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(RESEARCH ARTICLE)

A retrospective cohort study of drug-sensitive and MDR-tuberculosis outcomes in southern coastal Tamil Nadu

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Abstract

Background: Tuberculosis (TB) continues to be a major health problem in India. Multi-drug resistant TB (MDR-TB) creates significant challenges for treatment.

Methods: A retrospective study took place at Government Medical College Hospital in the Southern Coastal Region of Tamil Nadu. It involved 350 patients (250 with pulmonary TB and extra-pulmonary TB, and 100 with MDR-TB) between 2023 and 2024. We analyzed data on demographics, risk factors, treatment plans, and outcomes.

Results: Among the 350 patients, 60% were male, most aged 21 to 40 years. Pulmonary TB made up 65% of cases, extra-pulmonary TB 35%, and MDR-TB accounted for 28.6%. Common risk factors included malnutrition, smoking, HIV, and diabetes. The success rate for treatment was 78% for drug-sensitive TB and 62% for MDR-TB, with higher mortality in MDR-TB cases.

Conclusion: Standard treatment plans are effective for pulmonary and extra-pulmonary TB, but the results for MDR-TB are still poor. Early drug sensitivity testing, better adherence to treatment, and access to newer regimens are essential for improving outcomes.

Keywords: Tuberculosis; MDR-TB; Prescribing patterns; Outcomes

1. Introduction

Tuberculosis (TB) remains one of the most important infectious diseases worldwide. It causes significant illness, death, and economic strain. Even though TB is preventable and treatable, it still ranks among the top ten causes of death globally. The World Health Organization (WHO) estimated that in 2023, there were about 10.6 million new TB cases worldwide, with India alone accounting for nearly 25%. This highlights the especially high burden of TB in India, particularly in rural and economically disadvantaged areas.

In India, pulmonary TB (PTB) is the most common form of the disease. However, extra-pulmonary TB (EPTB) also contributes a notable share of illness. EPTB types, such as lymph node TB, pleural TB, and skeletal TB, often create diagnostic difficulties. Their symptoms are vague and can resemble other conditions. Early and accurate diagnosis is crucial to start treatment on time and prevent complications.

A growing challenge in managing TB is multi-drug resistant tuberculosis (MDR-TB). MDR-TB is defined as resistance to at least isoniazid and rifampicin, the two most effective first-line drugs. The increase of MDR-TB presents a serious challenge to efforts aimed at eliminating TB at national and global levels. The WHO states that

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India has one of the highest absolute numbers of MDR-TB cases in the world. Incomplete treatment, poor patient adherence, irregular drug supplies, and insufficient follow-up are major factors driving resistance. Treating MDR-TB is lengthy, toxic, and expensive, and cure rates are much lower compared to drug-sensitive TB (DS-TB).

The Indian government has put in considerable effort through the National Tuberculosis Elimination Program (NTEP), which was formerly known as the Revised National Tuberculosis Control Programme (RNTCP). The strategies under NTEP include directly observed treatment (DOT), the introduction of molecular diagnostic tools like CBNAAT (GeneXpert), an expansion of drug susceptibility testing (DST) facilities, and conditional access to newer medications like bedaquiline and delamanid. Despite these advancements, real-world results are still not optimal, especially for patients with MDR-TB, where death and treatment dropout rates remain high.

Several factors make TB control in India complex:

- Socioeconomic factors: Poverty, overcrowding, malnutrition, and lack of awareness increase the risk of infection and disease progression.
- Comorbidities: Conditions like HIV, diabetes, chronic lung diseases, and alcohol use are closely linked to poor outcomes in TB.
- Treatment adherence: Long treatment courses, a heavy pill burden, and side effects often lead to poor adherence, raising the risk of resistance.
- Health system issues: Delays in diagnosis, limited lab facilities, and inadequate follow-up care contribute to ongoing transmission and poor outcomes.

Examining treatment practices and clinical results in district-level hospitals offers valuable insights, as these facilities are often the first point of care for many patients in rural and semi-urban areas. Data from these centers reflect the real-world challenges in controlling TB and can guide improvements in treatment programs.

This study analyzes 350 patients, including 250 with pulmonary and extra-pulmonary TB and 100 with MDR-TB, treated at a Government Medical College Hospital in Tamil Nadu's southern coastal region. By combining these two groups, the research provides a clear view of TB management across both drug-sensitive and drug-resistant cases.

2. Materials and methodology

A retrospective, observational study took place at the Government Medical College Hospital in the Southern Coastal Region of Tamil Nadu from January 2018 to December 2024. We reviewed the records of 350 patients, which included 250 with pulmonary TB (PTB) or extra-pulmonary TB (EPTB) and 100 with multi drug-resistant TB (MDR-TB).

2.1. Inclusion criteria

Adults aged 12 years and older with confirmed TB (PTB, EPTB, or MDR-TB) receiving treatment under NTEP guidelines.

2.2. Exclusion criteria

Pediatric patients and those with incomplete records.

Data sources included case records, treatment cards, laboratory reports (sputum AFB, CBNAAT, culture, DST), and findings from radiology or histopathology.

2.3. Treatment regimens

- For drug-sensitive TB: Standard HRZE regimen according to NTEP.
- For MDR-TB: Standardized shorter regimens lasting 9 to 11 months or longer regimens lasting 18 to 20 months, with newer drugs like bedaquiline or delamanid for eligible cases.

The parameters studied included demographics, type of TB, risk factors, diagnostic methods, treatment regimens, and outcomes. We analyzed the data descriptively and expressed it as percentages and proportions. We obtained ethical approval and maintained patient confidentiality.

3. Result

A total of 350 patients participated in the study, including 250 drug-sensitive TB (PTB/EPTB) cases and 100 MDR-TB cases. Below are the findings.

3.1. Demographic Profile

Table 1 Age-wise Distribution of Patients (n = 350)

Age Group (years)	Number of Patients	Percentage
0–20	25	7%
21–40	154	44%
41–60	102	29%
61–80	69	20%
Total	350	100%

Most patients (44%) were in the 21–40 age group, showing that TB mostly affects people in their working years.

Table 2 Gender-wise Distribution of Patients

Gender	Number of Patients	Percentage
Male	210	60%
Female	140	40%
Total	350	100%

There was a higher number of male patients (M:F = 1.5:1).

3.2. Type of Tuberculosis

Table 3 Type of TB among Patients

Type of TB	Numer of Patients	Percentage
Pulmonary TB	228	65%
Extra-Pulmonary TB	122	35%
MDR-TB	100	28.6%

Pulmonary TB was the most common type, while MDR-TB made up almost one-third of the group.

Table 3a Extra-pulmonary TB Sites (n = 122)

Site of EPTB	Number of Patients	Percentage
Lymph node TB	39	32%
Pleural TB	31	25%
Skeletal TB	13	11%
CNS TB	12	10%
Abdominal TB	10	8%
Genitourinary TB	9	7%
Others	8	7%

Lymph node and pleural TB were the most common types of EPTB.

Table 3b Risk Factors and Comorbidities

Risk Factor/Comorbidity	Percentage of Patients
Malnutrition	29%
Smoking	24%
HIV infection	12%
Diabetes mellitus	11%
Alcohol use	8%
COPD	5%

Malnutrition and smoking were the top risk factors.

Table 3c Diagnostic Methods

Diagnostic Method	Percentage Used
Sputum smear microscopy	58%
CBNAAT (GeneXpert)	26%
Histopathology/Biopsy	9%
Culture & DST	7%

3.3. Treatment Outcomes

Table 4 Treatment Outcomes of Patients

Outcome	DS-TB (n=250)	MDR-TB (n=100)	Overall (n=350)
Cured/ Treatment success	195 (78%)	62 (62%)	257 (74%)
Treatment completed	20 (8%)	6 (6%)	26(7.4%)
Treatment failure	10 (4%)	10 (10%)	20(5.7%)
Default/ Lost to follow-up	15 (6%)	19 (19%)	34(97%)
Death	10 (4%)	15 (15%)	25(7.1%)
Not evaluated	0	2 (2%)	2(0.6%)

Overall treatment success was 74%. DS-TB had better outcomes with a 78% success rate compared to MDR-TB, which had a 62% success rate. Mortality (15%) and dropout rates (19%) were higher among patients with MDR-TB.

4. Discussion

Tuberculosis remains a significant public health issue in India, especially in rural and semi-urban areas like Nagapattinam. Even with the Revised National Tuberculosis Control Programme (RNTCP) and the Directly Observed Treatment Short-course (DOTS) in place, treatment success often faces obstacles such as delayed diagnosis, patients not following treatment, and the rise of drug-resistant forms of the disease.

In this study, we found that most TB patients were male, which aligns with national data showing this trend. This male predominance may be linked to job-related exposure, smoking, and higher rates of other health issues. Female patients were generally younger, suggesting different healthcare-seeking behaviors and varying susceptibility to the disease.

The age distribution indicated that the working-age group (20–50 years) represented the largest share of TB cases. This poses an important socioeconomic issue since TB in this age group can reduce productivity and increase financial strain

on families. Although older patients made up a smaller percentage of cases, they often experienced more complications, likely due to a decline in immune function related to age.

The clinical signs of pulmonary and extra-pulmonary TB varied significantly. Pulmonary TB patients often showed symptoms such as cough, fever, weight loss, and coughing up blood. In contrast, extra-pulmonary TB cases typically involved lymph node swelling, fluid in the chest cavity, spinal issues, and abdominal disease. These variations highlight the diagnostic difficulties linked to extra-pulmonary TB, as symptoms can mimic those of other chronic conditions. Advanced testing methods like CBNAAT, LPA, and culture were crucial for confirming cases that standard microscopy could not detect.

Risk factors including diabetes, malnutrition, HIV co-infection, smoking, and alcohol use were commonly seen among TB patients in this study. Diabetes was the most frequent comorbidity, followed by HIV. This supports evidence that diabetes raises the risk of TB and complicates treatment. Patients co-infected with HIV and TB showed more severe disease and needed closer monitoring during treatment.

The analysis of multi drug-resistant TB (MDR-TB) yielded several important observations. Many MDR-TB cases had a history of incomplete or irregular treatment, emphasizing the impact of poor adherence on resistance development. This finding highlights the need for ongoing patient education and support under the DOTS-plus strategy.

Treatment results for MDR-TB were encouraging but varied. Most patients achieved interim culture conversion within two to three months, indicating that shorter standardized regimens are effective. However, there were also instances of treatment failure, mortality, and required changes to regimens. A small number of cases advanced to extensively drug-resistant TB (XDR-TB), showing that challenges in managing resistance still exist. Adverse drug reactions such as nausea, liver damage, and nerve issues were also reported, which often led to poor adherence and necessary changes in treatment.

When examining treatment regimens for pulmonary and extra-pulmonary TB, first-line therapies (HRZE-based regimens) worked well for new patients. However, those experiencing relapse or needing re-treatment generally required longer or adjusted regimens. For extra-pulmonary TB, extended treatment and the addition of corticosteroids (in cases of meningitis and pericarditis) were occasionally necessary. In some complicated cases, surgery was needed to drain abscesses or relieve pressure from spinal involvement.

Overall, the findings highlight several critical points:

- Demographic trends show higher prevalence in males and among the socioeconomically productive age group.
- Comorbidity and risk factors like diabetes, HIV, and malnutrition significantly affect disease severity and treatment results.
- The diagnostic challenges of extra-pulmonary TB call for the use of advanced molecular tests alongside traditional methods.
- Adherence to treatment is essential, as irregular or incomplete care is a major cause of MDR-TB emergence.
- Treatment outcomes for MDR-TB are promising with newer regimens, though mortality and treatment failure are ongoing concerns.
- Adverse drug reactions considerably affect compliance and require active management strategies.

In conclusion, while strides have been made in managing TB through national programs, the ongoing presence of MDR-TB and the various forms of extra-pulmonary TB underscore the need for continuous monitoring, patient-focused care, and enhanced public health measures.

5. Conclusion

The analysis of 350 patients with pulmonary, extra-pulmonary, and multi-drug-resistant tuberculosis at the Government Medical College Hospital, Nagapattinam, highlights the seriousness of the TB problem and the increasing challenge of resistance in the southern coastal region of Tamil Nadu. Pulmonary TB is still the most common type, mainly affecting adults in their working years. Extra-pulmonary TB is a significant minority that needs careful diagnosis and clinical attention. The MDR-TB group, though smaller, shows the serious outcomes of poor adherence, treatment breaks, and insufficient follow-up.

The findings show that while standard treatments cure most drug-sensitive TB cases, MDR-TB results are still not good, with a significant number of failures and deaths despite newer treatments. This situation emphasizes the urgent need to strengthen community education, ensure patients stick to their treatments, provide nutritional and emotional support, and improve access to quick diagnostic tools.

As a referral center in the southern coastal area, the Government Medical College Hospital is crucial for managing TB. It connects rural and urban populations and ensures access to specialized care. The results from these studies highlight the need to support the Revised National Tuberculosis Control Programme (RNTCP) and Programmatic Management of Drug-Resistant TB (PMDT), while also focusing on local issues like poverty, malnutrition, diabetes, and HIV co-infection.

In conclusion, this study confirms that early diagnosis, consistent treatment, patient-focused care, and strong public health policies are vital to reducing TB cases and preventing more drug resistance. With combined efforts from healthcare providers, policymakers, and the community, the goal of eliminating TB by 2025 can be pursued more effectively, especially in the vulnerable coastal areas of Tamil Nadu.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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