

Original Research Article

Study of Oral glucose Tolerance in Pulmonary Tuberculosis in Shri B.M. Patil Medical College Hospital & Research Center

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Abstract: The relation of pulmonary tuberculosis and development of altered OGT are not well documented and very few studies have reported that the incidence of diabetes mellitus in patients with pulmonary tuberculosis. The present study was aimed to find the incidence of glucose intolerance in patients with pulmonary tuberculosis. This one year cross sectional study was conducted in the Department of Medicine, Shri B M Patil Medical College, Vijayapur on patients with pulmonary tuberculosis. A total of 75 patients with positive sputum smear for acid fast bacilli or chest x-ray features suggestive of pulmonary tuberculosis aged more than 30 years and less than 65 years were selected for the study. The results showed majority of the patients were males (84%) with male to female ratio of 5.25:1. The most commonest age group was 41-50 years (25.33%) followed by age >60 years (21.33%). The commonest presentation of pulmonary tuberculosis was cough and expectoration of sputum (100% each) followed by loss of appetite (96.67%) followed by fever (76%). AFB findings showed +++ in 29.33% patients. On chest x-ray almost 60% of the patients had cavitary lesions with infiltration. In 18.67% and 16% of patients fibrotic changes and cavitary lesions without infiltration were noted. This study of 75 cases showed overall incidence of impaired glucose tolerance as 17.33% in patients with pulmonary tuberculosis. Among 82.67% patients GTT was normal (Fasting < 110 mg/dL and 2 hours < 140 mg/dL). In 13.33% of patients impaired glucose tolerance (Fasting < 126 mg/dL and 2 hours > 140 mg/dL) was recorded and among 4% patients diabetes mellitus (Fasting > 126 mg/dL and 2 hours > 200 mg/dL) was diagnosed. No statistically significant association of sex, age and chest X-ray findings was seen in patients with pulmonary tuberculosis and diabetes mellitus.

Keywords: Diabetes mellitus; Glucose tolerance test; Impaired glucose tolerance; Pulmonary tuberculosis

INTRODUCTION

People with diabetes are at higher risk of developing tuberculosis (TB) than those without diabetes. People with a weak immune system, as a result of chronic diseases such as diabetes are at a higher risk of progressing from latent to active TB. About 10% of TB cases globally are linked to diabetes. All people with TB should be screened for diabetes, particularly in areas with high prevalence of TB [1].

Acute severe stress, fever, inactivity and malnutrition stimulate the stress hormones epinephrine, glucagon and cortisol which raise the blood sugar level

suggesting tuberculosis of pancreas as the possible cause [2].

Several theories have been put forward to explain why tuberculosis patients develop glucose intolerance. Bloom suggested that occult glucose tolerance predisposes to diabetes. Zack *et al* suggested that glucose intolerance was not merely a reaction to acute tuberculosis infection but rather a pre-diabetic state. Hadden suggested malnutrition in TB as a possible cause [2].

Plasma levels of IL-1 and TNF- α are also raised in severe illness, which can stimulate anti-insulin responses. Age co-existing illness and alcoholism also influence the host response [2].

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). The disease spreads by droplet infection when people suffering from pulmonary TB expel bacteria, for example by coughing [3].

Diabetes Mellitus is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both [4].

The relation of pulmonary tuberculosis and development of altered OGT are not well documented and very few studies have reported the incidence of diabetes mellitus in patients with pulmonary tuberculosis.

Hence this study was aimed to find the incidence of impaired glucose tolerance in patients with pulmonary tuberculosis.

OBJECTIVE OF STUDY

The objective of the present study was to assess oral glucose tolerance in pulmonary tuberculosis.

MATERIALS AND METHODS

Seventy five patients diagnosed with pulmonary tuberculosis based on sputum ZN stain under RNTCP at Shri BM Patil Medical College, Vijayapur were subjected to OGTT as per WHO guidelines and samples were obtained as Fasting, 1 hr and 2hr samples.

Patients were classified as having Impaired glucose tolerance or Diabetes mellitus based on the ADA guidelines.

Inclusion Criteria

- Patients with positive sputum smear for acid fast bacilli.
- Patients with chest x-ray features suggestive of pulmonary tuberculosis.

- Patients aged more than 30 years and less than 65 years.

Exclusion Criteria

- Type 1 Diabetes mellitus.
- Already diagnosed cases of Type 2 diabetes mellitus.
- Previously diagnosed and treated patients of pulmonary tuberculosis

Type of Study

Cross sectional study

Sample Size

With 95% level of confidence, expected prevalence of Pulmonary Tuberculosis (based on review of literature) as 25% [6]. The minimum sample size coming out to be 71 at $\pm 10\%$ margin of error, $N=73$ approx. 75.

The formula used in the calculation [5]

$$N = \frac{Z^2 P(1-P)}{D^2}$$

Where, $Z=1.96$ at 95% level of confidence

P =prevalence of pulmonary tuberculosis.

D =margin of error

STATISTICAL METHODS

1. Mean \pm SD
2. Graphical presentation
3. χ^2 test of association
4. Student t test

RESULTS

The present one year cross sectional study was conducted in the Department of Medicine, Shri B M Patil Medical College, Vijayapur on patients with pulmonary tuberculosis.

A total of 75 patients with positive sputum smear for acid fast bacilli or chest x-ray features suggestive of pulmonary tuberculosis aged more than 30 years and less than 65 years were selected for the study.

In the present study 88% patients were male and 12% were female with male to female ratio of 7.33:1.

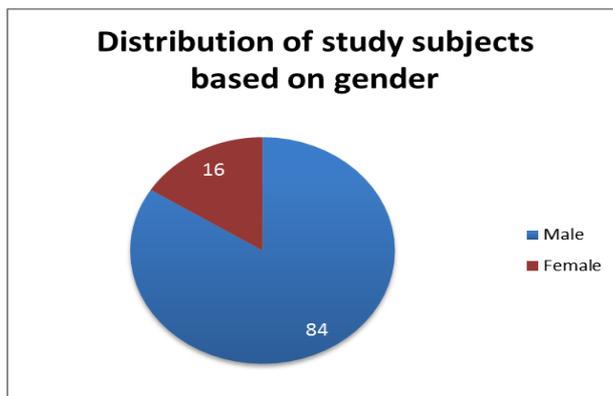


Fig-1: Distribution of study subjects based on gender

In this study the most commonest age group was 51 to 60 years (33.33%) followed by 41 to 50 years (32%). However 21.33% and 13.33% patients had age between 31 to 40 years and more than 60 years respectively.

The mean age of the patients was 49.93 ± 8.94 years. The median age was 49 years with range 31 being minimum and 64 being maximum.

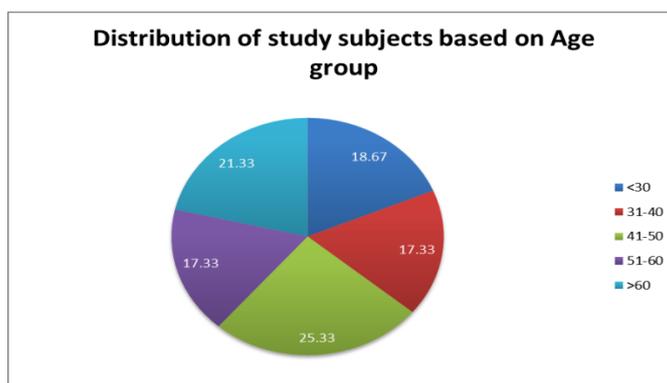


Fig-2: Distribution of study subjects based on age group

In the present study most of the patients (72%) presented with fever followed by cough and sputum (66.67% each).

In this study 8% of patients each presented with polyuria and polydipsia. The other diabetic signs were polyphagia, blurred vision, parasthesia (5.33% each) and one patient (1.33%) had other diabetic sign.

Table 1: History

History	Number	Percentage
Cough	75	100
Sputum	75	100
Fever	57	76
Loss of appetite	71	96.67
Loss of weight	57	76
Weakness/fatigue	5	6.66
Polyuria	6	8
Polydypsia	6	8
Polyphagia	4	5.33
Blurred vision	4	5.33
Paraesthesia	4	5.33

PERSONAL HISTORY

In the present study 24% were smokers and 14.67% consumed alcohol and 26.67% had history of

both consumption of alcohol as well as smoking. 34.67% of patients had no habits of smoking and alcohol consumption.

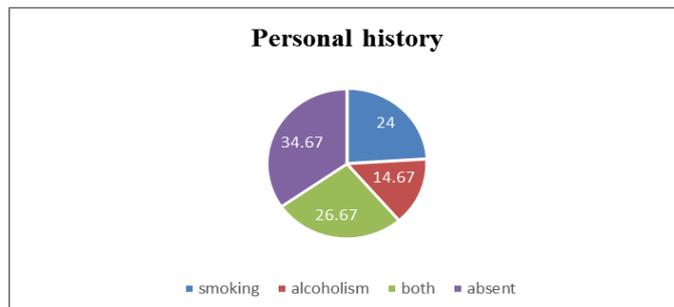


Fig-3: personal history

Table 2: Sputum for acid fast bacilli

Sputum Negative	26	34.66
+	7	9.33
++	20	26.67
+++	22	29.33

In this study AFB findings showed + in 9.33% patients, ++ in 26.67% and +++ in 29.33%. 34.66% patients were negative for acid fast bacilli.

Table 3: X ray Findings

Normal	4	5.33
Cavitatory without infiltration	12	16
Cavitatory with infiltration	45	60
Fibrotic Changes	14	18.67

In the present study on chest x-ray almost 16% of the patients had cavitatory lesions without infiltration. In 18.67% and 60% of patients fibrotic changes and cavitatory lesions with infiltration were noted. However, in 5.33% patients, chest x-ray was normal.

Glucose tolerance test

In the present study 82.67% patients GTT was normal (fasting <110mg/dl and 2hrs <140mg/dl). In 9.33% patients have impaired glucose tolerance test and 4% patients had impaired fasting glycemia and other 4% have diabetes mellitus was diagnosed.

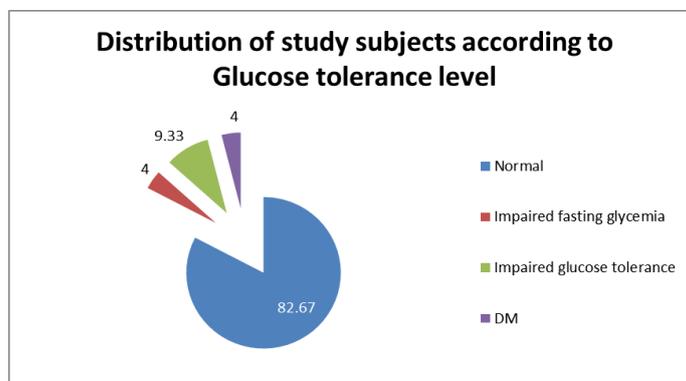


Fig-4: Distribution of study subjects according to glucose tolerance level

Incidence of Impaired Glucose Tolerance in Patients with Pulmonary Tuberculosis

In the present study overall incidence of impaired glucose tolerance and DM was 17.33% (including 3 cases of confirmed diabetes mellitus).

Table 4: Incidence of Impaired Glucose Tolerance in Patients with Pulmonary Tuberculosis

Glucose tolerance	Distribution	
	Number	Percent
Normal	62	82.67
Impaired	13	17.33
Total	75	100

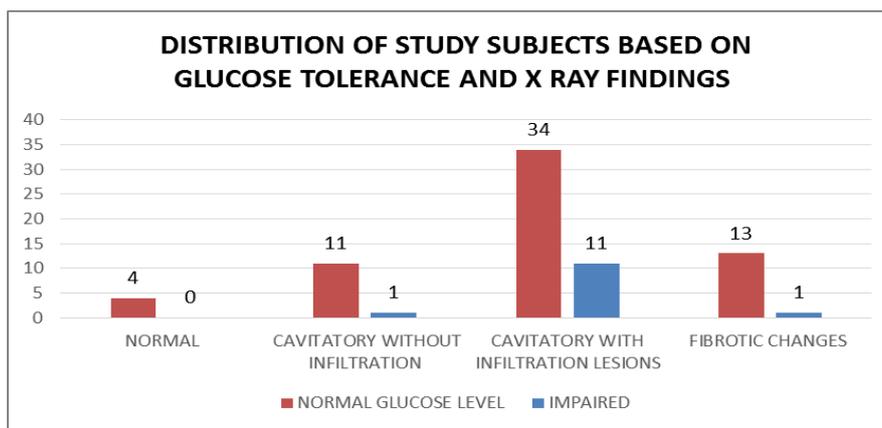


Fig-5: Distribution of study subjects based on glucose tolerance and x-ray findings

In this study 8.33% of patients showing cavitatory lesions without infiltration on chest X-ray had impaired glucose tolerance followed by 7.14% with those having fibrotic changes followed by 24.44% having cavitatory lesions with infiltration changes in x ray. No statistically significant association of chest X-ray findings with impaired glucose tolerance was found in the present study.

DISCUSSION

A high incidence of glucose intolerance in patients with active tuberculosis has been reported by a number of workers [6-8]. Occult glucose intolerance could either be a cause for the development of pulmonary tuberculosis or some endocrine abnormality may predispose to both impaired glucose tolerance and tuberculosis [9]. Tuberculosis and diabetes mellitus are very common diseases of Asia especially India [10]. Higher prevalence of tuberculosis in diabetic patients is well known fact [11, 12], the suspected reason being decreased immune response in diabetic patients and hyperglycemia as a good growth medium for tuberculosis bacilli. The impaired glucose tolerance in a tuberculosis population is also being increasingly realized.

The present study was an attempt to find the incidence of impaired glucose tolerance in patients with pulmonary tuberculosis.

The present one year cross sectional study was conducted in the Department of Medicine, Shri B M Patil Medical College Hospital And Research Centre, Vijayapura, on patients admitted with pulmonary tuberculosis. A total of 75 patients with positive sputum smear for acid fast bacilli or chest x-ray features suggestive of pulmonary tuberculosis aged more than 25 years and less than 65 years were selected for the present study.

The present study of 75 cases showed overall incidence of impaired glucose tolerance as 17.33% in patients with pulmonary tuberculosis. Among 82.67% patients GTT was normal (Fasting < 110 mg/dL and 2 hours < 140 mg/dL). In 13.33% of patients impaired glucose tolerance (Fasting < 126 mg/dL and 2 hours > 140 mg/dL) was observed, impaired fasting glycemia in 4% of patients and among 4% of patients diabetes mellitus (Fasting > 126 mg/dL and 2 hours > 200 mg/dL) was diagnosed.

The 4% patients with diabetes mellitus (Fasting > 126 mg/dL and 2 hours > 200 mg/dL) based on glucose tolerance test were subjected to FBS and PPBS. These tests confirmed diagnosis of diabetes mellitus among all the (100%) patients.

In the present study males outnumbered females (84% males versus 16% females) with male to female ratio of 5.25:1. The most common age group was 41-50 years (25.33%) followed by age >60 years (21.33%). However, the present study showed no statistically significant association of sex and age with impaired glucose tolerance. Overall TB continues to infect an estimated one-third of the world's population, to cause disease in 8.8 million people per year, and to kill 1.6 million of those afflicted. The global burden of diabetes mellitus (DM) is expected to rise from an estimated 180 million prevalent cases currently to a predicted 366 million by 2030⁸, with the greatest increase projected in the developing world. To date very few studies have reported the incidence of diabetes in patients with pulmonary tuberculosis.

A study by Jain MK *et al* [13], reported that out of the 106 patients of pulmonary tuberculosis (all aged 30 years and above) 18 (16.98 %) had abnormal Glucose Tolerance Test (GTT) of which 2 (1.88%) had impaired fasting glycemia, 11 (10.34 %) had impaired glucose tolerance and 5 (4.7 %) were frankly diabetic. Yamagishi *et al* [14], reported 14.1% patients diagnosed with pulmonary tuberculosis had impaired glucose tolerance test. Firsova *et al* [15], reported 10.8% patients of pulmonary tuberculosis had impaired glucose tolerance test. Gupta *et al* [16], reported 9.7% patients of pulmonary tuberculosis with impaired glucose tolerance. Roy Choudary *et al* [17], reported 27.25% patients of pulmonary tuberculosis had impaired glucose tolerance test. These findings were comparable with the present study except the study done by Choudary Roy *et al* [17].

A case series by Deshmukh *et al* [18] with 138 TB-DM patients revealed that 82.6% of the study population was above 45 years of age and there was a male preponderance. In another study by Tripathi *et al*, the authors observed 55% of TB-DM group were underweight and this group was mostly more than 40 years of age. In the present study 52% of patients had normal BMI, 44 % of the patients were underweight and the remaining 4 % were in the overweight category.

The commonest presentation of pulmonary tuberculosis in the present study was Cough and

expectoration of sputum (100% each) followed by loss of appetite (96.67%) followed by fever (76%). History of loss of weight was noted in 76 % of cases.

The diabetic symptoms of polyuria and polydipsia were seen in 8% of patients and other symptoms of polyphagia, blurred vision and paresthesia were noted in 5.33 % of patients.

All the patients in the present study were subjected for sputum examination with 2 samples being taken, one at the time of admission and the other subsequent day early morning. In the present study AFB findings showed + in 9.33 % patients, ++ in 26.67 % patients, +++ in 29.33 % and 34.66% patients were negative for AFB. In the present study, 65.3 % of the patients turned out to be sputum positive for pulmonary tuberculosis .

On examination of the chest x-ray of the subjects, 16 % of the patients had cavitory lesions without infiltration. In 18.67% and 60% of patients fibrotic changes and cavitory lesions with infiltration were noted. However, in 5.33% patients, chest x-ray was normal.

In the present study 8.33% of patients showing cavitory lesions without infiltration on chest X-ray had impaired glucose tolerance followed by 7.14% with those having fibrotic changes followed by 24.44% having cavitory lesions with infiltration changes in x ray. However no statistically significant association of chest X-ray findings with impaired glucose tolerance was found in the present study.

The limitations of the present study were smaller sample size and HbA1c was not done to confirm the diagnosis. More research with large sample size and other variables such as HbA1c, duration of symptoms and the presence of other diabetic complications would be more beneficial for better outcome of the study.

CONCLUSIONS

The present study of 75 cases showed overall incidence of impaired glucose tolerance as 17.33% in patients with pulmonary tuberculosis.

Among 82.67% patients GTT was normal (Fasting < 110 mg/dL and 2 hours < 140 mg/dL). In 13.33% of patients impaired glucose tolerance (Fasting < 126 mg/dL and 2 hours > 140 mg/dL) was recorded and among 4% patients diabetes mellitus (Fasting > 126

mg/dL and 2 hours > 200 mg/dL) was diagnosed. 4% patient had impaired fasting glycemia.

This study showed no statistically significant association of sex, age and chest X-ray findings in patients with pulmonary tuberculosis and diabetes mellitus.

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