

# Prevalence and Associated Risk Factors of Pulmonary Tuberculosis in Diabetic Patients

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## Abstract

**Background:** One-third of India's population is infected with mycobacterium tuberculosis; there are 12 million active tuberculosis cases in India. One person dies of Tuberculosis every minute in India. No other disease has so much sociological, economic and health significance as Tuberculosis has. In 2005 there were an estimated 8.8 million new cases of Tuberculosis worldwide, with 1.9 million of those occurring in India. In India in 2000, there were an estimated 481,573,000 people over the age of 25 years. Among these, 4.3% i.e. around 20,707,639 had diabetes, 19 and 939,064 developed. **Subjects and Methods:** The study conducted over a period of 2 yrs. Adult patients with diabetes mellitus with pulmonary Tuberculosis were included, while Diabetic patients with extrapulmonary Tuberculosis were excluded from the study. **Results:** The maximum incidence of pulmonary Tuberculosis was noted above the age of 30yrs were 13(26.0%). The peak incidence was in the age group of 31 – 40 and 41 – 50 yrs. The mean age is 52.62. As Shown in [Figure 1], the total numbers of males were 64% and females were 36%. The male to female ratio was 2.11:1 As Shown in [Table 3], the distribution of patient according to their occupation noted were Skilled (18%), Unskilled (38%), Business (16%), Service (2%), Housewife (22%), and Student (4%). As shown in [Table 4], the socio-economic status among 50 patients was distributed into: Upper (2%), Upper Middle (22%), Upper lower (32%), Lower (12%), Lower middle (32%), and Lower-middle (32%). **Conclusion:** Early diagnosis and properly monitored treatment regimen is the only time tested answer to this problem. All diabetics at the initial diagnosis and every year must have an x-ray chest done. All diabetics with abnormal weight loss, unexplained cough, or sudden increase of insulin requirement should have sputum examination and chest x-ray done.

**Keywords:** Ziehl-Neilsen Stain, Lowenstein –Jensen Medium, Bilateral Opacities, Mortality Rates

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Received: 24 December 2019

Revised: 12 February 2020

Accepted: 5 March 2020

Published: 25 June 2020

## Introduction

Tuberculosis is an ancient disease that continues to haunt us even as we step into the next millennium and it is one of the major public health problems in the developing countries of the world today. One-third of India's population is infected with mycobacterium tuberculosis. There are 12 million active tuberculosis cases in India. One person dies of Tuberculosis every minute in India.<sup>[1]</sup> No other disease has so much sociological, economic and health significance as Tuberculosis has. In 2005 there were an estimated 8.8 million new cases of Tuberculosis worldwide, with 1.9 million of those occurring in India. In India in 2000, there were an estimated 481,573,000 people over the age of 25 years.<sup>[2]</sup> Among these, 4.3% i.e. around 20,707,639 had diabetes, 19 and 939,064 developed. Pulmonary Tuberculosis, of which 575,900 were smear-positive and hence infectious.<sup>[3]</sup> Recent

studies predict that in India, 18.4% (12.5% to 29.9%) of people with pulmonary Tuberculosis have diabetes and that in the smear-positive group diabetes prevalence is 23.5% (12.1% to 44%). United Nations: World Population Prospects 2006. Various studies show that the incidence of Tuberculosis in diabetic patients varies from 1.6 – 8.4%.<sup>[4]</sup> Early diagnosis of the combination is rare. At the time of diagnosis, a large majority of cases have severe diabetes and far advanced pulmonary Tuberculosis.<sup>[5]</sup> In a study from the regional institute of medical sciences, Imphal, the prevalence of pulmonary Tuberculosis in diabetics was found to be 27% by radiological diagnosis and 6% by sputum positivity.<sup>[6]</sup> Rising prevalence of Tuberculosis in diabetics has been seen with age. Mortality rates in these patients are reported to be several times higher than in nondiabetic pulmonary tuberculosis patients. In a study from Congo, diabetes appeared to have an induction

and aggravating effect on Tuberculosis. Irrespective of the triggering mechanisms, the fact remains that an epidemic of diabetes mellitus is sweeping the country.<sup>[7]</sup> The recent prevalence data has propelled the estimates for India upwards- 32 million in 2000 and 80 million in 2030. This study has, therefore, been undertaken to determine the prevalence rate and associated risk factors of Tuberculosis in diabetes.

### Subjects and Methods

All type 2 diabetic patients reporting to MVJMC and RH will form the subjects for study. The study conducted over a period of 2 yrs. Adult patients with diabetes mellitus with pulmonary Tuberculosis were included, while Diabetic patients with extrapulmonary Tuberculosis were excluded from the study. Diagnosis of diabetes was based on the National Diabetes Data Group and World Health Organization (WHO) which issued diagnostic criteria for diabetes mellitus based on the spectrum of fasting plasma glucose (FPG) and the response to an oral glucose load varying among normal individuals. Individuals with IFG or IGT are at substantial risk for developing type 2 diabetes mellitus (40% risk over the next 5 years) and cardiovascular disease. Oral glucose tolerance testing, although still a valid mechanism for diagnosing diabetes mellitus is not recommended as part of routine care. Diagnosis of Pulmonary Tuberculosis was made on the basis of sputum examination that was examined by direct smear using the Ziehl-Neilsen stain. The fluorescence method allows a large number of specimens to be examined rapidly. Sputum smear examination is usually positive in advanced disease but may be negative in less advanced disease, Sputum culture: Growth is visible on culture only after 3 – 8 weeks (Lowenstein –Jensen medium). Rapid diagnosis is now possible within 2 – 6 days using a radiometric culture system, the basic system. In any patient in whom the diagnosis is in doubt, repeated smear and culture examination should be carried out,

### Radiological appearances suggestive of Tuberculosis

Following characteristics of a Chest radiograph favors the diagnosis of Tuberculosis:

1. Opacities mainly in the upper zone (s),
2. Patchy or nodular opacities,
3. Presence of cavity or cavities,
4. Presence of calcification,
5. Bilateral opacities especially if in upper zones,
6. Opacities that persists after several weeks (and thus are less likely due to acute pneumonia).

### Results

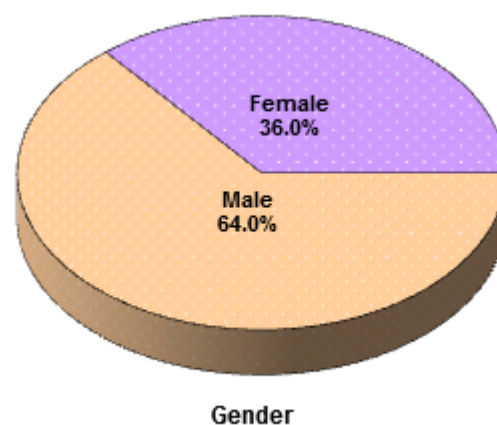
Table 1 shows the age wise distribution of Patients. The maximum incidence of pulmonary Tuberculosis was noted

above the age of 30 years were 13 (26.0%). The peak incidence was in the age group of 31 – 40 and 41 – 50 years. The mean age is 52.62. As shown in Figure 1, the total numbers of males were 64% and females were 36%. The male to female ratio was 2.11:1 As Shown in the Table 2 the distribution of patient according to their occupation noted were Skilled (18%), Unskilled (38%), Business (16%), Service (2%), Housewife (22%), and Student (4%). As shown in Table 3, the socio-economic status among 50 patients was distributed into Upper (2%), Upper Middle (22%), Upper lower (32%), Lower (12%), Lower middle (32%), and Lower-middle (32%). As shown in the Table 4, The predominant presenting symptoms noted were cough (76%), expectoration (74%), fever (60%), in all the age groups. Significant percentage of patients had a loss of weight. As shown in Table 5 38% of the patients had a duration of diabetes between 6–10 years and 22% of the patients had a duration of diabetes between 11 – 20 years and in 36% of the patients, duration of the diabetes was less than 5 year. 4% of the patients had diabetes for more than 20 years. 40% of male patients in our study were smokers and 34% are alcoholics [Figure 2, Figure 3].

**Table 1: Age Distribution Of Patients Studied**

Age in years	Number of patients	Percentage (%)
31-40	13	26.0
41-50	13	26.0
51-60	10	20.0
61-70	8	16.0
>70	6	12.0
Total	50	100.0

Mean ± SD: 52.62±14.25



**Figure 1: Gender distribution of patients studied**

**Table 2: Distribution of occupation of patients studied**

Occupation	Number of patients	Percentage (%)
Skilled	9	18.0
Unskilled	19	38.0
Business	8	16.0
Service	1	2.0
Housewife	11	22.0
Student	2	4.0
Total	50	100.0

**Table 3: Distribution of socio-economic status of patients studied (SES)**

SES	Number of patients	Percentage (%)
Upper	1	2.0
Upper middle	11	22.0
Upper lower	16	32.0
Lower	6	12.0
Lower middle	16	32.0
Total	50	100.0

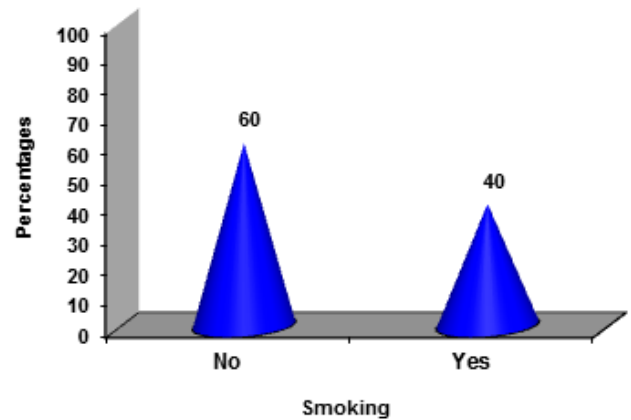
**Table 4: Distribution Of Symptoms Of Patients Studied**

Symptoms	Number of patients (n=50)	Percentage (%)
Fever		
• No	20	40.0
• Yes	30	60.0
Cough		
• No	12	24.0
• Yes	38	76.0
Expectoration		
• No	6	12.0
• Yes	44	88.0
Breathlessness		
• No	19	38.0
• Yes	31	62.0
Loss of weight		
• No	23	46.0
• Yes	27	54.0

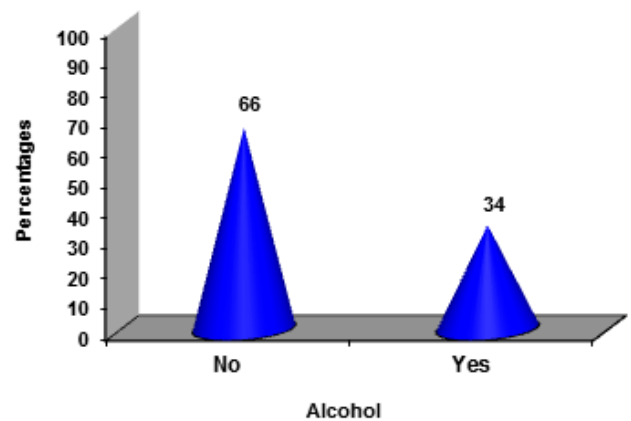
**Table 5: Distribution of Duration of Diabetics of Patients Studied**

Duration of diabetics	Number of patients	Percentage (%)
<5	18	36.0
6-10	19	38.0
11-20	11	22.0
>20	2	4.0
Total	50	100.0

Mean ± SD: 7.98±4.87



**Figure 2: Distribution of Habit (Smoking) of Patients Studied**



**Figure 3: Distribution of Habit (Alcohol) of Patients Studied**

## Discussion

This study was conducted on 50 patients who came with Tuberculosis and had Diabetes mellitus on investigations. Clinical and radiological evaluation of 50 cases of pulmonary Tuberculosis with diabetes mellitus was done. The high incidence of Tuberculosis in diabetic patients, reported by western and Indian workers, suggests a significant association between these two diseases.<sup>[8]</sup> In the present study, the number of patients above the age of 30 years was 13(26.0%) and the peak incidence was in the age groups of 31-40 and 41-50(26.0%). 50% of the total cases were in these age groups. The majority of cases of tuberculous diabetics belong to the age group of 45 yrs and above (82.6%).<sup>[9]</sup> 57.1% of the patients were above the age of 40 yrs.<sup>[10]</sup> Half of the active new cases of Tuberculosis were observed in those who were at least 45 yrs and relative incidence was highest in those who had passed 65 yrs.<sup>[11]</sup> This study also showed a higher incidence of tuberculous diabetics in people over the age of 40 yrs. In this study the highest incidence was in the age group of 60 –69 yrs. In our study the total number of males was 64% and females were 36%. The male to female ratio was 2.11:1. Other studies have shown that, the prevalence as well as incidence of Tuberculosis is higher among males than among females, the ratio varying from 3:1 to 5:1. In a study of 2434 cases of pulmonary Tuberculosis, it was reported that 62.9% were males and 37.1% were females.<sup>[12]</sup> Among the 138 cases of diabetes with pulmonary Tuberculosis, 72.4% were males and 27.53% were females.<sup>[13]</sup> A similar ratio of male female. In the 179 cases he studied, 76% were males and 24% were females.<sup>[14]</sup> In other study observed that male population outnumbered the females.<sup>[15]</sup> 78% of patients were males.<sup>[16]</sup> All the above studies showed an increased incidence of the disease in males as compared to females and our study also noted the same. The high incidence of disease in males is possibly due to the fact that both Tuberculosis and diabetes are more common in males. Another reason could be that the number of male patients getting admitted to the hospital are more than females. In our study when socio-economic status of patients is considered the upper, lower, and lower-middle are 32% and 32% among the total patients. The same as well as other studies showed prevalence is common in low socio-economic status. The role of diabetes mellitus in the higher prevalence of Tuberculosis.

When the occupation is taken in to picture in our study it is commonly found in unskilled patients (38.0%) and next to them house wives (22.0%). Other studies also show the same findings.<sup>[17]</sup> The predominant symptoms noted in this study were cough (76%) (No of patients -38) expectoration (74%), (No of patients-36) fever (60%) (No of patients- 30) loss of weight (54%) (No of patients-27).<sup>[18]</sup> In a study done in Ethiopian diabetic patients with Tuberculosis, three most common symptoms of Tuberculosis were fever (80.5%),

sweating (80.4%) and cough (70.5).<sup>[19]</sup> In our study also a percentage of cough and fever was high associated with a history of weight loss in 27 patients among fifty patients. 20% of our patients had a past history of Tuberculosis. 10% of patients in our study had family history of Tuberculosis. 20 out of 32 males (40.0%) were smokers in our study. It has been shown that in patients of both sexes over the age of 30 with pulmonary Tuberculosis, there is a highly significant deficiency of nonsmokers and light smokers, and an excess of moderate and heavy smokers compared to controls of same age suffering from other diseases.<sup>[20]</sup>

This study shows that 40.0% were smokers (males) and smoking may be a contributing factor in developing Tuberculosis in these patients. The study of the duration of diabetes in relation to the onset of Tuberculosis showed that, in most cases, Diabetes mellitus was diagnosed before the development of Tuberculosis. Prior to the onset of Tuberculosis, 38% patients had a duration of diabetes between 6-10 years. 36% patients had a duration of diabetes between less than 5 years, the average duration of diabetes in this study was 6.9 yrs with SD 7.98+ 4.87. The interval between the detection of diabetes and the onset of pulmonary Tuberculosis reported that it varied from several months to 15 yrs, the mean interval being about 6 yrs, which is same to this study.<sup>[21]</sup> In another study, diabetes was detected before Tuberculosis in 70% of cases. 32% of patients had diabetes for 1 – 5 yrs, 32% had it for 6 – 10 yrs and 20% more than 10 yrs.<sup>[22]</sup> The duration of diabetes is significant because there is an increased opportunity for infections with increased duration of diabetes. The result of the present study is comparable to other studies. Some studies have reported that there is no correlation between the duration of diabetes and the development of pulmonary Tuberculosis.

## Conclusion

Early diagnosis and properly monitored treatment regimen is the only time tested answer to this problem. All diabetics at the initial diagnosis and every year must have an x-ray chest done. All diabetics with abnormal weight loss, unexplained cough, or sudden increase of insulin requirement should have sputum examination and chest x-ray done.

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**How to cite this article:** Leelamohan PVR, Kumar R M. Prevalence and Associated Risk Factors of Pulmonary Tuberculosis in Diabetic Patients. *Acad. J Med*. 2020;3(1):47-51.

DOI: [dx.doi.org/10.47008/ajm.2020.3.1.10](https://dx.doi.org/10.47008/ajm.2020.3.1.10)

**Source of Support:** Nil, **Conflict of Interest:** None declared.