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# **Original Research**

### A study to asses in active tuberculosis patients' prevalence of diabetes mellitus and its predictors

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#### ABSTRACT:

**Background:** There is a growing awareness on a global scale on the possible relationship between tuberculosis (TB) and diabetes mellitus (DM). The aim and objective of this study were to study to asses in active tuberculosis patient's prevalence of diabetes mellitus and its predictors. **Materials & Methods:** 212 patients of tuberculosis of both genders were recruited. Family history of TB, tobacco usage, frequency of getting blood sugar tested was recorded. **Results:** Among 212 TB patients13.1% was found to be the prevalence of diabetes. Newly diagnosed diabetics was 4.0% and pre-existing diabetics was 9.1%. current/former smokers was 25.5% and current/former smokeless tobacco users were 13.1%. In all, 48 of the 212 study participants had a family history of TB (23%). The mean age at the diagnosis of "known diabetics" was 44.6 years. Regularly antidiabetic daily medication was consumed by 85%. Significant predictor for diabetes TB comorbidity was emerged as age 50 years and above. **Conclusion:** In TB patients' prevalent comorbidity was diabetes. Age more or equal to 50 years increases the chance of getting this morbidity together.

Key words: Blood glucose, Diabetes, Tuberculosis

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#### INTRODUCTION

World's leading public health issues includes Diabetes Mellitus (DM) and Tuberculosis (TB). There is a growing awareness on a global scale on the possible relationship between tuberculosis (TB) and diabetes mellitus (DM).<sup>1</sup> DM is also known to alter the clinical presentation of TB and its outcomes in terms of delayed sputum/culture conversion, case fatality and treatment failure.<sup>2</sup>

Studies have established the bidirectional link between diabetes and TB. It is hypothesized that diabetes worsens the clinical course of TB treatment. Furthermore, in TB, the glycemic control in diabetics is impaired.<sup>3</sup> A plausible hypothesis of TB correlation is the impaired host defence in individuals in diabetics. An immunological study conducted by Yamashiro<sup>4</sup> postulated that reduced production of Th1-related cytokines and nitrous oxide in mice accounts for the hampered host defence against mycobacterium TB infection under diabetic conditions. Further, the literature review shows that various risk factors, such as sociodemographic, family history of TB, smoking tobacco, and type of TB are associated with it.<sup>4</sup>

The physiologic association between the two diseases is not fully explored, but studies suggested that DM weakened the immune response, which, in turn, enhances the infection of Mycobacterium tuberculosis and/or progression from latent to active disease state.<sup>5</sup> Alternately, TB can temporarily cause impaired glucose tolerance and might predispose patients to DM. Moreover, chronic infections such as TB are associated with idiopathic hyperglycemia, which occurs due to increased production of counterregulatory stress hormones such as epinephrine, glucagon, cortisol, and growth hormone which act synergistically.<sup>6</sup> The aim and objective of this study were to study to asses in active tuberculosis patient's prevalence of diabetes mellitus and its predictors.

#### **MATERIALS & METHODS**

The present observational cross- sectional study was conducted among 212 patients of tuberculosis of both genders at tertiary diabetes care hospital in Bihar. All patients were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Diagnosis of smear positive pulmonary TB was performed for all patients following the national TB diagnosis guidelines and tuberculosis treatment was initiated in all patients in accordance with current guidelines. Family history of TB, tobacco usage and self-reported information on diabetes was collected at the time of enrolment in the study. Frequency of getting blood sugar tested, type of treatment taken and daily drug adherence were also collected from diabetic tubercular patients during the study. Data were analysed by using statistical software. A p-value < 0.05 was considered as statistically significant in all the analyses.

#### RESULTS

#### Table I Prevalence of diabetes in TB patients

| <b>TB</b> patients | Diabetes prevalence |
|--------------------|---------------------|
| 212                | 13%                 |

Table I shows that among 212 TB patients13.1% was found to be the prevalence of diabetes.

#### **Table II Assessment of parameters**

| Parameters                               | Percentage |
|--|------------|
| Newly diagnosed diabetics                | 4%         |
| Pre-existing diabetics                   | 9.1%       |
| Current/former smokers                   | 25.5%      |
| Current/former smokeless tobacco users   | 13.1%.     |
| Family TB history                        | 23%        |
| Antidiabetic medication consumption      | 85%        |
| Mean age of diagnosis of known diabetics | 44.6 years |
| Predictor age for diabetes TB            | >50 years  |

Table II shows that newly diagnosed diabetics was 4.0% and pre-existing diabetics was 9.1%. current/former smokers was 25.5% and current/former smokeless tobacco users were 13.1%. In all, 48 of the 212 study participants had a family history of TB (23%). The mean age at the diagnosis of "known diabetics" was 44.6 years. Regularly antidiabetic daily medication was consumed by 85%. Significant predictor for diabetes TB comorbidity was emerged as age 50 years and above.

#### Table III Blood sugar assessment

| Diabetics       | Duration | Percentage | P value |
|-----------------|----------|------------|---------|
| Known diabetics | Daily    | 8%         | 0.02    |
|                 | Weekly   | 28%        |         |
|                 | Monthly  | 64%        |         |
| New diabetic    | Daily    | 18.2%      | 0.01    |
|                 | Weekly   | 27.2%      |         |
|                 | Monthly  | 54.6%      |         |

Table III, graph I shows that the proportion of "known diabetic" who got their blood sugar tested daily, weekly, monthly, was 8%, 28%, and 64%, respectively. The proportion of "new diabetic" who got their blood glucose tested daily, weekly, and monthly was 18.2%, 27.2%, and 54.6%, respectively. The difference was significant (P < 0.05).



#### Graph I Blood sugar assessment

#### DISCUSSION

The World Health Organization has called upon countries of the South-East Asia Region to gear up efforts for ending tuberculosis (TB) by the year 2030. India stands committed to meet this objective and is a signatory to the "End TB Strategy." <sup>7</sup>The "Revised National TB Control Program" of India has treated millions of patients, though the rate of decline in TB cases has been slow. Among the numerous reasons which adversely impact TB control in India are the urbanization and accompanying lifestyle changes which have led to a rapid increase in noncommunicable diseases.8 The aim and objective of this study were to study to asses in active tuberculosis patient's prevalence of diabetes mellitus and its predictors.

We found that among 212 TB patients13.1% was found to be the prevalence of diabetes. Sharma et al<sup>9</sup> determined prevalence of diabetes and its predictors among TB patients currently on treatment. The secondary objective was to examine the self-reported blood glucose monitoring and antidiabetic drug adherence practice among diabetic TB patients. This cross-sectional study was undertaken on 275 TB cases enrolled from selected designated microscopy centers. Self-reported information on diabetes, tobacco usage, and family history of TB was collected by trained investigators. In addition, for diabetic tubercular patients, the study investigators inquired about the type of treatment taken (allopathic/traditional), frequency of getting blood sugar tested, and daily drug adherence. For comparison between the "diabetes TB comorbidity" and "TB only group." The prevalence of diabetes among TB patients was found to be 13.1% (known diabetics -9.1% and new diabetics -4.0%). There were 25.5% of current/former smokers (70/275) and 13.1% of current/former smokeless tobacco users (36/275). In logistic regression analysis, age 50 years and above emerged

as a significant predictor for diabetes TB comorbidity (adjusted odds ratio = 9.8 [4.3-22.3]).

We found that the mean age at the diagnosis of "known diabetics" was 44.6 years. newly diagnosed diabetics was 4.0% and pre-existing diabetics was 9.1%. current/former smokers was 25.5% and current/former smokeless tobacco users were 13.1%. In all, 48 of the 212 study participants had a family history of TB (23%). Regularly antidiabetic daily medication was consumed by 85%. Significant predictor for diabetes TB comorbidity was emerged as age 50 years and above. Alebel et al<sup>10</sup> in metaanalysis estimates the overall prevalence of diabetes mellitus among tuberculosis patients in Sub-Saharan Africa. The findings of these 16 studies revealed that the pooled prevalence of diabetes mellitus among tuberculosis patients in Sub-Saharan Africa was 9.0% (95% CI: 6.0, 12.0%). The highest prevalence of diabetes mellitus among tuberculosis patients was found in Nigeria (15%), followed by Tanzania (11%), and then Ethiopia (10%). Besides, the prevalence of diabetes mellitus among HIV infected TB patients was (8.9%) which is slightly higher than HIV uninfected (7.7%) TB patients.

We observed that the proportion of "known diabetic" who got their blood sugar tested daily, weekly, monthly, was 8%, 28%, and 64%, respectively. The proportion of "new diabetic" who got their blood glucose tested daily, weekly, and monthly was 18.2%, 27.2%, and 54.6%, respectively. Viswanathan and Gawde<sup>11</sup> reported that diabetes increases the risk of poor treatment outcomes among pulmonary TB patients. Fonkeng et al<sup>12</sup> determined the prevalence of type 2 diabetes, associated risk factors and the impact of diabetes in the treatment outcome. Of the 222 patients who participated in the study, 9.4% [21/222] were diabetic with age 21-70 years, 15.32% [34/222] had impaired glucose tolerance whereas 32.43% [72/222] had a family history of diabetes. Among the 21 patients who had diabetes, 20 had T2D (17 where

newly diagnose whereas 3 were known T2D) and one had type 1 diabetes and was also newly diagnose. We noted a threefold increase in the risk of diabetes among unmarried TB patients and a 32% increase in the risk of diabetes for every unit increase in the body mass index (BMI). HIV Patients had a four-fold risk of being diabetic in our analysis. In conclusion the prevalence of DM among TB patients was found to be 9.4%. The principal risk factors associated with the DM among TB patients were BMI, unmarried and HIV infected.

#### CONCLUSION

Authors found that in TB patients' prevalent comorbidity is diabetes. Age more or equal to 50 years increases the chance of getting this morbidity together.

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