Original Research

Diabetes and Tuberculosis – Tackling Double Trouble

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Abstract:

Introduction: Diabetes mellitus (DM) is an important and recognized risk factor for tuberculosis (TB). India is a high TB burden country along with an increased prevalence of diabetes in its population. The current study aimed to study the diagnostic profile and treatment outcomes of tuberculosis in diabetics (TBDM) as compared to that in non-diabetics.

Materials and methods: A retrospective analysis from clinical records of TB patients diagnosed between November 2016 to April 2018 (eighteen months) was carried out in a tertiary care teaching institute.

Results: Out of a total 1592 TB patients diagnosed during the study period, 66 (4.15 %) patients were diabetics. Amongst them, 49 patients had declared outcomes and were analyzed further. 98 TB patients without diabetes, diagnosed during the same period, were selected randomly in 1:2 ratio as the control group. There were 26(53%) microbiologically confirmed TB patients and 23(47%) clinically diagnosed TB cases among diabetics as compared to 43(43.87%) microbiologically confirmed TB patients and 55(56.12%) clinically diagnosed TB cases among non-diabetics. There were 41(83.63%) pulmonary and 8(16.32%) extra-pulmonary TB cases among diabetics as compared to 56 (57.14%) pulmonary and 41(42.85%) extra-pulmonary TB cases among non-diabetics. Among diabetics, 39 (79.59%) patients were newly diagnosed and 10(20.40%) patients were retreatment cases of TB whereas 80(81.63 %) patients were newly diagnosed and 18(18.36 %) patients were retreatment cases of TB among non-diabetics. Poor treatment outcome of TB was seen in 14 (28.57%) diabetics as compared to 10(10.2%) non-diabetics.

Discussion: Diabetics are at an increased risk of developing pulmonary TB. TB is associated with poor treatment outcome in diabetics.

Conclusion: A robust screening of diabetics for TB is imperative and the healthcare provider must be well aware of the diagnostic spectrum and possible poor treatment outcomes of TB in these patients.

Keywords: Diabetes, Tuberculosis, TB, India, Anti TB Treatment

Introduction:

Diabetes mellitus (DM) is an important and recognized risk factor for tuberculosis (TB). Diabetes triples a person's risk of developing TB.(1) TB can temporarily cause impaired glucose tolerance which is a risk factor for developing diabetes as well as the presence of diabetes can cause increase in blood sugar levels, and persistent hyperglycemic levels can have a negative impact on presentation and outcome of TB.(2) India is a high TB burden country along with an increased prevalence of diabetes in its population and hence the association of both these diseases needs to be addressed.(3)

Objectives:

The study aimed to evaluate the following parameters: 1. Proportion of microbiologically confirmed and clinically diagnosed cases of TB in diabetics. 2. Proportion of pulmonary and extra-pulmonary TB in diabetics.3. Proportion of newly diagnosed and retreatment cases of TB in diabetics. 4. Treatment outcome of TB among diabetics as compared to non-diabetics.

Materials and Methods:

A retrospective analysis from clinical records of TB patients diagnosed between November 2016 to April 2018 (eighteen months) was carried out in the department of Respiratory medicine, Indira Gandhi Government Medical College, Nagpur. The study would comprise of two groups viz. Diabetics with TB and Non-diabetics with TB as control group, with patients in both groups in the ratio of 1:2. The various comparative parameters would then be analysed in both groups.

Results:

Out of a total 1592 TB patients diagnosed during the study period, 66 (4.15 %) patients were diabetics. Amongst them, 49 patients had declared outcomes and were analyzed further. 98 TB patients without diabetes, diagnosed during the same period, were selected randomly in 1:2 ratio as the control group. The results are depicted in Table no 1.

The significant findings were as follows: The proportion of pulmonary TB was more in diabetics as compared to non-diabetics (83.63% vs 57.14%; p = 0.0017). Tuberculosis had increased proportion of poor treatment outcomes (Loss to follow up, failure, drug resistance & death) in diabetics as compared to non-diabetics (Figure no. 1) (28.56% vs 10.2%; p = 0.0045). There was no significant difference in proportion of microbiologically confirmed and clinically diagnosed cases of TB in diabetics as compared to non-diabetics. There was no significant difference in proportion of newly diagnosed and retreatment cases of TB in diabetics as compared to non-diabetics.

Table no. 1 Various Result Parameters in TB patients with Diabetes as compared to TB patients without Diabetes

Variables	TB with DM (N=49)	TB without DM (n=98)	OR (95%CI)	p value
Male	32(65.30)	51(52.04)		
Female	17(34.69)	47(47.95)	1.73	0.126
Diagnosis of TB Cases				
Microbiologically confirmed	26(53)	43(43.87)	1.44	0.2929
Clinically Diagnosed	23(47)	55(56.12)		
Type of TB cases				
New	39(79.59)	80(81.63)	0.875	0.13

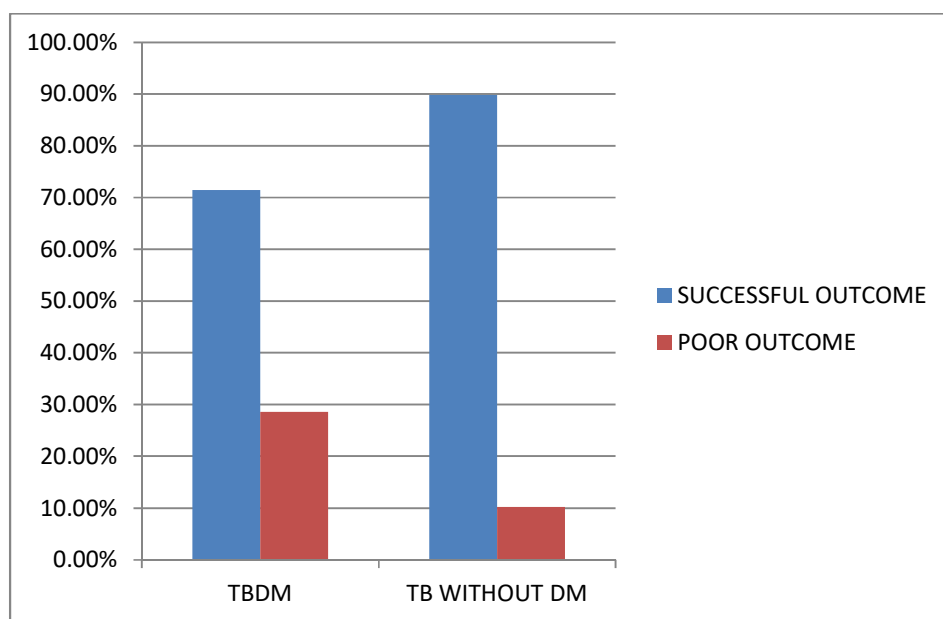|				
Retreatment	10(20.40)	18(18.36)		
Pulmonary TB	41(83.63)	56(57.14)		
Extra-pulmonary TB	8(16.32)	42(42.85)	3.75	0.0017**
Treatment Outcomes				
Successful outcomes	35(71.42)	88(89.79)		
Cured	25(51.02)	36(36.73)		
Treatment completed	10(20.40)	52(53.06)		
Poor Outcomes	14(28.56)	10(10.2)	8.06	0.0045**
Lost to follow up	7(14.28)			
Failure		5(5.10)		
Died	4(8.16)	4(4.08)		
Shifted to regime for MDR TB	3(6.12)	1(1.02)		

Figure 1. Treatment outcomes of Tuberculosis in Diabetics and Non- Diabetics.

Discussion:

Our study shows that TB is associated with relatively poor outcome in diabetics in accordance with the previous studies (Dooley et al. (2009), Sulaiman et al (2013), Pan et al (2015), Siddiqui et al. (2016) and Workneh et al (2016)).(3–7) The possible reasons for this could be as following: **a. Poor glycaemic control:** Optimal glycaemic control might improve tuberculosis treatment outcomes and prevent many of the diabetes associated complications.

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However, tuberculosis often leads to loss of appetite, bodyweight, and physical activity, all of which might have a cumulative adverse effect on glucose homoeostasis. (2,8) b. Subtherapeutic levels of anti TB drugs in diabetics. Previous studies have shown that people with diabetes have lower plasma concentrations of rifampicin, isoniazid and rifampicin than expected (2,9,10) c. High mycobacterial burden at treatment initiation: It has been shown previously that TB patients with DM tend to have a higher mycobacterial burden at start of treatment as compared to patients without DM, possibly due to immune dysregulation.(11) In the current study also the proportion of microbiologically confirmed TB cases were higher among diabetics as compared to non-diabetics, though statistically non-significant. d. Drug interactions: Rifampicin interacts with many drugs, reducing plasma concentrations of sulphonylureas, repaglinide and nateglinide, pioglitazone, saxagliptin, linagliptin, canagliflozin, and dapagliflozin. Also, theoretically, dipeptidyl peptidase (DPP) IV inhibitors may cause immune paresis and possibly worsen treatment outcomes in TB management (2,8,12,13) e. ADR's (Adverse Drug Reactions) : It has been previously reported that increased incidence of ADR's to anti TB drugs is seen in diabetics.(3) f. Drug Resistance: A recently published meta-analysis by Liu et al. concluded that DM was an independent risk factor for MDR-TB (Multi drug resistant TB), especially for primary MDR-TB.(14)

Considering the poor treatment outcome of TB in diabetes, it is imperative to screen for TB in diabetics and vice versa. A good initial counselling, active supervision for possible ADR's and early management of the same is important in TB patients with diabetes. Baseline screening for drug resistance is mandatory in these patients. Considering that major proportion of diabetics had pulmonary TB as compared to extrapulmonary TB, it is imperative that all diabetics who are TB suspects should undergo sputum smear and CBNAAT (Cartridge Based Nucleic Acid Amplification Test) examination.

Conclusion:

A robust bidirectional screening i.e. screening of diabetics for TB and vice versa is imperative. The healthcare provider must be well aware of the diagnostic spectrum and possible poor treatment outcomes of TB in these patients.

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