

A Study of Treatment Outcomes in Patients with Tuberculosis and Diabetes Mellitus on DOTS Therapy in Goa

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ABSTRACT

Introduction: Diabetes mellitus (DM) is known to adversely affect treatment outcome in tuberculosis patients. Poor glycemic control can delay the time to sputum smear conversion from positive to negative in tuberculosis patients and increases the risk of recurrent tuberculosis and deaths due to tuberculosis. This study was conducted to study link between diabetes mellitus and tuberculosis treatment outcome.

Material and methods: This descriptive study was carried out using records maintained under Revised National Tuberculosis Control Programme, Goa. All tuberculosis patients registered from 1st July 2014 to 30th June 2015 under two Tuberculosis units (TU) were included in this study. Data on diabetes mellitus status, sputum smear conversion at end of intensive phase and treatment outcome at the end of the treatment were analyzed

Results: Out of 897 tuberculosis patients analyzed, 140 (16%) had diabetes, most of them belonged to 40-59 years age group (55%), followed next by 60-79 years (23%). Although there was no effect of diabetes mellitus on sputum smear conversion, higher failure rate was seen in tuberculosis patients with diabetes compared to tuberculosis patients without diabetes.

Keywords: Tuberculosis, Diabetes Mellitus, Smear-Positive Pulmonary Tuberculosis, Sputum Smear Conversion, Treatment Outcomes.

INTRODUCTION

India alone carries one fourth of the global tuberculosis burden with estimated 2.8 million new cases annually.¹ More than 40% of India's population is infected with mycobacterium tuberculosis.² India also accounts for second largest number of diabetic people in the world.³ Estimated number of diabetes mellitus cases in India has been reported as 72.9 million for the year 2017.³ Rising living standards, urbanization, changes in lifestyle etc. are associated with growing epidemic of diabetes mellitus in India. Tuberculosis and diabetes mellitus often coexist and each disease is thought to worsen the outcome for the other.⁴

Malnutrition, alcohol abuse, smoking, diabetes mellitus, etc. increase the risk of progression from infection to active tuberculosis disease.⁵ Diabetes mellitus impairs the immunity of patients and is recognized as an independent risk factor for infections such as tuberculosis.⁴ People with diabetes has two to three times more risk of developing active tuberculosis compared to those not having diabetes.⁶ Diabetes also increases the risk of failure, death and relapse among tuberculosis patients.⁷

Tuberculosis disease may lead to impaired glucose tolerance and hamper glycemic control.⁸ Also the drugs used to treat

tuberculosis (especially rifampicin and isoniazid) interact with oral antidiabetic drugs and may lead to poor glycemic control.⁴ Pyrazinamide can also lead to loss of diabetic control.⁹ This study was conducted to study link between diabetes mellitus and tuberculosis treatment outcome.

MATERIALS AND METHODS

This descriptive study was carried out using reports and records maintained under Revised National Tuberculosis Control Programme, Goa. All tuberculosis patients registered from 1st July 2014 to 30th June 2015 under Margao Tuberculosis unit in south Goa District and Panaji Tuberculosis unit (TU) in North Goa district were included in this study.

Diabetes status, sputum smear conversion at end of intensive phase and treatment outcome at the end of the treatment were recorded from tuberculosis registers and treatment cards maintained under RNTCP. For study purpose, treatment outcomes were categorized as successful (cured and treatment completed) and other outcomes (died, defaulted, failure, transferred out).²

Patients were grouped according to whether or not they had diabetes mellitus and sputum smear conversion at end of intensive phase and treatment outcome at end of treatment were analyzed. Categorical variables such as baseline characteristics and treatment outcomes were also compared. Analysis was done using SPSS (version 18) and chi-square was the test of significance used ($p < 0.05$ was considered significant).

Ethics approval was obtained from the institutional ethics committee of Goa Medical College, Bambolim Goa, and Directorate of Health Services, Goa.

RESULTS

Out of 897 TB patients analyzed, 140 (16%) had DM. Key

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Characteristics	Patients with Tuberculosis		P value
	With DM n = 140 No. (%)	Without DM n = 757 No. (%)	
Sex			
Male	109 (78)	453 (60)	0.00007
Female	31 (22)	304 (40)	
Age			
<20	1 (1)	101 (13)	0.000001
20-39	24 (17)	380 (50)	
40-59	77 (55)	217 (29)	
60-79	32 (23)	56 (7)	
≥80	6 (4)	3 (1)	
Disease classification			
Pulmonary smear-positive	88 (63)	331 (44)	0.00001
Pulmonary smear-negative	23 (16)	118 (15)	
Extra-pulmonary	29 (21)	308 (41)	
Treatment Category			
New	112 (80)	608 (80)	0.9
Previously treated	28 (20)	149 (20)	
HIV status			
Positive	5 (4)	72 (9)	0.02
Negative	126 (90)	657 (87)	
Unknown	9 (6)	28 (4)	

Table-1: Key variables associated with Tuberculosis and Diabetes mellitus (DM) patients

Treatment outcomes	Tuberculosis patients		P value
	With DM n = 140 No. (%)	Without DM n = 757 No. (%)	
Treatment success	112 (80.0)	628 (83.0)	0.15
Cured	66 (47)	236 (31)	
Treatment completed	46 (33)	392 (52)	
Failure	12 (8.5)	35 (4.6)	
Other outcome	16 (11.5)	94(12.4)	

Table-2: Treatment outcomes in Tuberculosis patients with Diabetes Mellitus

Sputum smear conversion	Tuberculosis patients		P value
	With DM n = 87 No. (%)	Without DM n = 332 No. (%)	
End of intensive phase			
Converted	69 (79)	251 (76)	0.25
Not converted	14 (16)	47 (14)	
Unknown	4 (5)	34 (10)	
End of treatment			
Converted	65 (75)	233 (70)	0.21
Not converted	4 (5)	7 (2)	
Unknown	18(20)	92 (28)	

Table-3: Sputum smear conversion in Tuberculosis patients with Diabetes Mellitus

variables associated with tuberculosis (TB) and Diabetes mellitus (DM) are shown in Table 1. In TB with DM group,

78% patients were males and 22% were females whereas in TB without DM group, this proportion was 60% males and 40% females. In TB with DM group, majority of patients belonged to 40-59 years age group (55%) whereas in TB without DM group, maximum number of patients belonged to 20-39 years age group (50%).

Smear positive pulmonary TB cases were more common in TB with DM group (63%) compared to TB without DM group (44%) and this difference was found to be statistically significant (p value:0.00001) In TB with DM group 4% were HIV positive whereas in TB without DM group 9% were HIV positive.

Among TB patients with DM, Treatment success (Cured plus treatment completed) was found to be 80% compared to 83% in TB patients without DM. Higher failure rate of 9% was seen in TB patients with DM compared to 5% in Tuberculosis patients without Diabetes Mellitus. However the difference was not found to be statistically significant. (Table 2) Other outcomes like defaulted, died and transferred out were almost similar in both the groups.

The sputum smear conversion in smear positive pulmonary TB patients; at the end of intensive phase and at the end of treatment are shown in Table 3. The sputum smear conversion in smear positive pulmonary TB patients at the end of intensive phase was found to be similar in TB patients with and without DM (79% vs 76%).

The sputum smear conversion in smear positive pulmonary TB patients at the end of treatment was also found to be similar in TB patients with and without DM (75% vs 70%).

DISCUSSION

Epidemiological models have shown that DM accounts for 14.8% of pulmonary TB and 20.2% of smear-positive pulmonary TB.¹⁰ TB patients with DM are more likely to present with sputum smear-positive pulmonary TB than those without.²² Some studies have indicated that the increase in DM prevalence in India has been an important obstacle to reducing TB incidence in the country.¹¹ In the present study, 15.6% of TB patients and 21% of smear positive pulmonary TB patients had co-existing DM. Thus, association of DM is stronger with infectious form of TB.

In TB with DM group, majority patients belonged to 40-59 years age group, whereas in TB without DM group, majority patients belonged to 20-39 years age group. This may be because Type 2 DM disease tends to occur more commonly in older individuals.¹² The reason for higher prevalence TB in older patients are not clear but may be related to pulmonary microangiopathy and deficient activation of pulmonary macrophages which are reported to occur in DM and may predispose patients to TB.¹³

At the end of intensive phase, sputum smear conversion rates were similar in TB with DM patients compared to TB without DM patients (79% vs 76%). Prasad P et al have reported that sputum smear conversion rates (from positive to negative) were similar in TB patients with and without DM.¹⁴

Treatment outcomes as cured, treatment completed, failure, died and defaulted were comparable in both the groups. In

the present study it was found that the association of diabetes mellitus does not significantly alter the treatment outcome of TB patients. Some other studies have shown that the presence of DM does not adversely affect TB outcomes.¹⁴ However, some studies have reported that DM patients have higher sputum positivity at the end of 2-month treatment and poor outcome at the completion of treatment compared with non DM patients.^{15,16}

CONCLUSION

Diabetes mellitus is a common co-morbid condition in TB patients. This study also identified certain patient characteristics like male gender, older age group, smear positive status etc. are more prevalent in TB patients with DM, thus allowing targeting these patient groups if resources are constrained. However, sputum smear conversion rate and treatment outcome were not affected by having concomitant DM in TB patients. Assessing the effect of better DM control on TB treatment outcomes should be the subject of future research.

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