

# Tuberculosis and HIV

Written by **Dr Prince Eferé** – for Trans-Atlantic College & the College of Venereal Disease Prevention, London

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## 1. Introduction

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By far the most opportunist HIV/AIDS related disease is tuberculosis (TB). It is the leading infectious killer of people living with HIV/AIDS, especially in the developing world. TB used to be known as the 'WHITE PLAGUE' or 'CONSUMPTION' in the first half of the 20<sup>th</sup> century.

TB is caused by the bacterium **MYCOBACTERIUM TUBERCULOSIS** which is an extremely infectious rod-shaped germ or micro-organism referred to as **BACILLUS** (plural BACILLI).

There is a particular concept that everyone studying tuberculosis should understand. This is that not everyone who has a tuberculosis infection is suffering from tuberculosis. It is said that 90% of those infected with Mycobacterium Tuberculosis may never develop active TB, as the body's immune system tames and suppresses the germs, which then lie dormant in the body.

## ***2. Different Stages of Tuberculosis***

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There are 3 known stages of tuberculosis infection which are briefly explained below.

(a) Early Infection (Stage - 1)

This is the first stage of TB infection which normally heals either without being noticed or might pass off as "common cold or flu".

(b) Dormant TB (Stage - 2)

The dormant TB stage also known as "**SLEEPING TB**" is when the bacilli germs remain dormant (although maybe widespread) in the body. Though present in the body, the germs may have no harmful effect on the infected person.

(c) Active TB (Stage - 3)

Active TB, which is the third and final stage is when the dormant TB activates and "wakes up", causing sores in the lungs and possibly other parts of the body. It is at this stage that a person is referred to as having TB or suffering from TB.

## ***3. Different Types of TB***

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Understanding tuberculosis is not as easy as some may expect. TB is a complex disease. Although about 80% of all infections relate to the TB of the lungs - known as pulmonary tuberculosis - TB can infect several other parts of the body (i.e. extra-pulmonary TB). It is worth noting however, that only Pulmonary tuberculosis is infectious.

### **a) Pulmonary Tuberculosis**

As mentioned above, this is TB of the lungs which is the predominant types of tuberculosis. Even Pulmonary TB is by no means uniform, but diverged as explained below:

(i.) Primary Tuberculosis Pneumonia

This is a very infectious pneumonia-based TB that comes with a high fever and productive cough. It is particularly predominant in young children, the elderly and HIV/AIDS patients.

(ii.) Tuberculosis Pleurisy

This is tuberculosis that causes a rupture of the space (the pleural space) between the lung and the chest wall as the infection compresses the lung. Tuberculosis Pleurisy can cause shortness of breath and extreme chest pain that worsens when a deep breath is taken (pleurisy).

(iii.) Cavitary TB

This is TB that causes the destruction of the lung by forming cavities or enlarged air spaces. The symptoms of cavitary TB may include weight loss, productive cough (sometimes with blood), weakness, night sweat and fever.

(iv.) Miliary TB

Miliary TB can cause acute and chronic illness for patients who may appear to be dying slowly. As the name implies, this is tuberculosis in the form of many small lumps on the lung that look like millet seeds.

Other symptoms of Miliary TB include weight loss, night sweats and fever.

(v.) Laryngeal TB

An extremely contagious form of pulmonary tuberculosis, is Laryngeal TB, which is TB of the Larynx or the vocal chord.

**b) Extra-pulmonary TB**

As opposed to pulmonary TB, extra-pulmonary TB may infect many areas of the body other than the lungs. This is the type of TB that is peculiar primarily to people with a weak or compromised body immune system.

Extra-pulmonary TB itself is made-up of different strains of TB that are explained below.

(i) Lymph Node Disease

Lymph is a colourless fluid containing white blood cells, drained from the tissues and conveyed through the body in the Lymphatic system.

Lymph node means a small mass of tissue in the Lymphatic system where lymph is purified and Lymphocytes are formed.

Lymph Node Disease, therefore, is TB that causes the Lymph node to become enlarged. The disease may later spread to the skin.

(ii) Tuberculosis Peritonitis

This is TB that infects the outer linings of the intestines and the linings in the abdominal wall, which then produces increased fluid. This increase in fluid causes abdominal swollen and extreme pain.

Symptoms of TB Peritonitis include fever and illness.

(iii) Tuberculosis Pericarditis

Pericardium means the membrane surrounding the heart. Tuberculosis Pericarditis causes the space between the pericardium and the heart to be filled with fluid, preventing the heart from beating efficiently and restricting blood supply to the heart.

(iv) Osteal Tuberculosis

This is TB infection of the bones, but notably the spine which may fracture and cause deformation of the patient's back.

(v) Renal Tuberculosis

This type of tuberculosis can cause white blood cells in the urine. This may spread to the reproductive organs and which may adversely affect the patient's ability to reproduce.

In men, renal tuberculosis can cause an inflammation of the epididymis; which is a convoluted duct behind the testis, along which sperm passes to the vas deferens.

(vi) Adrenal Tuberculosis

This is TB of the adrenal glands which can lead to the production of insufficient adrenalin in the body. Some of the symptoms are constant weakness and collapse.

(vii) TB Meningitis

This is TB of the nervous system. It is the TB that infects the membrane surrounding the brain and the spinal cord. TB meningitis can cause permanent impairment and possible death.

Symptoms include constant headache, sleepiness and constant coma.

## ***4. How TB is Transmitted***

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Tuberculosis is a very contagious air-borne disease, which can be transmitted by:

- a) Coughing
- b) Sneezing
- c) Spitting, or
- d) Talking

However, not everyone infected will necessarily get sick with TB, as the body immune system prevents the bacilli germs from progressing to active TB which, protected by a thick waxy coat, can be dormant for years. Only people who are sick with pulmonary tuberculosis are infectious.

## ***5. Symptoms of Tuberculosis***

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Special skin tests and chest X-rays may show whether or not a person is infected with tuberculosis. There are however, some symptoms that indicate whether a person may have active TB. These include:

- a) Severe and irritating cough that hangs on, sometimes coughing out blood
- b) Chest pain
- c) Weight loss
- d) Pneumonia
- e) Breathlessness
- f) Loss of appetite
- g) Constant fevers
- h) Constant tiredness

- i) Night sweats
- j) Vomiting
- k) Dark urine
- l) Yellowish skin
- m) Stomach cramps
- n) Changes in eyesight

While not everyone experiencing any of these symptoms may be suffering from TB, it is important to note that these are some of the signs to watch out for in people with active TB.

## ***6. Prevalence of Tuberculosis***

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Tuberculosis infection is so prevalent in the world that in 1993, the World Health Organisation (WHO) declared it a global emergency.

According to WHO:-

- (a) One-third of the world's population is currently infected with Mycobacterium tuberculosis;
- (b) Nearly one percent of the world's population is infected with TB each year;
- (c) Someone in the world is infected with TB every second;
- (d) 5-10 percent of people who are infected with TB become sick or infections at some time during their life;
- (e) TB kills about 2 million people each year;
- (f) Around 8 million people become sick with TB each year;
- (g) Over 1.5 million TB cases per year occur in sub-Saharan Africa. This number is rising rapidly as a result of the HIV/AIDS epidemic;
- (h) Nearly 3 million TB cases per year occur in south-east Asia;
- (i) It is estimated that between 2000 and 2020, nearly 1 billion people will be newly infected, 200 million people will get sick, and 35 million will die from TB – if control is not further strengthened;
- (j) TB is the leading infectious killer of youth and adults;
- (k) TB is the leading killer of women;
- (l) TB is likely to create more orphans than any other infectious disease;
- (m) The level of TB in prisons all over the world has been reported to be up to 100 times higher than the civilian population;
- (n) Cases of TB in prisons may account for up to 25% of a country's burden of TB;

- (o) Transmission of *Mycobacterium tuberculosis* may also occur during long (i.e. more than 8 hours) commercial aircraft flights, from an infectious source (a passenger or crew member) to other passengers or crew members. The risk of infection is related to the proximity and the duration of exposure to the source patient. Decreased ventilation in crowded and confined environments is often a contributing risk factor;
- (p) As many as 50 percent of the world's refugees may be infected with TB. As they move, they may spread TB;
- (q) TB is also very prevalent among the homeless population in both industrialised and poor countries.

TB has indeed become a global epidemic in both developed and developing countries.

## ***7. Treatments and Control of TB***

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Though complicated, TB can be effectively treated and controlled with various anti-TB medicine that is normally taken over 6 months.

The World Health Organisation's (WHO) recommended strategy for effective TB control is known as DOTS, meaning Directly Observed Treatment, Short-course. DOTS combines five elements:

- (a) Political commitment;
- (b) Microscopy services;
- (c) Anti-TB drug supplies;
- (d) Surveillance and monitoring system; and
- (e) Use of highly efficacious regimes with direct observation of treatment.

Sputum smear testing is repeated after 2 months, to check progress, and again at the end of treatment. A recording and reporting system documents patient's progress throughout, and the final outcome of treatment.

According to WHO:

- (a) DOTS produces cure rates of up to 95 percent even in poorest countries;
- (b) DOTS prevents new infections by curing infectious patients;
- (c) DOTS prevents the development of Multi-Drug Resistant TB (MDR-TB) by ensuring the full course of treatment is followed;
- (d) A six-month supply of drugs for DOTS costs **US \$11** per patient in some parts of the world. The World Bank has ranked the DOTS strategy as one of the "most cost-effective of all health interventions".

The DOTS strategy means that with the direct observation of treatment, the patient does not bear the sole responsibility of adhering to treatment. Healthcare workers, public health officials, governments and communities must all share the responsibility and provide a range of support services patients need to continue and finish treatment.

## ***8. Drug Resistant TB***

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There is now the emergence of the frightening Drug Resistant TB that has complicated the whole treatment of tuberculosis.

Multi-Drug Resistant Tuberculosis (MDR-TB or DRT) as it is normally called, is caused by the improper, inconsistent and partial treatment and management of existing tuberculosis. This may be the case where TB patients fail to take their medication regularly and as prescribed, probably because they feel better, or when doctors prescribe the wrong combination of drugs.

The MDR-TB strain of tuberculosis is known to be resistant to the most important drugs in TB treatment namely **ISONIAZID** and **RIFAMPICIN**. Other common drugs used in treating TB are pyrazinamide and Ethambutol.

While there can be a successful treatment of MDR-TB, the cost of treatment is astronomically high as much as **US \$250,000** per patient. As a result, MDR-TB is now an incurable disease in many developing countries, as they cannot afford the cost of such treatment.

## ***9. Preventing TB***

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The only effective way of preventing being infected with active TB is:

- a) To have regular consultation and check-ups by a qualified doctor;
- b) To take any medication promptly and regularly as prescribed by a qualified doctor;
- c) To get enough rest
- d) To eat healthy food; and
- e) To avoid alcoholic drinks
- f) By vaccination (mostly BCG vaccination ). BCG means **Bacillus Calmette Guerin**. It is said that the BCG vaccination has 80% protection rate for ten years.

## 10. Tuberculosis and HIV/AIDS

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There is now conclusive proof that there exists a strong connection between HIV and Tuberculosis (TB), which makes HIV/AIDS prevention a lot more complicated. "AVERT" UK (1999), provided the following information concerning the relationship between HIV/AIDS and Tuberculosis:

*"The interaction between the HIV epidemic and the Tuberculosis (TB) epidemic is lethal. TB adds to the burden of illness of people with HIV. The HIV epidemic spurs the spread of TB.*

*World-wide around 1 in 3 people are infected with the germ that can lead to tuberculosis. Prevalence is highest in conditions of poverty and overcrowding. In some of the developing world's poorest and most overcrowded cities, up to 80% of the adults carry the TB germ. Cities are also the epicentres of the epidemic of HIV, the virus that causes AIDS. In some cities in East Africa, as many as 25-35% of all adults are infected with HIV.*

*Millions of people infected with the TB germ who would otherwise have escaped active tuberculosis are now developing the disease because their immune system is under attack from HIV. Studies in Italy, Rwanda, Spain, the USA and Zaire found that people who were infected with the TB germ who were also infected with HIV were 30-50 times more likely to develop active tuberculosis than those without HIV.*

*Unlike HIV, the TB germ can spread through the air. So individuals with active tuberculosis can pass it on to those with whom they come into close contact. If left untreated for a year, one individual can typically infect 10 – 15 other people.*

*For these reasons, once HIV is introduced into a community where there are people infected with the TB germ, the population faces parallel epidemics of AIDS and TB. In the USA a long-standing annual decline in TB cases ended abruptly in 1985, at the peak of HIV spread. In Asia 14% of all TB cases will be attributable to HIV by the end of the 1990s. This figure was only 2% at the start of the decade. The growing wave of TB is not only a menace for those infected with HIV. Tuberculosis can spread through the air to HIV-negative people. It is the only major AIDS-related opportunistic infection to pose this kind of risk.*

*Africa, where HIV has spread widely since the late 1980s, already faces a disastrous dual epidemic. In some countries, TB cases have doubled or even tripled since 1985. Tuberculosis is the leading killer of HIV-positive Africans. More than 5 million of the 13 million Africans now alive with HIV are expected to develop TB, and over 4 million will die unnecessarily early deaths because of TB.*

*Almost all individuals with TB can live longer with proper treatment, and treatment with anti tuberculosis drugs is just as effective in people with HIV, as in those who are not infected. Controlling the dual epidemic requires a dual strategy-treatment TB and preventing new infections with HIV.*

*The TB germ, a bacterium called Mycobacterium tuberculosis, is highly prevalent in much of the developing world and in poor urban "pockets" of industrialised countries. In these communities, people typically become infected in childhood. But a healthy immune system usually keeps the infection in check. People can remain infected for life with dormant, uninfected TB. Such people are called TB carriers.*

*In the past, most TB infected people remained healthy carriers. Only 5-10% ever developed active tuberculosis. Those few kept the TB epidemic going by transmitting the TB germ to their close contacts. TB germs can be spread through the air from patients with active pulmonary (lung) tuberculosis.*

Today, as TB carriers increasingly become infected with HIV, many more are developing active tuberculosis because the virus is destroying their immune system. For these dually infected people, the risk of developing active tuberculosis is 30-50 fold higher than for people infected with TB alone. And, because *Mycobacterium tuberculosis* can spread through the air, the increase in active tuberculosis cases among dually infected people means:

- More transmission of the TB germ,
- More TB and carriers,
- More TB disease in the whole population.

As a consequence, the HIV/AIDS epidemic is reviving an old problem in developed countries and exacerbating an existing one in the developing world. Altogether, TB may claim as many as 30 million lives during the 1990s from among the HIV positive and HIV-negative populations.

As HIV slowly weakens the immune system, the individual gradually becomes unable to fight off "opportunistic infections" – infection with viruses, bacteria parasites and fungi that would normally pose little threat. Common opportunistic infections include fungal infections of the mouth and throat, intestinal infections, and pneumonia.

Tuberculosis, a major opportunistic infection, poses a particular threat to the well-being and survival of HIV-positive people. Only 35-50% of HIV positive people have pulmonary tuberculosis, detectable from just a sputum sample. The remainder develop "disseminated" tuberculosis, which can be diagnosed only with special laboratory facilities. Tuberculosis also progresses faster in HIV-infected people and is more likely to be fatal if undiagnosed or left untreated".

## **11. Conclusion**

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Although TB is not transmitted through sexual contact, it does have a very close relationship with HIV and the statistics show that the 2 diseases are often linked, so a person with HIV/AIDS is advised to undergo tuberculosis test for prompt treatment and vaccination.

## *12. Self-Assessment Questions*

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- 1. What is the name of the bacterium which causes TB?*
- 2. Roughly how many people may be carriers of this bacterium without ever developing TB?*
- 3. Name the 3 main stages of TB infection*
- 4. What is the main part of the body affected by Pulmonary Tuberculosis?*
- 5. List the main types of Pulmonary Tuberculosis.*
- 6. Which areas of the body may be affected by Extra-Pulmonary TB?*
- 7. List the main types of Extra-Pulmonary TB*
- 8. What are the 4 main ways of transmitting TB?*
- 9. Why can it be difficult to diagnose that someone has TB?*
- 10. What does DOTS stand for?*
- 11. Why is MDR-TB such a worrying form of TB?*
- 12. Why is the link with HIV so strong? Explain your answer fully.*