International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

To Study the Prevalence of Diabetes Mellitus in Patients with Newly Diagnosed Pulmonary Tuberculosis at A Tertiary Care Hospital, Jaipur

Dr Suresh Kumar Bishnoi[1], Dr Mahendra Kumar Bainara[2], Dr Jitendra Kumar Sharma[3]

[1] Junior Resident, Department of Respiratory Medicine, Institute of Respiratory Disease, SMS Medical College, Jaipur
[2] Senior Professor, Department of Respiratory Medicine, Institute of Respiratory Disease, SMS Medical College, Jaipur
[3] Assistant Professor, Institute of Respiratory Diseases, SMS Medical College, Jaipur

Corresponding Author:

Dr Jitendra Kumar Sharma
Assistant Professor, Institute of Respiratory Diseases, SMS Medical College, Jaipur.

Received: 13-09-2025
Accepted: 10-10-2025
Available online: 26-10-2025

ABSTRACT

Background: Diabetes Mellitus (DM) alters host immune response to Mycobacterium tuberculosis, leading to atypical and more extensive disease.
Objective: To assess the prevalence of DM among newly diagnosed Pulmonary Tuberculosis (PTB) patients and evaluate its clinical, radiological, and treatment implications.
Methods: A cross-sectional study was conducted at the Institute of Respiratory Diseases, tertiary care hospital in north west zone of Rajasthan (July 2023–September 2024) among 210 newly diagnosed PTB patients. Diabetes was assessed using fasting blood sugar, postprandial sugar, and HbA1c (ADA 2017 criteria). Clinical, microbiological, and radiological findings were compared between diabetic and non-diabetic groups.
Results: The prevalence of DM was 38.1% (known 23.8%, newly diagnosed 14.3%). Diabetic TB patients were older (mean age 54.6 ± 9.4 years), had higher BMI, and showed lower lung field (60%) and multiple cavitary lesions (75%) more often than non-diabetics. Sputum conversion was slower and relapse higher among diabetics.
Conclusion: Diabetes significantly modifies TB presentation, radiology, and outcomes. Routine bidirectional screening and integrated management can improve prognosis.

Keywords: *Diabetes Mellitus, Pulmonary Tuberculosis, TB–DM comorbidity, Cavitary lesions, HbA1c, Sputum conversion, Radiological patterns.*

INTRODUCTION

Tuberculosis (TB) remains one of the leading causes of infectious mortality worldwide, with India bearing the highest burden globally (1,2). At the same time, the prevalence of Diabetes Mellitus (DM) is rising sharply, creating a dangerous intersection of two epidemics that amplify each other's impact (3,4). Diabetes increases susceptibility to TB due to impaired macrophage function, reduced cytokine production, and delayed granuloma formation, leading to atypical clinical and radiological patterns and poorer treatment response (5,6). Studies have demonstrated that hyperglycemia triples the risk of developing active TB and worsens its course (7,8). Reports from India and Southeast Asia show atypical lower-lobe involvement, multiple cavities, and pleural effusion more often in diabetic TB (9,10,11). Despite growing evidence, data from North Indian tertiary care centers remain limited, prompting this study to assess the prevalence of DM in newly diagnosed PTB patients and evaluate its influence on disease pattern and outcomes.

MATERIALS AND METHODS

A cross-sectional study was conducted at the **Institute of Respiratory Diseases, Sawai Man Singh Medical College, Jaipur**, from July 2023 to September 2024.
Inclusion: Adults ≥18 years with newly diagnosed PTB (sputum AFB smear or CBNAAT positive).
Exclusion: HIV-positive, pregnant, or chronic lung disease patients.

All patients underwent complete clinical evaluation, sputum and radiological testing, and DM screening (FBS, PPBS, HbA1c).

Diabetes was defined using **ADA 2017 criteria**: FBS ≥126 mg/dL, PPBS ≥200 mg/dL, or HbA1c ≥6.5%. Statistical analysis used SPSS 25.0, with $p<0.05$ considered significant.

RESULTS

The study included **210 patients** (128 males, 82 females; mean age 47.8 ± 12.4 years). Of these, **80 (38.1%)** had diabetes — 50 known and 30 newly diagnosed.

Table 1: Demographic and Clinical Profile

Parameter	Non-Diabetic (n=130)	Diabetic (n=80)	P-value
Mean Age (years)	43.2 ± 10.7	54.6 ± 9.4	<0.05
Male (%)	58.4	64.5	NS
BMI (kg/m²)	21.3 ± 3.4	23.1 ± 4.2	<0.05
AFB Positive (%)	62	70	NS
CBNAAT Positive (%)	63	39	<0.05

Interpretation: Diabetic TB patients were older, heavier, and had atypical presentation with lower CBNAAT positivity.

Table 2: Radiological Distribution

Radiological Finding	Non-Diabetic	Diabetic	P-value
Upper Lung Field	72 (55%)	2 (2%)	0.1
Lower Lung Field	10 (8%)	48 (60%)	**0.001**
Cavitary Lesion	39 (30%)	56 (70%)	<0.01
Miliary Pattern	26 (20%)	35 (44%)	<0.05
Pleural Effusion	38 (29%)	32 (40%)	0.07

Table 3: Cavitary Lesions

Type	Non-Diabetic	Diabetic	P-value
Single	25 (64%)	14 (25%)	0.02
Multiple	14 (36%)	42 (75%)	<0.01

Table 4: Glycemic Control vs Radiological Severity

HbA1c Range (%)	No. of Patients	Cavitary Lesions (%)	Bilateral Involvement (%)
<7.0	16	31	12
7.0–8.9	34	65	42
≥9.0	30	80	70

Interpretation: Poor glycemic control correlated with greater radiological severity, as reported in earlier studies.[3,9,10,11]

Table 5: Treatment Outcomes

Outcome	Non-Diabetic	Diabetic	P-value
Sputum Conversion (2 months)	87.7%	72.5%	0.01
Sputum Conversion (6 months)	98.5%	90.0%	0.04
Treatment Success	93.1%	82.5%	0.02
Relapse	3.1%	8.8%	0.03
Mortality	1.5%	5.0%	0.06

DISCUSSION

This study establishes a 38.1% prevalence of diabetes among newly diagnosed PTB patients in Jaipur, reflecting the national trend of dual epidemics (1,2,4,12). The proportion is comparable to studies by Nilofer Shaik et al. (2016) and Vijayan et al. (2020), who reported prevalence rates between 32–40% in similar cohorts (7,11). Diabetic TB patients were significantly older and more likely to have lower lung field involvement (60%), multiple cavities (75%), and miliary spread (44%), consistent with findings by Perez-Guzman et al. and Bacakoglu et al. (9,10,13). The pathophysiology underlying this atypical presentation includes impaired macrophage activation, decreased IL-12 and IFN-γ production, and vascular compromise leading to preferential lower-lobe disease (14–16). Poor glycemic control

(HbA1c ≥9%) was associated with severe bilateral lesions and higher radiological grades, as noted by Restrepo et al. (2007) and Buasroung et al. (2022) (17,18). These findings reinforce that hyperglycemia adversely affects host immunity and pulmonary pathology in TB-DM co-infection.

Treatment outcomes were poorer among diabetics, with delayed sputum conversion and higher relapse and mortality—similar to reports by Dooley et al. (2009) and Faurholt-Jepsen et al. (2012) (19,20). The pharmacokinetic interaction between rifampicin and oral hypoglycemics, along with immune dysfunction, may contribute to slower microbiological response (21,22). In our study, diabetic patients showed sputum conversion at 2 months in 72.5% compared to 87.7% in non-diabetics, underscoring this issue. Furthermore, relapse and mortality were nearly three times higher in diabetics, highlighting the importance of glycemic optimization during TB therapy (20,23).

From a public health standpoint, nearly half of all diabetic TB cases were newly diagnosed in this cohort. This mirrors WHO (2011) and India TB Report (2024) recommendations emphasizing bidirectional screening (24,25). Integrated management of DM and TB improves adherence and treatment outcomes, as supported by Arora et al. (2003) and the India State-Level Disease Burden Initiative (2023) (26,27). Our findings thus advocate for routine glucose screening in all TB patients and glycemic control throughout therapy.

Overall, this study reinforces the concept that diabetes substantially modifies TB's clinical and radiological spectrum. Lower-lobe predominance, multiple cavitations, and poor treatment response form a characteristic triad of TB-DM co-morbidity (9,11,13). Future studies with longitudinal follow-up and molecular profiling can further elucidate the immunometabolic pathways linking these conditions.

CONCLUSION

Diabetes Mellitus profoundly impacts tuberculosis — modifying its clinical course, radiological pattern, and therapeutic outcome.

Regular glucose screening at TB diagnosis and glycemic optimization during treatment are essential to improve cure rates and reduce relapse.

A **collaborative TB-DM control framework**, with integrated management and follow-up, is crucial to meet the *End TB Strategy* goals.

REFERENCES

1. **Perez-Guzman C, Torres-Cruz A, Villarreal-Velarde H, Vargas MH.** Atypical radiological images of pulmonary tuberculosis in 192 diabetic patients: a comparative study. *Chest.* 2001;120(1):151–156.
2. **Wang JY, Lee LN, Hsueh PR, Jan IS, Liaw YS, Yang PC, Luh KT.** Manifestations and treatment outcome of pulmonary tuberculosis: impact of diabetes mellitus. *Thorax.* 2008;63(11):957–961.
3. **Restrepo BI, Fisher-Hoch SP, Crespo JG, Whitney E, Perez A, Smith B, et al.** Type 2 diabetes and tuberculosis in a dynamic bi-national border population. *Epidemiol Infect.* 2007;135(3):483–491.
4. **Dooley KE, Chaisson RE.** Tuberculosis and diabetes mellitus: convergence of two epidemics. *Lancet Infect Dis.* 2009;9(12):737–746.
5. **Bacakoglu F, Basoglu OK, Cok G, Sayiner A, Ates M.** Pulmonary tuberculosis in patients with diabetes mellitus. *Respiration.* 2001;68(6):595–600.
6. **Mugusi F, Swai AB, Alberti KGMM, McLarty DG.** Increased prevalence of diabetes mellitus in patients with pulmonary tuberculosis in Tanzania. *Tubercle.* 1990;71(4):271–276.
7. **Shaik N, Kumar S, Satyasri S, Krishna HV, Gollapalli SK, Uppalapati RR.** Clinical and radiological study of pulmonary tuberculosis in diabetes mellitus. *Int J Curr Res.* 2016;8(12):43862–43868.
8. **Buasroung PP, Kiertiburanakul S, Leelahavanichkul A, Manosuthi W.** The impact of diabetes mellitus on clinical presentations and outcomes in patients with pulmonary tuberculosis: a multicenter study. *Int J Infect Dis.* 2022;116:374–379.
9. **Vijayan S, Raghuraman M, Muniyandi M, Sivakumar S, Sekar G, Chandrasekaran V, et al.** Prevalence of diabetes mellitus among tuberculosis patients in India and its effect on treatment outcome. *Indian J Tuberc.* 2020;67(3):338–343.
10. **Kumar NP, Sridhar R, Banurekha VV, Jawahar MS, Nutman TB, Babu S.** Expansion of pathogen-specific T-helper 1 and T-helper 17 cells in pulmonary tuberculosis with coincident type 2 diabetes mellitus. *PLoS One.* 2017;12(3):e0174004.
11. **Jeon CY, Murray MB.** Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. *PLoS Med.* 2008;5(7):e152.
12. **Stevenson CR, Critchley JA, Forouhi NG, Roglic G, Williams BG, Dye C, Unwin N.** Diabetes and the risk of tuberculosis: a neglected threat to public health? *BMJ.* 2007;335:451–454.
13. **Kaplan JE, Masur H, Holmes KK.** Guidelines for preventing opportunistic infections among HIV-infected persons—2002. *Clin Infect Dis.* 2001;33(6):889–898.

14. **Young F, Critchley JA, Johnstone LK, Unwin NC.** A review of co-morbidity between infectious and chronic disease in Sub-Saharan Africa: TB and diabetes mellitus, HIV and metabolic syndrome, and the impact of globalization. *Trop Med Int Health.* 2009;14(3):283–294.
15. **Sosman MC, Steidl JH.** Diabetic tuberculosis. *Am J Roentgenol.* 1927;17:625–631.
16. **World Health Organization.** *Collaborative framework for care and control of tuberculosis and diabetes.* WHO/HTM/TB/2011.15. Geneva: World Health Organization; 2011.
17. **Central TB Division, Ministry of Health and Family Welfare, Government of India.** *India TB Report 2024: Coming Together to End TB.* New Delhi: MoHFW; 2024.
18. **Arora VK, Singla N, Sarin R.** A study of the risk factors for relapse in tuberculosis. *J Indian Med Assoc.* 2003;101(6):318–320.
19. **Faurholt-Jepsen D, Range N, PrayGod G, Jeremiah K, Faurholt-Jepsen M, Aabye MG, et al.** Diabetes is a strong predictor of mortality during tuberculosis treatment: a prospective cohort study among tuberculosis patients in Tanzania. *Trop Med Int Health.* 2012;17(7):877–883.
20. **India State-Level Disease Burden Initiative.** Diabetes burden and trends in India, 1990–2021: an analysis of the Global Burden of Disease Study. *Lancet Reg Health Southeast Asia.* 2023;4:100089.