

**ORIGINAL RESEARCH**

# Comparison Of Various Clinical And Radiological Presentations Among Sputum Smear Positive Pulmonary Tuberculosis Patients With Diabetes Mellitus And Sputum Smear Positive Pulmonary Tuberculosis Patients Without Diabetes Mellitus

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## ABSTRACT

**Background and aim:** The prevalence of Tuberculosis (TB) among diabetics, especially in those with poor glycemic control, is higher than in non-diabetic population. In 2019, just **over 15% of people with TB** were estimated to have diabetes globally. Diabetes may alter the clinical presentation of tuberculosis and it takes longer time to diagnose tuberculosis in DM Patients. The purpose of this study was to observe the various presentation of tuberculosis with diabetes mellitus now days, as with the passage of time (decades) presentations could be changed. **Materials and methods:** The study was a prospective study conducted from January 2017 to February 2018. 55 pulmonary tuberculosis patients who were sputum smear positive with diabetes mellitus and 50 sputum smear positive patients who did not have diabetes mellitus were included in this study. **Result:** Hemoptysis was present in significantly more number while weight loss was in significantly less number of pulmonary tuberculosis patients with diabetes mellitus ( $p < 0.002$ ). Thick walled cavity with ragged internal margin was present in 15% patient in study group, which was significantly high ( $p = 0.01$ ) than control group (4.4%). Significantly least common presentation was unilateral lesions any extent with any size cavity with upper and middle zone preponderance (8.3%) ( $p < 0.01$ ). **Conclusion:** In tuberculosis patients with and diabetes there was predominantly lower lung field involvement, thick walled cavity and cavity/consolidation lesion merging with the hilum were more common than tuberculosis patients without diabetes and least common was unilateral lesions with any size cavity with upper and middle zone preponderance.

**Keywords:** Tuberculosis, Sputum Positive, Diabetes Mellitus, Radiological Findings

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## INTRODUCTION

Diabetes mellitus (DM) is a chronic disease mainly in developed countries. In developing countries the

prevalence of DM is also increasing. Many studies show that the prevalence of Tuberculosis (TB) among patients with diabetes mellitus, particularly in those

with poor glycemic control, is higher than in non-diabetic population. The prevalence of diabetes mellitus is 9.3% (463 million people)<sup>1</sup> and tuberculosis is 5.6 million men and 3.3 million women, 1.1 million children (total 10 million people).<sup>2</sup>

In Diabetics there is increased susceptibility to TB due to dysfunction of the immune system caused by DM. The immunologic abnormalities in patients with DM are: abnormal functioning of polymorphonuclear cells, impaired phagocytosis, decreased peripheral monocytes, defect in complement opsonic function and poor blast transformation of lymphocytes.<sup>3</sup> The pulmonary physiologic functions are also altered in diabetic patients.

TB may be a factor in increasing the blood glucose levels and may trigger latent diabetes. Malnutrition, fever and inactivity stimulate the stress hormones, that cause increase in the blood sugar level. DM has been associated with increased risk of TB treatment relapse or failure and of increased risk of mortality.

In 2020, an estimated 0.37 million new cases of TB were attributable to diabetes. In 2019, just over **15% of people with TB** were estimated to have diabetes globally.<sup>4</sup>

In patients with DM it takes more time to diagnose tuberculosis and may also alter its presentation. The risk of tuberculosis increases by a factor of 2-3 in patients with DM. Patients with both DM and TB suffer from adverse treatment outcomes and a high rate of relapse or death following treatment as compared to patients with TB alone. TB may trigger the onset of DM, and worsen glycemic control in existing disease.

Anti tubercular medications may cause drug interactions and interfere in DM treatment and vice versa. TB more commonly infects patient with immune compromised status, for example patient with DM, malignancy and patient on long-term corticosteroids. Therefore, the purpose of this study was to observe the various presentation of tuberculosis with diabetes

mellitus now days as with the passage of time (decades) presentations could be changed.

## METHODS

### STUDY DESIGN

The study was a prospective study conducted in the Department of Tuberculosis and Respiratory Diseases, G.S.V.M. Medical College, Kanpur from January 2017 to February 2018. A total of 55 pulmonary tuberculosis patients who were sputum smear positive with diabetes mellitus and 50 sputum smear positive patients who did not have diabetes mellitus, from out patient department and ward were included in this study.

### STATISTICAL ANALYSIS

Information collected during the study was entered into Microsoft excel worksheet. All the data were processed using Statistical Package for Social Sciences (SPSS) version 20 (IBM, Chicago, USA). Categorical data was expressed as percentage (%) and Pearson's Chi Square test with degree of freedom 1 and confidence interval 95% was used. A P-value less than 0.05 (0.01) was considered as significant (Highly significant).

### RESULTS

In this study 55 sputum smear positive pulmonary tuberculosis patients with diabetes mellitus and 50 sputum smear positive patients without diabetes mellitus as comorbidity were included as cases and controls respectively.

Out of 55 tuberculosis patients with diabetes mellitus (cases), 43 (78.1%) were male and 12 (21.9%) were females. Mean age of this study group was  $51.2 \pm 8.05$  years. Among 50 tuberculosis patients without diabetes mellitus (controls) 30 (60%) were males and 20 (40%) were female and Mean age was  $39.5 \pm 9.2$  years.

**Table 1: Sputum Smear Positivity Grading In Study Group And Control Patients**

| Positivity Grade* | Study Group      | Control Group    |
|-------------------|------------------|------------------|
| SCANTY            | 2 (3.63%)        | 18 (36%)         |
| 1+                | 10 (18.1%)       | 15 (30%)         |
| 2+                | 20 (36.4%)       | 11 (22%)         |
| 3+                | 23 (41.8%)       | 6 (12%)          |
| <b>TOTAL</b>      | <b>55 (100%)</b> | <b>50 (100%)</b> |

\* Sputum positivity grades as per revised national tuberculosis control programme (RNTCP)

A total of 23 (41.8%) patients in study group and 6 (12%) patients in control group were sputum grade 3+. The patients of the study group had significantly high grade of positivity as compared to control group (p value = 0.0014).

**Table 2: Symptomatology In Cases And Controls**

| Symptomatology | Study group | Control group |
|----------------|-------------|---------------|
| Cough          | 45 (81.8%)  | 33 (66%)      |
| Fever          | 40 (72.7%)  | 29 (58%)      |
| Haemoptysis    | 22 (40%)    | 05 (10%)      |
| Breathlessness | 22 (40%)    | 14 (28%)      |
| Weight loss    | 11 (20%)    | 23 (46%)      |

|                       |                  |                  |
|-----------------------|------------------|------------------|
| <b>Total patients</b> | <b>55 (100%)</b> | <b>50 (100%)</b> |
|-----------------------|------------------|------------------|

Hemoptysis was present in 40 % patients in the study group that was significantly higher as compared to only 10 % in the control group ( $p < 0.002$ ). Weight loss was significantly lower in the study group than the control group, that is, in 20 % and 46 % patients respectively ( $p = 0.0001$ ). There was no significant difference in other symptoms like cough, fever and breathlessness between both the groups.

**Table 3: General Examination Finding In Cases And Controls**

| Genral examination | Study Group      | Control          |
|--------------------|------------------|------------------|
| Pallor             | 12 (21.8%)       | 18 (36%)         |
| Icterus            | 00 (0%)          | 04 (8%)          |
| Clubbing           | 06 (10.1%)       | 10 (20%)         |
| Edema              | 04 (7.3%)        | 06 (12%)         |
| Lymphadenopathy    | 00 (0%)          | 00 (0%)          |
| <b>Total</b>       | <b>55 (100%)</b> | <b>50 (100%)</b> |

Pallor was significantly less in patients with diabetes than in control group ( $p = 0.04$ ). There was no significant difference in other general examination findings.

**Table 4: Pre Treatment Radiological Findings In Chest X Ray Pa View**

| Pattern no.   | Pattern Details   | Study Group | Control    | Total     |
|---------------|---|-------------|------------|-----------|
| <b>ONE</b>    | Thick walled cavity with ragged internal margin   | 12 (15%)    | 2 (4.4%)   | <b>14</b> |
| <b>TWO</b>    | Cavity with air fluid level   | 4 (6.6%)    | 2 (4.4%)   | <b>6</b>  |
| <b>THREE</b>  | Cavity with significant pericavitary consolidation  | 10 (16.6%)  | 3 (6.6%)   | <b>13</b> |
| <b>FOUR</b>   | Cavity/ consolidation lesions merging with the hilum  | 10 (16.6%)  | 02 (4.4%)  | <b>12</b> |
| <b>FIVE</b>   | Predominantly unilateral lesion   | 16 (26.6%)  | 06 (13.3%) | <b>22</b> |
| <b>SIX</b>    | Predominantly lower lung field lesion   | 24 (40%)    | 5 (11.2%)  | <b>29</b> |
| <b>SEVEN</b>  | Extensive bilateral lesion without cavity   | 15 (25%)    | 07 (4.4%)  | <b>22</b> |
| <b>EIGHT</b>  | Pneumothorax/hydropneumothorax  | 3(5%)       | 3 (6.6%)   | <b>6</b>  |
| <b>NINE</b>   | Bilateral lesions any extent with any size cavity with upper and middle zone preponderance  | 5 (8.3%)    | 10 (22.3%) | <b>15</b> |
| <b>TEN</b>    | Unilateral lesions any extent with any size cavity with upper and middle zone preponderance | 5 (8.3%)    | 13 (28.9%) | <b>18</b> |
| <b>ELEVEN</b> | Bilateral/unilateral lesions non extensive and no cavity                                    | 10 (16.6%)  | 18 (40%)   | <b>28</b> |
|               | Total no. Of cases  | 55 (100%)   | 50(100%)   |           |

Pattern one ( thick walled cavity with ragged internal margin) was present in 15% patient in study group which was significantly high as compared to 4.4% in control group ( $p = 0.01$ ).

Pattern four (cavity/ consolidation lesions merging with the hilum) was also seen significantly more in study group (16.6%) as compared to control (16.6% vs 4.4%) ( $P = 0.04$ ).

Study group patient (40%) were significantly associated with pattern six (predominantly lower lung field lesion) as compared to control group (11.2%) ( $p = 0.0003$ ).

Other findings like cavity with air fluid level and pericavitary consolidation which were also common in diabetic patients but were statistically non-significant. Significantly least common presentation in study group was Pattern eleven (Unilateral lesions any extent with any size cavity with upper and middle zone preponderance) (8.3%) ( $p < 0.01$ ).

## DISCUSSION

This prospective study was carried out in DrMurarilal Chest Hospital of Department of Tuberculosis and

Respiratory Diseases G.S.V.M Medical College Kanpur from January 2017 to February 2018.

In this study, we investigated the patients who had 'Tuberculosis and Diabetes mellitus both'. Patients having 'Tuberculosis without diabetes mellitus' were controls. Purpose of this study was to observe the various presentation of tuberculosis with diabetes mellitus now days as with the passage of time (decades) presentations could be changed.

There are many studies in literature, which depict that pulmonary tuberculosis with diabetes mellitus have some different and specific presentations.

Alisjahbana B et al found that DM was diagnosed in 14.8% of patients with TB and was associated with older age and a greater body weight while we studied, diabetic patients with TB had more symptoms but had less severe TB.<sup>5</sup> Patel J et al found incidence of tuberculosis infection with diabetes in 4,349 diabetics admitted in the Bombay Hospital was 5.77% and the commonest age group was 40-60 years, similar to our study in which mean age of the study group was  $51.2 \pm 8.05$  years.<sup>[6]</sup>

Ullah H et al studied 100 patients with diabetes mellitus. 62% were males and 38% were females.

Mean age was 50.45 + S.D 14.00 years.<sup>[7]</sup> Similarly in our study the mean age of study group patients was 51.2 ± 8.05, which was older than the control group where mean age was 39.5 ± 9.2 years, also there were more males in the study group than females (78.1% vs 21.9%). Mean age in Patel Anand K et al study was also 50.5 (± 13.5) years, similar to our patients.<sup>[8]</sup> The majority of their patients were between 51-60 years (CI 1.04 to 3.23), contrary to these Swai AB et al found that prevalence of tuberculosis with diabetes mellitus was greater in the young, in those with a low body mass index (BMI), in patients with insulin-dependent diabetes mellitus compared to those with non-insulin-dependent diabetes mellitus (9.0% vs 2.7%) and in those whose diabetes was poorly controlled. 17 (24.3%) of the 70 patients were known to have died.<sup>[9]</sup>

Ullah H et al found that Fever was the most common symptom 93%, followed by cough (45%), weight loss (32%), sputum production (29%) and night sweats (15%).<sup>[7]</sup> Feza Bacakoglu et al found that there were no effect of presence of diabetes mellitus on patients' symptomatology, bacteriology results, tuberculin reaction and localization of pulmonary infiltrates.<sup>[10]</sup> In our study however, hemoptysis was present in 40 % patients in study group which was significantly more than only 10 % in control group (p<0.002). Weight loss was only in 20 % patients in study group while it was in 46 % in control group. Again this lack of weight loss in large number of patients having tuberculosis with diabetes mellitus compared to control was statistically significant (p= 0.0001).

Kelly E Dooley et al concluded that diabetes mellitus alters immunity to tuberculosis, leading to higher baseline mycobacterial burdens and took longer times to culture conversion with treatment, a higher rate of relapse might result.<sup>[11]</sup> Three small retrospective studies suggest that baseline mycobacterial burdens might be higher in diabetic patients than in control.<sup>[12],[13],[14]</sup> We also noticed that the diabetic patients in the study group had high grade of positivity as compared to control .41.8 % patients were 3+ in study group as 13.3 % in controls (p=0.0014).<sup>[15],[16]</sup> demonstrated that patients with TB and DM were more likely to present with higher sputum smear grade compared to TB patients without DM.

Sosman MC et al reported that a large proportion of diabetic patients with tuberculosis had lower-lung involvement, whereas non-diabetic patients usually had upper-lobe infiltrates.<sup>[17]</sup> We also found that Study group patient had significantly more predominantly lower lung field lesions (40%) as compared to control (11.2%) (p=0.0003). It was widely believed that pulmonary tuberculosis in diabetic patients presented with an atypical radiographic pattern and distribution, particularly lower-lung involvement. Whereas in one series, 20% of patients with diabetes mellitus presented with lower-lobe involvement.<sup>[18]</sup> In other studies, lower-lobe involvement was only seen in

1.8% and 8.3% of pulmonary tuberculosis with diabetes mellitus.<sup>[19][20]</sup> In a retrospective study, S. Carreira et al reviewed the records of 123 patients with TB and DM admitted from 2000 to 2008 and compared this group with another one of 123 patients with TB without DM.<sup>[21]</sup> In both groups multi-lobe lung lesions predominated, there were more cases of isolated lower lung field (LLF) involvement in diabetics than in non-diabetics (10.6% v/s 3.3%, p = 0.03). Cavitory lesions were less frequent (63.4% v/s 82.1%, p = 0.01). In our study cavitory lesion was common presentation in diabetic patients. Thick walled cavity with ragged internal margin was present in 15% patient in study group as compared to 4.4% in control group and this difference was statistically significant (p=0.01). Sfirlează V et al studied glucose tolerance test in 50 patients with cavitory pulmonary tuberculosis, in 8 cases chemical diabetes was found representing a proportion of 16% as compared to 2.13% in the rest of the population while we noticed that cavity/consolidation lesions merging with the hilum, were significantly more in diabetic patient (16.6%) as compared to control (4.4%).<sup>[22]</sup>

## CONCLUSION

1. The mean age of tuberculosis patients with diabetes mellitus **51.2 ± 8.05** years, was higher than the mean age (**39.5 ± 9.2 years**) of pulmonary tuberculosis patients without diabetes mellitus.
2. Hemoptysis was present in significantly more number of pulmonary tuberculosis patients with diabetes mellitus as compared to pulmonary tuberculosis without diabetes mellitus. (**40% vs 10%, P < 0.002**).
3. There was weight loss in significantly less number of tuberculosis patients with diabetes mellitus as compared to tuberculosis patients without diabetes mellitus (**20% vs 46%, P=0.0001**).
4. Sputum positivity grades as per revised national tuberculosis control programme (RNTCP) grading system were higher in pulmonary tuberculosis with diabetes mellitus than pulmonary tuberculosis without diabetes mellitus.
5. Following X-ray patterns were present significantly more in tuberculosis patients with diabetes mellitus than pulmonary tuberculosis without diabetes mellitus.
  - i. Predominantly lower lung field lesion ( 40% vs 11.2%, P=0.0003)
  - ii. Thick walled cavity with ragged internal margin (15% vs 4.4%, P =0.01)
  - iii. Cavity/consolidation lesion merging with the hilum (16.6% vs 4.4%, P=0.04)
6. Least common presentation in pulmonary tuberculosis patients with diabetes mellitus was **“unilateral lesions of any extent with any size cavity with upper and middle zone preponderance”** as compared to tuberculosis patients without diabetes mellitus, 8.3% vs 28.2% respectively.