



RESEARCH ARTICLE

Study of the Prevalence of Pulmonary Tuberculosis in Patients with Diabetes Mellitus at Katihar Medical College

Mohd Atif Khan¹, Dr. Pramod Kumar Agarwal², Md. Shueb Alam³, Md. Aftab Alam⁴, Dr. Saimuddin⁵, Dr. Nayeem Shaik⁶

ABSTRACT

Abstract: Background: Diabetes mellitus (DM) is an important risk factor for pulmonary tuberculosis (PTB). Chronic hyperglycaemia impairs host immune responses and increases susceptibility to Mycobacterium tuberculosis infection and active disease. The coexistence of DM and PTB represents an important clinical and public-health concern, particularly in high-burden settings such as India.

Aim: To determine the prevalence of pulmonary tuberculosis among patients with diabetes mellitus attending Katihar Medical College and Hospital, Katihar, Bihar.

Methods: A hospital-based cross-sectional observational study was conducted over 18 months, from March 2024 to August 2025, among 100 patients with diabetes mellitus attending the Outpatient and Inpatient Departments of General Medicine. Participants underwent detailed clinical evaluation, assessment of glycaemic status, laboratory investigations, chest radiography and, where indicated, high-resolution computed tomography. Suspected PTB was evaluated by sputum examination for acid-fast bacilli and molecular testing using CBNAAT or TRUNAT. Data were analysed using SPSS version 22.0 and Microsoft Excel 2019.

Results: Pulmonary tuberculosis was identified in 10 of 100 diabetic patients, giving a prevalence of 10.0%. The mean age of participants was 48.33 years, and 57.0% were male. Among the study population, 82.0% were known cases of diabetes mellitus. Among patients with PTB, cough was the most frequent symptom, followed by fever, weight loss and night sweats. Chest radiography was suggestive of PTB in 10.0% of participants; AFB positivity was observed in 2.0% and CBNAAT positivity in 8.0%.

Conclusion: Pulmonary tuberculosis was an important comorbidity among patients with diabetes mellitus in this hospital-based study. The findings support active clinical assessment and appropriate microbiological and radiological evaluation for PTB among diabetic patients, together with attention to glycaemic status and other associated risk factors.

Keywords: Diabetes mellitus; pulmonary tuberculosis; TB-DM comorbidity; glycaemic status; CBNAAT.

Indian J. Pharm. Biol. Res. (2026); <https://doi.org/10.30750/ijpbr.14.4.53>

INTRODUCTION

Mycobacterium tuberculosis is the cause of pulmonary tuberculosis (PTB), a chronic infectious disease that is primarily spread by airborne droplets from infected people. It mostly affects the lung parenchyma and can cause caseous necrosis, granuloma development, and gradual lung tissue deterioration. Chronic cough, fever, night sweats, weight loss, haemoptysis, and chest pain are among the typical clinical symptoms. India has a significant disease burden from tuberculosis, which is still a major source of morbidity and mortality globally, especially in low- and middle-income nations. Malnutrition, medication resistance, HIV co-infection, delayed diagnosis, and diabetes mellitus all contribute to ongoing transmission and unfavourable consequences. The most contagious type of tuberculosis and the main cause of community transmission is pulmonary tuberculosis. Cavitory lesions, consolidation, and upper-lobe infiltrates are typical radiological signs [1, 2].

Clinical evaluation and radiological and

microbiological testing, such as sputum smear microscopy, culture, and molecular assays like CBNAAT or TRUNAT, are used to support the diagnosis. Reducing transmission and enhancing clinical outcomes need early identification and timely beginning of suitable treatment. One significant risk factor for pulmonary TB is diabetes mellitus. In addition to impairing innate and adaptive immunological responses, such as neutrophil and macrophage activity, chronic hyperglycemia may make a person more vulnerable to active tuberculosis. Adverse treatment-related outcomes and more severe disease have also been linked to poor glycaemic management. As a result, the coexistence of diabetes and tuberculosis has grown to be a significant clinical and public health concern, especially in areas where both conditions are quite common [3].

In order to determine the prevalence and clinical characteristics of pulmonary tuberculosis among patients with diabetes mellitus, the current study was conducted in the Department of General Medicine at Katihar Medical

¹Junior Resident, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

²Professor & Head, Department of General Medicine, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

³Assistant Professor, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

⁴Professor, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

⁵ Junior Resident, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

⁶Department of General Medicine, JR 3 Katihar Medical College, Katihar, Bihar, India

Corresponding Author: Mohd Atif Khan, Junior Resident, Department of General Medicine, Katihar Medical College, Katihar, Bihar, India

How to cite this article: Mohd Atif Khan MA, Agarwal PK, Alam MS, Alam MD. Study of the Prevalence of Pulmonary Tuberculosis in Patients with Diabetes Mellitus at Katihar Medical College. Indian J. Pharm. Biol. Res. 2026;14(4):365-372

Source of support: Nil

Conflict of interest: None.

Received: 15/09/2026 **Revised:** 26/09/2026 **Accepted:** 10/10/2026

College and Hospital, Katihar, Bihar. The study also assessed clinical manifestations, related risk factors, radiological and microbiological results, duration and status of diabetes, and demographics. The results could lead to more integrated management of diabetic patients at higher risk, early detection of PTB, and appropriate diagnostic evaluation [4].

Table 01: distribution of age

Age (Years)	Frequency	Percentage
10 to 24	8	8.0
25 to 39	14	14.0
40 to 54	40	40.0
55 to 69	33	33.0
70 to 75	5	5.0
Total	100	100.0
Mean Age: 48.33		

AIM

To determine the prevalence of pulmonary tuberculosis among patients with diabetes mellitus attending Katihar Medical College and Hospital, Katihar, Bihar.

OBJECTIVES

- To determine the prevalence of pulmonary TB among patients with diabetes mellitus.
- To study the demographic and clinical characteristics of diabetic patients diagnosed with pulmonary TB.
- To assess the association between pulmonary TB and duration of diabetes mellitus.
- To assess the association between pulmonary TB and glycaemic status.
- To describe the common clinical manifestations and diagnostic findings among diabetic patients with pulmonary TB.

MATERIALS AND METHODS

Study design and setting

A hospital-based cross-sectional observational study was

Table 02: Distribution Of Sex

SEX	FREQUENCY	PERCENTAGE
Male	57	57.0
Female	43	43.0
Total	100	100.0

Table 03: Distribution Of Dm Status

Dm Status	No. Of Patients	% Of Patients
Known	82	82.0
New	18	18.0
Total	100	100.0

Table 04: Distribution Of Duration Of Dm

Duration Of Dm (Years)	No. Of Patients	% Of Patients
0 to 4	35	35.0
5 to 9	43	43.0
10 to 14	20	20.0
15 to 19	1	1.0
20 and above	1	1.0
Total	100	100.0
Mean Duration: 5.82		

Table 05: Distribution Of Cough

<i>Cough</i>	<i>No. Of Patients</i>	<i>% Of Patients</i>
No	69	69.0
Yes	31	31.0
Total	100	100.0

Table 06: Distribution Of Associated Symptoms

<i>Associated Symptoms</i>	<i>No. Of Patients</i>	<i>% Of Patients</i>
Fever	25	25.0
Hemoptysis	3	3.0
Weight Loss	12	12.0
Night Sweat	12	12.0
Loss of Appetite	16	16.0
Total	100	100.0

Table 07: Distribution Of Adverse Habits

<i>Variable</i>	<i>Category</i>	<i>Number Of Patients</i>	<i>% Of Patients</i>
TB Contact	No	85	85.0
	Yes	15	15.0
Smoking	No	77	77.0
	Yes	23	23.0
Alcohol	No	80	80.0
	Yes	20	20.0
Total		100	100.0

Table 08: Distribution Of Cxr Findings

<i>Cxr Findings</i>	<i>Number Of Patients</i>	<i>% Of Patients</i>
Normal	63	63.0
Other	27	27.0
Suggestive	10	10.0
Total	100	100.0

Table 09: Distribution Of Hrct Findings

<i>HRCT Findings</i>	<i>Frequency</i>	<i>Percentage</i>
Not Performed	90	90.0
Non-Specific Findings	4	4.0
Suggestive of Pulmonary Tuberculosis	6	6.0
Total	100	100.0

Table 10: Distribution Of Laboratory Findings

<i>Diagnosis Basis</i>	<i>Number Of Patients</i>	<i>% Of Patients</i>
No Test Findings	90	90.0
AFB Positive	2	2.0
CBNAAT Positive	8	8.0
Total	100	100.0

Table 11: Distribution Of Prevalence Of Ptb

<i>Ptb Status</i>	<i>Number Of Patients</i>	<i>% Of Patients</i>
No	90	90.0
Yes	10	10.0
Total	100	100.0

Table 12: Assessment Of Adverse Habit In Prevalence Of Ptb

<i>Variable</i>	<i>Positive Cases</i>	<i>% Of Ptb Positive Cases</i>
Smoking	5	50.0
Alcohol	4	40.0
none	1	
Total	10	100.0
χ^2 sq value	3.02	
p-value	<0.05	

conducted in the Department of General Medicine, Katihar Medical College and Hospital, Katihar, Bihar, over a period of 18 months from March 2024 to August 2025.

Study population and sample size

A total of 100 patients with diabetes mellitus attending the Outpatient Department (OPD) or admitted to the Inpatient Department (IPD) of General Medicine were included. Patients were evaluated for clinical manifestations suggestive of pulmonary tuberculosis.

Inclusion criteria

All new and known cases of diabetes mellitus, patients aged 10–75 years, and patients who provided written informed consent were included.

Exclusion criteria

Patients who were HIV positive, had gestational diabetes mellitus or other forms of diabetes, were receiving long-term steroid therapy or immunosuppressive drugs, were critically ill, or refused consent were excluded.

Clinical evaluation and data collection

All patients underwent detailed clinical history and

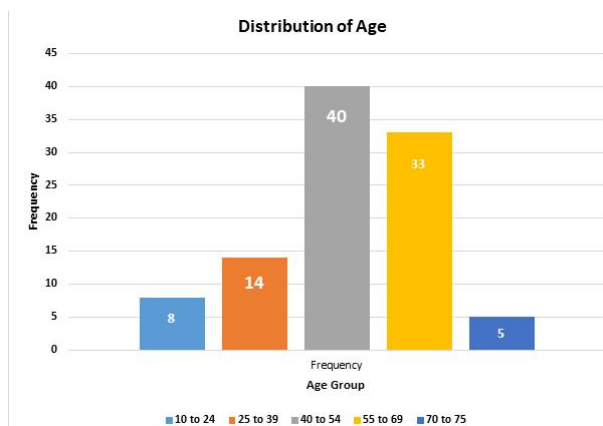


Figure 01: Distribution Of Age

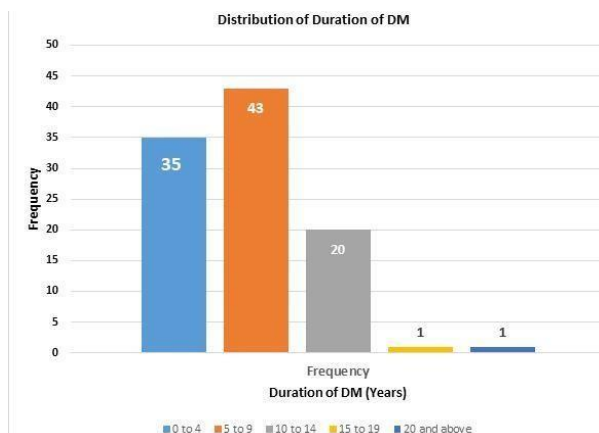


Figure 04: Distribution Of Duration Of Dm

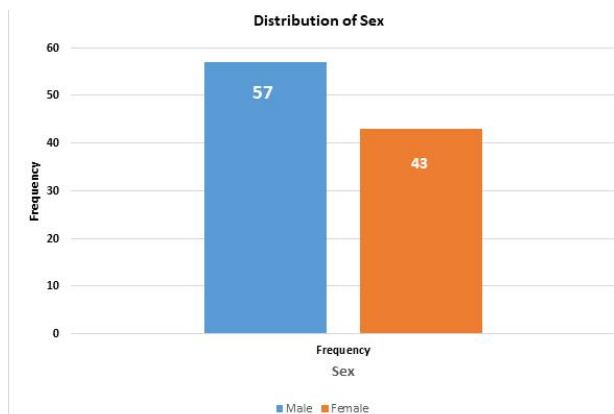


Figure 02: Distribution Of Sex

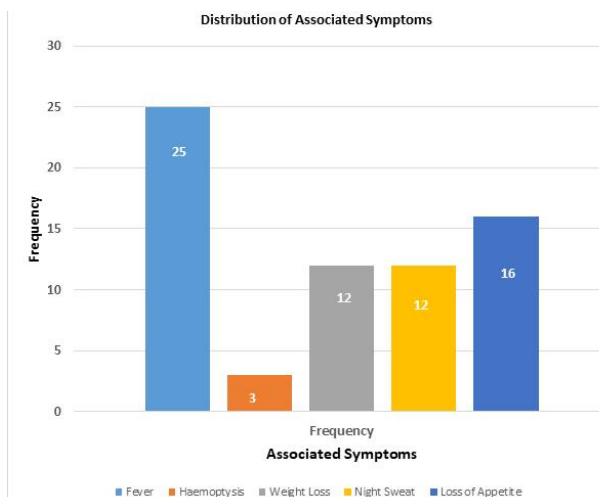


Figure 05: Distribution Of Cough

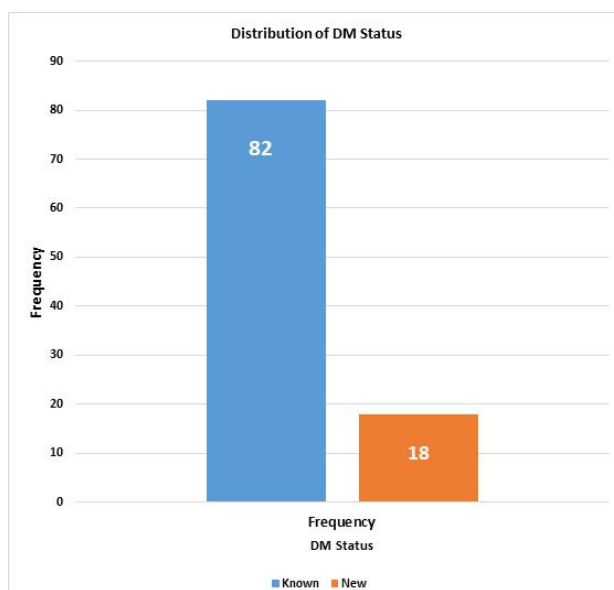


Figure 03: Distribution Of Dm Status

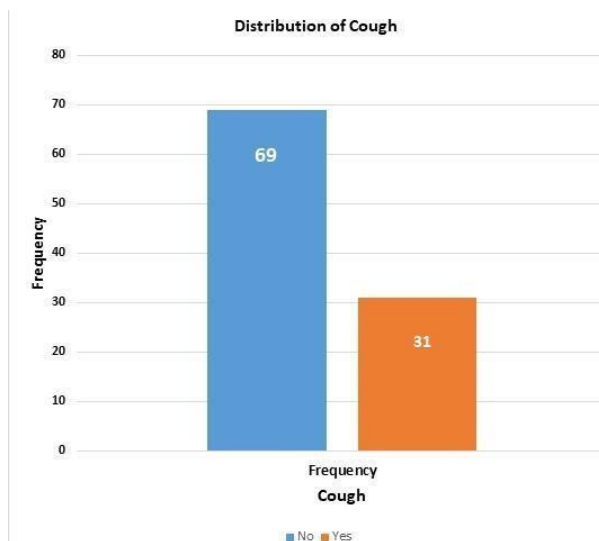


Figure 06: Distribution Of Associated Symptoms

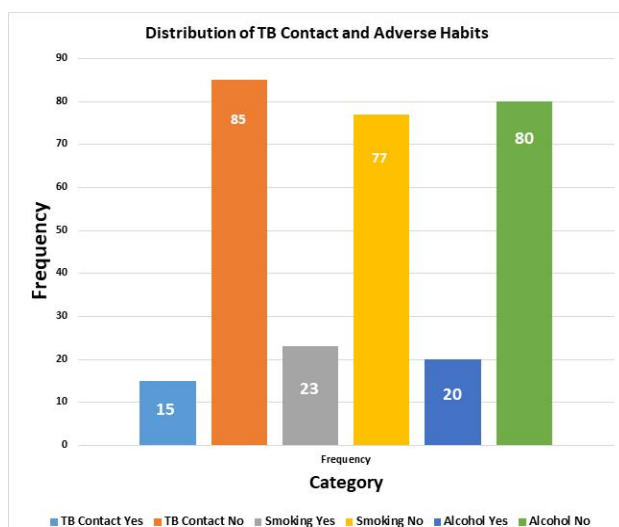


Figure 07: Distribution Of Adverse Habits

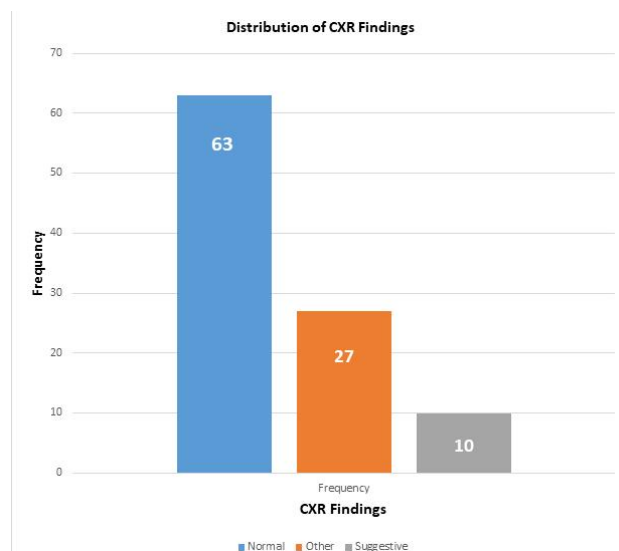


Figure 08: Distribution Of Cxr Findings

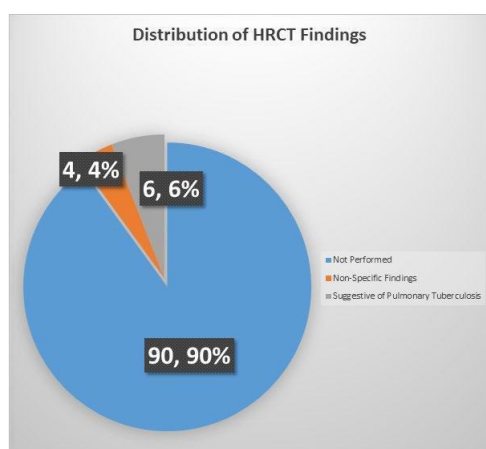


Figure 09: distribution of hrct findings

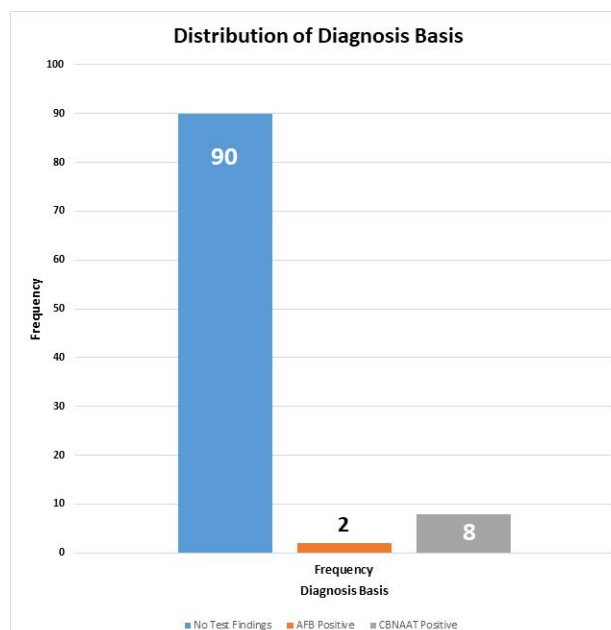


Figure 10: Distribution Of Laboratory Findings

physical examination. Symptoms suggestive of pulmonary tuberculosis, including chronic cough, fever, hemoptysis, weight loss, night sweats, loss of appetite and history of tuberculosis contact, were assessed. Demographic characteristics, diabetes status, duration of diabetes, treatment history, glycaemic status and associated risk

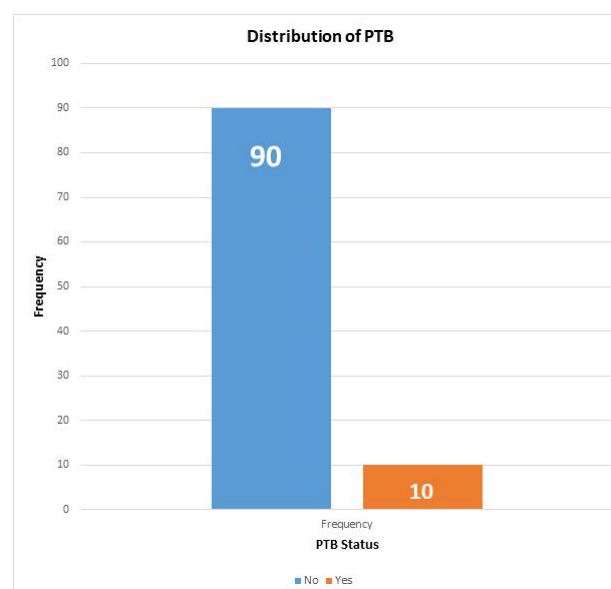


Figure 11: Distribution Of Prevalence Of Ptb

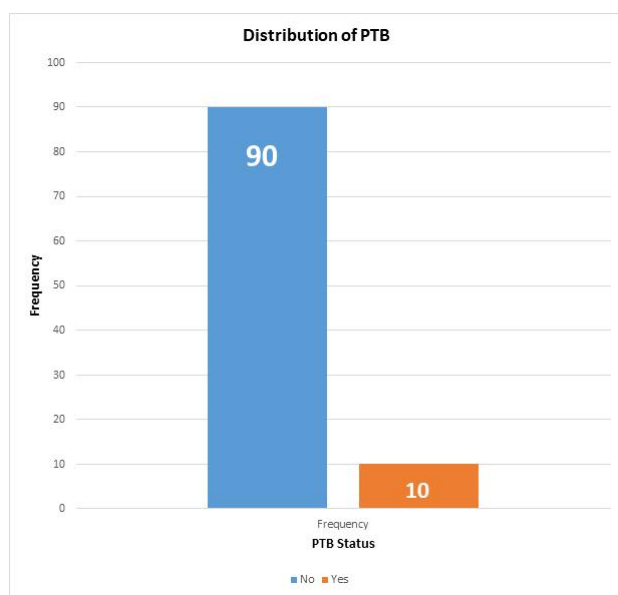


Figure 12: Assessment Of Adverse Habit In Prevalence Of Ptb

factors were recorded using a structured Tuberculosis Assessment Tool.

Diagnostic criteria and assessment for pulmonary tuberculosis

Diabetes mellitus was diagnosed according to standard criteria, including fasting plasma glucose ≥ 126 mg/dL, 2-hour plasma glucose ≥ 200 mg/dL, random plasma glucose ≥ 200 mg/dL, or HbA1c $\geq 6.5\%$. Laboratory investigations included random blood sugar, HbA1c, serum electrolytes, blood urea, serum creatinine, urine ketone bodies and serum ADA. Evaluation for PTB included sputum examination for acid-fast bacilli and molecular testing by CBNAAT or TRUNAT. Chest X-ray was performed for radiological assessment, with high-resolution computed tomography performed wherever indicated.

Statistical analysis

All collected data were entered into Microsoft Excel 2019 and cleaned before analysis. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean and standard deviation. Statistical analysis was performed using SPSS version 22.0 and Microsoft Excel 2019. The chi-square test and independent t-test were used wherever applicable, and odds ratios with confidence intervals were calculated when required. A p-value < 0.05 was considered statistically significant.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Katihar Medical College and Hospital before commencement of the study. Written informed consent was obtained from all participants. Confidentiality of patient information was maintained, and collected data were used solely for academic and research purposes.

RESULTS

DISCUSSION

The goal of the current hospital-based cross-sectional investigation was to ascertain the clinical profile and prevalence of pulmonary tuberculosis (PTB) in patients with diabetes mellitus (DM) who were receiving care at Katihar Medical College and Hospital in Bihar. Ten of the 100 diabetes patients assessed during the course of the 18-month study period had PTB, yielding an overall prevalence of 10.0%. This result indicates that PTB is a significant comorbidity in high-burden diabetic patients. However, given the hospital-based methodology and limited sample size, the observed prevalence should not be regarded as representative of the overall diabetic population. The study population's average age was 48.33 years. The largest age group of participants was 40–54 years old (40%), followed by 55–69 years old (33%). As a result, the majority of participants were middle-aged or older. Because both diabetes and tuberculosis are more common as people age, suggesting cumulative metabolic and infectious risk, this pattern is clinically significant. Of the study population, 57% were men and 43% were women [5,6].

The modest male predominance is consistent with the known epidemiological burden of tuberculosis among males, even though the study was not intended to determine a sex-specific risk of PTB. Of the individuals, 82% had a history of diabetes, whereas 18% had just received a diagnosis. The average duration of diabetes was 5.82 years, with 20% having the disease for 10–14 years and 43% for 5–9 years. The known biological connection between the two conditions is supported by the presence of PTB in this diabetic population. Immunological dysfunction linked to diabetes, namely impairment of cellular and macrophage immunological responses, may enhance vulnerability to Mycobacterium TB infection and the development of active illness. The significance of this relationship is supported by a recent Cochrane analysis, which found that diabetes likely raises the chance of contracting tuberculosis [7, 8].

The significance of symptom-based assessment is further shown by the clinical results. Of the entire study

population, 31% reported having a cough, 25% reported having a fever, 16% reported losing their appetite, 12% reported having night sweats and weight loss, and 3% had haemoptysis. These symptoms indicate clinically significant manifestations that should warrant investigation of tuberculosis in diabetic patients, especially when chronic or unexplained, even though they were reported for the entire study population and were not cross-tabulated individually against PTB status. According to available data, people who are more susceptible to tuberculosis should receive comprehensive care for respiratory and constitutional symptoms [9, 10].

The identification of PTB was greatly aided by radiological and microbiological studies. 10% of participants had chest radiography that suggested PTB, while 6% of participants had selective HRCT results that suggested PTB. Crucially, microbiological testing showed that 2% of samples had AFB positivity and 8% had CBNAAT positivity. Thus, the majority of the study's laboratory-confirmed positive results were due to molecular testing. This discovery bolsters the present focus on quick molecular diagnostic techniques for suspected tuberculosis since they can reveal medication resistance and enable earlier detection. The existence of negative behaviours among PTB-positive patients was another finding. Five (50%) of the ten PTB-positive individuals reported smoking, four (40%) reported drinking, and one (10%) reported neither [11].

These results point to a potential link between negative behaviours and PTB in the study population; however, a conclusive independent association cannot be established because the available data do not show the full two-way distribution of alcohol and smoking exposure across PTB-positive and PTB-negative groups. Despite this, alcohol and tobacco use are known to increase the risk of tuberculosis and have a negative impact on the course of the illness. The results have applications for coordinated TB-DM care. When clinically necessary, diabetic patients should have a proper clinical evaluation for tuberculosis, including fast molecular testing and chest imaging [12].

However, since poor glycaemic control may negatively impact treatment response and outcomes, diabetes management should continue to be a crucial component of TB therapy. Therefore, in high-burden areas like India, integrated methods to screening, diagnosis, treatment, and follow-up are especially important.

LIMITATIONS

The study has several limitations. Its single-centre, cross-sectional design and sample size of 100 limit generalizability

and preclude determination of causal relationships. In addition, the available results do not provide detailed comparative analysis of glycaemic control, duration of diabetes, or individual symptoms between PTB-positive and PTB-negative groups. Larger multicentric prospective studies with multivariable analysis are required to identify independent predictors of PTB among diabetic patients.

CONCLUSION

Pulmonary tuberculosis was identified in 10% of the 100 patients with diabetes mellitus evaluated in this hospital-based study at Katihar Medical College and Hospital. The majority of the study participants were middle-aged, with a small male preponderance. Common clinical complaints included cough, fever, appetite loss, weight loss, and night sweats. Chest radiography, HRCT, and microbiological tests helped identify PTB. Rapid molecular testing is helpful in suspected cases, as seen by the higher CBNAAT positivity (8%) compared to AFB positivity (2%). Alcohol consumption and smoking were common among PTB-positive patients. These results highlight the significance of performing suitable radiographic and fast molecular diagnostic procedures and maintaining clinical suspicion for PTB in diabetic individuals. Integrated TB-DM screening and management, together with adequate glycaemic care, may facilitate earlier diagnosis and improve patient outcomes. Larger multicentric prospective studies are warranted to establish prevalence and independent risk factors more reliably.

REFERENCES

1. Franco JVA, Bongaerts B, Metzendorf MI, Risso A, Guo Y, Peña Silva L, et al. Diabetes as a risk factor for tuberculosis disease. *Cochrane Database Syst Rev.* 2024;8:CD016013. doi: 10.1002/14651858.CD016013.pub2.
2. World Health Organization. WHO consolidated guidelines on tuberculosis. Module 3: diagnosis. Geneva: World Health Organization; 2025.
3. World Health Organization. Global tuberculosis report 2025. Geneva: World Health Organization; 2025.
4. Boadu AA, Yeboah-Manu M, Osei-Wusu S, Yeboah-Manu D. Tuberculosis and diabetes mellitus: the complexity of the comorbid interactions. *Int J Infect Dis.* 2024; 146:107140. doi: 10.1016/j.ijid.2024.107140.
5. Vaishya R, et al. Diabetes and tuberculosis syndemic in India: a narrative review of facts, gaps in care and challenges. *J Diabetes.* 2024;16(5). doi:10.1111/1753-0407.13427.
6. Khattak M, et al. Tuberculosis treatment challenges in TB-diabetes comorbid patients: a systematic review and meta-analysis. *Ann Med.* 2024;56(1):2313683. doi:10.1080/07853890.2024.2313683.

7. Zahid M, Afaq S, Shafique K, Qazi FK, Ashfaq U, Asim M, et al. Effect of glyceemic control on tuberculosis treatment outcomes among patients with tuberculosis and diabetes mellitus: a systematic review and meta-analysis. *Trop Med Int Health*. 2025;30(8):749-762. doi:10.1111/tmi.14140.
8. Gupta A, Chandra E, Mrigpuri P. Navigating the dual burden of diabetes mellitus and tuberculosis: a comprehensive review of clinical and public health strategies. *Indian J Tuberc*. 2025;72(2):253-258. doi: 10.1016/j.ijtb.2025.03.011.
9. Shewade HD, Ravichandran P, Satish S, Pradeep SK, Jeyashree K, Mahajan P, et al. Effect of glyceemic control and type of diabetes treatment on TB treatment outcomes among people with TB-diabetes: a systematic review (updated August 2024). *PLoS One*. 2025;20(7): e0328619. doi: 10.1371/journal.pone.0328619.
10. Zhou G, Guo X, Cai S, Zhang Y, Zhou Y, Long R, et al. Diabetes mellitus and latent tuberculosis infection: an updated meta-analysis and systematic review. *BMC Infect Dis*. 2023; 23:770. doi:10.1186/s12879-023-08775-y.
11. Xu G, Hu X, Lian Y, Li X, et al. Diabetes mellitus affects the treatment outcomes of drug-resistant tuberculosis: a systematic review and meta-analysis. *BMC Infect Dis*. 2023; 23:813. doi:10.1186/s12879-023-08765-0.
12. World Health Organization. WHO consolidated guidelines on tuberculosis: module 1, prevention—tuberculosis preventive treatment. 2nd ed. Geneva: World Health Organization; 2024.