

Research Article

Relationship between diabetes mellitus and pulmonary tuberculosis and the outcome of treatment

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ABSTRACT

Background: Diabetes mellitus (DM) TB co-infection is associated with poor glycemic control in DM patients. The dual curse of these two diseases may have an impact on the outcome of treatment.

Methods: 72 out of 164 patients above 18 years of age were had Diabetes mellitus and 92 of them were non diabetic. Demographic details, physical and clinical examination, Blood tests for Hb1Ac, chest x rays, and sputum for AFB were done for all the patients. Antitubercular treatment was given for all of them. To the diabetics, in addition to the ATT, anti-diabetic drugs were also given. Follow up was done after 2 and 6 months.

Results: The most common age group to be affected was 55-64 years among the diabetic group and 45-54 among the non-diabetic group. Most of the patients with diabetes had an elevated HbA1c levels which was significantly prominent among 35-64 years of age group. Most of the diabetics had 3+ sputum positivity. 54.2% had far advanced severity on chest X-rays. Sputum conversion was seen in 77.7% of the cases among the diabetic patients, 16.7% of these patients had failed treatment and 2 of the persons died during the study period.

Conclusions: Screening for DM in patients with TB could improve case detection, early treatment, and prevention of DM complications.

Keywords: Tuberculosis, Diabetes mellitus, Coinfection, Hb1Ac

INTRODUCTION

Tuberculosis still continues to be one of the most health hazards in India. Around one third on the world's population is estimated to be infected by Mycobacterium tuberculosis, with approximately nine million people developing the disease each year and almost two million dying annually from the disease.^{1,2} In India 3.1 million live with tuberculosis and the number of new TB cases in continuously on the rise with more than 2.3 million cases each year.³

Over the past 30 years, the status of diabetes has changed from being considered a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged also. This rise is seen though out the world.⁴ India is said to be the diabetic capital of the world with most number of cases. The International Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025.

The first report of the association between DM and TB was documented by Avicenna (980-1027 AD) over one

thousand years ago. Since then, the relationship between diabetes mellitus (DM) and tuberculosis (TB), and the nature of their interaction with regards to co-morbidity are largely suggested by numerous epidemiological studies. There is rising concern worldwide about the twin epidemics of these two chronic diseases, especially in low to middle-income countries such as India and China. The escalating epidemic of DM is also said to have a significant impact on global TB control.⁶

Diabetes mellitus (DM) TB co-infection is associated with poor glycemic control in DM patients. Reactive hyperglycemia often accompanies chronic infections due to the associated pro-inflammatory state and release of counter-regulatory stress hormones such as epinephrine, cortisol and glucagon, all insulin antagonists.⁷ The dual course of these two diseases may have an impact on the outcome of treatment.

This study was performed to assess the presence of diabetes mellitus on the treatment of pulmonary tuberculosis.

METHODS

This observational study was performed by the Department of pulmonology in Medciti Institute of Medical Sciences, during the period of two years. 164 patients above the age of 18 years, who were newly diagnosed sputum positive for pulmonary tuberculosis and enrolled into the RNTCP were included into our study, 72 of them were had Diabetes mellitus and 92 of them were non diabetic. At presentation, the clinical symptoms were carefully noted and analyzed. Sputum examination was done for all the patients by Zeihl Neelson's method and only those who were sputum positive were included into the study. All these positive samples were graded as per the RNTCP guidelines. General demographic details were taken for all the patients including their height and weight and the Body Mass Index was calculated.

Chest X-rays were taken for all the patients for the presence and location of cavities, opacities, hilar enlargement, pleural effusion, fibrosis, pneumothorax etc. The x-rays were also graded as minimal, moderately advanced and far advanced as per the national tuberculosis association guidelines: Minimal: -Slight to moderate density, no cavities, small part of one\both lungs, total extent not >volume of lung one side the space above 2nd chondrosternal junctions and T4\T5; Moderately advanced: -Slight to moderate density lesions one\both lungs. Total extent; far advanced, more extensive than moderate.

All the patients were stated on the first line of drugs for tuberculosis, namely isoniazid, rifampicin, pyrazinamide and ethambutol. In the diabetic patients, the anti-diabetic drugs were continued in case of a known diabetic patient

or were given them in a newly diagnosed case in addition to the antitubercular drugs.

The patients were followed up after 2 months and 6 months and in each follow up, sputum smear, chest X-rays and other blood tests were performed. Sputum smear-positive patients were declared cured only if they had negative sputum results at the end of full course of anti-tubercular treatment. The patients were declared to have completed treatment if they had completed full course of anti-tubercular drugs and had no symptoms at the end of treatment.

Patients who were sputum negative, without any of the classic symptoms for TB, HIV positive patients, pregnant women, patients with chronic renal or liver disease, chronic alcoholics, any connective tissue disorders were excluded from the study. Patients who were previously treated for tuberculosis were also excluded from the study.

RESULTS

Out of the total 164 patients, 72 were diabetic and 92 were non diabetic.

The numbers of males were more than the females in both the diabetic and the non-diabetic group. The most common age group to be affected was 55-64 years among the diabetic group and 45-54 among the non-diabetic group. The BMI was generally low among both the groups and most of the patients in both the groups were alcoholic or smokers or both (Table 1).

Table 1: General characteristics of the pulmonary tuberculosis patients with and without diabetes.

	PTB with DM	PTB without DM
Sex (Male/Female)	51/21	69/23
Age group		
<35	1 (1.4%)	15 (16.3%)
35-44	6 (8.3%)	14 (15.2%)
45-54	17 (23.6%)	16 (17.4%)
55-64	19 (26.4%)	7 (7.6%)
65-74	16 (22.2%)	21 (22.8%)
>75	13 (18.1%)	19 (20.8%)
BMI	22.7 ± .2	18.3 ± 2.9
Hb	12.9 ± 1.2	12.5 ± 1.9
ESR	50.3 ± 19.7	59.3 ± 21.2
Smokers	33 (45.8%)	41 (44.6%)
Alcoholics	39 (54.2%)	45 (48.9%)

Most of the patients with diabetes had an elevated HbA1c levels which was significantly prominent among 35-64 years of age group (Figure 1).

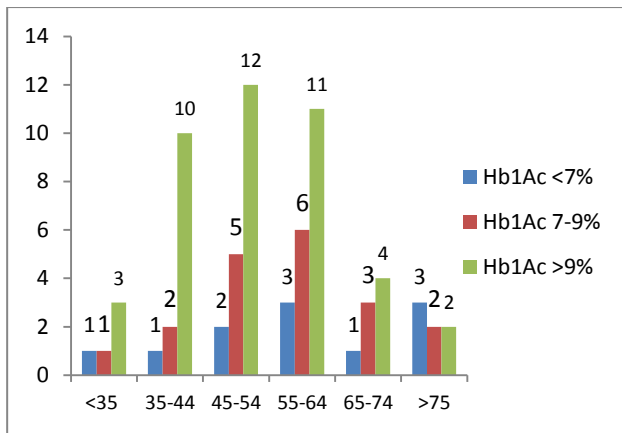


Figure 1 :Relation between Hb1Ac and age among the diabetic patients with PTB.

Most of the diabetics had 3+ sputum positivity, while among the non-diabetic the patients were equally divided between 1+, 2+ and 3+. There were no patients with scanty sputum result but among the non-diabetic patients, there was 1 patient who had scanty sputum (Fig: 2).

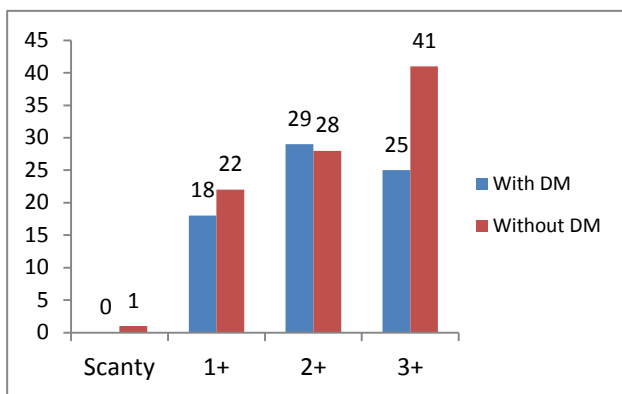


Figure 2 : Sputum positivity among the diabetic and non-diabetic patients

Among the diabetics only 11.1% of the patients had minimal Chest X-ray severity. Majority of them (54.2%) had far advanced severity. Among the non-diabetic patients most of them (47.8%) had moderately advanced severity (Figure 3).

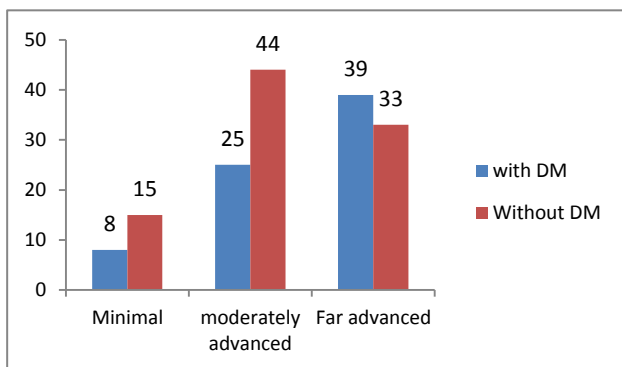


Figure 3: Chest X-ray severity among the patients.

Most of the patients without diabetes were fully cured after 6 months of intensive treatment worth the first line of drugs with only one failed case for treatment. 29% completed the treatment successfully with improvement but required extended treatment due to non-adherence to regular drugs and missing out on one or two days. All these patients (93.5%) had a sputum conversion from positive to negative. Sputum conversion was seen in 77.7% of the cases among the diabetic patients, 16.7% of these patients had failed treatment and 2 of the persons died during the study period (Table 2). Both the patients who died had 3+ sputum positivity and far advanced X-ray severity with pleural effusion.

Table 2: Outcome of treatment at the end of 6 months

	With DM	Without DM
Cured	24 (33.3%)	59 (64.1%)
Completed	32 (44.4%)	27 (29.%)
Failure	12 (16.7%)	1 (1.1%)
Default	2 (2.8%)	4 (4.3%)
Death	2 (2.8%)	1 (1.1%)

DISCUSSION

The risk of diabetic patients getting tuberculosis increases three to four fold than non-diabetic patients^{8,9}. Given the prevalence of diabetes and its projected increase, there would be a concurrent increase in the coinfection of diabetes and TB.

In the present study, the number of diabetics was 43.9% of the total patients included. The prevalence of DM in TB patients in Kerala is reported to be 44%¹⁰ while it was reported to be 15.2% in a study in Tamil Nadu.¹¹

Diabetic TB patients are usually older than those without DM. This may be due to an association of type 2 DM with older age. Some have reported no difference in term of gender but some reported higher frequency among men.^{12,13} The most common age group to be affected was 55-64 years among the diabetic group and 45-54 among the non-diabetic group in the present study. Similar findings were reported by Perez-Guzman et al who also found that the TB-DM patients to be older.¹⁴ HbA1c was elevated to >9% in the 45-54 age group although it was high even in the 35-44 and 55-64 age groups. Similar results were observed in studies by Adhami et al and Patel et al.^{15,16} Many other studies showed that relative risk of having pulmonary tuberculosis is higher among diabetics aging less than 50 year old, specifically 30-49 year old with a relative risk of 9.88 and 4.72 in the 30-39 year and 40-49 year age group respectively, compared to somewhat lower relative risk in older age groups, 1.76 relative risk in those over 49 year old.¹⁷

Many of the symptoms of DM and TB are very similar such as weight loss and fatigue. It has been reported that the body weight of TB patients with DM is more than that of the patients without DM.^{12,18} We have also

observed that the TB patients with DM and a higher BMI compared to those without.

16.7% of the cases among the diabetic and only 1.1% case among the non-diabetics failed to convert from sputum positive to sputum negative. Compared to the non-diabetics, the conversion was poor in the diabetics. This was observed in few other studies. Alisjahbana et al study showed significant number of positive sputum culture results at the end of 6 months in DM group (22.2%), compared in patients without DM (9.6%) with P value of <0.05% diabetes remained a significant risk factor for sputum conversion.¹⁹

Among the Chest X-ray findings, far advanced severity was more common among the diabetics than the non-diabetics. Most of the diabetic patients were either having far advanced severity or moderately advanced severity with very only 11.1% showing minimally advanced stages. This was concurrent with studies by Chiang et al and Avuthu et al, where it was reported that multiple cavities and lesions in the lungs were more among the patients with poor glycemic control than other wise.^{20,21} In another study by Park et al, it was demonstrated that poor glycemic control was linked with high frequency of cavitary lesions than patients with proper glycemic control.²²

Maintenance of blood sugar level at normal or near normal level, is one of the most primary goal in patient care. Tuberculosis worsens glycemic control and makes the control of DM difficult.

CONCLUSIONS

Screening for DM in patients with TB could improve case detection, early treatment, and prevention of DM complications

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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