

## Original Research Article

# Study of clinical and radiological profile of pulmonary tuberculosis among patients having diabetes mellitus

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## ABSTRACT

**Background:** Onset of tuberculosis is high among diabetic mellitus patients in relation to non-diabetic patients. Due to weakened immune system there is a greater risk of tuberculosis seen among type 2 diabetes mellitus patients. As a result, affected patients have difficulty in responding to any kind of treatment when compared to healthy individuals. The objective was to study the clinical and radiological profile of pulmonary tuberculosis among patients having diabetes mellitus (DM).

**Methods:** The study was conducted at the department of pulmonary medicine, in a tertiary health care centre in Eastern India. The study included smear positive pulmonary tuberculosis (PTB) patients with diabetes mellitus and the patients who were smear positive for pulmonary tuberculosis (control group) who met the criteria to participate in the study after a thorough examination. Informed written consent was obtained from all patients before enrolment.

**Results:** A total of 80 patients (15 to 65 years and above) were enrolled in the study with equal numbers being diagnosed with diabetes who had elevated blood sugar values (refer to Table 1). Classical clinical signs were totally correlated with radiography and 57.5% cases showed pulmonary lesions. Among the radiological findings, infiltration was most common in both groups, but more significant in PTB DM group (75 %) followed by cavity (52.5%) in PTB DM group.

**Conclusions:** It can be concluded from the study that in diabetic patients the pattern of pulmonary tuberculosis was significantly different from non-diabetic patients. Pre-treatment bacillary load was high in diabetic patients with pulmonary tuberculosis.

**Keywords:** Blood Sugar, Cavitory and non-cavitory lesions, Immune system, Sputum bacteriology, Smear positive, Type I diabetes

## INTRODUCTION

One of the major causes of mortality and morbidity globally is tuberculosis (TB) an infectious disease. The risk of developing active TB is threefold higher in those patients having diabetes mellitus (DM) in comparison to non-diabetic patients.<sup>1</sup> It is projected that one-third of the world's population is infected, 8.8 million people develop TB, and 1.45 million people die annually from the

disease.<sup>2</sup> Also as per the world health organization (WHO) statistics the disease is on the rise and its annual incidence especially in some Asian countries may reach 300 per 100,000 individuals.<sup>3</sup>

India the second most populated country in the world accounts for one fourth of global TB incidence cases yearly. In 2012, it was estimated that 2.3 million TB cases occurred in India out of 8.6 million incidence of TB

cases that were recorded globally.<sup>8</sup> Diabetes prevalence was found to be 7.1% in India in the adult population.<sup>8</sup> India accounts for 26% of all cases of TB in the globe annually. At the same time, India is dealing with the highest burden of TB in the world.<sup>9</sup> In India, the incidence rate of TB was estimated to be 176/1 lakh individuals and prevalence rate was 230/1 lakh population in 2012. The mortality statistics was documented as 22/1 lakh population in the same year.

Worldwide diabetes affected population is projected to increase to 366 million by 2030 with the fastest increase in low-to middle-income countries.<sup>10</sup> Criteria for diabetes diagnosis is fasting blood sugar level of >125 mg/dl and 2-hour post-glucose load of >200 mg/dl. The main reason that may lead to development of TB among diabetes patients is weak immune system because of chronic disease, which places the population at higher risk from latent infection, it is noted that cellular immunity that is weakened, alveolar macrophages dysfunction, interferon gamma low levels, microangiopathy of lungs, and deficiency of micronutrients play a significant role in the occurrence of tuberculosis in Diabetic patients.<sup>11-13</sup>

**Aim and objective**

The objective was to study the clinical and radiological profile of pulmonary tuberculosis among patients having diabetes mellitus.

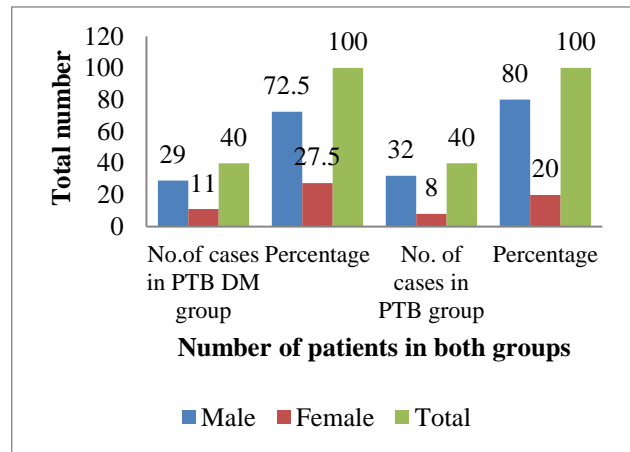
**METHODS**

The study was conducted at the department of pulmonary medicine, in a tertiary health care center in Eastern India. A total of 80 smear positive pulmonary tuberculosis patients were screened, underwent a thorough examination and matched the eligibility criteria to be included in the study. The diagnosis of PTB was made on history, physical examination, sputum bacteriology,

radiology and the diagnosis of diabetes was made based on fasting blood sugar, post prandial blood sugar, and urine sugar. 40 cases were associated with diabetes along with pulmonary tuberculosis. Only those patients who were smear positive at the time of diagnosis for pulmonary tuberculosis were included in the study. The written informed consent was obtained from all the patients before enrollment.

**RESULTS**

A total of 80 patients (15 to 65 years and above) participated in the study with equal numbers being diagnosed with diabetes who had increased blood sugar values (refer to Figure 1). Of these 28 were known cases and 12 were unknown cases along with pulmonary tuberculosis. Among the diabetes group 6 (15%) patients were of type 1 with female patients being more than male patients and 34 (85%) patients were of type 2 category where male patients were more when compared to female patients.



**Figure 1: Total PTB patients with and without DM.**

**Table 1: Elevated blood sugar levels distributed by age.**

Age in years	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 and above	Total
PTB cases	2	3	6	18	7	4	40
Blood sugar mg% (126-199)	0	0	3	8	4	2	17
200-299	2	3	3	7	2	2	19
300 and above	0	0	0	3	1	0	4

All patients in both the groups had various symptoms; cough with or without expectoration was the most common symptom followed by fever as listed in Table 2. The radiological findings were also compared. Cavitory lesions were more significant (57.5%) when compared to non-cavitory lesions as listed in Figure 2. In the current study, 5 (12.5%) patients were observed with minimal

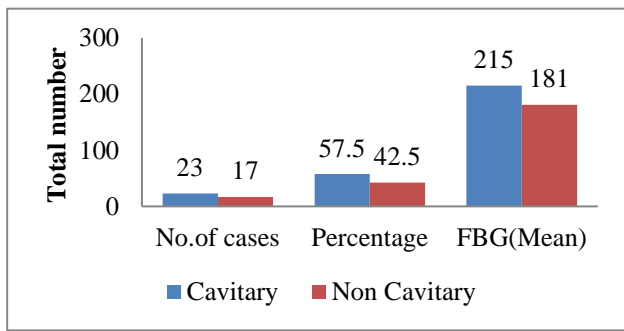
lesions and 15 (37.5%) of them were observed with moderately advanced lesions and the remaining 20 (50%) of them had far advanced lesions associated with a fasting blood glucose of 226 mg/dl (refer to Figure 3). Among the radiological findings, infiltration is most common in both group, but more significant in PTB DM group (75%) followed by cavity (52.5%) in PTB DM

group. With regards to medication 11 (27.5%) patients were on insulin and the remaining 29 (75.2%) were on

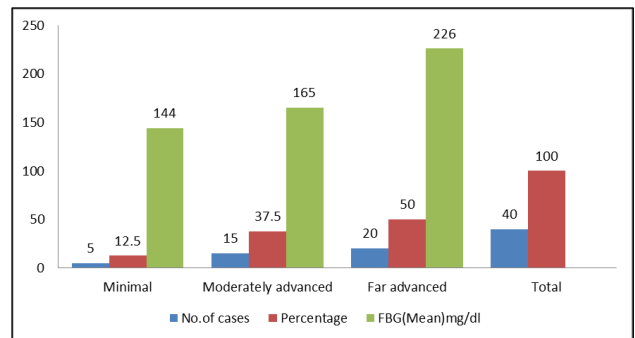
OHA (refer to Figure 5).

**Table 2: Symptoms observed in screened patients.**

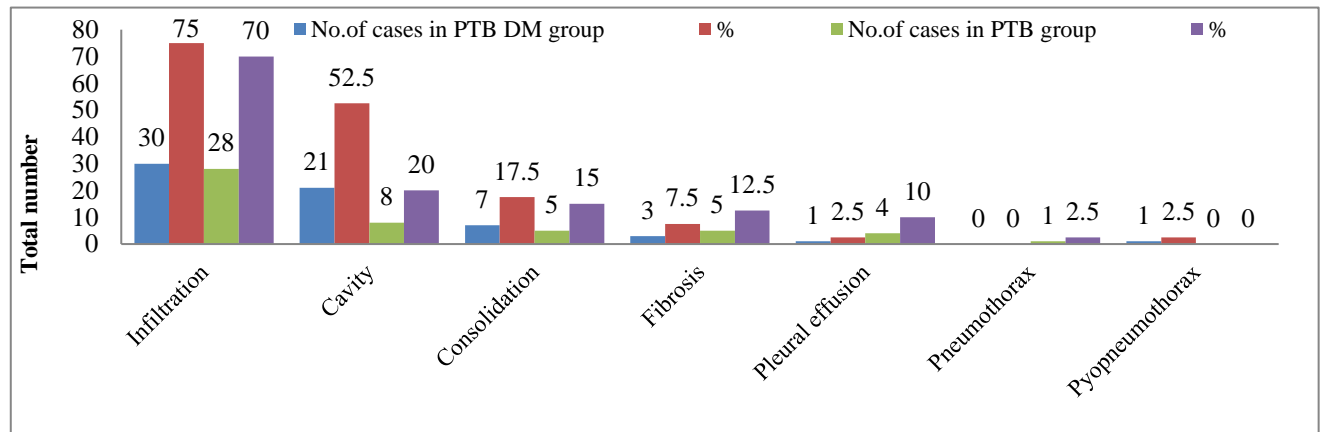
Symptoms	No. of cases in PTB DM	%	No. of cases in PTB group	%
Cough with or without expectoration	39	97.5	36	90
Fever	35	87.5	34	85
Haemoptysis	9	22.5	11	27.5
Chest pain	4	10	6	15
Loss of appetite	17	42.5	18	45
Loss of weight	14	35	21	52.5
Hoarseness of voice	0	0	3	7.5
Breathlessness	7	17.5	6	15



**Figure 2: Cavitary lesions comparison with non-cavitary lesions.**



**Figure 3: Chest X-ray findings and severity of disease.**



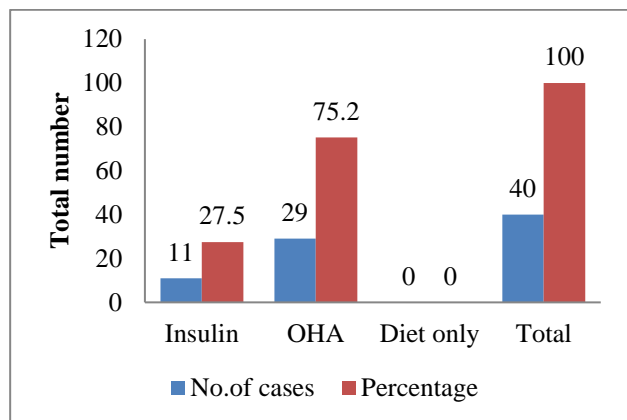
**Figure 4: Chest X-ray findings.**

**DISCUSSION**

Tuberculosis is a transmittable disease that can result in mortality and morbidity worldwide. Those previously diagnosed with diabetes mellitus are at a greater risk of developing pulmonary tuberculosis than non-diabetic individuals. High levels of blood sugar are because of

cells which does not respond to insulin resulting in diabetes, a metabolic disorder.<sup>5</sup> Gender predominance and age group 45-55 are more susceptible to both diabetes and tuberculosis in the present study; Ullah H et al, noticed similar observations. They found 31% susceptibility between 41 to 50-year age group.<sup>7</sup> Surface defence mechanism of nasal passage, pharynx, and

respiratory tract were reduced due to low surface antibody production. Low antibody production occurred due to low metabolic processes of the sub mucosal lymphoid follicles like BALT (bronchiole associated lymphoid tissues), as described by Reinhard Pabst and Thomas Tschernig.



**Figure 5: Percentage comparison of medication.**

The present study was undertaken in the department of pulmonary medicine, in a tertiary health care centre in Eastern India. The clinical and radiological profile of pulmonary tuberculosis with diabetes mellitus was studied.

Classical clinical signs were totally correlated with radiography and 57.5% cases showed pulmonary lesions (refer to Figure 2); similar findings were noticed by Venkateshwara Babu et al. One of the alarming findings was increasing susceptibility to tuberculosis due to type 1 diabetes at early age of 15-22 years. Lots of precautions and measures of control should be advised for this age group and research and remedies like stem cell therapy should be made practical to develop curative method for diabetes type 1 patients who are in the above-mentioned age group as suggested by Yang Xi and ShizhongBu.

Cases of rise in blood sugar or glycosuria should not be ignored and such cases should be observed closely to start treatment of tuberculosis at the earliest. Besides these, sophisticated diagnostic tools like polymerase chain reaction (PCR), enzyme-linked immunoassay (ELISA) should be used in early screening of tuberculosis, as radiographic diagnosis will be confirmed after formation of calcified/ fibroid nodules in lung tissues and sputum test will be positive for acid fast bacteria in the later stage. Such patients will be the source of infection till the final diagnosis; hence early screening of TB will restrict spread of disease to other susceptible population

## CONCLUSION

The pattern of pulmonary tuberculosis in diabetic patients differed significantly from non-diabetic patients. Patients

having PTB with diabetes were mostly between 45 to 64 years of age. No difference was observed between two groups as far as symptoms are concerned. PTB in patients with diabetes is characterized by presence of higher pre-treatment bacillary load. Also, chest x-ray images significantly depart from the typical presentation (refer to Chart 4). Lower lung field, Bacillary Load (B/L), or multi-lobar involvements with cavitory lesions are common, which must be considered by the clinicians to avoid misdiagnosis.

With the help of early laboratory diagnosis, clinicians must restrict spread of infection and start the treatment in advance to prevent spread.

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