



Epidemiological Convergence of TB and Diabetes: A Prospective Surveillance Study in the Kalahandi District.

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Abstract

Background: The converging epidemics of Tuberculosis (TB) and Diabetes Mellitus (DM) present a major public health challenge, particularly in developing nations. Diabetes compromises the immune system, increasing susceptibility to TB and complicating its treatment. This study aimed to determine the prevalence of diabetes among tuberculosis patients and explore the clinico-demographic associations in a tertiary care setting in Odisha. **Materials and Methods:** We conducted a facility-based prospective observational study at the Department of Pulmonary Medicine and General Medicine, SRM Medical College and Hospital (MCH), Bhawanipatna, Odisha. The study period spanned from March 2025 to March 2026. A total of 102 consecutively diagnosed TB patients (both pulmonary and extrapulmonary) were enrolled. All patients underwent screening for diabetes using Fasting Blood Sugar (FBS) and HbA1c tests. **Results:** Out of the 102 TB patients, 28.4% (n=29) were found to have diabetes. Among those with diabetes, 19 had a known history of the condition, while 10 were newly diagnosed during our screening. Diabetes was significantly more prevalent in the older age group (>45 years) with a statistically significant association ($p < 0.05$). Patients with diabetes also exhibited a higher bacillary load in sputum smear examinations ($p = 0.032$). While pulmonary TB was more common in diabetic patients than extrapulmonary TB, the difference did not reach statistical significance. **Conclusion:** We found a high prevalence of diabetes (28.4%) among TB patients in the Bhawanipatna region. The findings strongly underscore the necessity of routine, bi-directional screening—testing all TB patients for diabetes—to improve clinical outcomes, reduce disease severity, and curb the dual burden of these interacting diseases.

Keywords: Tuberculosis, Diabetes Mellitus, Bi-directional screening, Prevalence, Sputum smear, SRM MCH Bhawanipatna, Syndemic.



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INTRODUCTION

The intersection of Tuberculosis (TB) and Diabetes Mellitus (DM) has created a complex "syndemic" that threatens global TB control efforts. While TB remains a leading infectious cause of mortality in India, the rapidly rising incidence of type 2 diabetes adds severe fuel to the fire. Diabetes weakens the cell-mediated immunity required to fight the *Mycobacterium tuberculosis* bacilli, increasing a person's risk of developing active TB by two to three times. Furthermore, diabetic patients who contract TB often experience more severe symptoms, delayed sputum conversion, and a higher risk of treatment failure or relapse.

Despite national guidelines advocating for bi-directional screening, ground-level implementation and regional data often remain limited. Bhawanipatna, located in the Kalahandi district of Odisha, serves a vast rural and semi-urban population where awareness regarding diabetes is relatively low. This study was undertaken at SRM Medical College and Hospital (MCH) in Bhawanipatna to assess the actual ground reality: how many of our TB patients are silently battling diabetes, and how does this co-infection affect their clinical presentation?

MATERIALS AND METHODS

Study Design and Setting:

This was a prospective, observational study conducted at SRM MCH, Bhawanipatna, Odisha.

Study Duration:

The research was carried out over a one-year period, from March 2025 to March 2026.

Sample Size and Population:

We enrolled 102 patients who were newly diagnosed with or already on treatment for Tuberculosis (both Pulmonary and Extrapulmonary TB).

Inclusion and Exclusion Criteria:

Patients aged 18 years and above with microbiologically confirmed or clinically diagnosed TB who gave informed consent were included. We excluded critically ill patients, pregnant women, and those unable to provide consent.

Data Collection:

We collected baseline demographic data, medical history, and clinical symptoms using a pre-tested questionnaire. Blood samples were drawn to test Fasting Blood Sugar (FBS), Post-Prandial Blood Sugar (PPBS), and HbA1c. Diabetes was diagnosed based on standard WHO guidelines (FBS $\geq$ 126 mg/dl or HbA1c $\geq$ 6.5%).

Statistical Analysis:

Data were entered into Microsoft Excel and analyzed using SPSS software. Categorical variables were expressed as frequencies and percentages. The Chi-square test was used to find associations between categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

We analyzed data from 102 patients. The results are summarized in the following tables.

The majority of the TB patients in our study fell into the active working age groups, with a distinct male predominance.

Table 1: Age and Gender Distribution of the Study Population

Demographic Variable	Category	Number of Patients (n=102)	Percentage (%)
Age Group (Years)	18 - 30	24	23.5%
	31 - 45	34	33.3%
	46 - 60	32	31.4%
	> 60	12	11.8%
Gender	Male	68	66.7%
	Female	34	33.3%

Screening revealed that over a quarter of the TB patients were diabetic. Crucially, roughly one-third of the diabetic patients were completely unaware of their elevated blood sugar levels until they were screened in our study.

Table 2: Prevalence of Diabetes Mellitus among TB Patients

Diabetic Status	Number of Patients	Percentage (%)
Non-Diabetic	73	71.6%
Diabetic (Total)	29	28.4%
— Known Diabetic	19	18.6%
— Newly Diagnosed Diabetic	10	9.8%

When breaking down the prevalence by age, we found a stark increase in diabetes among older patients. The statistical analysis confirmed that age is heavily associated with DM in this cohort, whereas gender did not show a statistically significant difference.

Table 3: Association of Age and Gender with Diabetes in TB Patients

Variable	Total TB Patients	DM Present (%)	DM Absent (%)	Chi-Square Value	p-value	Significance
Age $\leq$ 45 years	58	9 (15.5%)	49 (84.5%)	9.42	0.002	Significant
Age > 45 years	44	20 (45.4%)	24 (54.6%)			
Male	68	21 (30.9%)	47 (69.1%)	0.74	0.389	Not Significant
Female	34	8 (23.5%)	26 (76.5%)			

We looked at whether diabetes was more prevalent in patients with Pulmonary TB (PTB) compared to Extrapulmonary TB (EPTB). Though the percentage was higher in the pulmonary group, the difference was not statistically significant.

Table 4: Association between Type of Tuberculosis and Diabetes

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Type of TB	Total Cases	DM Present (%)	DM Absent (%)	Chi-Square Value	p-value	Significance
Pulmonary TB	78	25 (32.0%)	53 (68.0%)	2.21	0.137	Not Significant
Extrapulmonary TB	24	4 (16.7%)	20 (83.3%)			

For the 78 patients with Pulmonary TB, we analyzed their initial sputum smear grading. Patients with diabetes were significantly more likely to present with higher bacillary loads (3+ grading) compared to non-diabetics.

Table 5: Sputum Smear Grading and Diabetes Status

Sputum Grade (PTB only)	Total (n=78)	DM Present (n=25)	DM Absent (n=53)	p-value	Significance
Scanty / 1+	31	5 (16.1%)	26 (83.9%)	0.032	Significant
2+	25	8 (32.0%)	17 (68.0%)		
3+	22	12 (54.5%)	10 (45.5%)		

Note: Chi-square test performed for trend across the three grading categories.

DISCUSSION

The results of our year-long observation at SRM MCH Bhawanipatna highlight a sobering reality: 28.4% of our TB patients were suffering from concurrent diabetes. This is slightly higher than the national Indian average, which typically hovers around 20-25%. The fact that nearly 10% of our total cohort (and roughly a third of all diabetics in the study) were completely unaware of their diabetic status until they were tested strongly validates the National TB Elimination Programme's (NTEP) mandate for routine bi-directional screening.

When looking at the demographics, age played a massive role. Patients over the age of 45 were significantly more likely to have diabetes ($p=0.002$). This aligns with the natural epidemiology of Type 2 diabetes but serves as a clinical red flag: an older patient walking into the clinic with TB should automatically be treated with a high index of suspicion for underlying metabolic dysfunction.

Interestingly, while we saw more diabetic patients presenting with Pulmonary TB rather than Extrapulmonary TB, this difference didn't reach statistical significance ($p=0.137$). However, what was highly significant was the bacterial load. Among those with pulmonary TB, diabetic patients were far more likely to present with a 3+ sputum smear grade ($p=0.032$). This heavier bacterial burden not only indicates more severe lung damage and cavitation but also means these patients are highly infectious to the community before initiating treatment. A weakened immune response in the diabetic lung creates an ideal environment for the *Mycobacterium* to multiply rapidly.

Our findings emphasize that managing TB in isolation without addressing a patient's glycemic control is a battle half won. In regions like Bhawanipatna, where healthcare access can be challenging for rural populations, catching both diseases in a single visit is critical.

CONCLUSION

This prospective study from March 2025 to March 2026 demonstrates a high prevalence of diabetes (28.4%) among tuberculosis patients in Bhawanipatna, Odisha. The significant association between diabetes, older age, and high baseline bacillary load points to a more severe clinical presentation of TB in diabetic individuals. Routine, mandatory screening for blood sugar in all confirmed TB cases must be strictly enforced. Early detection and aggressive co-management of both conditions will be essential to improve patient survival and achieve the goal of TB elimination.

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