(RESEARCH ARTICLE)

A prospective study on the clinical profile, risk factors, diagnosis and management of pulmonary and extrapulmonary tuberculosis at a tertiary care hospital in Nagapattinam, India

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Abstract

Background: Tuberculosis (TB) remains a major global public health challenge, presenting primarily as pulmonary TB (PTB) or, less commonly, as extra pulmonary TB (EPTB).

Objectives: This study aimed to: (1) document the clinical symptoms of PTB and EPTB; (2) identify associated risk factors; (3) classify the types of EPTB observed; (4) evaluate diagnostic approaches; and (5) review treatment regimens for drug-sensitive TB, multi drug-resistant TB (MDR-TB), and extensively drug-resistant TB (XDR-TB).

Methods: A prospective observational study was conducted from April to September 2024 at Government Medical College Hospital, Nagapattinam, involving 250 confirmed TB patients. Demographic, clinical, diagnostic, and treatment data were collected and analysed.

Results: PTB accounted for 83.6% of cases, while EPTB represented 16.4%. Male patients predominated (63.6%), and the highest prevalence occurred among adults aged 19–59 years (54%). The most common PTB symptoms included cold-like manifestations (90.9%), weight loss (85.1%), and cough (74.6%). Lymph nodes (26.8%), pleura (21.9%), and genital sites (17%) were the most frequently affected EPTB locations. Notable risk factors included smoking (15%), alcohol use (12%), HIV infection (10%), and diabetes mellitus (8%). Diagnosis was established using sputum smear microscopy, culture, radiographic imaging, and site-specific tests. All patients were treated according to WHO-recommended regimens, with modifications for MDR-TB.

Conclusion: Pulmonary TB remains the predominant form, with lymph node, genital, and pleural TB as the leading extra pulmonary sites. The findings underscore the influence of behavioural and chronic disease risk factors and highlight the need for integrated TB control strategies. Strengthening early diagnosis and adherence to WHO-recommended treatment is critical to achieving India's TB elimination target by 2025.

Keywords: Pulmonary tuberculosis; Extra pulmonary tuberculosis; MDR-TB, Diagnosis; Risk factors; Treatment

1. Introduction

Mycobacterium tuberculosis is the main cause of tuberculosis (TB), a chronic infectious disease that is still one of the top ten causes of death globally. TB is still a major public health concern despite persistent worldwide control efforts, especially in low- and middle-income nations where transmission is facilitated by overcrowding and a lack of medical resources.

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Clinically, TB most often manifests as pulmonary tuberculosis (PTB), affecting the lungs and serving as the primary reservoir for transmission. In contrast, extra pulmonary tuberculosis (EPTB) involves organs and tissues outside the lungs—such as lymph nodes, pleura, bones, and the genitourinary tract—and accounts for a substantial minority of TB cases. While PTB is generally easier to diagnose due to its characteristic respiratory symptoms, EPTB presents a more complex diagnostic challenge, often with nonspecific or organ-specific symptoms that delay detection.

One of the highest TB burdens in the world is found in India, where a number of risk factors, such as HIV co-infection, diabetes mellitus, malnutrition, smoking, and alcohol consumption, increase vulnerability and worsen disease outcomes. These co morbidities raise the risk of disease progression in addition to making treatment more difficult.

The increasing incidence of extensively drug-resistant TB (XDR-TB) and multi drug-resistant TB (MDR-TB), which are mainly caused by insufficient or improper treatment, is a new threat to TB control. These TB types present serious problems for public health systems since they necessitate lengthier, more costly, and less successful treatment plans. Because of these complications, early diagnosis, timely initiation of appropriate therapy, and strict adherence to treatment protocols are necessary for effective TB management. The current study looks at the clinical presentation, diagnostic methods, treatment trends, and local epidemiology of PTB and EPTB in patients who are treated at Government Medical College Hospital in Nagapattinam. The results are intended to guide focused public health initiatives and promote better clinical decision-making.

2. Materials and Methods

2.1. Study Design and Setting

This prospective, observational study was conducted from April to September 2024 at the Government Headquarters Hospital, Nagapattinam, Tamil Nadu, India.

2.2. Study Population

A total of 250 patients diagnosed with TB—both pulmonary (PTB) and extra pulmonary (EPTB)—were enrolled, based on predefined inclusion and exclusion criteria.

2.3. Inclusion Criteria

Patients of the defined study age group with confirmed PTB or EPTB through clinical, microbiological, or radiological evidence, including those with co morbidities such as diabetes mellitus or HIV infection.

2.4. Exclusion Criteria

Pregnant or lactating women and paediatric patients below the defined age threshold were excluded to avoid potential treatment-related risks and variability in clinical presentation.

2.5. Diagnostic Procedures

Diagnosis of PTB was based on clinical assessment, sputum smear microscopy, culture, and GeneXpert MTB/RIF testing. Imaging (chest X-ray, ultrasound, CT) was used as required. For EPTB, site-specific procedures such as fine needle aspiration cytology and fluid analysis were performed.

2.6. Data Analysis

Data were analysed using descriptive statistics to determine case distribution, symptom prevalence, co morbidities, diagnostic methods, and treatment regimens.

3. Results

3.1. Demographic Characteristics:

Table 1 Age-wise distribution of tb patients

Parameter category	No. Of patients	Percentage (%)
ADOLESCENTS	35	14%
ADULTS (19-59)	135	54%
SENIOR ADULTS (>60)	80	32%
TOTAL	250	100%

Table 2 Gender-wise distribution of tb patients

Parameter category	No. Of patients	Percentage (%)
MALE	159	63.6%
FEMALE	91	36.4%
TOTAL	250	100%

Adults aged 19–59 years formed the largest group (54%), followed by senior adults aged ≥60 years (32%) and adolescents (14%). Males accounted for 63.6% of cases, females 36.4% (Table-1 & Table-2).

3.2. Types of Tuberculosis:

Table 3 Distribution of PTB and EPTB cases

Type	No. Of patients	Percentage (%)
PULMONARY TB (PTB)	209	83.6%
EXTRAPULMONARY TB (EPTB)	41	16.4%
TOTAL	250	100%

PTB was the predominant from 83.6%, occurring in approximately five times as many patients as EPTB 16.4% (Table-3).

3.3. Sites of EPTB:

Table 4 Distribution of EPTB by site

SITE	NO. OF PATIENTS	PERCENTAGE (%)
Lymph node TB	11	26.8%
Pleural TB	9	21.9%
Genital TB	7	17%
Osteoarticular TB	5	12.1%
Gastrointestinal & Peritoneal TB	3	7.5%
Urinary TB	3	7.5%
TB Pericarditis	2	4.8%
CNS TB	1	2.4%

Lymph node TB (26.8%) was the most frequent, followed by pleural TB (21.9%) and genital TB (17%). Less common sites included osteoarticular, gastrointestinal, urinary, pericardial, and CNS TB (Table-4).

3.4. Symptoms:

Table 5 Common symptoms in PTB patients

Pulmonary tb symptom	Percentage of patients (%)
COLD	90.9%
WEIGHT LOSS	85.1%
COUGH	74.6%
FEVER	55%
SHORTNESS OF BREATH	45.4%
LOSS OF APPETITE	51.6%

Table 6 Common symptoms of EPTB patients

EPTB symptom	Percentage of patients (%)
FEVER	58.3%
COUGH	36.58%
CHEST PAIN	34.14%
SHORTNESS OF BREATH	34.14%

PTB most often presented with cold-like symptoms (90.9%), weight loss (85.1%), and cough (74.6%). EPTB symptoms varied by site but fever (58.3%), cough (36.58%), and chest pain (34.14%) were most common (Table-5 & Table-6).

1.1. Risk Factors:

Table 7 Distribution of major risk factors

Risk factor	Percentage of patients
SMOKING	15%
ALCOHOL USE	12%
HIV	10%
DIABETES MELLITUS	8%

Smoking (15%) and alcohol use (12%) were the leading modifiable risks. HIV infection (10%) and diabetes mellitus (8%) were notable medical contributors.

4. Discussion

This study confirms that pulmonary tuberculosis (PTB) is the most common clinical form in the study population, which is consistent with global epidemiological trends. 16.4% of cases were extra pulmonary tuberculosis (EPTB), a percentage that probably reflects the difficulties in diagnosing EPTB, which frequently necessitates specialised testing in addition to standard pulmonary screening.

Men and adults in the economically productive age group have a disproportionately higher burden of disease, according to an analysis of the distribution of ages and genders. This discrepancy is likely caused by behavioural and occupational

risk factors, such as men's higher rates of alcohol use, smoking, and occupational exposure, which not only make them more susceptible but also affect how they seek medical attention.

The most prevalent presentation of EPTB was lymph node TB, which was followed by genital and pleural TB. These results support the worldwide significance of such trends and are in line with both domestic and foreign reports. Further symptom analysis showed that while EPTB presents more sporadically and frequently calls for site-specific diagnostic techniques for precise detection, PTB usually manifests as a combination of respiratory and constitutional symptoms.

The importance of integrating TB control strategies with chronic disease management and lifestyle modification programs is highlighted by the identification of smoking, alcohol use, HIV co-infection, and diabetes as major risk factors. This emphasises a larger public health goal: combating tuberculosis (TB) by reducing underlying risk factors through social and preventive measures in addition to biomedical interventions.

In order to maximise case detection, the diagnostic algorithm used in this study combined imaging, molecular, and bacteriological modalities in accordance with WHO guidelines. However, following WHO treatment guidelines is still crucial, especially given the current global increase in multi drug-resistant TB (MDR-TB). Therefore, it is crucial to ensure standardised, guideline-based treatment for both individual patient outcomes and larger TB control initiatives.

5. Conclusion

While extra pulmonary manifestations, most commonly lymph node, genital, and pleural TB, represent a significant percentage of cases that require more diagnostic attention, this study confirms that pulmonary tuberculosis continues to be the most common type of TB in the study population. The concentration of cases among adults and men in the economically productive age group emphasises how behavioural patterns, occupational exposures, and biological susceptibility all work together to shape disease burden. Diabetes, alcoholism, smoking, and HIV co-infection are all important risk factors that highlight the need for integrated disease management strategies by illuminating the intricate relationship between communicable and non-communicable diseases.

The results also highlight the significance of rigorous adherence to standardised treatment plans, thorough diagnostic approaches that comply with WHO guidelines, and early detection. Given the growing threat of multi drug-resistant TB, where errors in diagnosis and treatment compliance can have serious public health repercussions, these steps are especially important.

When combined, the study's findings demonstrate the necessity of a comprehensive approach to TB control that goes beyond biomedical treatment to include behavioural interventions, chronic illness management, and preventive health measures. In line with the global End TB strategy, strengthening such integrated and multi sectoral approaches will be essential to lowering the TB burden in this area and making a significant contribution to India's national goal of eradicating tuberculosis by 2025.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflicts of interest related to this study.

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