Section: Pulmonary Medicine

Original Research Article

# A STUDY ON PREVALENCE AND TREATMENT OUTCOME OF PULMONARY VERSUS EXTRAPULMONARY TUBERCULOSIS IN KAKINADA DISTRICT

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***Received*** *: 05/05/2025*
***Received in revised form*** *: 08/07/2025*
***Accepted*** *: 31/07/2025*

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**DOI:** 10.70034/ijmedph.2025.3.250

**Source of Support:** Nil,
**Conflict of Interest:** None declared

**Int J Med Pub Health**
2025; 15 (3); 1358-1362

ABSTRACT

**Background:** Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, manifests as pulmonary (PTB) or extrapulmonary TB (EPTB). The burden of TB remains high in India, especially among immunocompromised individuals. Region-specific data are essential for optimizing TB control strategies under the National Tuberculosis Elimination Programme (NTEP). **Objectives:** To compare the prevalence and clinical characteristics of PTB and EPTB, identify common anatomical sites of EPTB, and evaluate treatment outcomes in relation to HIV and diabetes in Kakinada district.

**Material and Methods:** A prospective observational study was conducted between March 1 and May 31, 2025. Patients registered under NTEP at the District Tuberculosis Centre and Community Health Centres were included. Although the initial protocol planned for 200 participants, the final sample comprised 696 patients. Data on demographics, type of TB, comorbidities, diagnostic methods, site of involvement, drug resistance, and treatment outcomes were collected and analyzed using descriptive statistics.

**Results:** Of 696 TB cases, 472 (67.8%) had PTB and 224 (32.2%) had EPTB. PTB was predominant among males (69.7%), while EPTB was more common in females (57.6%). HIV co-infection was present in 6.8% and diabetes in 11.2% of cases. Microbiological confirmation was achieved in 72.9% of PTB and only 4.9% of EPTB cases. Lymph node (45.1%), pleural (14.8%), and abdominal TB (13.0%) were the most frequent EPTB sites. Treatment success rates were 95.2% for PTB and 98.7% for EPTB. Drug-resistant TB, seen only in PTB, had a success rate of 68%. HIV-positive and diabetic individuals had lower treatment success rates (82.1% and 82.7%, respectively).

**Conclusions:** PTB remains the predominant form of TB, especially in males and older adults. EPTB affects younger individuals and females more frequently, with excellent treatment outcomes despite diagnostic limitations. Targeted strategies are needed for drug-resistant, HIV-positive, and diabetic populations to further improve TB control.

**Keywords:** Tuberculosis, Pulmonary TB, Extrapulmonary TB, Treatment Outcome, HIV, Diabetes.

## INTRODUCTION

Tuberculosis (TB), caused by Mycobacterium tuberculosis, remains a significant global health burden, particularly in low- and middle-income countries. It manifests in two main forms: pulmonary tuberculosis (PTB), which affects the lungs and is the most contagious, and extrapulmonary tuberculosis (EPTB), which affects organs other than the lungs such as lymph nodes, pleura, bones, meninges, and

abdomen. While PTB continues to be more prevalent, the incidence of EPTB has been increasing, especially in populations with compromised immunity, such as those with HIV or diabetes mellitus.[1,2]

In India, EPTB accounts for a significant proportion of TB cases, with regional variations in prevalence and treatment outcomes. A recent study in South India reported that EPTB constituted a substantial proportion of notified TB cases, and several factors, including HIV co-infection, were associated with poor treatment outcomes.[2] Another Indian study highlighted the importance of identifying and managing EPTB promptly due to its diverse clinical presentations and diagnostic challenges.[3]

Studies comparing clinical profiles and outcomes of PTB and EPTB have shown that while PTB is more common in males and older adults, EPTB tends to affect younger individuals and females more frequently.[4,5] Despite the availability of standardized treatment under national TB control programs, outcomes vary depending on disease type, comorbidities, and diagnostic delays.

This study was conducted to assess the prevalence and treatment outcomes of PTB and EPTB in Kakinada district, with a special focus on patients with HIV and diabetes mellitus. It also aimed to identify the common anatomical sites involved in EPTB and compare diagnostic patterns and drug resistance between the two forms of TB.

## MATERIALS AND METHODS

**Study Design and Setting**

A prospective observational study was conducted by enrolling patients diagnosed with tuberculosis and registered under the National Tuberculosis Elimination Programme (NTEP) at the District Tuberculosis Centre (DTC) and various Community Health Centres (CHCs) in Kakinada district, Andhra Pradesh.

**Study Period**

Data were collected over a three-month period from March 1, 2025, to May 31, 2025.

**Study Population**

Initially, the research protocol planned for the inclusion of 200 patients. However, during the course of data collection, the sample size was expanded due to the availability of additional eligible cases and institutional approval, resulting in a final study population of 696 tuberculosis patients. This included all patients diagnosed with either pulmonary TB (PTB) or extrapulmonary TB (EPTB) during the specified study period. Patients with unknown or undocumented treatment outcomes were excluded from analysis.

**Data Collection**

Patient data were extracted from TB registers and NTEP records using a structured proforma. Variables included age, sex, type of TB (pulmonary or extrapulmonary), site of involvement (for EPTB), diagnostic method (microbiological or clinical), HIV status, diabetes mellitus status, type of case (new or previously treated), drug resistance status, and final treatment outcomes.

**Definitions**

**Cured:** A bacteriologically confirmed TB patient who completed treatment with documented negative results and no evidence of treatment failure.

**Treatment Completed:** A patient who completed treatment without bacteriological confirmation at the end but showed clinical improvement.

**Treatment Failure:** A patient requiring a change in treatment regimen due to non-response or drug resistance.

**Lost to Follow-Up:** A patient who did not start or interrupted treatment for ≥1 consecutive month.

**Not Evaluated:** A patient whose treatment outcome could not be assessed or documented.

**Statistical Analysis:**

Descriptive statistics were used to summarize demographic data, disease distribution, and treatment outcomes. Results were presented in tables as frequencies and percentages.

**Ethical Consideration:**

The study was approved by the Institutional Ethics Committee of Rangaraya Medical College and Government General Hospital, Kakinada (IEC/RMC/2025/1377/March 2025). Informed written consent was obtained from all participants prior to enrollment.

## RESULTS

A total of 696 tuberculosis (TB) patients were enrolled during the study period, comprising 472 (67.8%) cases of pulmonary TB (PTB) and 224 (32.2%) cases of extrapulmonary TB (EPTB) (Table 1).

**Demographic Distribution**

PTB was more commonly observed among males (n = 329; 69.7%), whereas EPTB showed a female predominance (n = 129; 57.6%). Overall, males accounted for 60.9% (n = 424) and females 39.1% (n = 272) of the study population. Age-wise analysis revealed that PTB peaked in the fifth decade (23%), while EPTB was most common in the third decade (19.6%) (Table 1).

**Comorbidities**

Of the total TB cases, 47 (6.8%) were HIV-positive, with PTB accounting for 74.5% (n = 35) and EPTB 25.5% (n = 12). Diabetes mellitus was documented in 78 patients (11.2%), of whom 87.2% (n = 68) had PTB and 12.8% (n = 10) had EPTB (Table 1).

**Diagnostic Patterns and Drug Resistance**

Microbiological confirmation was significantly higher in PTB cases (n = 344; 72.9%) compared to EPTB (n = 11; 4.9%), with the majority of EPTB cases (95.1%) diagnosed clinically. Drug resistance was detected exclusively in PTB cases (n = 15; 3.2%). Among these, H-mono resistance was seen in 53% (n = 8), short-course MDR in 33% (n = 5), and long-

course M/XDR in 13% (n = 2). No drug-resistant cases were reported among EPTB patients (Table 2).

**Anatomical Distribution of Extrapulmonary TB**

Among the 224 EPTB cases, lymph node involvement was the most frequent site (45.1%, n = 101), followed by pleural (14.8%, n = 33), abdominal (13.0%, n = 29), skeletal (excluding spine) (9.0%, n = 20), TB meningitis (8.4%, n = 19), spinal TB (8.3%, n = 19), genitourinary (1.0%, n = 2), and pericardial TB (0.6%, n = 1) (Table 3, Figure 1).

**Treatment Outcomes**

Treatment success (sum of cured and treatment completed) was high across both TB types. PTB cases demonstrated a success rate of 95.2%, with 46.5% cured and 38.0% completing treatment. EPTB cases had a higher success rate of 98.7%, largely due to the higher proportion completing treatment (84.0%) (Table 4).

When stratified by sex, treatment success was marginally higher among females (96.2%) than males (94.7%). Among drug-resistant TB cases, the success rate was 68.0%, with a high mortality rate of 24.0%. HIV-positive patients had a success rate of 82.1%, while diabetic patients achieved 82.7%. The detailed distribution of outcomes across groups is shown in Table 4 and visualized in Figure 2.

**Table 1: Distribution of Tuberculosis Cases by Type, Age, Sex, and Comorbidities**

| Parameter | Pulmonary TB (n=472) | Extrapulmonary TB (n=224) | Total (n=696) |
|---|---|---|---|
| **Percentage** | 67.8% | 32.2% | 100% |
| **Sex Distribution** | Male: 329 (69.7%)<br>Female: 143 (30.3%) | Male: 95 (42.4%)<br>Female: 129 (57.6%) | Male: 424 (60.9%)<br>Female: 272 (39.1%) |
| **Common Age Group** | 5th Decade (23%) | 3rd Decade (19.6%) | 5th Decade (22%) |
| **HIV Positive** | 35 (74.5%) | 12 (25.5%) | 47 (6.8%) |
| **Diabetes Mellitus** | 68 (87.2%) | 10 (12.8%) | 78 (11.2%) |

**Table 2: Diagnostic Basis and Drug Resistance**

| Parameter | Pulmonary TB (n = 472) | Extrapulmonary TB (n = 224) |
|---|---|---|
| Microbiologically Confirmed | 344 (72.9%) | 11 (4.9%) |
| Clinically Diagnosed | 128 (27.1%) | 213 (95.1%) |
| Drug Resistance Detected | 15 (3.2%) | 0 |
| Type of Drug Resistance | H-mono: 8 (53%)<br>Short MDR: 5 (33%)<br>Long M/XDR: 2 (13%) | NA |

**Table 3: Site Distribution of Extrapulmonary TB (n = 224)**

| Site of TB | Percentage (%) | Number of Cases |
|---|---|---|
| Lymph Node | 45.1% | 101 |
| Pleural | 14.8% | 33 |
| Abdominal | 13.0% | 29 |
| Skeletal (excl. spine) | 9.0% | 20 |
| TB Meningitis | 8.4% | 19 |
| TB Spine | 8.3% | 19 |
| Genitourinary | 1.0% | 2 |
| Pericardial | 0.6% | 1 |

**Table 4: Treatment Outcome by TB Type and Risk Groups**

| Group | Cured (%) | Treatment Completed (%) | Died (%) | Success Rate (%) |
|---|---|---|---|---|
| Pulmonary TB | 46.5 | 38.0 | 1.4 | 95.2 |
| Extrapulmonary TB | 1.8 | 84.0 | 0.6 | 98.7 |
| Males | 42.8 | 51.9 | 2.5 | 94.7 |
| Females | 32.2 | 64.0 | 2.1 | 96.2 |
| Drug-resistant TB | 44.0 | 24.0 | 24.0 | 68.0 |
| HIV Positive | 41.7 | 40.4 | 5.3 | 82.1 |
| Diabetic Individuals | 50.2 | 32.5 | 3.4 | 82.7 |

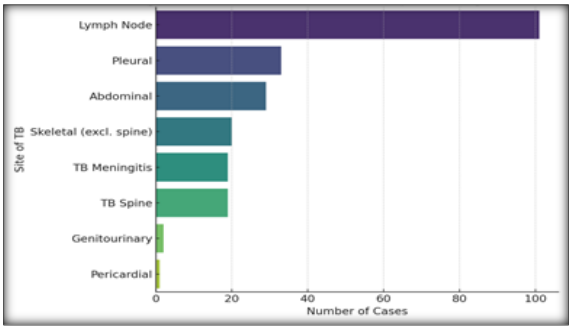


**Figure 1: Site Distribution of Extrapulmonary TB**

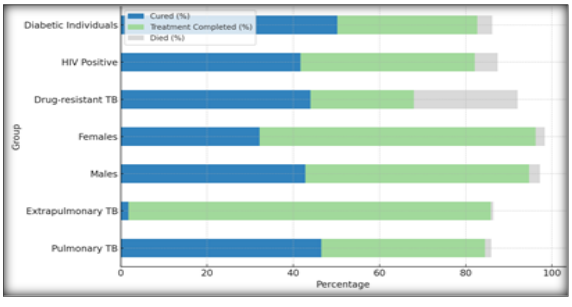


**Figure 2: Treatment Outcomes by TB Type and Risk Groups**

## DISCUSSION

This study provides an updated assessment of the epidemiological patterns and treatment outcomes of pulmonary (PTB) and extrapulmonary tuberculosis (EPTB) under the National Tuberculosis Elimination Programme (NTEP) in Kakinada district. The prevalence of EPTB in our cohort was 32.2%, which is slightly higher than previous reports from India but consistent with estimates from other South Asian and low-to-middle-income settings, where EPTB contributes substantially to the TB burden despite diagnostic challenges.[6,7]

Our findings indicate distinct demographic patterns. PTB was more prevalent among males and older adults, whereas EPTB showed a female predominance and was more common in younger age groups. This trend aligns with previous studies from Nepal and Uganda, which also reported higher EPTB rates in women and younger individuals, and PTB as more frequent in men.[7,10] Such gender and age-related variations may reflect differential exposure, healthcare-seeking behavior, and immunological or hormonal influences.

Lymph node TB was the most common site of EPTB (45.1%), followed by pleural (14.8%) and abdominal TB (13%), in agreement with studies from Bhutan, Iran, and India.[9,11] These patterns reinforce the need for heightened clinical suspicion and standardized diagnostic pathways for EPTB, particularly when microbiological confirmation is low—as seen in our cohort, where only 4.9% of EPTB cases were microbiologically confirmed. This mirrors diagnostic difficulties reported even in high-resource settings such as Germany.[12]

Treatment success rates were commendable: 95.2% in PTB and 98.7% in EPTB, underscoring the effectiveness of standardized regimens when patients are appropriately diagnosed and retained in care. Similar high success rates have been reported from Bhutan and Iran for EPTB.[9,11] However, the treatment success among drug-resistant TB patients was significantly lower at 68%, and outcomes were also suboptimal among HIV-positive (82.1%) and diabetic patients (82.7%), consistent with existing literature [6,8]. These findings highlight the pressing need for tailored interventions in high-risk groups.

Our study reaffirms that while the overall treatment program performance is robust, diagnostic delays and poor outcomes in vulnerable populations remain critical challenges. Strengthening microbiological testing, especially for EPTB, and ensuring timely intervention among drug-resistant, HIV-positive, and diabetic subgroups should be key programmatic priorities.

**Limitations**

Although the prospective design enhanced data reliability and minimized loss to follow-up, certain limitations must be acknowledged. Reporting and classification bias could not be completely excluded. Additionally, while site-specific data were available for most EPTB cases, a small proportion lacked anatomical detail in earlier datasets, which may marginally affect the precision of site-wise distribution.

## CONCLUSION

This study confirms that pulmonary TB remains the dominant presentation in Kakinada district, especially among males and older individuals. In contrast, extrapulmonary TB is more frequent among females and younger adults, with lymph node TB as the leading anatomical subtype. Despite diagnostic challenges, EPTB showed superior treatment success compared to PTB. However, drug-resistant TB, HIV co-infection, and diabetes mellitus were associated with poorer outcomes. Enhanced diagnostic tools, vigilant follow-up, and targeted management strategies for high-risk populations are essential to advance TB control under the NTEP framework.

## REFERENCES


1. Alavi SM, Salmanzadeh S, Bakhtiyariniya P, Albagi A, Hemmatnia F, Alavi L. Prevalence and treatment outcome of pulmonary and extrapulmonary pediatric tuberculosis in southwestern Iran. Caspian J Intern Med. 2015 Fall;6(4):213-9. PMID: 26644895; PMCID: PMC4649270.
2. VidyaRaj CK, Vadakunnel MJ, Mani BR, Anbazhagi M, Pradhabane G, Venkateswari R, et al. Prevalence of extrapulmonary tuberculosis and factors influencing successful treatment outcomes among notified cases in South India. Sci Rep. 2025 Mar 10;15(1):8290. doi: 10.1038/s41598-025-92613-5. PMID: 40065047; PMCID: PMC11893790.
3. PR, G. PB. A study of extra-pulmonary tuberculosis and its outcome. Int J Adv Med [Internet]. 2017 Jan. 23 [cited 2025 Jul. 16];4(1):209-13. Available from: https://www.ijmedicine.com/index.php/ijam/article/view/310
4. Mani S. T, Deshmukh H, Jadhav S, Deshmukh A, Kasat S, S. T, Roy A. Study of the clinical profile and treatment outcome of pulmonary and extrapulmonary tuberculosis patients coming to respiratory medicine OPD. Int J Res Med Sci [Internet]. 2023 Feb. 28 [cited 2025 Jul. 16];11(3):977-81. Available from: https://www.msjonline.org/index.php/ijrms/article/view/11645
5. Ramya VH, Gayathri G, Gangadharan V. A study of treatment outcomes of pulmonary tuberculosis and extrapulmonary tuberculosis patients in a tertiary care centre. Int J Adv Med [Internet]. 2017 Jul. 20 [cited 2025 Jul. 16];4(4):1133-7. Available from: https://www.ijmedicine.com/index.php/ijam/article/view/711
6. GPB, P. R. A study on treatment outcome and adverse drug reactions among extra pulmonary tuberculosis patients treated under DOTS in a tertiary care hospital. Int J Basic Clin Pharmacol [Internet]. 2016 Dec. 24 [cited 2025 Jul. 16];6(1):48-52. Available from: https://www.ijbcp.com/index.php/ijbcp/article/view/132
7. Kyagulanyi E, Mirembe J, Nantaayi B, Nalukenge S, Mukasa D, Tamale J, Oriekot A, Kamya MR, Baluku JB. The prevalence of concurrent pulmonary and extrapulmonary tuberculosis in Uganda: a retrospective study. Ther Adv Infect Dis. 2022 Jun 30;9:20499361221107304. doi: 10.1177/20499361221107304. PMID: 35795170; PMCID: PMC9252008.
8. Arnedo-Pena A, Romeu-Garcia MA, Meseguer-Ferrer N, Vivas-Fornas I, Vizcaino-Batllés A, Safont-Adsuara L, Bellido-Blasco JB, Moreno-Muñoz R. Pulmonary Versus Extrapulmonary Tuberculosis Associated Factors: A Case-Case Study. Microbiol Insights. 2019 Apr

4;12:1178636119840362. doi: 10.1177/1178636119840362. PMID: 30992667; PMCID: PMC6449815.
9. Jamtsho T, Harries AD, Malhotra S, Wangchuk D, Dophu U, Dorji T, Dendup T. The burden and treatment outcomes of extra-pulmonary tuberculosis in Bhutan. Public Health Action. 2013 Mar 21;3(1):38-42. doi: 10.5588/pha.12.0085. PMID: 26392994; PMCID: PMC4463083.
10. Sreeramareddy CT, Panduru KV, Verma SC, Joshi HS, Bates MN. Comparison of pulmonary and extrapulmonary tuberculosis in Nepal- a hospital-based retrospective study. BMC Infect Dis. 2008 Jan 24;8:8. doi: 10.1186/1471-2334-8-8. PMID: 18218115; PMCID: PMC2245948.
11. Hashemzadeh M, Dezfuli AAZ, Khosravi NA, Mehr FJ. A retrospective study of extrapulmonary tuberculosis in the Khuzestan province of southwest Iran between 2002 and 2023. BMC Infect Dis. 2024 Dec 25;24(1):1463. doi: 10.1186/s12879-024-10386-0. PMID: 39722034; PMCID: PMC11670499.
12. Wilmink J, Vollenberg R, Olaru ID, Fischer J, Trebicka J, Tepasse PR. Diagnostic Challenges in Extrapulmonary Tuberculosis: A Single-Center Experience in a High-Resource Setting at a German Tertiary Care Center. Infect Dis Rep. 2025 Apr 23;17(3):39. doi: 10.3390/idr17030039. PMID: 40407641; PMCID: PMC12101312.