



A Study on prevalence of pulmonary tuberculosis among diabetes mellitus patients

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Abstract

Background: Association of diabetes and tuberculosis (TB) has been reported in various literatures globally. Recently there has been increasing mortality in diabetic patients infected with TB. Thus, the present study was undertaken to find out the prevalence of TB in diabetic patients, symptoms, smoking status and radiological patterns of TB in diabetic subjects.

Methods: 500 diabetics patients were screened for the presence of TB and out of these 56 patients affected with TB were designated as cases (DM-TB). Meanwhile aged matched non diabetic TB patients were designated as controls (Non DM-TB). The parameters like symptoms, smoking history, sputum positivity and X-ray pattern were evaluated.

Results: In this study the prevalence of TB in diabetics was found to be 11.2%. The male subjects were higher in both the groups. The most common symptoms in both the groups were cough, fever and breathlessness. The male smokers were significantly ($P < 0.005$) higher in DM-TB as compared to the Non DM-TB. The sputum positivity for AFB was higher in DM-TB as that of the Non DM-TB ($p > 0.005$). The chest X-ray displays more bilateral infiltration pattern of lesions and bronchiectasis and multiple zones of lesion in DM-TB group.

Conclusion: Thus early screening for TB in diabetes is highly vital for better treatment outcome and to reduce the mortality.

Keywords: Diabetes, tuberculosis, smoking, respiratory symptoms, acid fast bacilli, chest X-ray.

Introduction

Tuberculosis (TB) is a microbial lung disease caused by *Mycobacterium tuberculosis* and it is one major cause of death globally⁽¹⁾. As per 2017,

globally 10 million people developed TB and 1.3 million are died from the disease⁽²⁾. As per WHO Global report 2017, an estimated 28 lakh cases occurred and 4.5 lakh people died due to TB in

India⁽³⁾. Reports suggest that the incidence of TB is higher in patients affected with impaired immunity, HIV infection, or diabetes⁽⁴⁾. Diabetes mellitus (DM) is a metabolic disorder, characterized by an elevated blood sugar level. Globally, people affected with diabetes are estimated to be 422 million with the prevalence of 8.5% among over 18 years of age according to 2014 WHO report. Further, the prevalence of diabetes is increasing steeply in developing countries⁽⁵⁾. As per International Diabetic Federation report there are about 72.946.400 cases of diabetes in India in 2017⁽⁶⁾. Apart from HIV, nutritional deficiency, alcohol intake and smoking, recently diabetes mellitus has been highlighted as one of the major risk factor for TB⁽⁷⁾. Epidemiological studies have displayed an interlink between the diabetes and TB⁽⁸⁾. Meta-analysis studies reveal that diabetic patients are 3.11 times vulnerable to TB as that of the normal population⁽⁹⁾. Diabetes mellitus affects the immune system especially, the cell mediated immunity and thus reduces the proliferation of T-helper cells and their production of cytokines in response to TB. Further, the macrophage activation, phagocytic and chemotaxis mechanism are impaired in diabetics, albeit immune response is vital for TB inhibition. Thus compromised immunity in the event of diabetes mellitus increases the risk of TB progression⁽¹⁰⁾. Earlier studies have shown that prevalence of TB in Indian diabetic subject is 18.4%⁽¹¹⁾. Mean while, report suggests that TB in diabetics displayed an atypical radiographic pattern and distribution⁽¹²⁾. In this backdrop, the present study was undertaken to evaluate the prevalence of TB among the diabetic subjects and also to assess the various radiological patterns of TB in diabetic patients.

Patients and Methods

The present study was a prospective case control study carried on 500 established Diabetes mellitus patients who attended the diabetology department Govt. Kilpauk Medical College & Hospital, Chennai.

Patients with Type 2 diabetes mellitus with respiratory symptoms, age group between 19 to 75 years, and duration of diabetes was from newly diagnosed to maximum 25 years were included in the study.

Patients treated earlier for tuberculosis, immunosuppressed states like HIV positivity, patients who were on steroid therapy and chronic renal failure patients were excluded from the study.

In the present study, 500 cases of diabetes mellitus patients were screened for tuberculosis based on inclusion criteria and exclusion criteria. Out of 500 diabetic cases the TB was detected in 56 cases and they were enrolled in further study. 56 cases of TB aged and sex matched without the evidence of diabetes were designated as controls.

Clinical history and physical examination findings of cases and control were recorded with respect to age, sex, BMI, symptoms and clinical features of tuberculosis.

Further, laboratory investigations like estimation of hematological parameters, lipid profiles, renal profiles, fasting and post prandial blood sugar level and Mantoux test were performed.

Microbial test like Ziehl-Nielsen staining of sputum was performed for the detection of acid fast bacilli.

Furthermore, X -ray of chest was performed and the radiological lesions were analysed by number of zones involved, nature of lesions like infiltration, consolidation, fibrosis, cavity and consolidation etc.

Statistical Analysis

Data were entered in a Microsoft Excel computers read sheet and analysed by using WHO epidemiological information package. Data were analyzed by the student 't' test and Fisher's and $p < 0.05$ was considered significant.

Results

In the present study, Out of 500 diabetic subjects 56 patients were found to be suffering from TB were designated as case group (DM-TB) and thus the prevalence was found to be 11.2%. Mean

while, 56 age matched patients suffering from tuberculosis alone and non diabetics were designated as control group (Non DM-TB). Further, the sex distribution, clinical symptoms and various patterns of radiological lesions and number of zones involved were compared between the cases and control.

Out of 56 cases DM- TB group, 35 were male and 21 were females. Meanwhile, in out of 56 cases in Non DM-TB population 43 were males and 13 were females. Thus male: female ratio was found to be 1.67 in DM-TB group and 3.31 in Non DM-TB group. The results were displayed in Table 1.

Table 1: Sex distribution in the present study

	DM-TB	Non DM-TB
No. of subjects	56	56
Male	35	43
Female	21	13
Male: Female ratio	1.67	3.31

In the DM -TB group, out of 56 patients majority of the patients were above 40 years of age, whereas in Non DM -TB group, out of 56 patients majority of the patients were above 30 years of age.

Regarding, the spectrum of symptoms all the patients in DM -TB group showed cough with expectoration (100%), followed by fever (53.6%), breathlessness (39.3%) and haemoptysis (32.1%). Meanwhile, in Non DM -TB group majority of the patients presented with the following symptom fever (72%) and breathlessness (62.5%). The clinical symptom in the present study is similar in both DM-TB and Non DM-TB group. There was no significant difference in the overall symptomatology.

The smoking habit in males in the DM –TBgroup (58.94%) was found to be higher as compared to the males in Non DM-TB group (55.4%). However the value was found to be non-significant (p=0.703).

In the present study the sputum Acid Fast Bacilli positivity was higher in DM-TB group (57.1%) as that of the Non DM –TB group (55.45 %). However the value was found to be non-significant (p=0.849).

Regarding the various radiological lesions and the pattern of distribution, the DM –TB group displayed more bilateral involvement in the infiltration pattern of lesions and bronchiectasis. Left sided lesions were more with consolidation, cavity with infiltration and fibrosis.

Meanwhile, in Non DM-TB group a more right sided pattern of infiltration was observed. Further, the right sided lesions were seen as equally as left sided lesion in cavity with infiltration type of lesions. Thus more significant bilateral lesions were observed in DM-TB as that of the Non DM-TB.

Regarding zone of lesions, more number of zones was observed in DM-TB as that of the Non DM-TB. Three zone involvement was seen in almost similarity in both the groups. Meanwhile, four and five zone involvement was seen only in DM-TB group (Table 2).

Table 2: Zone of lesions observed in the present study

No. of zones	No of Cases	Cases (%)	No of Control	Control (%)
One	14	26	40	74
Two	26	45	34	55
Three	6	43	8	57
Four	2	100	0	0
Five	1	100	0	0
Six	0	0	0	0

Discussion

The overall prevalence of pulmonary TB in diabetics was shown to be 11.2% in our study. However, this range is lower when compared to a study conducted by Stevenson et al. among the Indian patients where the prevalence rate is reported to be 18.4%⁽¹¹⁾. Meanwhile, our prevalence rate is higher than other Indian studies conducted by Lalit and Kumar et al. where the prevalence rate is reported to be 6% and 2.3% respectively^(13,14).

In this study the most of the cases in DM- TB group are more than 40 years age and in non DM-TB group most of the cases are above 30 years of age. This result is in accordance with the previous report reported by Agarwal et al⁽¹⁵⁾.

In our study the male preponderance was higher in both the DM-TB and Non DM-TB groups. Mounting studies have displayed the preponderance of the male gender in diabetic patients affected with TB⁽¹⁶⁻¹⁸⁾. This might be due to the combined effect of smoking and alcohol consumption which is common among the males⁽¹⁹⁾.

In our DM -TB group showed the following spectrum of symptoms like cough with expectoration, fever, breathlessness and haemoptysis. Likewise, in Non DM –TB group the most common symptoms are fever and breathlessness. Similar studies have reported no difference in the symptomatology between diabetic and non-diabetic TB patients^(20, 21).

In the present study, the smoking habit is higher in DM-TB group as that of the non DM-TB group, but there is no significant difference between the groups. Previous studies indicate that most of the patients are current smokers or have smoked, smoking being a risk factor significantly associated with DM-TB co-epidemic. Diabetics adds to the increased susceptibility for TB among the smokers^(22, 23, 24).

In the present study both diabetics and non diabetic TB group showed similar sputum positivity rates, although it was slightly higher in the DM –TB group and it was found to be non-significant. In a study done by Singla et al⁽²⁵⁾ in the DM-TB group, 65.2% of the patients had AFB on sputum smear examination compared to 54.1% of the Non DM-TB group (p=0.008).

Radiological studies reveal that more bilateral infiltration pattern of lesions and bronchiectasis is seen among the DM-TB group in the present study. Our observation is consistent with the previous reports done by Perez-Guzman et al (26). Further, in our study the DM-TB group displayed multiple zones of lesions. Our report is in consistent with a study conducted by Jalamkar and Salve, wherein DM-TB subjects chest X-ray showed upper zone involvement in majority -10 patients (66.6%), mid zone and lower zone involvement was seen in one patient (6.6%), lower

zone in 2 patients (13.3%) respectively. Furthermore, multiple lobe involvement was observed in 2 patients (13.3%), and cavitations were seen in 4 patients (26.67%).

Conclusion

Thus from our experience, the prevalence of pulmonary tuberculosis in diabetics is 11.2%. Further in this study the male preponderance is more in both DM-TB and Non DM-TB group. The symptoms like cough, fever, bronchiectasis and breathlessness are common among both the groups. Further, the frequency of smoking and sputum positivity rate for AFB is higher among the DM-TB group as that of the Non DM-TB group. Further, chest X-ray shows more bilateral infiltration pattern of lesions and bronchiectasis and multiple zones of lesion in DM-TB group. Thus, early detection of TB in diabetics and proper treatment might reduce the morbidity and mortality in diabetic patients affected with tuberculosis.

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