

## To Assess the Prevalence of Impaired Glucose Tolerance in Pulmonary Tuberculosis and Comparison of Pulmonary Tuberculosis with Normal OGTT and Abnormal OGTT

Kanika Sethi<sup>1</sup>, Rahul Gupta<sup>2</sup>, Dinkar Dubey<sup>3</sup>, Seema<sup>4</sup>, O. P. Jatav<sup>5</sup>

<sup>1</sup>Senior Resident, Department of Medicine, GRMC, Gwalior, M.P

<sup>2</sup>Senior Resident, Department of Respiratory Medicine, GRMC Gwalior, M.P

<sup>3</sup>Registrar Consultant, Artemis Hospitals, Gurugram

<sup>4</sup>Senior Resident, Department of Medicine, SSMC, Rewa

<sup>5</sup>Professor and Head, Department of Medicine, GRMC, Gwalior, M.P

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Corresponding author: Dr. Seema

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### Abstract:

**Background & Method:** The aim of the study is to assess the prevalence of impaired glucose tolerance in pulmonary tuberculosis and comparison of pulmonary tuberculosis with normal OGTT and abnormal OGTT. The patient information was collected regarding age, sex, residence, socioeconomic status. Patients were asked about symptoms related to pulmonary tuberculosis and diabetes. Samples of blood were drawn in accordance to the W.H.O. guidelines after the patient has fasted overnight for at least 12 hours, then at 1 and 2 hours following 75 gms of glucose ingestion.

**Result:** Mean fasting plasma glucose in patients with normal OGTT was 76.47mg% (SD=12.59) as compared to 82.44 mg% (SD=15.78) in patients with IGT. This was not significant as  $p > 0.01$ . 2h plasma glucose in normal OGTT group was 96.30 mg% (SD=17.88) as compared to 167 mg%(SD=17.46) in IGT group. This was statistically highly significant with  $p < 0.0001$ . The p value was found significant also at ½ h, 1h and 1½h. Impaired glucose tolerance was noticed more in those with severe lung involvement and this was statistically highly significant with a  $p < 0.05$ .

**Conclusion:** Insulin- glucose metabolism is altered in TB patients and a diabetic like state is present in TB patients and there is also an impaired glucose tolerance secondary to TB. The question is whether this metabolic derangement is characteristic of TB patho-physiology, or whether people with this derangement are prone to TB. According to the aetio-pathogenesis of the disease in which a poor immune response in the host plays an important role, the most logical explanation is that people with this derangement are prone to TB. In our study it was found that impaired glucose tolerance was found in 27 of 130 patients, which equals to a prevalence rate of 20.7% and the prevalence was significantly high in those with severe disease.

**Keywords:** diabetes, tuberculosis & OGTT.

**Study Designed:** Cross sectional.

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### Introduction

Pulmonary tuberculosis affects a large number of people of all socioeconomic strata throughout the world particularly those of low socioeconomic status [1]. It remains the number one cause of adult death by a curable infectious disease worldwide despite the availability of effective diagnostic, preventive and curative strategies against *Mycobacterium tuberculosis* [2].

In 1991, the World health assembly recognized tuberculosis as a major public health problem and suggested two targets for national tuberculosis programs; of detecting 70 percent of new sputum smear positive patients and curing 85 percent of such cases by 2000 [3]. In 1993, the WHO

recognized the lethal impact of the disease and declared it as a “Global emergency”

Though the evidence of diabetic patients being at an increased risk of developing tuberculosis is well known, the converse relationship, i.e. patients with tuberculosis having a higher prevalence of diabetes was not known until 1950's. When oral glucose tolerance test was used for diagnosis, a much higher prevalence of diabetes was found among patients with tuberculosis [4]. Since 1957 various studies have shown that the prevalence of impaired glucose was indeed higher among patients with tuberculosis. Unlike patients of diabetes developing tuberculosis where the disease tends to

be extensive and bilateral it was found that in tuberculosis GTT was abnormal early in the course of disease long before both the lungs became involved. This may be due to the fact that latent diabetes predates tuberculosis and if patients of tuberculosis are subjected to GTT early detection of diabetes can be made. Several theories have been put forward to explain why tuberculosis patients develop glucose intolerance [5]. As in rest of the country, tuberculosis is quite prevalent in northern Madhya Pradesh region also. Hence this study is undertaken to know the prevalence of impaired glucose tolerance among pulmonary tuberculosis patients in northern Madhya Pradesh region [6].

### Material & Method

This cross-sectional study was conducted in patients attending the outdoor patient Department and admitted in the tuberculosis and general wards of the J.A. Group of Hospitals, G.R.M.C., Gwalior over a period of one year from August 2021 to August 2022.

The study group comprised of 130 patients of pulmonary tuberculosis. The clinical, sputum and radiological examination of all patients were done. All patients were subjected to the Standard Oral Glucose Tolerance Test and the results were

evaluated according to the criterion laid by W.H.O. for diabetes.

The patient information was collected regarding age, sex, residence, socioeconomic status. Patients were asked about symptoms related to pulmonary tuberculosis and diabetes. Samples of blood were drawn in accordance to the W.H.O. guidelines after the patient has fasted overnight for at least 12 hours, then at 1 and 2 hours following 75 gms of glucose ingestion. OGTT was done in P.G. Lab of the Department of Medicine, G.R. Medical College, Gwalior (M.P.).

### Inclusion criteria

1. All patients of pulmonary tuberculosis
2. All patients before start of ATT
3. All patients of age > 15.

### Exclusion criteria

1. All patients with existing diabetes mellitus
2. All patients on ATT
3. All patients with other severe comorbid illness
4. Those on diabetogenic drugs
5. Pregnancy
6. Obese patients (BMI > 30 kg/m<sup>2</sup>).

### Results

**Table 1: Age distribution**

Age group in years	Number (n=130)	Percentage
15-25	22	16.9
25-35	23	17.7
35-45	36	27.7
45-55	19	14.6
55-65	22	16.9
65-75	6	4.6
>75	2	1.5

Above table shows that in the present study age group varied from 15-90 years, maximum number of cases were seen in the age group 35-45 years (36) consisting of 27.7%. Only 2 cases were seen in the age group above 75 years i.e. 1.5%. This indicates that tuberculosis frequently affects the younger age group. The mean age in the study group was 42.72 years and the standard deviation 15.796 years.

**Table 2: Showing OGTT value in mg/dl (mean ± SD) in normal and IGT group**

Time	Normal	IGT	Student t test
0	76.47±(12.59)	82.44±(15.78)	p>0.01
½	105.97±(19.20)	121.19±(22.92)	p<0.001
1	126.19±(16.71)	162.85±(33.39)	p<0.001
1½	111.53±(16.30)	159±(37.28)	p<0.001
2	96.30±(17.88)	167±(17.46)	p<0.0001

Above table shows that Mean fasting plasma glucose in patients with normal OGTT was 76.47mg% (SD=12.59) as compared to 82.44 mg% (SD=15.78) in patients with IGT. This was not significant as p>0.01. 2h plasma glucose in normal

OGTT group was 96.30 mg% (SD=17.88) as compared to 167 mg% (SD=17.46) in IGT group. This was statistically highly significant with p<0.0001. The P value was found significant also at ½ h, 1h and 1½h.

**Table 3: Showing X-ray findings and distribution of Glucose tolerance**

X-ray findings	Non IGT (n=103)	IGT (n=27)
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Bilateral extensive (n=36)	27(26.2%)	9(33.33%)
Bilateral nonextensive (n=32)	20(19.4%)	12(44.44%)
Unilateral (n=28)	24(23.30%)	4(14.81%)
Upper lobe involvement (n=20)	18(17.4%)	2(7.4%)
Cavitary (n=9)	9(8.7%)	0(0%)
Pleural effusion (n=3)	3(2.9%)	0(0%)
Consolidation (n=1)	1(0.09%)	0(0%)
Lung abscess (n=1)	1(0.09%)	0(0%)

**Table 4: Showing severity of X-ray findings and distribution of Glucose tolerance**

X-ray involvement	Non IGT (n=103)	IGT (n=27)
>50% (n=68)	47(45.6%)	21(77.7%)
<50% (n=62)	56(54.3%)	6(22.2%)

p value=0.03

Above two tables shows that impaired glucose tolerance was noticed more in those with severe lung involvement and this was statistically highly significant with a  $p < 0.05$ .

### Discussion

Age group in the study was between 15-90 years, most of the cases were in the age group of 35-45 years (36 i.e. 27.7%). Mean age among the patients was 42.72 years. Of the 130 cases, 79 (60.8%) were males and 57 (39.2%) were females. The male to female ratio was 1.54:1.

Both sputum positive (53.1%) and sputum negative (46.9%) cases were taken in our study.

Impaired glucose tolerance was more in sputum negative (55.55%) cases though it was statistically insignificant[7]. This aspect has not been compared in previous studies although it has been noted that in pulmonary tuberculosis affecting known case of diabetics the chances of sputum negative pulmonary TB is more[8].

In the present study based on WHO criteria and recommended methodology, 130 patients of pulmonary TB were studied. 27 patients had impaired glucose tolerance. This amounts to a prevalence rate of 20.7%.

In study by Oluboyo[7] et al (1990), the prevalence of IGT was 3.7% and diabetes was 5.6%. In study of F Mugusi[8] et al (1990) prevalence of IGT was 16.2% and diabetes was 6.7%.

In study of Lalita Fernandes[9] et al (1997), prevalence of IGT was 3% and diabetes prevalence was 3.8%. In study of Bauglo[10] et al (1999) IGT prevalence was 10.4% and the prevalence of diabetes was 8.6%. In study of Jain M.K.[11] et al, the prevalence of abnormal GTT result was 18 (16.98%) and 5(4.7%) were frankly diabetic. Thus, in our study the prevalence of impaired glucose tolerance of (20.7%) was significant and compares to those found in Mugusi[8] et al and Jain M.K.[11] et al studies. Extensive and non-extensive bilateral tuberculosis was the most common x-ray finding followed by lesion involving single lung.

Of the 27 patients having impaired glucose tolerance 12 (44.4%) had bilateral non extensive lesion and 9 (33.3%) had bilateral extensive lesions. It was noticed that those with severe lung involvement in the X-ray, the prevalence of impaired glucose tolerance was higher and it was statistically highly significant[9].

Upper lobe involvement was found in 6(22.2%) suggesting that unlike patients of diabetes developing tuberculosis where the disease tends to be extensive and bilateral GTT was abnormal even early in the course of disease long before both the lungs became involved.

In study by Mugusi[10] et al bilateral lung involvement was present in 47.2% of the cases.

In study by Jain M.K.[11] et al, unilateral lung involvement was seen in 11 out of 18 (61.11%) cases with IGTT, while bilateral involvement was seen in 7 out of 18 (38.9%) cases. Our study compares with Mugusi[10] et al.

### Conclusion

Insulin- glucose metabolism is altered in TB patients and a diabetic like state is present in TB patients and there is also an impaired glucose tolerance secondary to TB. The question is whether this metabolic derangement is characteristic of TB patho-physiology, or whether people with this derangement are prone to TB. According to the aetio-pathogenesis of the disease in which a poor immune response in the host plays an important role, the most logical explanation is that people with this derangement are prone to TB. In our study it was found that impaired glucose tolerance was found in 27 of 130 patients, which equals to a prevalence rate of 20.7% and the prevalence was significantly high in those with severe disease.

Mean fasting plasma glucose in patients with normal OGTT group was 76.47 mg% compared to 82.44mg% in patients with IGT. This was

statistically insignificant. 2h plasma glucose in normal OGTT group was 96.30mg% and 167mg% in IGTT group. This was statistically significant.

Extensive bilateral tuberculosis was the most common x-ray finding in the cases studied followed by bilateral non extensive and then lesion involving single lung. Bilateral non extensive lesion was more in those with impaired glucose tolerance. Impaired glucose tolerance was noted in cases with severe lung involvement (77.7%) and this was statistically highly significant.

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