



## Prevalence and Clinical profile of diabetes and pre-diabetes among Tuberculosis patients diagnosed at tertiary care hospital in Western Maharashtra

Authors

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### Abstract

**Background:** *The burden of tuberculosis and diabetes mellitus is significantly high in India. People with diabetes are at higher risk of developing active tuberculosis. The main purpose of this study is to determine prevalence of diabetes and pre-diabetes among TB cases. As the risks of treatment failure, death and reactivation are high in TB-DM patients, we had also included study of clinical profile of these patients.*

**Material and Method:** *We have done a prospective study over a period of two years. Study size was 1000 TB patients diagnosed at our institute. All willing patients above the age of 12 years were included in our study. We followed WHO criteria with Fasting glucose level (FGL) for diagnosis of diabetes and pre-diabetes. Tuberculosis patients with FGL more than /equal to 110 mg/dl were evaluated in details to study their clinical profile. Outcomes of these patients were noted from TB registers/records.*

**Result:** *Out of 1000 TB patients, 212 patients had impaired FGL. Among them, 80 TB patients had diabetes and 132 TB patients had pre diabetes. 15% among the 212 patient were previously diagnosed cases of diabetes mellitus on treatment. Impaired FGL was significantly associated with age group 31 to 45 years, male predominance, low socio economical status. Pulmonary tuberculosis and sputum positivity was common. Pleural TB was the most common type of extra-pulmonary tuberculosis seen. Out of 212, only 7 patients died before completion of DOTS under RNTCP.*

**Conclusion:** *In our study, the prevalence of diabetes is 8% and pre-diabetes is 13.2%. TB –DM patient pre-dominantly seen in age of group of 31-45 yrs TB-DM patient commonly had infective form of tuberculosis. Outcome of these patients on DOTS under RNTCP is significantly good. Screening patient with TB for FGL will definitely help in early detection of diabetes mellitus.*

**Keywords:** *Diabetes, Pre-diabetes, Tuberculosis, prevalence.*

### Introduction

Screening of diabetes in patients with tuberculosis will ensure early detection and better management of diabetes and it will indirectly lead to better treatment outcome in TB. People with weak immune system, as a result of chronic disease

such as diabetes, are at a higher risk of progressing from latent to active TB.

The global burden of diabetes mellitus and tuberculosis is very high. India has the maximum load of TB estimated to be 2 million cases per annum and also account for more than 62 million

people with Diabetes mellitus. About 10 % of TB cases globally are linked to diabetes. People with diabetes have 2.5 times higher risk of TB compared to people without diabetes. A large proportion of people with diabetes as well as TB are not diagnosed, or diagnosed too late. Early detection can help to improve care and control of both. It has been argued that good glycaemic control in TB patients can improve treatment outcome.

Studies that screened for DM among TB patient reported a wide range of DM Prevalence ranging from 1.9% to as high as 35% .A recent nationwide study conducted in 2011 reported the prevalence rates of diabetes and pre diabetes to be 10.4% and 8.3% respectively in South India (Tamil Nadu).

Diabetes may adversely affect TB treatment outcomes by delaying the time for microbiological response, reducing the possibility of favourable outcome and increasing the risk of treatment failure, death, drug resistance and relapse. A study from Jaipur, Rajasthan which followed up TB cases taking RNTCP DOTS treatment for 2 years reported diabetes as one of the associated factors for relapse of TB cases. Similarly findings were also reported in a study conducted amongst Chinese population.

To strongly recommend screening of DM among TB patients in primary health setting and to ensure early detection and better management of diabetes, we planned this study to detect prevalence of diabetes and pre-diabetes amongst TB patients diagnosed at our institute in Western Maharashtra.

## Material and Methods

### Ethics statement

Ethical committee of our institute headed by DR. Manerikar approved the study and consent was obtained from all study subjects District Tuberculosis Centre permitted to use their data/records. The study was initiated after the approval from the Institute Ethical committee.

**Study population:** It included all patients attending OPD at our tertiary care institute in

western Maharashtra mainly coming from Kolhapur, Ratnagiri and Sindhudurg district and some adjoining areas of Karnataka.

**Study size:** A sample size of 1000 TB patients was planned. Total 1450 were TB diagnosed adult in our institute during study period (2012-2014). Among them, 1000 eligible and willing patients were included in the study randomly.

**Method:** All TB cases more than 12 years of age willing for study, excluding confirmed cases of MDR TB were included in our study. All types of TB including new, retreatment, sputum positive/sputum negative pulmonary TB and extra-pulmonary TB cases were included in the study. We had done a prospective study over a period of two years (2012-2014). We followed WHO criteria with FGL for diagnosis of diabetes and pre-diabetes status.

On the first day the purpose of the study was explained to the patient and relative and their informed consent was obtained. All willing participants were enrolled and were interviewed for basic information. To assess risk factors age, sex, address, habit, income, weight, symptoms, medical history were recorded. They were asked to come the next day after overnight fasting. The FGL was collected and processed for testing using glucose oxidase and peroxidase method (GOD-POD method) in our institute laboratory.

Diagnosis of TB was based on the standard RNTCP diagnostic criteria. Other details noted about type of TB, sputum status, X-rays findings, EPTB investigation etc. All information obtained from the patients was kept confidential. Outcome of the study population on RNTCP were noted from TB registers/ record.

### Statistical Analysis

Statistical analysis was done by R. Salamwade with Z statistics with Excel 2008.

### Result

Out of 1000 TB cases, 212(21.2%) had impaired FGL. Among them, 80 patients were diabetic and 132 patients were pre diabetic.

**Table 1:** Age distribution with IGL

Sr.No.	Age group	No. of patients
1	12-30 yrs	43
2	31-45yrs	80 (p < 0.03)
3	46-60 yrs	55
4	> 60 yrs	34

In 212 patients with impaired FGL, 15% patients were known cases of diabetic mellitus on treatment. Maximum patients enrolled in our study were from low social economic status.

In 212 patients, 138 were males and 74 were female. The prevalence was found more in male as compared to female. But we had observed same gender ratio disparity in patients attended our general adult OPD and patients enrolled in this study.

Occupation wise the largest proportion consisted of labour work or unskilled work. It was more common in age group 31 to 45 years which was not commonly observed in other studies.

Majority of the patients were not over weight. Symptoms were same as we usually observe in non diabetic patients with TB. Cough was commonest symptoms observed in 75% patients.

**Table 2:** Common symptoms with IGL

Sr. no.	Symptom	No. of patients with impaired glucose level	%
1	Cough	159	75%
2	Fever	120	56.6%
3	Dyspnea	32	15.1%
4	Chest pain	17	08.02%
5	Other	28	13.2%

Pulmonary TB with sputum smear positive status was common type of presentation in PTB (61.4%). About 186 out of 212 patients (87.7%) were newly diagnosed cases started on Cat I. Pleural effusion was the most common type of extra-pulmonary TB seen in our study group. 29 patients (40%) had only PE and 9 had PE with PTB.

**Table 3:** Extra pulmonary tuberculosis with IGL

Sr. no.	Type of EPTB	No. of patients with impaired FGL
1	Pleural effusion	38 (p < 0.023)
2	Lymph node	13
3	Abdomen	13
4	CNS	08
5	Other	11

Radiologically, pulmonary TB patients presented commonly with bilateral infiltration (33%) or multi-lobe involvement (30%) or cavities etc.

We had collected outcome data from TB registers/ records. Out of 212, 7 patients died before completion of anti TB treatment. As death rate was not high (3.3%), it gave promising result of these TB-DM patients on DOTS under RNTCP if taken regularly and for adequate duration.

### Discussion

With high burden of tuberculosis as well as diabetes mellitus, India is facing challenges in controlling both the disease. In India, we need a good quality implementation research to screen for this dual burden of disease. As diabetes patients have impaired cell mediated immunity, it is a risk factor for tuberculosis. A comparatively higher proportion of subject with dual disease had treatment failure, death, reactivation TB if compared with non-diabetic subject with TB.<sup>24, 25</sup> Tuberculosis itself can induce glucose intolerance or hyperglycaemia and deteriorates glycaemic control in DM. Both are working as a dual curse for each other.<sup>3</sup>

Now the incidence of TB is declining very slowly globally at less than 1% annually. We need to take efforts for speeding up the decline in incidence by taking care of the risk factor.

There are several studies conducted among newly diagnosed TB prevalence of DM among them. Maximum studies are showing higher prevalence of diabetes among TB patient than that of general population, ranging from 8 to 40%

A Nationwide Indian study conducted in the general population of Tamil Nadu, South India, showed that the prevalence rate of diabetes and pre-diabetes were 10.4 % and 8.3% respectively

which matches approximately with the estimated prevalence of diabetes and pre-diabetes in our study. Studies from China and Indonesia have demonstrated a lower prevalence.<sup>23</sup>

In Tamil Nadu, crude prevalence rates of the diabetes and prediabetes in TB patients were found to be 25% and 24% respectively. In study from the state of Kerala, 44% of TB patients were found to have diabetes and 21% were newly diagnosed. They had used Hb1AC to diagnose diabetes prevalence rates in these studies compared to our study.

A comparison of different method of screening for diabetes (FGL/OGTT/HbA1C) showed the FGL to be the more cost efficiency, which we have used in our study as a screening method.

In other studies, diabetes was more prevalent among men than women, which was not seen in pre-diabetes. In our study we also had prevalence of male more compared to female, but similar ratio of gender disparity we have observed in our general adult OPD also. The higher prevalence might be an accumulative effect of this or other risk factors such as alcohol, smoking which impact both TB and DM.

In various studies older age was the commonest age group affected if compared with our study. We had high prevalence seen in age group 31-45 years.

Infective form of pulmonary tuberculosis was associated with diabetes in many other studies which is also true in current study.<sup>19, 26</sup>

In our study, outcome of TB patients with impaired glucose level was good on regular treatment in government set up under RNTCP. Few studies reports the good outcome among TB-DM with existing treatment. Several studies indicate the diabetes is associated with increased death rate in patients with TB which was not seen in our study.<sup>12, 27</sup>

The clinical presentation of TB in diabetes subject may not be always different. In current study also symptoms in patients with impaired glucose level were similar to that in any other TB patients without diabetes mellitus.

There are two different opinions regarding the radiological images of TB patients with DM. Few studies reported that the DM subject with TB are more likely to have lower lung filed cavities. Other study opinion said that involvement of more than one lobe is common among diabetes patients. In current study, we had multiple lobe involvement on X ray chest in the form of infiltration as commonest radiological presentation.

Considering the growing prevalence of DM and huge burden of tuberculosis infection in India, it is very essential to focus on diagnosis of TB and screening them for DM and ensuring appropriate and adequate care for both. There is a need for greater collaboration between RNTCP and National programme for prevention and control for cancer, Diabetes, CVD and stroke (NPCDCS) in India. We need to have a standard protocols and guidelines to fight with this dual burden.

### Limitations

An earlier report stated that prevalence might be overestimated in TB since TB itself can cause transient hyperglycaemia. Ideally, glucose screening for DM diagnosis may be more appropriate after TB treatment has taken effect. Majority of our study subjects were screened at initiation of TB Treatment.

We have done screening for diabetes and pre diabetes by FGL method. Patients need to undergo OGTT/HbA1C for confirmation of DM. The study reports prevalence of diabetes and pre diabetes among TB patients registered in RNTCP. Since there is not active case detection under RNTCP, a community based study would provide a better representative sample.

### Conclusion

Our study revealed that prevalence of diabetes and pre-diabetes among TB patients was 8% and 13.2% respectively. Subjects with TB-DM were more likely to have the infective form of TB. Outcome of the patients on DOTS under RNTCP was good with low death rate.

Screening patients with FGL estimation will help in early detection of DM. The routine implementation of bi-directional screening of the two diseases, TB and DM, is beneficial to patients, community and Nation.

We need to do more research to find out the best time for screening and cost effective method of screening. This dual burden needs to be given the attraction.

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