

## A pilot study to find the prevalence of diabetes mellitus among newly diagnosed pulmonary tuberculosis and individuals on anti tuberculosis treatment

Sarma S.<sup>1</sup>, Chandra T.<sup>2\*</sup>


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<sup>1</sup> S Srinivasa Sarma, Assistant Professor, Department of Microbiology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India.

<sup>2\*</sup> T Jaya Chandra, Associate Professor, Department of Microbiology, GSL Medical College, Rajahmundry, Andhra Pradesh, India.

**Introduction:** Diabetes Mellitus (DM) is a known risk factor of tuberculosis (TB). Moreover, the risk of getting TB is 3 times more among diabetics compared to the non-diabetics. **Materials and Methods:** Study was conducted in department of Microbiology, GSL Medical College, Rajahmundry. Individuals aged  $\geq 18$  years were included in the study. The study participants were divided into two groups. Group A consist of newly diagnosed pulmonary tuberculosis (PT) individuals and individuals on anti tuberculosis treatment (ATT) were included in group B. Two spot sputum samples were collected from the participants, same day sputum collection approach; smear was stained by Ziehl Neelsen staining technique. Blood sample was collected and analyzed by HbA1C technique for sugar estimation. **Results:** In group A, 17%, 33% and 50% individuals were diagnosed to be normal, prediabetic and diabetic respectively. Whereas this was 7%, 20% and 73% respectively among group B. Age wise, individuals with diabetes were increased in both groups. **Conclusion:** Diabetes is more among the individuals who are on ATT compared to newly diagnosed PT cases. Studies with large sample size are recommended.

**Keywords:** Diabetes, Prevalence, Tuberculosis

Corresponding Author	How to Cite this Article	To Browse
T Jaya Chandra, Associate Professor, Department of Microbiology, GSL Medical College, Rajahmundry, Andhra Pradesh, India. Email: <a href="mailto:chanduthegreat2014@gmail.com">chanduthegreat2014@gmail.com</a>	Sarma SS, Chandra TJ. A pilot study to find the prevalence of diabetes mellitus among newly diagnosed pulmonary tuberculosis and individuals on anti tuberculosis treatment. Trop J Pathol Microbiol. 2020;6(1):30-34. Available From <a href="https://pathology.medresearch.in/index.php/jopm/article/view/404">https://pathology.medresearch.in/index.php/jopm/article/view/404</a>	

### Introduction

*Mycobacterium tuberculosis* (MTB) complex, an Acid-Fast Bacilli (AFB) is the causative agent of tuberculosis (TB) [1]. MTB can infect any organ in human body but lung infection, pulmonary tuberculosis (PT) is the most

Common. India is one of the highest TB burden countries in the world, alone accounts for 26% of total TB cases, worldwide [2]. Multi Drug Resistant TB (MDR TB) is another burning issue of the globe because the treatment success rate is significantly low compared to new TB cases, 48% and 86%,

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Respectively [3]. HIV is the important contributory factor for MDR TB.

Diabetes Mellitus (DM), a non-contagious metabolic disorder is another most burning issues of the world. As per the recent WHO guidelines, incidence of DM is increased 2 folds for the last three years in India. DM is a known risk factor of TB [4]. Moreover, the risk of getting TB is 3 times more among diabetics compared to the non-diabetics [5,6].

Several studies regarding DM and TB were reported but the results are ambiguous. Some studies reported low [7,8] smear positivity among DM and high-grade smear positivity [9, 10] was also reported.

Moreover, the present study did not find reports on DM and TB from East Godavari district where the burden of TB is high. With this a study was planned with an aim to find the prevalence of DM among newly diagnosed PT and individuals on anti tuberculosis treatment (ATT).

## Materials and Methods

**Settings:** Study was conducted in department of Microbiology, GSL Medical College, Rajahmundry, South India.

**Duration of study:** Study was conducted for 2 months, December 2018 to January 2019.

**Inclusion criteria:** Individuals aged >18 years, who submitted informed consent, were included in the study.

**Exclusion criteria:** Individuals aged <18 years, who didn't submit informed consent, were excluded in the study.

**Sample size:** All the individuals who satisfy the inclusion criteria during the study period were included in the study.

**Ethical approval:** Study protocol was approved by the institutional ethical committee.

The study participants were divided into two groups. Group A consisted of newly diagnosed PT individuals and individuals on ATT were included in group B. Individuals with signs and symptoms suggestive of PT were considered in group A.

Two spot sputum samples were collected from the participants, same day sputum collection approach. Immediately after collection of sputum, smear was prepared, stained by Ziehl Neelsen (ZN) staining

Technique. Collection of sputum samples, staining and screening under microscope were done as per the revised national Tuberculosis Control Programme guidelines [11].

Blood sample was collected from the participants and analyzed by HbA1c technique for sugar estimation.

**HbA1c estimation:** HbA1c technique was performed by using auto analyser. In this test, 180 µl EDTA blood sample was mixed with 7.5µl of hemolysate after incubating at 37°C for 5 minutes 60 µl of HbA1cR2 was added and again incubated at 37°C for 5 minutes after thorough mixing. Then absorbance was measured at 630nm. Finally, the average glucose will be measured using formula  $(28.7 \times \text{HbA1c}) - 46.7$ . Based on the result, individuals can be categorized as normal ( $\leq 5.6$ ), prediabetic (5.7 to 6.5) and diabetic ( $\geq 6.5$ ).

## Results

During the study period, 30 participants were included in each group. In group A, 5 (17%), 10 (33%) and 15 (50%) individuals were diagnosed to be normal, prediabetic and diabetic respectively.

Whereas in group B, 2 (7%) were normal, 6 (20%) were prediabetes and 22 (73%) were diabetes individuals. (Table 1); statistically there was no significant difference between prediabetes and diabetes among the groups

**Table-1: HbA1c levels among the study participants; n (%).**

	Group A	Group B
Normal	5 (17)	2 (7)
Prediabetes	10 (33)	6 (20)
Diabetes	15 (50)	22 (73)
Group A: Newly diagnosed pulmonary tuberculosis individuals; Group B: Individuals on anti-tuberculosis treatment		
Statistical analysis: The Chi square statistic with Yates correction was 1.3701. P value is 0.241803. Not statistically significant between Prediabetes and diabetes among the groups		

When age was considered, individuals with diabetes were increased in both groups with age. In group A, 1, 1, and 2 were included in normal prediabetes and diabetes categories in 18 – 36 years group.

In 37 – 55 group, it was 1, 3 and 2, in 56 – 74 age group it was 1, 4 and 4 and in >75 age group it was 2, 2 and 7 respectively normal, prediabetic and diabetic individuals (Table 2).

**Table-2: Age wise HbA1c levels among group A.**

Age	Normal	Prediabetes	Diabetes	Total	Mean age
18 - 36	1	1	2	4	34
37 - 55	1	3	2	6	47
56 - 74	1	4	4	9	68
>75	2	2	7	11	81
Total	5	10	15	30	57.5

Group A: Newly diagnosed pulmonary tuberculosis individuals

In group B, 0, 1, and 3 were included in normal prediabetes and diabetes categories in 18 - 36 years group. In 37 - 55 group, it was 1, 2 and 5, in 56 - 74 age group it was 1, 1 and 7 and in >75 age group it was 0, 2 and 7 respectively normal, prediabetic and diabetic individuals (Table 3).

**Table-3: Age wise HbA1c levels among group B**

Age	Normal	Prediabetes	Diabetes	Total	Mean age
18 - 36	0	1	3	4	32
37 - 55	1	2	5	8	41
56 - 74	1	1	7	9	61
>75	0	2	7	9	79
Total	2	6	22	30	53.2

Group B: Individuals on anti-tuberculosis treatment

## Discussion

The epidemic of DM is one of the major global health challenges. Moreover, India is one of the highest TB burden countries in the world [12]. Factors such as poverty, close living and so on increases the spread of TB. With these WHO declared TB as global public health emergency. One of the reports mentioned that out of the 9 million reported TB cases, 2 million were from Indian subcontinent [13].

When DM was considered, the cases are being increasing day by day. Factors such as lifestyle, eating habits, lack of exercise are the contributory factors of this. It was mentioned that deaths because of DM may become double between 2005 and 2030 [14]. DM increases the risk of active TB by approximately three times [5,6]. Several biological pathways were reported among DM which may alter the immune system [15].

It was reported that rise in concentration of insulin decreases T helper1 which automatically influence individual's immunity [16]. Other investigators reported that there was significant reduction of interferon-c levels among DM individuals compared to people without and some studies reported defect in the immune function of Neutrophils [17,18].

Change in the immune response is the predisposing and contributory factors for development of TB.

Several correlation studies between DM and PT were reported [19,20]. Indian study reported that high prevalence of TB among the DM. Meta analysis also reported strong association among DM patients where TB was confirmed microbiologically [21]. DM can affect different aspects of TB including treatment outcomes. With this it is clear that DM can influence the route of transmission of PT also. Hence literature also reported that the prevalence of TB is more among the diabetics when compared to non-diabetic individuals [22].

The prevalence of DM in this study was 50%, 73% respectively in group A and B (Table 1). However, this is higher than reports from India and other neighboring countries. A South Indian study on tribal had observed a lower prevalence of DM compared to the present study [23]. Recent study from Vietnam reported 29% of prediabetic and 13.7% diabetics among the PT individuals and the authors also reported 8.8% rise in prevalence of TB among DM compared to their previous report [24]. The associated risk factors for TB DM comorbidity including sex, age, family history of DM, PT and positive sputum smear were found in many other studies.

Mixed results have been reported in relation to the effect of gender on diabetes in TB, some studies did not mark any difference; however some studies reported a higher frequency among men [25]. Whereas in this research, correlation between gender and DM with PT was not done. Family history is one of the important risk factors for DM TB. Vietnam report mentioned that the prevalence of TB was 29% higher among the TB patients with family history of DM [20]. But the family history was not considered in this study.

As the age increases, there is decrease in immune status, which is one of the risk factors of TB and DM. When age was considered in this study, blood sugar levels were increased in both the groups. However, this rise was significant among the groups (Table 2 and 3). But small sample size is the limitation of the research.

## Conclusion

Diabetes is more among the individuals who are on ATT compared to newly diagnosed PT cases. Studies with large sample size are recommended.

## What the study adds to the existing knowledge?

This study shows that diabetes is more among the individuals on ATT.

## Author's contributions

**Dr. S Srinivasa Sarma:** Literature survey, Paper writing, data analysis

**Dr. T Jaya Chandra:** Sample collection, Bench work, statistical analysis, manuscript writing

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