

## ORIGINAL RESEARCH

### To determine the clinical and radiological features of pulmonary TB in diabetic mellitus patients

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#### ABSTRACT

**Aim:** To determine the clinical and radiological features of pulmonary TB in diabetic mellitus patients.

**Methods and materials:** After receiving approval from the ethics council, the study was conducted on 100 individuals with DM and PT. A comprehensive history, clinical examination, sputum analysis for acid fast bacilli, and chest radiography were used to diagnosis PT. The clinical profile, pertinent tests, and radiological data were collated and analysed.

**Results:** Males made up 55 percent of the study sample, while females made up 45 percent. Cough (75%), fever (65%), and anorexia (77%) were the most common symptoms reported. Other symptoms included hemoptysis (13%), weight loss (51%), dyspnea (21%), chest discomfort (21%), and night sweats (41%). 24% of the patients had a history of tuberculosis, 13% had related hypertension, 9% had associated ischemic heart disease, 67% of male patients were smokers, and 9% had a family history of tuberculosis. Right sided lung lesions were found in 45% of patients over 45 years old and 31.67% of cases under 45 years old, whereas left sided lesions were found in 27.5% of cases under 45 years old and 28.33% of cases over 45 years old. Bilateral lesions were seen in 27.5% of individuals under the age of 45 and 40% of cases beyond the age of 45. Lesions in the lower lung field were seen in 43% of the patients. The chest x-ray revealed a cavity in 30% of the patients, a fibrous cavity in 11% of the patients, and an infiltrative lesion in 9% of the patients. Consolidation (7%), pleural effusion (7%), hydro pneumothorax (3%), parenchymal opacity (2%), and bronchiectasis (4%) were also seen.

**Conclusion:** Severe hyperglycemia seems to be a risk factor for diabetics developing pulmonary TB. Diabetes seems to have no influence on the presenting characteristics of pulmonary TB.

**Key words:** Diabetes Mellitus, Pulmonary Tuberculosis, Hyperglycaemia, Lower Lung Field Tuberculosis

## INTRODUCTION

Tuberculosis (TB), an infectious illness, is one of the leading causes of death and morbidity worldwide. Diabetes mellitus (DM) patients are three times more likely to acquire active tuberculosis (TB) than non-diabetic people.<sup>1</sup> It is estimated that one-third of the world's population is infected, 8.8 million people get tuberculosis, and 1.45 million people die from the illness each year.<sup>2</sup> According to World Health Organization (WHO) figures, the illness is on the increase, with an annual incidence of 300 per 100,000 people in various Asian nations.<sup>3-7</sup>

India, the world's second most populous nation, accounting for one-fourth of worldwide TB incidence cases each year. In 2012, it was predicted that 2.3 million TB cases occurred in India, out of an estimated 8.6 million TB cases worldwide.<sup>8</sup> Diabetes prevalence in India's adult population was determined to be 7.1%.<sup>8</sup> India accounts for 26% of all TB cases worldwide each year. At the same time, India has the greatest TB burden in the world.<sup>9</sup> In India, the incidence rate of tuberculosis was estimated to be 176/1 lakh persons in 2012, with a prevalence rate of 230/1 lakh population. In the same year, the death rate was recorded as 22 per lakh people. Diabetes is expected to impact 366 million people worldwide by 2030, with low-to-middle-income nations seeing the greatest growth.<sup>10</sup> A fasting blood sugar level of more than 125 mg/dl and a 2-hour post-glucose load of more than 200 mg/dl are required for diabetes diagnosis. The main cause of tuberculosis in diabetic patients is a weakened immune system caused by chronic disease, which puts the population at higher risk of latent infection. It is noted that cellular immunity that is weakened, alveolar macrophage dysfunction, interferon gamma low levels, microangiopathy of the lungs, and micronutrient deficiency all play a significant role in the occurrence of tuberculosis in diabetic patients.<sup>11</sup>

## METHODS AND MATERIALS

This study was done in the department of medicine and radiodiagnosis. After receiving approval from the ethics council, the study was conducted on 100 individuals with DM and PT. A comprehensive history, clinical examination, sputum analysis for acid fast bacilli, and chest radiography were used to diagnosis PT. The national diabetes data group and WHO diagnostic criteria were used to diagnose diabetes. Adult patients who met the following criteria were included in the research, although diabetic individuals with extrapulmonary TB were excluded. Patients were thoroughly evaluated and submitted to necessary laboratory and radiographic tests. Age and sex distribution, symptom of presentation, past history of tuberculosis, duration of DM, history of smoking, incidence of clubbing, haemoglobin level, erythrocyte sedimentation rate (ESR), total leukocyte count (TLC), blood sugar levels (BSL), sputum AFB results, and radiological pattern were all evaluated in this study. The clinical profile, pertinent tests, and radiological data were collated and analysed.

## STATISTICAL INVESTIGATION

Descriptive statistics such as mean, SD, and so on were used for statistical analysis. The Student's Unpaired 't' test was used to compare the mean values of the continuous parameters under investigation. As applicable, the Mann Whitney test, Chi-square test, and Independent t test were employed to determine the significance of study categorical data. A 'P' value of 0.05 was deemed statistically significant.

## RESULTS

Males made up 55 percent of the study sample, while females made up 45 percent. The male-female ratio is 1.22:1. Above the age of 45, the prevalence of pulmonary tuberculosis was highest. (Table 1). Cough (75%), fever (65%), and anorexia (77%) were the most common symptoms reported. Other symptoms included hemoptysis (13%), weight loss (51%),

dyspnea (21%), chest discomfort (21%), and night sweats (41%). (Table 2). 24% of the patients had a history of tuberculosis, 13% had related hypertension, 9% had associated ischemic heart disease, 67% of male patients were smokers, and 9% had a family history of tuberculosis (Table 3). 41% of the patients had diabetes for 6 to 10 years, 31% for 2 to 5 years, 9% for less than 1 year, and 19% for more than 10 years. Fasting blood sugar (FBS) levels were shown to be significantly associated with pulmonary tuberculosis (TB). FBS was seen in 36% of the individuals. Between 201 and 300 mg dl-1, 39% had a value between 151 and 200 mg dl-1, and 25% had a value over 300 mg dl-1. 46% of the patients had PPBS levels more than 350 mg dl-1, 27% had values between 251 and 350 mg dl-1, and 27% had values less than 250 mg dl-1. In the study group, the mean PPBS value was 331.25 mg dl-1. Anerythrocyte sedimentation rate (ESR) of more than 100 mm hr-1 was found in 12% of the patients, with 48% having values between 51 and 100 mm hr-1. Only 16% of the patients had a value less than 20 mm hr-1, whereas 84% of the research participants had an elevated ESR. Sputum AFB was found in 70% of individuals over 45 years old and 50% of those under 45 years old (Table 4). Right sided lung lesions were found in 45% of patients over 45 years old and 31.67% of cases under 45 years old, whereas left sided lesions were found in 27.5% of cases under 45 years old and 28.33% of cases over 45 years old. Bilateral lesions were seen in 27.5% of individuals under the age of 45 and 40% of cases beyond the age of 45. (Table 5). Lesions in the lower lung field were seen in 43% of the patients. (Table 6). The chest x-ray revealed a cavity in 30% of the patients, a fibrous cavity in 11% of the patients, and an infiltrative lesion in 9% of the patients. Consolidation (7%), pleural effusion (7%), hydro pneumothorax (3%), parenchymal opacity (2%), and bronchiectasis (4%) were also seen. (Table 7).

**Table 1: Age and sex wise distribution of patients**

Gender	Number	%
Male	55	55
Female	45	45
Age		
below 45	40	40
above 45	60	60
Mean age	52.58±4.69	

**Table 2: Clinical symptoms**

Symptoms	Number	%
Cough	75	75
Fever	65	65
Hemoptysis	13	13
Dyspnea	21	21
Anorexia	77	77
Loss of weight	51	51
Chest pain	21	21
Night sweats	41	41

**Table 3: Past history**

Past history	Number	%
Tuberculosis	24	24
Hypertension	13	13

Ischemic heart disease	9	9
Smoking	57	57
Family history of Tuberculosis	9	9

**Table 4: Sputum AFB**

Age groups	Yes	No	Total	%
Below 45	20	20	40	40
Above 45	12	48	60	60

**Table 5: Side of lesion (right/left/bilateral)**

Age groups	Left	%	Right	%	Bilateral	%	Total
Below 45	11	27.5	18	45	11	27.5	40
Above 45	17	28.33	19	31.67	24	40	60

**Table 6: Lower lung field tuberculosis**

Age groups	yes	%	no	%	Total
Below 45	12	30	28	70	40
Above 45	31	51.67	29	48.33	60

**Table 7: Chest X-ray Diagnosis**

Chest X-ray Diagnosis	Total	%
Parenchymal opacity	2	2
Parenchymal opacity, Infiltration	2	2
Bronchiectasis	4	4
Cavity	30	30
Cavity, Infiltration	4	4
Consolidation	7	7
Fibrous cavity, Infiltration	7	7
Fibrous cavity	11	11
Fibrosis	8	8
Fibrosis, Infiltration	2	2
Hydro pneumothorax	3	3
Infiltration, Hydro pneumothorax	2	2
Infiltration	9	9
Pleural effusion	7	7
Pleural effusion, Infiltration	2	2
Total	100	100

## DISCUSSION

A clinical and radiological assessment of 100 patients with pulmonary TB and diabetes was performed. The high prevalence of TB in diabetic individuals observed by western and Indian researchers suggests a link between these two illnesses.<sup>12</sup> Males made up 55% of the participants in our research, while females made up 45%. 1.22:1 was the male to female ratio. In a research conducted by Desmukh and colleagues, 72.4% of the 138 cases of diabetes with pulmonary TB were men, while 27.53% were girls.<sup>13</sup>

Patel JC had a similar male:female ratio. In the 179 instances he looked at, 76% were men and 24% were women.<sup>14</sup> The above-mentioned research found that males had a higher incidence of the condition than females, and our investigation found the same. Males have a higher illness incidence than females, presumably because TB and diabetes are more frequent

in men. Another factor might be because male patients seek medical treatment or examination at a higher rate than females. In the current investigation, the largest incidence of pulmonary tuberculosis was seen in those above the age of 45. This is consistent with the findings of Desmukh's research, which found that the majority of tuberculous diabetics (82.6%) are above the age of 45.<sup>13</sup> One reason might be an increase in overall morbidity with age, as well as a gradual loss of immunity with age. Cough (75%), fever (65%), and anorexia (77%) were the most common symptoms reported. Other symptoms reported were hemoptysis (13%), weight loss (51%), dyspnoea (21%), chest discomfort (21%), and night sweats (41%). Fleke Y conducted a research on Ethiopian diabetic patients with TB and found that the three most prevalent tuberculosis symptoms were fever (80.5%), sweating (80.4%), and cough (70.5%).<sup>15</sup> Anorexia, cough, and fever were all prevalent in our research. Anorexia occurs because many patients have low immunity or toxemia, a poor nutritional diet, coughing is common because many patients smoke, which can be a contributing factor during the disease process, and fever may be due to a host immune response to bacteria or an auto immune response to maintain the thermoregulatory system.

24% of the patients had a history of tuberculosis, 13% had related hypertension, 9% had associated ischemic heart disease, 67% of male patients were smokers, and 9% had a family history of tuberculosis. Our findings are close to those of Lowe, who discovered that more than 82% of people smoked. When compared to controls of the same age suffering from other illnesses, pulmonary tuberculosis is less prevalent among nonsmokers and light smokers, and more common in moderate and heavy smokers.<sup>16</sup> Smoking may have a role in the development of TB in these people. A reduction in immunological response, CD4 lymphopenia, a deficiency in macrophage immune response, and mechanical disruption of ciliary function in the airways are all possible mechanisms. In our research, clubbing was seen in 14% of the patients. Clinical and radiological evaluation revealed that 86% of these patients had advanced tuberculosis. Gordonleitch A observed a 21% incidence of clubbing in his research, which was related with more severe pulmonary injury. Long-term tuberculosis causes extensive clubbing.<sup>17</sup> Finger clubbing is useful in evaluating individuals with pulmonary tuberculosis because it helps identify those with severe illness. In our investigation, 75% of the patients were found to be anaemic. 41% of the patients had diabetes for 6 to 10 years, 31% for 2 to 5 years, 9% for less than 1 year, and 19% for more than 10 years. Tripathy and colleagues investigated the time between the diagnosis of diabetes and the beginning of pulmonary tuberculosis. They reported that it ranged from a few months to 15 years, with a mean interval of roughly 6 years.<sup>18</sup> In the Anand AL investigation, DM was found in 70% of patients preceding TB. 32% of patients had diabetes for 1 to 5 years, 32% for 6 to 10 years, and 20% for more than 10 years.<sup>19</sup> The duration of diabetes is crucial since there is an increased risk of infection with a longer duration of diabetes. The current study's findings are similar to those of prior investigations. Fasting blood sugar (FBS) levels were shown to be significantly associated with pulmonary tuberculosis (TB). 36% of the patients had FBS values ranging from 201 to 300 mg dl-1, 39% had values ranging from 151 to 200 mg dl-1, and 25% had values more than 300 mg dl-1.

46% of the patients had PPBS levels more than 350 mg dl-1, 27% had values between 251 and 350 mg dl-1, and 27% had values less than 250 mg dl-1. In the study group, the mean PPBS value was 331.25 mg dl-1. In a research conducted by Sachdeva AK and colleagues, it was discovered that a high frequency of pulmonary tuberculosis was connected with severe hyperglycemia.<sup>20</sup>

Sputum AFB was found in 70% of individuals over 45 years old and 50% of those under 45 years old. The reason for increased sputum positivity in younger age groups is most likely due to their daily social and labour activities and being working class people, and their immune response is leading to TB breakdown. DM is associated with lower smear positive in

the elderly, despite the fact that cavitory lesions have a large bacterial population. This might be due to muscular weakness caused by uncontrolled hyperglycemia and ineffective expectoration.<sup>21</sup>

Right sided lung lesions were found in 45% of patients over 45 years old and 31.67% of cases under 45 years old, whereas left sided lesions were found in 27.5% of cases under 45 years old and 28.33% of cases over 45 years old. Bilateral lesions were seen in 27.5% of individuals under the age of 45 and 40% of cases beyond the age of 45. The greater prevalence of right-sided illness is most likely attributable to larger lung mass on the right side. In diabetics, bilateral distribution may be owing to fast bronchial spread of TB. Upper zone involvement is more prevalent in TB because alveolar concentrations are higher than arterial concentrations in upper zones, and bacteria grow better in upper zones since they are aerophilic.

The chest x-ray revealed a cavity in 30% of the patients, a fibrous cavity in 11% of the patients, and an infiltrative lesion in 9% of the patients. Consolidation (7%), pleural effusion (7%), hydro pneumothorax (3%), parenchymal opacity (2%), and bronchiectasis (4%) were also seen. According to a research conducted by Anand and colleagues, more tuberculous diabetics have numerous cavities, and cavitations are a more prevalent radiological pattern. 19 The increased occurrence of cavities among pulmonary TB patients is most likely due to the disease's widespread caseous necrosis. Fibrosis is most likely caused by active inflammation, which causes alveolar damage and maladaptive repair, resulting in fibroblast proliferation and, eventually, fibrosis in its chronic phase, a greater number of relapse instances, and a longer duration of illness. Bronchiectasis, hydropneumothorax, nonspecific parenchymal opacity, and consolidation were also seen on radiology.

## CONCLUSION

Multiple cavities and multiple lobe involvement are more likely in tuberculous diabetics, and the lower lung field is more typically affected in individuals over the age of 65. Severe hyperglycemia seems to be a risk factor for diabetics developing pulmonary TB. Diabetes seems to have no influence on the presenting characteristics of pulmonary TB.

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