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Tuberculosis and Its Treatment: A Review

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ABSTRACT

Tuberculosis (TB) is a granulomatous infectious illness caused by gram-positive, acid-fast bacteria belonging to the Mycobacterium genus. Mycobacterium tuberculosis causes tuberculosis in humans, which primarily affects the lungs and causes pulmonary tuberculosis. Extra pulmonary tuberculosis can damage the colon, meninges, bones, joints, lymph nodes, skin, and other bodily parts. Human tuberculosis is spread mostly by droplet infection and nuclei. Human infection with M. avium and M. africanum is quite rare. M. micro is not known to cause tuberculosis in humans, but M. bovis has a wider range of hosts. M. bovis can infect humans through milk and milk products, as well as meat from an infected animal. Bovine tuberculosis is thought to be responsible for up to 10% of human tuberculosis in some underdeveloped nations. More over 2 million people die each year from tuberculosis, and the death toll is rising due to the advent of drug resistant Mycobacterium tuberculosis.

In terms of incidence, the South East Asia Region accounts for 39% of the global TB burden. Approximately 3.4 million new cases of tuberculosis are projected to be diagnosed each year in this region, with the majority of infections occurring in India, Bangladesh, Indonesia, Myanmar, and Thailand. Tuberculosis is both a social and a medical disease. It has also been referred to as a social welfare barometer. Poor quality of life, poor housing, overcrowding, population explosion, under nutrition, smoking, alcohol misuse, lack of education, large families, early marriages, and lack of information about the cause and transmission of tuberculosis are some of the social causes. These elements are interconnected and play a role in tuberculosis occurrence and transmission. Children are thought to account for about 10% of all tuberculosis cases.

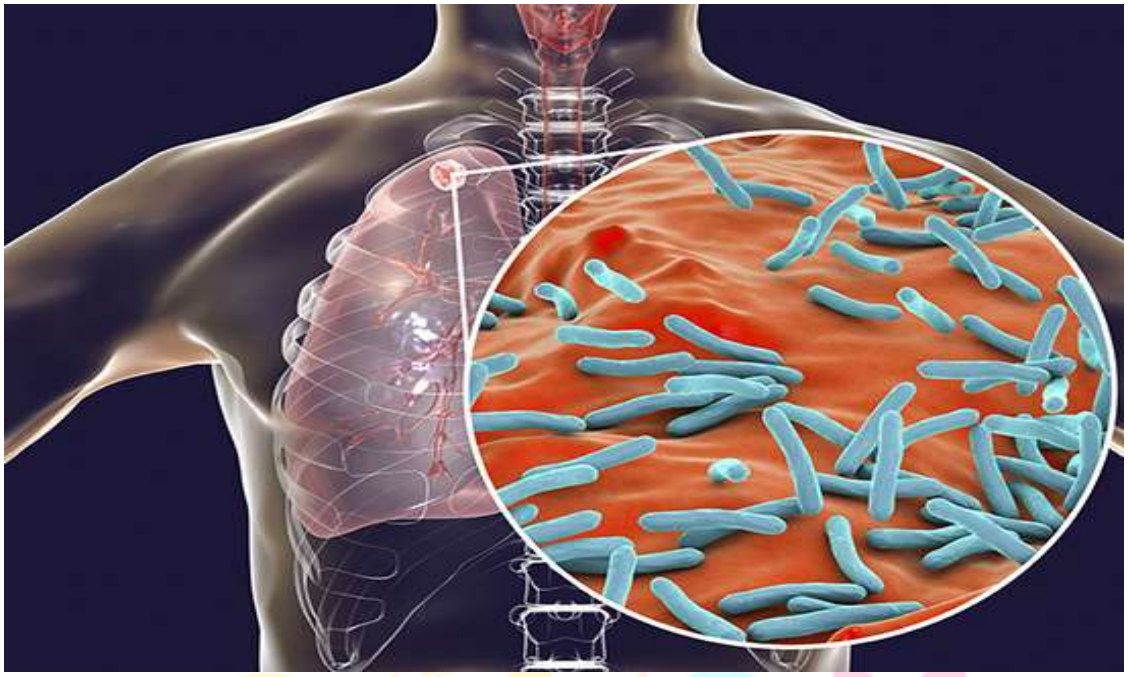

Figure 1 : Mycobacterium tuberculosis infection in the lungs[12]

INTRODUCTION

Tuberculosis (TB) is a contagious disease caused by the bacteria Mycobacterium tuberculosis (MTB). Tuberculosis affects the lungs in most cases, but it can also affect other regions of the body. The majority of infections are asymptomatic, which is known as latent tuberculosis. Around 10% of latent infections advance to active illness, which kills around half of individuals who are infected if left untreated. Chronic cough with bloody mucus, fever, night sweats, and weight loss are all common symptoms of active tuberculosis. Because of the weight loss linked with the disease, it was previously referred to as consuming. Other organ infections can generate a variety of symptoms.

Tuberculosis is transferred through the air by patients who have active TB in their lungs coughing, spitting, speaking, or sneezing. People who have latent tuberculosis do not convey the disease to others. People with HIV/AIDS and smokers are more likely to get active infection. Chest X-rays, as well as microscopic examination and culture of bodily fluids, are used to diagnose active tuberculosis. The tuberculin skin test (TST) or blood tests are used to diagnose latent tuberculosis.

Screening persons at high risk for tuberculosis, early diagnosis and treatment of cases, and immunisation with the bacillus Calmette-Guérin (BCG) vaccine are all part of TB prevention.Household, occupational, and social contacts of patients with active TB are among those at high risk. The administration of numerous antibiotics over a long period of time is required for treatment. Antibiotic resistance is becoming more of a problem as the number of patients with multidrug-resistant tuberculosis rises (MDR-TB). Tuberculosis is a bacterial infection caused by Mycobacterium tuberculosis (for which humans are the main reservoir). Similar symptoms can be caused by Mycobacterium bovis, Mycobacterium africanum, and Mycobacterium microti, which are closely related mycobacteria that constitute the Mycobacterium tuberculosis complexwith M. TB.[2]

Tuberculosis (TB) is an infectious disease that typically affects the lungs, though it can also involve other body parts. When it affects the lungs, it's called pulmonary TB. TB outside of the lung is called extrapulmonary TB.

It can also be categorized as being either active or latent. Active TB is contagious and causes symptoms. Latent TB, on the other hand, doesn't cause symptoms and isn't contagious.

Active vs. latent TB

TB can be active or latent. Active TB is sometimes referred to as TB disease. This is the type of TB that's contagious.[3]

Active TB

Active TB, sometimes called TB disease, causes symptoms and is contagious. The symptoms of active TB vary depending on whether it's pulmonary or extrapulmonary.

But general symptoms of active TB include:

- unexplained weight loss
- loss of appetite
- fever
- chills
- fatigue
- night sweats

Active TB can be life-threatening if not properly treated.[3]

Latent TB

If you have latent TB infection, you have TB bacteria in your body, but it's inactive. This means you don't experience any symptoms. You also aren't contagious. Still, you'll have a positive result from TB blood and skin tests.

Latent TB can turn into active TB in 5 to 10 percentTrusted Source of people. This risk is higher for those with a weakened immune system due to medication or an underlying condition.[3]

Pulmonary TB

Pulmonary TB is active TB that involves the lungs. It's likely what most people think of when they hear tuberculosis.

You contract it by breathing in air exhaled by someone who has TB. The germs can remain in the air for several hours.[3]

Along with the general symptoms of TB, a person with pulmonary TB may also experience:

- persistent cough lasting three weeks or longer
- coughing up blood
- coughing up phlegm
- chest pain
- shortness of breath

Extrapulmonary TB

Extrapulmonary TB is TB that involves parts of the body outside of the lungs, such as the bones or organs. Symptoms depend on the part of the body affected.[3]

TB lymphadenitis

TB lymphadenitis is the most common type of extrapulmonary TB and involves the lymph nodes.

It tends to affect the the cervical lymph nodes, which are the lymph nodes in your neck. But any lymph node can be affected.[3]

Swollen lymph nodes may be the only symptom you notice. But TB lymphadenitis can also cause:

- fever
- fatigue
- unexplained weight loss
- night sweats

Skeletal TB

Skeletal TB, or bone TB, is TB that spreads to your bones from your lungs or lymph nodes. It can affect any of your bones, including your spine and joints.

While skeletal TB is rare, it's been on the rise in some countries with high rates of HIV transmission and AIDS, which both weaken your immune system.[3]

Initially, skeletal TB doesn't cause symptoms. But over time, it can cause general active TB symptoms in addition to:

- severe back pain
- stiffness
- swelling
- abscesses
- bone deformities

Miliary TB

Miliary TB is a form of TB that spreads in your the body, affecting one or several organs. This type of TB often affects the lungs, bone marrow, and liver. But it can also spread to other parts of the body, including the spinal cord, brain, and heart.

Military TB causes general active TB symptoms in addition to other symptoms, depending on the body parts involved. For example, if your bone marrow is affected, you may have a low red blood cell count or a rash.[3]

Genitourinary TB

Genitourinary TB is the second most common typeTrusted Source of extrapulmonary TB. It can affect any part of the genitals or urinary tract, but the kidneys are the most common sites. It usually spreads to the area from the lungs through the blood or lymph nodes.[3]

Genitourinary TB can be spread through intercourse, though this is rareTrusted Source.

People with this type of TB often develop a tuberculous ulcer on the penis or in the genital tract.

Other symptoms of genitourinary TB depend on the parts affected and may include:

- testicular swelling

- painful urination
- decreased or interrupted flow of urine
- pelvic pain
- back pain
- decreased semen volume
- infertility

Liver TB

Liver TB is also called hepatic TB. It occurs when TB affects the liver. It accounts for less than 1 percent of all TB infections.

Liver TB can spread to the liver from the lungs, gastrointestinal tract, lymph nodes, or the portal vein.[3]

Symptoms of liver TB include:

- high-grade fever
- upper abdominal pain
- liver enlargement
- jaundice

Gastrointestinal TB

Gastrointestinal TB is a TB infection that involves any part of the gastrointestinal tract, which extends from the mouth to the anus. This type of TB causes symptoms similar to other gastrointestinal conditions, such as Crohn's disease.[3]

Symptoms of gastrointestinal TB depend on the area of the tract infected and may include:

- abdominal pain
- loss of appetite
- weight loss
- change in bowel habits, such as diarrhea or constipation
- nausea
- vomiting
- an abdominal mass you can feel

TB meningitis

Also known as meningeal tuberculosis, TB meningitis spreads to the meninges, which are the membranes surrounding the brain and spinal cord.

TB can spread to the meninges from the lungs or through the bloodstream. Unlike other types of meningitis that develop quickly, TB meningitis usually develops gradually.[3]

It often causes vague symptoms in the beginning, including:

- aches and pains
- fatigue
- loss of appetite
- persistent headache

- low-grade fever
- nausea and vomiting

As the condition progresses, it can also bring on:

- severe headachess
- sensitivity to light
- neck stiffness

TB peritonitis

TB peritonitis is TB that causes inflammation of the peritoneum, which is a layer of tissue that covers the inside of your abdomen and most of its organs.

It affects 3.5 percentTrusted Source of people with pulmonary TB and as many as 58 percentTrusted Source of people with abdominal TB.[3]

Ascites and fever are the most common symptoms of TB peritonitis. Ascites is a buildup of fluid in the abdomen that causes abdominal swelling, bloating, and tenderness.

Other symptoms include:

- nausea
- vomiting
- loss of appetite

TB pericarditis

TB pericarditis occurs when TB spreads to the pericardium. This consists of two thin layers of tissue separated by fluid that surround the heart and hold it in place.

It can present as different types of pericarditis, including constrictive pericarditis, pericardial effusion, or effusive-constrictive pericarditis.[3]

Symptoms of TB pericarditis include:

- chest pain
- fever
- palpitations
- shortness of breath
- cough

Cutaneous TB

Cutaneous TB affects the skin. It's very rare, even in countries where TB is common. There are several different types of cutaneous TB, and it can spread to other parts of the body.[3]

The main symptoms of cutaneous TB are usually sores or lesions in different areas, particularly the:

- elbows
- hands
- buttocks
- area behind the knees
- feet

These lesions may be:

- flat and painless
- purplish or brownish-red
- wart-like in appearance
- small bumps
- ulcers
- abscesses

HISTORY OF TUBERCULOSIS

Tuberculosis has been there since the dawn of time. About 150 million years ago, the genus Mycobacterium was found in the environment, and about 3 million years ago, an early version of Mycobacterium tuberculosis was discovered in East Africa. A rising body of evidence implies that today's M. tuberculosis strains descended from a common ancestor roughly 20,000–15,000 years ago.

The occurrence of skeletal malformations associated with tuberculosis, such as Pott's deformities, was discovered in Egyptian mummies dating from 2400 to 3400 B.C.

However, there was no evidence of tuberculosis in Egyptian papyri. The first descriptions of tuberculosis were found in India and China, respectively, 3300 and 2300 years ago. Tuberculosis was also mentioned in the Bible, with the Hebrew word'schachepheth' being used to characterise tuberculosis.

The first pre-Columbian evidence of tuberculosis was discovered in Peruvian mummies in the Andean republics, demonstrating that the disease existed before European colonisation of South America.

Tuberculosis was referred to as 'Phthisis' or 'Consumption' in Ancient Greece. Hippocrates reported the symptoms of Phthisis in Book I, Of the Epidemics, which are extremely similar to the prevalent characteristics of tuberculous lung infections.

Fever, sweating, coughing, and blood-stained sputum were recorded as signs of tuberculosis by Clarissimus Galen, a Greek physician who became the physician of Roman Emperor Marcus Aurelius in 174 AD. He also advised that fresh air, milk, and soy drinks be used in an efficient tuberculosis treatment.

Tuberculosis was referenced by Celso, Aretaeus of Cappadocia, and Caelius Aurelianus during the Roman era. It was, however, unrecognised at the time. Following the fall of the Roman Empire in the 5th century, archeologic evidence of tuberculosis was discovered all throughout Europe, demonstrating that the disease was widespread at the time. . The 'royal touch,' introduced by English and French kings, was practised for many years. The last British monarch to use this method of healing was Queen Anne.

Guy de Chauliac, a French surgeon, proposed the first medicinal intervention for tuberculosis treatment. As a therapy option, he suggested removing the scrofulous gland.

Girolamo Fracastoro, an Italian physician, was the first to provide a precise description of tuberculosis' infectious nature in the 16th century. Scrofula, a disease of the cervical lymph nodes, was first reported in the Middle Ages as a new clinical form of tuberculosis. The ailment was dubbed 'king's evil' in England and France, and there was a widespread belief that it could be cured with the 'royal touch.'

In his work 'Opera Medica,' Francis Sylvius offered the complete clinical and anatomical description of tuberculosis in 1679. In his publication 'A new theory of Consumption,' Benjamin Marten, a British physician, defined the infectious aetiology of tuberculosis for the first time in 1720. The words 'consumption' and 'phthisis' were used to characterise tuberculosis in the 17th and 18th centuries.

The clinical indications of tuberculosis, such as consolidation, pleurisy, and pulmonary cavitation, were first identified in 1819 by a French physician named Theophile Laennec. He also discovered that, in addition to the respiratory tract, M. tuberculosis can infect the gastrointestinal tract, bones, joints, neurological systems, lymph nodes, vaginal and urinary tracts, and skin (extra-pulmonary tuberculosis) (pulmonary tuberculosis).[4]

GLOBAL IMPACT OF TB

Tuberculosis (TB) is found all over the world. The WHO South-East Asian Region had the highest number of new TB cases in 2020, accounting for 43 percent of all new cases, followed by the WHO African Region with 25 percent and the WHO Western Pacific with 18 percent.

In 2020, the 30 nations with the highest TB burden accounted for 86 percent of new TB cases. India, China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa accounted for two-thirds of new TB cases.[7]

EPIDEMIOLOGY OF TUBERCULOSIS

Tuberculosis is most prevalent infectious disease in the world.

Tuberculosis is one of India's major public health problems. According to WHO estimates, India has the world's largest tuberculosis epidemic and approximately 2-3 million people are infected with tuberculosis out of a global incidence of 8.7 million cases. This is a public health problem. India bears a disproportionately large burden of the worlds tuberculosis rates , as it resides to be the biggest health problem in India.[5]

ETIOLOGY OF TUBERCULOSIS

Tuberculosis is nearly entirely caused by inhaling M. tuberculosis-containing airborne particles (droplet nuclei). Coughing, singing, and other forced respiratory manoeuvres by persons with active pulmonary or laryngeal TB whose sputum contains a considerable number of organisms disseminate them predominantly (typically enough to render the smear positive). Because of the large number of bacteria housed within a pulmonary cavitary lesion, people with it are extremely infectious.

Droplet nuclei (particles with a diameter of 5 microns) harbouring tubercle bacilli can float in room air currents for several hours, increasing the risk of infection. However, once these droplets settle on a surface, it is difficult to resuspend the organisms as respirable particles (e.g., by sweeping the floor or shaking out bed sheets). Although such processes can resuspend tubercle bacilli-containing dust particles, these particles are far too big to reach the alveolar surfaces required to commence infection. Contact with fomites (infected surfaces, food, and personal respirators, for example) does not appear to aid in their transmission.

Patients with untreated active pulmonary TB have a wide range of contagiousness. Certain strains of Mycobacterium TB are more contagious, and patients who have positive sputum smears are more contagious than those who merely have positive culture results. Patients with cavitary illness (which is linked to sputum mycobacterial burden) are more infectious than those without.

Environmental variables are also significant. Frequent or extended exposure to untreated patients disseminating huge quantities of tubercle bacilli in congested, poorly ventilated enclosed areas enhances transmission; as a result, persons living in poverty or in institutions are particularly vulnerable. Health-care workers who come into close contact with active cases are at a higher risk. As a result, estimates of contagiousness vary widely; some studies imply that only 1 in 3 untreated pulmonary tuberculosis patients transmit any close contacts; the WHO believes that each untreated patient infects 10 to 15 persons every year. However, the majority of persons who are infected do not go on to develop symptoms.

Once effective treatment begins, contagiousness decreases quickly; organisms are less infectious even if they persist in sputum, and cough decreases. According to studies of household contacts, transmissibility ends two weeks after patients begin effective treatment.

Contagion occurs much less frequently as a result of organisms being aerosolized following irrigation of infected wounds, in mycobacteriology laboratories, or in autopsy rooms.

Ingestion of M. bovis-infected milk or milk products (e.g., cheese) used to be a common cause of TB of the tonsils, lymph nodes, abdominal organs, bones, and joints, but this transmission route has been largely eliminated in developed countries thanks to the slaughter of cows that test positive on a tuberculin skin test and pasteurisation of milk. Tuberculosis caused by M. bovis continues to be a problem in poor countries and among immigrants from areas where bovine tuberculosis is widespread (eg, some Latin American countries). If the cheeses come from regions where bovine tuberculosis is an issue, the growing popularity of unpasteurized milk cheese brings new problems (eg, Mexico, the United Kingdom).[6]

RISK FACTORS

Tuberculosis primarily affects people in their prime years of work. All age groups, however, are at risk. Developing countries account for almost 95% of cases and deaths.

HIV-positive people are 18 times more likely to acquire active tuberculosis (see TB and HIV section below). Active tuberculosis is also more likely in those who have other illnesses that weaken the immune system. People who are malnourished are three times more likely to die.

In 2020, there were 1.9 million new tuberculosis cases worldwide due to malnutrition.

Tobacco smoking and alcohol abuse both raise the risk of tuberculosis by a factor of 3.3 and 1.6, respectively. In 2020, alcohol use disorder was responsible for 0.74 million new TB cases worldwide, while smoking was responsible for 0.73 million.[7]

PATHOPHYSIOLOGY

Inhalation of *Mycobacterium tuberculosis* leads to one of four possible outcomes:

- Immediate clearance of the organism
- Latent infection
- The onset of active disease (primary disease)
- Active disease many years later (reactivation disease).

Reactivation illness occurs in 5 to 10% of people with latent infection who have no underlying medical conditions. In HIV patients, the chance of reactivation is significantly higher. The interaction of factors attributed to both the organism and the host determines these consequences.[8]

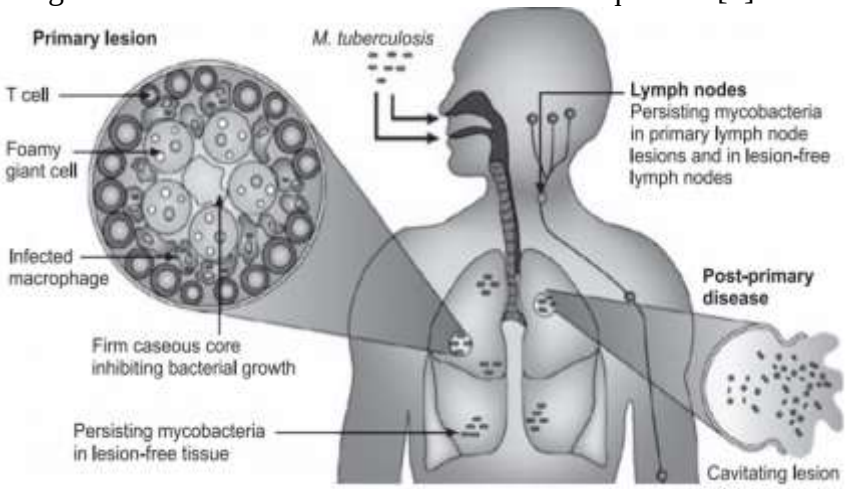

Figure 2 : Primary lesion in tuberculosis[5]

PRIMARY DISEASE

About half of the about 10% of infected people who acquire active disease do so within the first two to three years, and this is referred to as quickly progressing or primary disease.

After being conveyed in droplets small enough (5 to 10 microns) to reach the alveolar gaps, tubercle bacilli infect the lungs. The bacilli multiply inside alveolar macrophages and eventually destroy the cells if the host's defence system fails to eradicate the infection. Infected macrophages release cytokines and chemokines that attract other phagocytic cells, such as monocytes, other alveolar macrophages, and neutrophils, to form the tubercle, a nodular granulomatous structure. The tubercle enlarges and the bacilli invade local draining lymph nodes if bacterial multiplication is not controlled. This results in lymphadenopathy, which is a common symptom of primary tuberculosis (TB). The Ghon complex is a lesion caused by the tubercle expanding into the lung parenchyma and lymph node involvement. Bacteremia may occur as a result of the first infection.

The bacilli continue to multiply until a cell-mediated immune (CMI) response is established, which takes two to six weeks after infection. The lung is gradually destroyed due to the host's failure to mount an adequate CMI response and tissue repair. TNF-alpha, reactive oxygen and nitrogen intermediates, and cytotoxic cell contents (granzymes, perforin) may all play a role in the development of caseating necrosis, which is a hallmark of tuberculosis.

Unchecked bacterial development can result in the spread of bacilli via the bloodstream, resulting in disseminated tuberculosis. Miliary tuberculosis is a disseminated disease characterised by lesions that resemble millet seeds. Bacilli can also move across the lungs by eroding caseating sores into the airways, making the host infectious to others. In the absence of treatment, 80 percent of cases result in death. The rest of the patients either develop a chronic illness or recover. Repeated bouts of healing via fibrotic changes around the lesions and tissue disintegration characterise chronic illness. It is uncommon for the bacilli to be completely eradicated by themselves.[8]

REACTIVATION DISEASE

Reactivation tuberculosis is caused by the multiplication of a previously dormant bacterium that was seeded during the first infection. Reactivation disease affects 5 to 10% of people with latent infection who have no underlying medical concerns. Immunosuppression is linked to reactivation TB, while it's unclear what mechanisms keep the infection latent and what causes it to become overt. Immunosuppressive disorders

linked to reactivation TB are discussed in the previous article. In contrast to primary TB, the disease process in reactivation TB is more localised: there is less regional lymph node involvement and less caseation. Unless the host is highly immunocompromised, the lesion usually arises in the apices of the lungs, and widespread illness is uncommon. It is widely assumed that successfully containing latent TB protects against future TB exposure.[8]

CLINICAL MANIFESTATION

During initial infection and Granulomas, there are no symptoms of mild bronchial pneumonia but sputum test is positive.

In active TB, sign of chronic inflammation include :

- Anorexia,
- Overall sensation of feeling unwell,
- Weight loss,
- Low grade fever
- Night sweating,
- Coughing that lasts longer than 2 weeks with green , yellow , or bloody sputum,
- Shortness of breath,
- Chest pain
- Hemoptysis.

The occurrence of additional symptoms depends on where the disease has spread beyond the chest and lungs. For example, if TB spreads to the lymph nodes , it can cause swollen glands at the sides of the neck or under the arms.

When TB spreads to the bones and the joints, it can cause pain and swelling of the knee or hip.

Genitourinary TB can cause pain in the flank with frequent urination , pain or discomfort during urination , and blood in urine.[5]

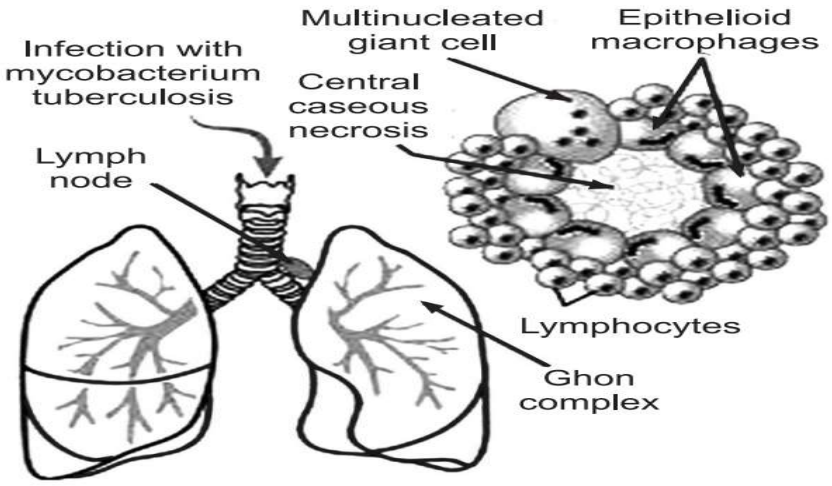

Figure 3 : Ghon's complex[5]

TRANSMISSION

When someone with tuberculosis coughs, sneezes, talks, laughs, or sings, tiny droplets containing the bacteria are released. You can catch it if you breathe in these microorganisms.

It's not simple to contract tuberculosis. You normally have to be around someone who has a lot of bacteria in their lungs for a long time. Coworkers, friends, and family members are the most likely sources of infection.

Germs that cause tuberculosis do not survive on surfaces. You can't get it through shaking hands or exchanging food or drink with someone who has it.[3]

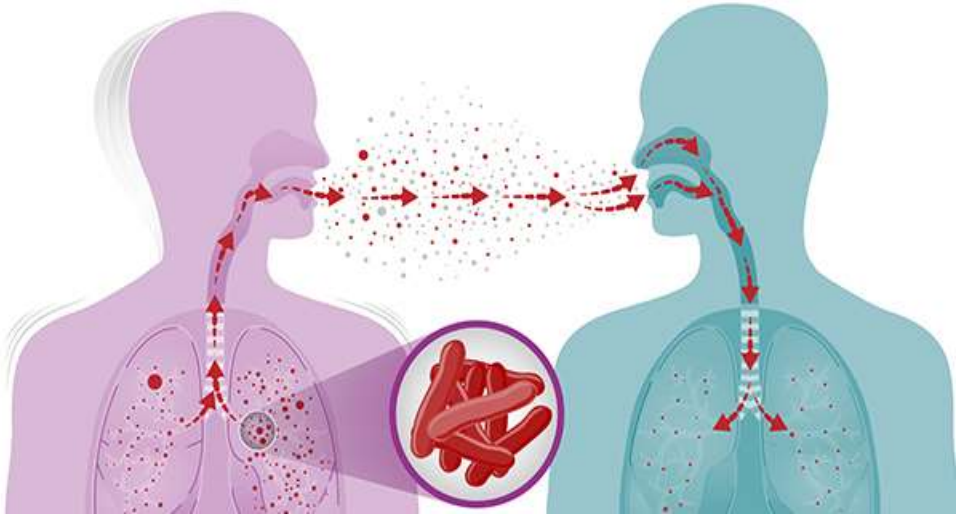

Figure 4 : Transmission of Mycobacterium through air in form of droplets[13]

CAUSE

Mycobacterium tuberculosis is the bacteria that causes tuberculosis. The bacteria are carried by the air and infect the lungs in most cases, but they can also infect other regions of the body. Although tuberculosis is contagious, it is not easily transferred. To catch a contagious disease, you normally have to spend a lot of time in touch with someone who is contagious.[10]

DIAGNOSIS

Symptoms such as a persistent cough, weariness, fever, weight loss, anorexia, and night sweats are checked during the medical history and physical exam.

Lab Tests Include :

Skin test :

The Mantoux tuberculin skin test is another name for this. A little amount of fluid is injected into the skin of your lower arm by a technician. They'll examine for swelling in your arm after 2 or 3 days. If your results are positive, you are most likely infected with tuberculosis bacteria. However, a false positive is possible. If you've had the bacillus Calmette-Guerin (BCG) tuberculosis vaccine, the test may indicate that you have TB when you don't. If you have a relatively new infection, the results can also be false negative, indicating that you don't have tuberculosis when you actually do. This test may be given to you more than once.[3]

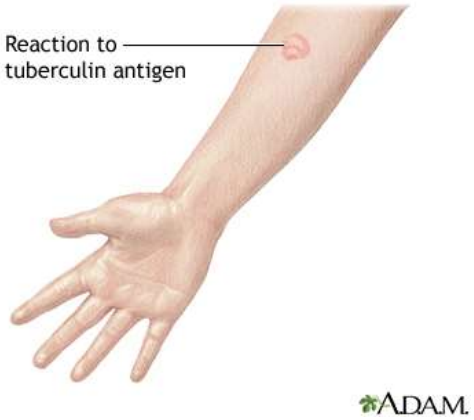

Figure 5 : Skin test [14]

Figure 6 : Blood test15]

Blood test :

When TB proteins are mixed with a small amount of your blood, these tests, also known as interferon-gamma release assays (IGRAs), detect the reaction.

These tests will not reveal whether your infection is dormant or active. Your doctor will determine which type you have if you have a positive skin or blood test:

A chest X-ray or CT scan to check for lung changes

AFB tests for tuberculosis germs in sputum, the mucus that comes up when you cough.[3]

Imaging tests :

Your doctor is likely to prescribe a chest X-ray or a CT scan if you have a positive skin test. This could indicate white spots in your lungs where your immune system has blocked TB bacteria from entering your body, or it could reveal alterations in your lungs caused by active tuberculosis.[9]

Sputum tests

Your doctor may take samples of your sputum — the mucus that comes up when you cough — if your chest X-ray shows signs of tuberculosis. The samples are examined for tuberculosis germs.

Drug-resistant TB strains can also be detected using sputum samples. This aids your doctor in selecting the most effective drugs. It can take four to eight weeks to receive the results of these testing.[9]

Diagnosing TB outside the lungs

Biopsy :

A sample of the affected area is taken out to look for TB causing bacteria.[5]

Urine culture :

This test looks for TB infection in the kidneys (renal TB)[5]

Lumbar puncture :

A sample of fluid around the spine is taken to look for TB infection in the brain (TB meningitis).[5]

TREATMENT

If you have latent TB and are at high risk of developing active TB, your doctor may offer pharmaceutical treatment. Antibiotics must be taken for at least six to nine months if you have active tuberculosis.

The drugs used and the length of treatment are determined by your age, overall health, drug resistance, and the location of the infection in your body.[9]

Most common TB drugs

If you have latent tuberculosis, you may only require one or two TB medications. Active tuberculosis, especially if it's a drug-resistant type, will require the use of many medications at the same time. The following are some of the most commonly prescribed TB medications:

- Isoniazid
- Rifampin (Rifadin, Rimactane)
- Ethambutol (Myambutol)
- Pyrazinamide

If you have drug-resistant tuberculosis, you'll need to take a combination of fluoroquinolone antibiotics and injectable drugs like amikacin or capreomycin (Capastat) for 20 to 30 months. Some strains of tuberculosis are becoming resistant to these drugs as well.

To combat drug resistance, other medications may be added to therapy, such as:

- Bedaquiline (Sirturo)
- Linezolid (Zyvox)[9]

Medication side effects

Serious TB treatment side effects are uncommon, but when they do occur, they can be deadly. All TB treatments might be damaging to your liver. If you have any of the following symptoms while taking these drugs, contact your doctor right away:

- Nausea or vomiting
- Loss of appetite
- A yellow color to your skin (jaundice)
- Dark urine
- Easy bruising or bleeding
- Blurred vision[9]

Completing treatment is essential

You won't be contagious after a few weeks, and you could feel better. Do not stop taking your tuberculosis meds; you must complete the entire course of treatment and take the pills exactly as directed by your doctor. Stopping therapy too soon or skipping doses might cause bacteria to become resistant to the medications, resulting in TB that is far more serious and difficult to cure.

Directly observed therapy (DOT) is a programme that can help people stay to their treatment plans. You are given your medication by a health care worker so that you do not have to remember to take it on your own.[9]

TB Vaccine (BCG)

The Bacille Calmette-Guérin (BCG) vaccination is used to prevent tuberculosis (TB). In the United States, this vaccine is not extensively used, but it is frequently administered to newborns and small children in other

countries where tuberculosis is prevalent. The BCG vaccine does not always protect people from contracting tuberculosis.[11]

Figure 7: BCG Vaccine[16]

BCG Recommendations

BCG should only be considered in the United States for a small number of persons who fit specified criteria and in collaboration with a TB expert. Health care providers who are thinking about giving BCG vaccination to their patients should talk to their local TB control programme about it.[11]

Children

BCG vaccination should only be considered for children with a negative TB test who are constantly exposed and cannot be separated from adults who: • Are untreated or ineffectively treated for TB disease, and the child cannot be given long-term primary preventive treatment for TB infection; or • Have TB disease caused by isoniazid and rifampin-resistant strains.[11]

Health Care Workers

BCG vaccination of health-care workers should be considered on an individual basis in settings where:

• a high percentage of TB patients are infected with drug-resistant TB strains that are resistant to both isoniazid and rifampin;

• drug-resistant TB strains are being transmitted to health-care workers and subsequent infection is likely; or

• TB infection control procedures have been put in place, however they have not been successful.

Health-care workers who are considering BCG vaccination should be informed about the hazards and advantages of both the vaccine and the treatment of latent tuberculosis infection.[11]

PREVENTION

1. **EDUCATION AND SCREENING :** To reduce the risk of infection and transmission , peoples with close contact with patient may undergo prophylactic therapt to minimize air borne infection use protective measures such as covering mouth and nose when coughing. Do not spend long periods of ti,e in stuffy, enclosed rooms with any one who has active TB until that person has been treated for atleast 2 weeks. Someone who has active TB, help and encourage that person to follow treatment instructions.[5]

2. **EARLY DIAGNOSIS & TREATMENT :** TB should be treated early in order to prevent deterioration of the disease and spread of the infection.[5]

3. **LEADING A HEALTHY LIFE STYLE :** The germs attack the lungs when a person's body resistance is reduced. Try to guard by leading a healthy lifestyle in order to minimize the chance of contracting the illness.[5]
4. **BCG (Bacillus Calmette-Guerin) Vaccination** : The TB and chest service provides BCG vaccination to all new born babies to protect them against tuberculosis.[5]

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