

Impact of Diabetes Mellitus on Treatment Outcome of Newly Diagnosed Smear Positive Pulmonary Tuberculosis Patients

Alan H Rosenstein *

Department of Medicine, University of Louisville School of Medicine, Kentucky, USA

ABSTRACT

The increase in the incidence of Diabetes Mellitus (DM) is an important risk and challenge to Tuberculosis (TB) control. The association between the two had been described many years ago by Avicenna, a Persian philosopher. The link of DM and TB is more prominent in developing countries where TB is endemic and the burden of DM is increasing.

Keywords: Diabetes mellitus; Tuberculosis; Anti-tubercular treatment

ABOUT THE STUDY

The estimated annual incidence of TB in India is around 2.8 million which is estimated to be a quarter of global load [1,2]. Diabetics have a 2-3 times higher risk of developing active TB than no diabetics. Diabetic patients with TB have an increased risk of death and failure during course of treatment and recurrent disease after treatment completion [3,4].

In recent decades, with the increasing prevalence of TB, particularly Multi Drug Resistant TB (MDR-TB), and DM cases in the world, the relationship is raising its head as a significant public health problem.

Inclusion criteria

The study population included 60 cases of new-smear positive PTB with a history of DM or newly diagnosed DM. Another 60 patients with new-smear positive PTB without DM formed the control group. An informed consent was obtained from all the patients [5].

- All the patients had
- Patients between the age groups of 18-64 years were included in the study.

Exclusion criteria

- Patients with drug resistant TB.
- Patients with chronic kidney disease or chronic liver disease.
- HIV positive status.

- Patients less than 18 years of age or more than 64 years of age.
- Patients who refused to give consent.

All the patients in the study group were started on injectable insulin after consultation with the endocrinologist. The smear status was followed up at the end of Intensive Phase (IP) and at treatment completion with sputum smear examination. FBS, 2 hr PPBS were repeated monthly and HbA1C was repeated every 3 months till completion of Anti-Tubercular Treatment (ATT).

The definitions used regarding disease profile, and treatment outcomes were according to RNTCP guidelines [6].

- Smear conversion at the end of I.P
- Two negative sputum smears at the end of I.P of treatment.
- Treatment success
- Patients declared as cured or treatment completed.

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dL (11.1 mmol/L). All the data was recorded using Microsoft excel. The statistical software namely SPSS Version16 was used to analyze all the data. The study was approved by Institutional Ethical Committee.

There were 60 patients each in the study and control group respectively. The mean age and body weight among cases were 52.03 ± 7.24 years and 58.23 ± 7.78 kg respectively while in control group, these were 36.32 ± 13.34 years and 55.11 ± 7.95 kg respectively (Table 1). Males and females among cases were 48 (80%) and 12 (20%) respectively while in control group, they were 41 (68.3%) and 19 (31.7%) respectively [7].

Correspondence to: Alan H Rosenstein, Department of Medicine, University of Louisville School of Medicine, Kentucky, USA, E-mail: ahrosensteinmd@aol.com

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Parameters	Category	N	Mean	Std. Deviation
Age	Case	60	52	7.25
	Control	60	36	13.3
Weight	Case	60	58	7.79
	Control	60	55	7.96
Fbs0	Case	60	212	63.6
	Control	60	81	9.41
HbA1c0	Case	60	12	11.5
	Control	60	4.9	0.59

Table 1: Demographic and laboratory data.

The mean duration of diabetes among cases was 4.18 ± 2.64 years. The mean FBS level at diagnosis (FBS0) in cases was 211.5 ± 63.5 mg/dl while in case of control group is 80.6 ± 9.4 mg/dl (P=0.01). Mean HbA1C level at diagnosis (HbA1C0) was $11.9 \pm 1.48\%$ among cases which was higher than control group, where it is $4.8 \pm 0.59\%$ (p=0.01) (Table 2) [8].

Category	Conversion	Non-conversion	Follow up smear not done	OR	95% ci	P value
Case	24(40%)	34(56.7%)	2(3.3%)	19	6.2-62	0
Control	55(91.7%)	4(6.6%)	1(1.7%)			

Table 2: Comparison of smear conversion between cases and control.

Treatment success was observed in 40 (66.7%) out of 60 cases versus 56(93.3%) out of 60 controls (Table 3). Treatment success rate was 10.23 times higher in control group as compared to cases (OR=10.231; 95% ci=2.35-36.66; P value=0.001).

Category	Success	Failure	Or	P-value	95% ci
Case	40(66.7%)	20(33.3%)		0	2.25-36.6
Control	56(93.3%)	4(6.7%)	10.23		
Total	96	24			

Table 3: Comparison of treatment outcome between cases and control.

A total of 51 patients in the study group had a poorly controlled DM. Smear conversion was observed in 21 (41.7%) out of the 51 poorly controlled DM patients (HbA1C $\geq 7.1\%$) versus three (42.8%) out of seven well controlled and newly diagnosed DM patients (HbA1C $\leq 7\%$) {OR: 1.26; 95%CI: 0.8-1.8; p value: 1.22} (Table 4).

Category	Smear conversion	Smear non-conversion	% conversion	OR	95% ci	P value
Well controlled diabetes	3	4	42.80%	1.3	0.8-1.8	0.22
Poorly controlled diabetes	21	30	41.17%			

Table 4: Comparison of smear conversion among controlled and poorly controlled diabetes mellitus.

DISCUSSION

The sputum smear conversion was 40% and treatment success rate was 66.7% among new smear positive TB cases with DM patients which were suboptimal as per the target set by RNTCP. The results from a previous systematic review on studies done worldwide in diabetic TB patients were heterogeneous with the relative risk ranging from 0.79 to 3.25 for sputum conversion. A study from Maharashtra reported significantly lower sputum conversion rates among PTB patients with diabetes (76.5%) compared to those without diabetes (92.7%) under TB Control Programme settings [2]. An earlier study in Tamil Nadu has reported that smear positive PTB patients with diabetes were less likely to have successful treatment outcomes and have documented higher proportion of treatment failure among diabetic TB patients. The present study is concordant with these studies regarding smear conversion and treatment outcomes among TB-DM patients showed 86% successful treatment outcomes of all new diabetic TB patients observed [9].

In our study the treatment outcome was low compared to the 90% target of RNTCP for the 12th 5 years plan (2012-2017). However, Viswanathan and Gawde, in their study found the success rates to be very similar for New Smear Positive (NSP) patients: 90% for diabetics and 91.9% for non-diabetics.

Some explanations for worse outcome among diabetics are higher rates of drug resistance, impaired cellular immunity, delay in sputum conversion, and lower plasma levels of anti TB drugs; the last may be explained by increased weight of DM patients or excess weight gain during TB treatment without an accurate adjustment of drug dosing in the later phase of treatment [9].

CONCLUSION

Smear conversion and treatment success rate among diabetic-TB patients were lower as compared to non-diabetic TB patients. There is no difference in smear conversion between controlled and poorly controlled diabetic-TB patients. A strict diabetic control during treatment and adherence to treatment is recommended for these patients for better outcomes.

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