

## Tuberculosis Control and Awareness: A Community-Based Survey Study

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### Abstract:

The National Prevalence Survey of India (2019-2021) estimated 31 per cent tuberculosis infection (TBI) burden among individuals above 15 years of age. However, so far little is known about the TBI burden among the different risk groups in India. Thus, this systematic review and metaanalysis, aimed to estimate the prevalence of TBI in India based on geographies, sociodemographic profile, and risk groups.

**Keywords:** Infectious disease, Mycobacterium tuberculosis, Airborne transmission, Symptoms, Cough, Fever, Weight loss, Diagnosis, Treatment, Medication, DOTS Prevention, Awareness, Public health, Survey, Early detection, Health education, Community health.

### Aim:

“To conduct a survey assessing knowledge, attitudes, and practices related to Tuberculosis, and to document relevant scientific and public-health information regarding its burden and management.”

### Objective:

1. To find out how much people know about how TB spreads and what causes it.
2. To understand what people think about TB, including its symptoms and how it is diagnosed and treated.
3. To see what people do in daily life to protect themselves and others from TB.
4. To identify any wrong beliefs or stigma people have about TB patients.
5. To collect clear information about TB—how it develops, its signs, and its effects on the body.
6. To understand the main tests used to detect TB in patients.

7. To summarize the treatment options for TB and the challenges like drug resistance.
8. To know where people get their information about TB (doctors, media, friends, etc.)
9. To find out what people still don't know or misunderstand about TB.

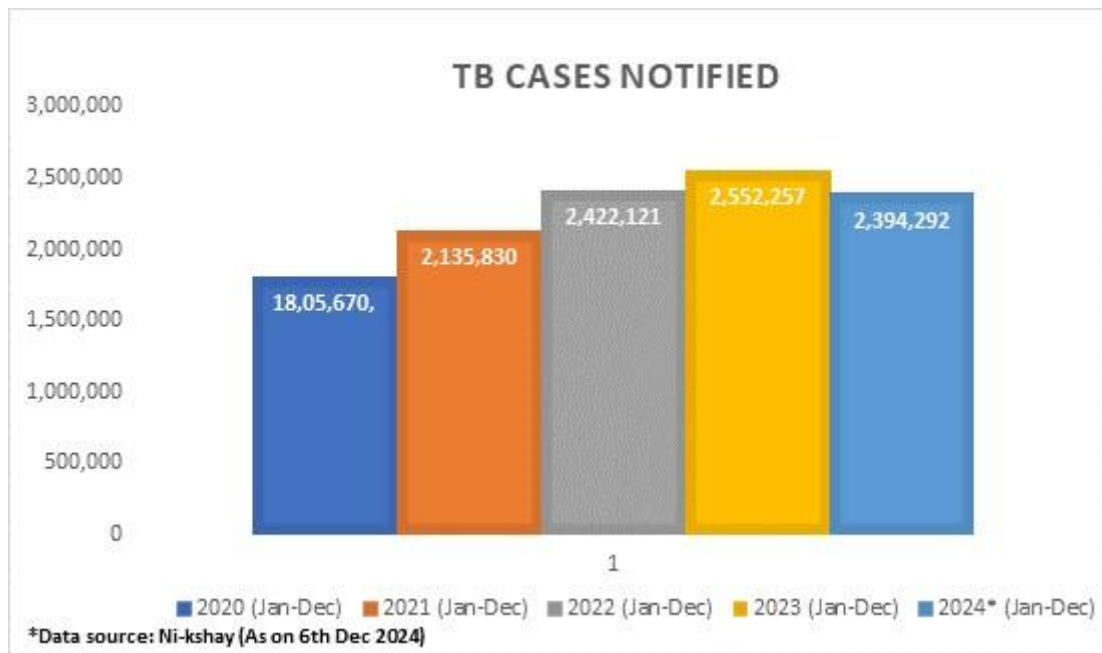
### I. Introduction:

Tuberculosis (TB) is an illness caused by a bacterial infection. It commonly affects your lungs, but it can also affect other areas of your body like your spine, brain or kidneys.

Tuberculosis (TB) disease continues to be a major public health problem globally and is still associated with social stigma in many parts of the world.<sup>[1]</sup>

It has always been difficult to measure the TB disease burden at the national level in order to track the progress of TB control. A limited National TB Prevalence Survey was conducted in India between 1955 and 1958 in a number of districts and block levels. Although the World Health Organisation (WHO) believes that India has met the Millennium Development Goals (MDGs) pertaining to tuberculosis (TB), these estimations are based on expert views and case notifications rather than precise measurements like prevalence surveys. Over the past few decades, numerous local and state-level TB prevalence surveys have shown that, despite regional variations, the prevalence of TB has remained high across the nation.<sup>[2][3]</sup>

The World Health Organisation (WHO) Global Tuberculosis (TB) Report 2025 shows a sharp 21% fall in India's TB incidence, dropping from 237 per lakh in 2015 to 187 per lakh in 2024 nearly twice the pace of the global decline and marking a major milestone in India's fight against the disease.



[Table.1]

**Types -**

**1. Pulmonary affecting:**

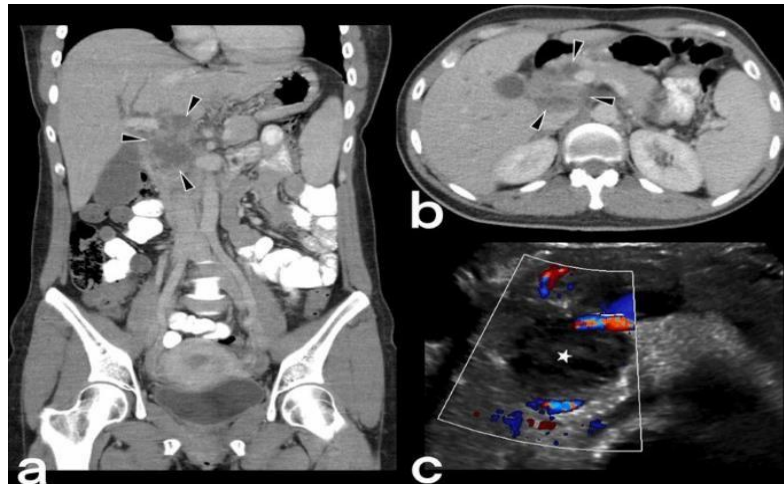
Pulmonary tuberculosis (TB) is a contagious bacterial infection that involves the lungs. It may spread to other organs.



[Fig.1] [Pulmonary TB infection]

**2. Extrapulmonary affecting:**

Extrapulmonary Tuberculosis (EPTB) affects any part of the body except the lungs, commonly impacting lymph nodes, pleura (lining around lungs), abdomen, bones/joints, brain, and genitourinary tract, often mimicking other serious illnesses like cancer, making diagnosis difficult.



[Fig.2] [Extrapulmonary TB infection]

• **Epidemiology:**

Ninety percent of people infected with TB develop latent infection. Approximately 5% of people infected with TB develop active disease within the first 2 years after infection; an additional 5% develop the infection later.<sup>[7]</sup>

The risk factors associated with the development of active TB are immunocompromised state, tobacco use, and excessive alcohol use. The immunocompromised state may be due to the following:

1. Immune senescence of older age
2. Genetic diseases causing immunodeficiency
3. Human immunodeficiency virus (HIV)
4. Transplantation
5. Prolonged corticosteroid use
6. Cytoreductive chemotherapy
7. Tumor necrosis factor (TNF) antagonists
8. Malnutrition
9. Diabetes

• **Causes:**

Mycobacterium tuberculosis, the bacterium that causes tuberculosis (TB), is mainly transmitted by airborne droplets that are inhaled by others when an infected person coughs, sneezes, or speaks, especially in crowded, poorly ventilated areas.

• **Symptoms:**

1. Persistent cough: A cough lasting three weeks or longer is a classic sign.
2. Chest pain: Pain, particularly when breathing or coughing.
3. Coughing up blood or bloody mucus.
4. Unexplained weight loss.

5. Fatigue and weakness.
6. Fever and chills.
7. Night sweats: Sweating profusely enough to soak your sheets.
8. Other possible symptoms
9. Swollen lymph nodes: Particularly in the neck.
10. Shortness of breath.
11. Loss of appetite.

• **Mode of transmission:**

When someone with active TB disease of the lungs or throat coughs, talks, or sings, TB bacteria can enter the air. Depending on the surroundings, these bacteria can linger in the air for several hours.

Indoor spaces and other locations with inadequate air circulation, such as a locked car, are more conducive to the propagation of tuberculosis germs than outdoor spaces. These germs can infect anyone in close proximity if they breathe them in.

TB bacteria are not transmitted by:

- Giving a handshake.
- Sharing a meal or beverage.
- Touching toilet seats or bed linens.
- Toothbrush sharing.

• **Complication:**

1. Pleurisy
2. Pleural effusion
3. Empyema
4. Pneumothorax
5. Aspergilloma
6. Endo bronchitis
7. Bronchiectasis
8. Laryngitis

9. Cor pulmonale
10. Ca bronchus
11. Enteritis
12. Miliary Tuberculosis
13. HIV related opportunistic infections.

**• Etiology:**

The closely related species that make up the Mtb family, or tuberculosis complex, are capable of infecting both people and animals.

M. tuberculosis is the most prevalent human disease worldwide, despite the fact that M. Bovis, M. africanus, and M. Canetti can infect humans.

Mtb are aerobic, nonmotile bacilli that do not produce spores.<sup>[4]</sup>

The remarkably high lipid concentration in the cell wall, which is also likely involved in immunomodulation and virulence, is responsible for their acid-fast staining capacity.

The TB organism grows slowly and has a generation time of roughly 20,000. Visible development on solid media usually takes three to eight weeks, making a timely diagnosis more challenging.<sup>[4][5]</sup>

Component	Indicator	Weightage (Points)
<b>TB notification</b>	<b>% of Target TB notification achieved</b>	<b>20</b>
<b>HIV screening for TB patients</b>	<b>% of net TB notified patients with known HIV status</b>	<b>10</b>
<b>Universal drug susceptibility testing (UDST)</b>	<b>% of net TB notified patients with UDST done</b>	<b>10</b>
<b>Treatment success rate</b>	<b>% of TB patients with treatment success (cured or treatment completed)</b>	<b>15</b>
<b>Nikshay Poshan Yojana beneficiaries paid</b>	<b>% of eligible TB patients receiving financial support</b>	<b>10</b>
<b>Drug-resistant TB (DR-TB) treatment initiation</b>	<b>% of MDR/RR TB patients initiated on treatment</b>	<b>15</b>
<b>Financial expenditure</b>	<b>% of expenditure of the approved ROP budget</b>	<b>10</b>
<b>Latent TB infection management</b>	<b>% of children and PLHIV given chemoprophylaxis</b>	<b>10 (5+5)</b>

[Table no.1]

**• Pathology:**

When TB droplet nuclei are present in an enclosed space, the likelihood of transmission rises with longer exposure times. Droplet nuclei that are inhaled may or may not cause infection.

TB bacilli can also be contracted by consuming tainted milk; although this is a historically significant method of infection, it is now uncommon.

Rarely, contact with droplet nuclei or fomites with nonintact skin can result in the acquisition of TB bacilli.<sup>[5]</sup>

Primary infection: Generally, the immune system is able to check this initial infection and a form of TB develops in which there are no symptoms or transmissibility: it's known as latent tuberculosis

(LTBI). But in some people, particularly those with compromised immune systems, an infection may progress to active TB disease

When inhaled, droplet nuclei may land on the mucosa of the upper airways, where the infection is unlikely to develop, or they may travel to the alveoli, where pathophysiological processes may start.<sup>[5][6]</sup>

The bacillus may be eliminated, remain dormant, or develop into active tuberculosis disease, depending on intricate and poorly understood pathogen virulence factors in conjunction with host immunomodulatory mechanisms.

A complex and dynamic host-pathogen relationship is probably oversimplified by these discrete categorical stages.

Furthermore, as our understanding of immune mechanisms has advanced, some aspects of the long-held conceptual pathophysiological model have come under scrutiny.

- **Pathophysiology:**

Tuberculosis bacilli are spread most commonly from person to person by airborne droplet nuclei that remain suspended in the air for several hours.

After being internalised by the macrophages, the bacilli either cause the primary infection or are destroyed. In the latter scenario, the bacilli can go to pulmonary lymph nodes and stimulate t lymphocytes after gaining access to the lung parenchyma. In order to create a granuloma around infected macrophages in the lung parenchyma, the primed t cells coordinate the recruitment of t cells, b cells, monocytes, multinucleated giant cells, dendritic cells, and fibroblasts. The life cycle of the tubercle bacillus within granulomas and the immunologic mechanisms governing granuloma development are poorly known and require more research.<sup>[8][9][10][11]</sup> The host remains asymptomatic, and the tb bacteria may get eliminated completely or step into latency inside the granuloma.<sup>[12]</sup>

- **Diagnosis:**

#### **Latent TB infection**

For patients who are at higher risk for tuberculosis, testing for the disease should be a regular and essential component of medical therapy. TB disease is prevented by identifying and treating latent TB infections. The transmission of tuberculosis to others can be stopped by preventing the disease. However, TB disease must be ruled out before starting treatment for latent TB infection.

#### **TB disease**

At the start of the 20th century, tuberculosis (TB) was the primary cause of death for numerous populations and areas in the US, but it is now less common. When assessing individuals who exhibit symptoms, some medical professionals may overlook the likelihood of tuberculosis because they have never seen someone with the illness. As a result, the patient may continue to be ill and potentially contagious for an extended length of time, and the diagnosis of TB disease may be postponed or even missed.<sup>[13]</sup>

#### **A complete medical evaluation for TB disease has five components:**

1. Medical history
2. Physical examination
3. TB blood tests or TB skin test
4. Chest radiograph

##### **1. Medical history:**

When conducting a medical history, the health care provider should ask about the following:

- If any symptoms of TB disease are present, and if so, for how long,
- If there is a known exposure to a person with TB disease,
- Whether or not the person has been diagnosed with and/or treated for latent TB infection or TB disease in the past,
- If the person has risk factors for exposure to TB bacteria, and
- If the person has underlying medical conditions, especially HIV, other immunocompromising conditions, or diabetes that can increase the risk for progression from latent TB infection to TB disease.

##### **2. Physical examination:**

A physical examination cannot be used to confirm or rule out TB disease. However, it is an essential part of any evaluation and can:

- Provide valuable information about the patient's overall condition,
- Inform the method of diagnosis, and
- Reveal factors that may affect treatment if the patient is diagnosed with TB disease.

Some signs of extrapulmonary TB disease (for example, redness and swelling over the infected lymph nodes of scrofula) may be observed during a physical examination.

##### **3. Tb blood test or tb skin test:**

There are two tests that are used to determine if a person has been infected with TB bacteria: **a. Blood test:**

A patient's blood samples are combined with peptides that mimic antigens produced by TB bacteria and with controls in the TB blood test (interferon gamma release assay [IGRA]).

The TB antigens were selected because they are present in *M. tuberculosis* complex, which includes *M. bovis*, but they are not present in BCG or most other mycobacteria.

Most TB bacteria-infected individuals develop specific immunity in six to eight weeks. Interferon gamma (IFN- $\gamma$ ) can then be released by

some white blood cells in response to the mimicked TB antigens. The IFN- $\gamma$  response level is measured by the assays. In order to confirm test results and ascertain an individual's baseline IFN- $\gamma$  level, control substances are utilised for comparison. **b. Skin test:** To find out if someone has TB bacteria, one test is the TB skin test. This test involves injecting a standardised solution under the skin using pure protein derivative (PPD), which is generated from tuberculin.

If a person has been infected with TB bacteria, PPD usually results in a T-cell mediated delayedtype hypersensitivity reaction. Because PPD is made from proteins that *M. tuberculosis* excretes when it grows in specialised media under standardised conditions, the immune system will identify it in the majority of TB-infected individuals. PPD is diluted in FDA-approved testing solutions to a standard concentration and potency.

It takes 2 to 8 weeks after initial infection with TB bacteria for the immune system to be able to react to PPD and for the infection to be detected by the TB skin test.

#### 4. Chest radiograph:

When a TB blood test or TB skin test is positive, chest radiographs (x-rays) can assist distinguish between latent TB infection and pulmonary TB illness.

To find anomalies in the chest, a posterior-anterior chest radiograph is employed. Lesions can vary in size, shape, density, and cavities, and they can develop anywhere in the lungs. Although these anomalies may indicate tuberculosis, they cannot be used to provide a conclusive diagnosis.

When a person has a positive reaction to a TB blood test or TB skin test and no symptoms of the illness, normal results on chest radiography can typically be used to rule out pulmonary TB. Patients with HIV whose immune system has not been recovered by antiviral therapy are rare exceptions.

#### 5. Sputum tests

Your healthcare professional may take a sample of the mucus that comes up when you cough, also called sputum. If you have active TB disease in your lungs or voice box, lab tests can detect the bacteria.

A relatively quick laboratory test can tell if the sputum likely has the TB bacteria. But it may be showing bacteria with similar features.

Another lab test can confirm the presence of TB bacteria. The results often take several weeks. A lab test also can tell if it's a drug-resistant form of the

bacteria. This information helps your healthcare professional choose the best treatment.

#### • Treatment:

Tuberculosis (TB) starts when airborne *Mycobacterium tuberculosis* bacteria are inhaled, reaching the lungs' alveoli, where macrophages engulf them. The bacteria survive inside macrophages by blocking immune responses, leading to bacterial multiplication and the formation of a granuloma (a walled-off cluster of immune cells) that contains the infection in a latent state.

Your doctor may start treating you if you have latent tuberculosis. This is particularly true for those who have HIV/AIDS or other conditions that raise their risk of developing active tuberculosis.

Treatment for latent TB infections often lasts three or four months.

Treatment for active tuberculosis might last four, six, or nine months. The optimal medications for you will be determined by TB treatment specialists.

You will have regular appointments to see if you're improving and to watch for side effects.

#### Take all of the medicines:

It is important to take every dose as instructed, and you must complete the full course of treatment. This is important for killing the bacteria in your body and preventing new drug-resistant bacteria.

Your public health department may use a program called directly observed therapy (DOT). With DOT, a healthcare worker visits you at home to watch you take your dose of medicines.

Some healthcare departments have programs that let you take your medicines on your own. The Centres for disease control and prevention has printable forms you can use to keep track of your daily doses.

#### Most common TB medicines:

If you have a latent TB infection, you might need to take only one or two types of medicines. Active TB disease requires taking several medicines. Common ones used to treat tuberculosis include:

- Isoniazid.
- Rifampin (Rimactane).
- Rifabutin (Mycobutin).
- Rifapentine (Priftin).
- Pyrazinamide.
- Ethambutol (Myambutol).

You may be prescribed other medicines if you have drug-resistant tuberculosis or other complications from your illness.



[fig.3] [Marketed preparation of Isoniazid.]



[fig.4] [Marketed preparation of Rifampin.]

#### Medication side effects

Most people can take TB medicines without serious side effects. If you have serious side effects, your healthcare professional may ask you to stop taking a medicine. You may have to change the dose of a medicine.

Talk to your healthcare professional if you experience any of the following:

- Upset stomach.
- Vomiting.
- Loss of appetite.
- Severe diarrhoea.
- Light-coloured stool.
- Dark urine.
- Yellowish skin or eye colour.
- Changes in vision.
- Dizziness or trouble with balance.

- Tingling in hands or feet.
- Easy bruising or bleeding.
- Unexplained weight loss.
- Unexplained tiredness.
- Sadness or depression.
- Rash.
- Joint pain.

It is important for you to list all medicines, dietary supplements or herbal remedies you take. You may need to stop taking some of these during your treatment.<sup>[14]</sup>

#### • Risk factors

Once infected with TB bacteria, some individuals with compromised immune systems (caused by specific drugs or medical conditions) are extremely

vulnerable to developing active TB disease. In order to prevent the development of active TB disease, it is crucial that these individuals receive treatment for inactive TB.

Some medications or health conditions can weaken your immune system.

These include:

- HIV infection
- Substance use (such as injection drug use)
- Specialized treatment for rheumatoid arthritis or Crohn's disease
- Organ transplants
- Severe kidney disease
- Head and neck cancer
- Diabetes
- Medical treatments such as corticosteroids
- Silicosis
- Low body weight

Babies and young children often have weak immune systems. Children, especially those under age five, have a higher risk of developing TB disease once infected with TB germs.

#### • **Prevention:**

Preventing tuberculosis is just as important as treating it. The focus is on several key strategies to stop the spread of TB:

#### **1. Vaccination:**

Children are advised to receive the Bacillus Calmette-Guérin (BCG) vaccine, which helps protect them from TB.

#### **2. Early Diagnosis and Treatment:**

Getting tested early allows for timely treatment, which greatly reduces the chance of passing TB to others.

#### **3. Proper Ventilation:**

Good airflow in homes and workplaces helps prevent TB bacteria from staying in the air.

#### **4. Mask Use:**

TB patients should wear masks to lower the risk of transmitting the infection through the air.

#### **5. Healthy Lifestyle:**

Eating nutritious food and staying physically active support a strong immune system, making people less vulnerable to TB.

#### **6. Reduce Exposure & Societal Risk Factors:**

Reduce overcrowding (schools, prisons, hostels). Improve nutrition (malnutrition weakens immunity). Control comorbidities: HIV (ART reduces TB risk), Diabetes control, Smoking cessation and alcohol reduction.

#### **7. Public Health & Community Measures:**

Contact tracing: screening family members of TB patients. Awareness programs: educate about symptoms, testing, and adherence to treatment. Surveillance & reporting: notify TB cases to public health authorities. Strengthening national TB programs.<sup>[15][16]</sup>

## **II. Conclusion:**

In summary tuberculosis remains a significant public health problem despite being a preventable and curable disease. The information gathered highlights that lack of awareness, delayed diagnosis, and incomplete treatment contribute to the continued spread of TB. The survey results indicate that while some individuals are aware of TB symptoms and transmission, many still have limited knowledge about prevention, treatment duration, and the importance of completing medication. This emphasizes the need for stronger health education programs, early screening, and community-based awareness initiatives. Improving access to healthcare services and promoting accurate information can play a vital role in reducing the burden of tuberculosis and preventing its spread in the community.

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