

Prevalence Of Diabetes Mellitus In Active Pulmonary Tuberculosis Patients And Clinico-Radiological Presentation Of Tubercular Diabetic Patients.

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ABSTRACT

BACKGROUND: Association between tuberculosis and diabetes mellitus is known since ancient times. Tuberculosis is more frequent (four to five times) among diabetics but there are conflicting views on increased prevalence of diabetes & prediabetes in tuberculosis patients. Presently developing nations are facing epidemic of both diseases. It becomes important to screen diabetes mellitus among tuberculosis patients as both diseases have adverse effects on each other outcomes. **AIMS AND OBJECTIVES:** To detect prevalence of diabetes mellitus (DM) and impaired glucose tolerance (IGT) in patients with active pulmonary tuberculosis and to correlate these patients with presentation of tuberculosis. **MATERIAL AND METHODS:** A cross-sectional study was carried out in 146 patients of active pulmonary tuberculosis. Their fasting plasma glucose & oral glucose tolerance test were performed after withdrawal of known diabetogenic and anti TB treatment was started immediately thereafter. Known diabetics excluded from study population. **RESULTS:** 8.2% & 12.3% patients had diabetes & prediabetes respectively. Prevalence of TB diabetics increases with age and was more in males compared to females. TB diabetics had more symptoms and far advanced disease which were statistically significant. **CONCLUSIONS:** TB diabetic patients have more symptoms but symptoms of pulmonary tuberculosis are not different from non diabetic TB patients, no other radiological presentation except of extent of disease are significant. Majority of TB diabetics have far advanced disease and grade 3 sputum positivity. Hence pulmonary tuberculosis patients should have screening for diabetes mellitus particularly if they have such presentation.

Keywords: pulmonary tuberculosis, diabetes mellitus, prevalence.

INTRODUCTION

Tuberculosis is a major global health problem causing illness among millions of people each year and still a leading cause of mortality and morbidity in developing Nations.¹ In 2014, an estimated 9.6 million people developed TB and 1.5 million died from the disease worldwide. In India (2014), prevalence, incidence & mortality due to TB were 2.5 million (195 per lakh), 2.2 million (167 per lakh) and 2.2 million (17 per lakh) respectively¹. According to International diabetes federation 2013², there are 382 million people living with DM (global prevalence 8.3%), among them 80% are in low & middle income countries and this

will increase to 592 million by 2035. There are 65.1 million cases of DM in India that will rise upto 109.0 million by 2035². Higher prevalence of pulmonary tuberculosis in patients of diabetes mellitus is a well known fact from long time however higher prevalence of impaired glucose tolerance and diabetes mellitus in a tuberculous population is also being increasingly realised now and it becomes more relevant due to increased prevalence of DM in general population. Presently both developed and developing nations are facing epidemic of diabetes, Diabetes mellitus and tuberculosis may complicate each other at many levels so it is necessary to screen DM in patients of tuberculosis, as DM increases chances of relapse, treatment failure^{3,4}, mortality⁵, delayed mycobacterial clearance⁶ suggested by systematic review of multiple studies. The present study assessed the prevalence of diabetes and prediabetes in active pulmonary tuberculosis patients with

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clinico- radiological presentation of tubercular diabetic patients.

AIMS & OBJECTIVES

1. To detect prevalence of diabetes mellitus (DM) and impaired glucose tolerance (IGT) in patients with active pulmonary tuberculosis and
2. To correlate these patients with presentation of tuberculosis.

MATERIALS & METHODS

Present study was carried out in 146 patients of active pulmonary tuberculosis admitted to Hospital of Chest & TB (Bari), Department of Pulmonary Medicine, RNT Medical College Udaipur, Rajasthan, India from November 2014- November 2015. The demographic profile, socioeconomic status, occupation, personal history, family history of TB, clinical history (tuberculosis and diabetes mellitus) and previous ATT history of each patient were carefully assessed and documented. Thorough physical examination was performed in each patient and was documented. All patients were subjected to chest radiograph. Early morning and spot sputum samples in sterile broad mouth containers were sent for AFB examination under RNTCP. After taking **written consent** explaining details and purpose of study, The selected patients will be evaluated and their fasting plasma glucose & oral glucose tolerance test were performed after withdrawal of known diabetogenic and anti TB treatment was started immediately thereafter. We also got approval from ethical committee of R.N.T. medical college, Udaipur for study. Glucose estimation was done on Siemens Dimension RL Max machine which quantifies glucose in human plasma by ‘GLUC’ method. GLUC⁷ method is hexokinase-6- phosphate dehydrogenase method which is adapted as reference method for measuring glucose. Diagnosis of diabetes and prediabetes were done using ADA 2015 criteria⁸.

Radiological classification of extent of disease⁹ was done as minimal, moderately advanced & far advanced. Tuberculosis symptom score¹⁰ was calculated which ranges from zero to six with 1 point each for cough, haemoptysis, dyspnoea, fever, night sweats and weight loss.

Exclusion criteria-

1. Known diabetics.
2. Patients having any other Respiratory illness not related to pulmonary tuberculosis.
3. Patients having any other systemic diseases & liver disease.
4. Pregnant woman

The statistical analysis was done using Statistical Package for Social Sciences ver. 16 (SPSS-16).

RESULTS

Out of 146 patients, there were 109 males and 37 females. The mean age of the patients was 40 ± 14.65 yrs. The mean **BMI** was 15.53 ± 2.55 kg/m². The mean duration of illness was 1.65 ± 2.33 yrs. The majority of male patients (33.6%) were **smokers** while only one female patient was smoker. The majority of patients were non alcoholic (89.7%) and 9.6% males and only one female was **alcoholic**. There were 47.9% patients in Cat I, 38.4% patients in Cat II and 13.7% in MDR **category**. 8.2% & 12.3% patients had diabetes & prediabetes respectively. 8.3% & 13.8% of **male** patients had diabetes & prediabetes respectively. 8.1% of **female** patients had diabetes & prediabetes each showing increased prevalence in males [Table-1].

Table 1. Distribution of patients according to blood sugar level

Group	Male (n=109)		Female (n=37)		Total(n=146)	
	No.	%	No.	%	No.	%
Diabetic	9	8.3	3	8.1	12	8.2
Prediabetic	15	13.8	3	8.1	18	12.3
Normal	85	78	31	83.8	116	79.5
Total (n=146)	109	100	37	100	146	100

P = 0.659 (NS)

Majority of diabetics and prediabetics belongs to more than 50 yrs of age (P=0.027, significant) [Table-2].

Table 2. Distribution of blood sugar with age

Blood sugar	Age (years)					
	16-35 (n=70)		36-50 (n=41)		>50 (n=35)	
	No.	%	No.	%	No.	%
Diabetic	2	2.9	3	7.3	7	20
Pre-diabetic	8	11.4	4	9.8	6	17.1
Normal	60	85.7	34	82.9	22	62.9
Total	70	100	41	100	35	100

P = 0.027 (S)

Prevalence of diabetes increases with age in both sex. Majority of diabetics (66.7%)

& prediabetics (88.9%) had **under-nutrition** (P=0.001, significant). Severe under-nutrition was present in 58.3% diabetics & 88.9% prediabetics although detail analysis shows that overall prevalence of severe under-nutrition (79.5%) was also more in study population. Present study shows that 33.3% of diabetic & 66.7% of prediabetic were highly symptomatic (TB symptom score > 4) and was statistically highly significant (P<0.001) [Table-3].

Table 3. Distribution of diabetics and prediabetics with tuberculosis symptom score (Alis Jah Bana)

Blood sugar	Tuberculosis symptom score (Alis Jah Bana)				Total
	≤ 4		> 4		
	No.	%	No.	%	
Diabetic (n=12)	8	66.7	4	33.3	12
Pre-diabetic (n=18)	6	33.3	12	66.7	18
Total (n=30)	14	46.7	16	53.3	30

P < 0.001 (HS)

Majority of diabetics and prediabetics had cough, fever and dyspnoea. There is no difference in **presenting symptoms** in Tuberculosis patients with or without diabetes. 75% diabetics and 55.6% pre diabetics had **diabetes symptoms**. There were 13.3% diabetic & 20% prediabetic in **alcoholic pts** compared to 7.6% diabetic & 11.5% prediabetic in non alcoholic pts (statistically not significant). Majority of diabetics (66.7%) & prediabetics (75%) were moderate smoker but there was no statistically significant correlation with **Smoking Index** 75% of diabetics & 100% prediabetics had bilateral lung involvement. Which is statistically not significant compared to non diabetic TB patients. 83.3% diabetics & 77.8% prediabetics had cavitary lung disease (statistically not significant). Most of the patients (72.6%) in study population also had cavitary disease. Majority of diabetics (50%) and prediabetics (61.1%) had upper zone involvement (statistically not significant). Majority of diabetics (41.7%) had consolidation on C-X ray while in prediabetics, there is equal number (33.3%) of acinonodular shadows and consolidation each (statistically not significant). Majority of diabetics (75%) & prediabetics (72.2%) had Far advanced extent of disease **which is only**

statistically significant radiological finding [Table-4].

Table 4. Distribution of diabetics and prediabetics with extent of disease

Blood sugar	Extent of disease						Total
	Minimal		Moderate		Far advanced		
	No.	%	No.	%	No.	%	
Diabetic (n=12)	0	0	3	25	9	75	12
Pre-diabetic (n=18)	0	0	5	27.8	13	72.2	18
Total (n=30)	0	0	8	26.7	22	73.3	30

P = 0.04(S)

Majority of diabetics (50%) & prediabetics (46.2%) had grade 3 sputum positivity. Prevalence of diabetes mellitus increases with **AFB sputum grading** but it is not statistically significant. Diabetics & prediabetics are higher in MDR TB patients as compare to Cat I, Cat II patients but statistically not significant.

DISCUSSION

In present study the prevalence of Diabetes(TB diabetes) & Prediabetes (TB prediabetes) in TB patients were found 8.2% & 12.3% respectively which is higher than prevalence of diabetes (3.9%) & prediabetes (6.6%) in general tribal population (Churu, Sikar, Jhunjhunu) of Rajasthan reported by Bandana Sachdev et al¹¹. Prevalence of diabetes & prediabetes varies from 5.3% to 13.6% and 8.1% to 14.6% respectively from various states of India in general population (ICMR-INDIAB phase-1 study 2011)¹². Rimpi Sangral et al¹³ (J & K) & Research committee of tuberculosis association¹⁴ 1987 also reported 8.2% & 9.7% prevalence of TB diabetes comparable to present study. Jain M K et al¹⁵ & A A Viswanathan et al¹⁶ found prevalence of TB prediabetes 10.34% & 13.11% comparable to present study. In present study the prevalence of TB diabetes & TB prediabetes was more in males (8.3% vs 8.1%) & (13.8% vs 8.1%) respectively. Jain M K et al¹⁵, Research committee of tuberculosis association¹⁴ 1987 also reported prevalence of TB diabetes & TB prediabetes more in males. In the present study the prevalence of TB diabetes increases with age and majority of TB diabetics belongs to more than 50 years of age. Jain M K et al¹⁵, Research committee of the Tuberculosis Association¹⁴ 1987 and

K K Jain et al¹⁷ also found increased prevalence of TB diabetes with age. In the present study, under nutrition was present in 66.7% TB diabetics & 88.9% TB prediabetics. MK Jain et al¹⁵ also reported that most of the TB diabetics had BMI lower than 18.5kg/m². In present study, 33.3% of TB diabetics & 66.7% of TB prediabetics were highly symptomatic (TB symptom score >4). Comparable to present study, Alisjahbana B et al¹⁰ (Jakarta & Bandung) himself reported that TB diabetic patients were more symptomatic (63.8% of TB diabetic patients had score > 4). In the present study, Majority of TB diabetics & TB prediabetics had cough, fever & dyspnoea and there is no difference in symptomatic presentation of TB patients with or without diabetes. Jain M K et al¹⁵ found fever as most common symptom both in study population. In present study, 75% TB diabetics & 55.6% TB prediabetics had diabetes symptoms. Jain M K et al¹⁵ found polyuria (22.2%) & polydypsia (50%) in TB diabetic patients. In present study the prevalence of TB diabetes & TB prediabetes were 13.3% & 20% respectively in alcoholic group. K K Jain et al¹⁷ also reported alcoholism was common in TB diabetic patients as compared to non diabetic TB patients. In present study, majority of TB diabetics (58.3%) & TB prediabetics (66.7%) belong to smoker and ex-smoker group and majority of TB diabetics and TB prediabetics were moderate smoker. K K Jain et al¹⁷ found that 46% TB diabetics were smoker comparable to present study. In present study, 83.3% TB diabetics & 77.8% TB prediabetics had cavitary lung disease. Perez-Guzman C et al¹⁸ found more cavitary lesion in TB diabetic patients. In present study, 16.7% TB diabetics had predominantly lower zone involvement. Alisjahbana et al¹⁰ reported no significant difference in lower lung field involvement in pulmonary TB patients with or without diabetes. While Perez-Guzman C et al¹⁸ found frequent lower lung field involvement in TB diabetic patients. In present study, majority of TB diabetics (75%) & TB prediabetics (72.2%) had Far advanced extent of

disease. Comparable to present study Fatema Javad et al¹⁹ found 53.3% TB prediabetics & 46.7% TB diabetics had extensive radiographic lesions. In present study, majority of TB diabetics (50%) and TB prediabetics (46.2%) had grade 3 sputum positivity, Singla R et al²⁰ & Kelley E Dooley⁵ et al reported diabetes as an independent risk factor associated with more numerous AFB on sputum smear. In present study, diabetics & prediabetics are higher in MDR TB patients as compare to Cat I, Cat II patients. In similar line Bashar et al²¹ & Zhang Q et al²² reported higher prevalence of diabetes in MDR-TB patients.

CONCLUSION

Prevalence of TB diabetics increases with age. Such patients have more symptoms but symptoms of pulmonary tuberculosis are not different, no other radiological presentation except of extent of disease are significant & they have far advanced disease. Hence pulmonary tuberculosis patients should have screening for diabetes mellitus particularly if they have such presentation.

LIMITATION

Our study was limited to patients admitted in hospital so not representative of whole community. Sample size was small. HBA1C showing long term glycaemic control of patients is not estimated.

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