer periods of treatment (around 6 to 24 months) to entirely eliminate mycobacteria from the body.^[11] Latent TB treatment usually uses a single antibiotic, while active TB disease is best treated with combinations of several antibiotics, to reduce the risk of the bacteria developing antibiotic resistance. People with latent infections are treated to prevent them from progressing to active TB disease later in life.

Drug-resistant tuberculosis is transmitted in the same way as regular TB. Primary resistance occurs in persons infected with a resistant strain of TB. A patient with fully susceptible TB develops secondary resistance (acquired resistance) during TB therapy because of inadequate treatment, not taking the prescribed regimen appropriately, or using low-quality medication. Drug-resistant TB is a public health issue in many developing countries, as treatment is longer and requires more expensive drugs. Multi-drug-resistant tuberculosis (MDR-TB) is defined as resistance to the two most effective first-line TB drugs: rifampicin and isoniazid. Extensively drug-resistant TB (XDR-TB) is also resistant to three or more of the six classes of second-line drugs.

The DOTS (Directly Observed Treatment Short-course) strategy of tuberculosis treatment recommended by WHO was based on clinical trials done in the 1970s by Tuberculosis Research Centre, Chennai, India. The country in which a person with TB lives can determine what treatment they receive. This is because multidrug-resistant tuberculosis is resistant to most first-line medications, the use of second-line antituberculosis medications is necessary to cure the patient. However, the price of these medications is high; thus poor people in the developing world have no or limited access to these treatments. In India the highly successful RNTCP launched by Govt. of India has won applause because of its good work towards the control of Tuberculosis.

The rise in HIV infections and the neglect of TB control programs have enabled a resurgence of tuberculosis. The emergence of drug-resistant strains has also contributed to this new epidemic with, from 2000 to 2004, 20% of TB cases being resistant to standard treatments and 2% resistant to second-line drugs. The rate at which new TB cases occur varies widely, even in neighboring countries, apparently because of differences in health care systems.

ORIGINAL ARTICLE

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