



CLINICAL AND RADIOLOGICAL MANIFESTATIONS OF PULMONARY TUBERCULOSIS AMONG DIABETES MELLITUS PATIENTS

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ABSTRACT **BACKGROUND:** This study was done to determine the concomitant burden of diabetes and tuberculosis among persons receiving TB care in our hospital.

METHODS: The patients who are known diabetics or who are diagnosed to have type 2 diabetes mellitus at the time of presentation are taken as cases. Patients without diabetes are considered as controls.

RESULTS: Upper zone involvement is most commonly seen in the study and control groups. Lower zone involvement was more pronounced in diabetics than non-diabetics. However, the status of glycemetic control has no influence on lower zone involvement.

CONCLUSION: There are no significant differences in the presentation of the disease between diabetics and non-diabetics. But the extent of the disease is more among diabetics with tuberculosis in comparison to their non-diabetic counterparts. The bacillary load in diabetics is also more in comparison to non-diabetic tuberculosis cases.

KEYWORDS : Diabetes, Lung.

BACKGROUND

Tuberculosis (TB) is a major global problem responsible for the ill health of millions of people. TB is the second leading cause of death from an infectious disease worldwide.¹ The association between tuberculosis (TB) and diabetes mellitus (DM) and their synergetic role in causing human disease and suffering has been recognized for centuries in many retrospective and prospective studies.²

The International Diabetes Federation estimates that 1 in 11 adults between 20 and 79 years had DM globally in 2015. Experts expect the prevalence of DM to increase from 415 to 642 million by 2040, with the most significant increase in populations from low to middle-income levels.³

Due to the high prevalence of both DM and TB, it is likely that these two conditions represent co-morbidity. It is well-known that diabetic patients are at increased risk of developing TB and vice versa. It is reported that the rate of DM in patients with TB is 2.0-4.6 times higher than in the general population. New cases of DM account for about 64% of all cases of DM in TB.⁴

About 10% of patients with TB are linked to diabetes. Patients with diabetes have a greater chance (2-3 fold risk) of developing tuberculosis, high risk of death, and relapse during and after anti-tubercular treatment, respectively.² The DM-TB co-morbidity confers an increased risk for the development of new and recurrent TB disease and also increases the risk of poor TB treatment outcomes and increased rates of recurrent disease after successful completion of treatment.⁵⁻⁸

These risks tend to become worse in people living with DM, especially if their blood glucose levels are high⁶⁻⁸. The stress due to a severe chronic infection may worsen existing insulin resistance and reveal an underlying β -cell deficiency which leads to hyperglycemia; it is, thus, possible that the risk of DM is increased among patients with TB, especially in the presence of other predisposing factors.

This study was done to determine the concomitant burden of diabetes and tuberculosis among persons receiving TB care in our hospital and also to compare the clinical and radiological parameters of patients with TB with and without DM, as among patients with TB with previously known and newly detected DM.

METHODS

A hospital-based prospective study conducted at NRI Medical College and General Hospital OPD/IPD patients of general medicine department where all cases of pulmonary tuberculosis (smear-positive and negative) are taken into study. The patients who are known diabetics or who are diagnosed to have type 2 diabetes mellitus at the time of presentation are taken as cases. Patients without diabetes are considered as controls.

OBJECTIVES:

- To assess the clinical manifestations and radiological pattern in patients of pulmonary tuberculosis with diabetes

INCLUSION CRITERIA:

- All cases of pulmonary tuberculosis with diagnosed type 2 Diabetes Mellitus

EXCLUSION CRITERIA:

- Children, non-co-operative patients
- patients with Type 1 Diabetes Mellitus, HIV, and other infectious diseases of the lung

Patients were counselled, and written consent was taken. In our present study, 120 cases of pulmonary tuberculosis were taken. Sixty patients who have associated diabetes mellitus were taken into the study group. Sixty patients without diabetes were considered as controls.

A detailed clinical history was taken in all cases of the present study and noted. Blood sugar levels (fasting and postprandial), glycosylated hemoglobin levels (HbA1C) are recorded in all cases.

The diagnosis of pulmonary tuberculosis was made based on RNTCP guidelines. All Pulmonary tuberculosis cases were classified into smear-positive and smear-negative according to the algorithm framed by RNTCP.

Sputum examination for acid-fast bacilli was done in RNTCP designated microscopic center attached to the department. Two samples (early morning, spot) were taken.

Chest x-ray was taken, and lesions were categorized as cavitory or non-cavitory, unilateral, or bilateral. The radiological extent was graded according to the classification of the National Tuberculosis Association of the USA as minimal, moderate, or far advanced.

Statistical analysis is done by using the Microsoft excel 2007 and IBM SPSS 20.0 software. A critical comparison is made for the clinical and radiological presentations and outcomes of the disease treatment of the study group with those of the control group.

RESULTS

Out of 120 cases with pulmonary tuberculosis, the mean age group of study groups was higher than the control group. It was 51.3 ± 8.5 in the study group and 41.4 ± 14.4 in the control group. Most of the diabetics are above the age of 40 years (91%), and the peak incidence was in the age group of 41-50 and 51- 60 years. Whereas in controls, most of the subjects belonged to the age group <40 years. 51.67% of controls were of < 40 year age group. The incidence of tuberculosis was low in elderly people more than 60 years, both in diabetics and non-diabetics. >60 years people account for 6.67% in the study group and 10% in the control group. (Table 1)

Table 1: Age Distribution

Age	Study group	Control group	Total
<40 years	5 (8.33)	31(51.67)	36 (30)
41-50 years	27 (45)	13 (21.67)	40 (33.33)
51-60 years	24 (40)	10 (16.67)	34 (28.33)
>60 years	4 (6.67)	6 (10)	10 (8.33)
Total	60 (100)	60 (100)	120 (100)

There is male preponderance observed in our study . Out of 120 individuals, 89 are males accounting for 74.17%, and 31 were female, accounting for 25.83%. Smokers are more commonly associated with tuberculosis than non-smokers. 56.67% of our study individuals are smokers, either current or ex-smokers, compared to 43.33% non-smokers. , the predominant symptoms in the study group are cough (96.67%), fever (70%), and breathlessness (65%). Other symptoms noted are hemoptysis (13.33%) and chest pain (6.67%).

Cough, breathlessness, and fever remain the common symptoms even in the control group, chest pain, and hemoptysis being less common. The majority of individuals in our study approached health care after two weeks of the duration of their symptoms.

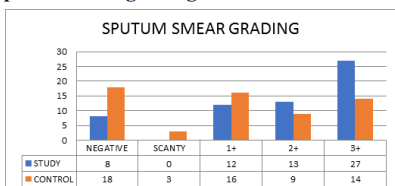
Mean FBS value in diabetics among tuberculosis is 189 ± 69.09 , lowest recorded being 88mg/dl and highest 381mg/dl, whereas in non-diabetics, it is 90.71 ± 12.8 lowest being 54mg/dl and highest being 121mg/dl. The mean PPBS value is 292.9 ± 119.1 and 125.86 ± 27.3 among the study and control group, respectively. PPBS values range from 102 mg/dl to 514mg/dl in cases and it ranges from 75mg/dl to 221 mg/dl in controls.(Table 2)

Table 2: Blood sugar and glycosylated hemoglobin levels

	Study group	Control group	't' value	Significance
Mean FBS	189.2 ± 69.09	90.71 ± 12.8	10.54	0
Mean PPBS	292.9 ± 119.1	125.86 ± 27.3	10.17	0
Mean HbA1C	7.38 ± 0.9			

In the study group, the lowest HbA1C noted was 5.8, and the highest was 10.7. Mean HbA1C noted was 7.38 ± 0.9 . There is no statistical difference in the categorization of cases between study and control groups. The high bacillary load is seen in diabetics compared to non-diabetics. 66.67% of cases have smear grading > 2+ in diabetics.61.67% of controls have smears ≤1+ and negative smears. (Figure 1)

Figure 1: Sputum smear grading



In our study, extensive lesions (moderate + far advanced) appeared more commonly than minimal lesions both in the study group and the control group. 86.66% of individuals in the study group have extensive lesions in comparison to 56.66% in the control group. (P<0.05). In the study group, patients with uncontrolled sugar levels have more moderate and far advanced lesions compared to patients with controlled sugar levels. 93.54% of those with HbA1C >7, i.e., in

uncontrolled diabetes, have extensive lesions in comparison to 79.3% with HbA1C <7 i.e., controlled diabetes. (Table 3)

Table 3: Extent of Lesions

	Minimal		Moderate		Far advanced	
	Study	Control	Study	Control	Study	Control
<40 years	1	10	3	14	1	7
41-50 years	5	6	12	4	10	3
51-60 years	1	7	12	3	11	0
>60 years	1	3	2	2	0	1
P-value	0.046		0.022		0.000	

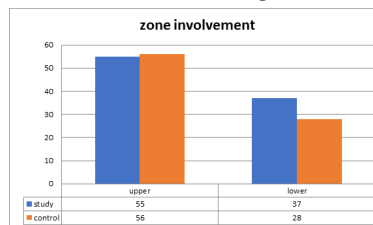
In the present study, patients with cavitary and non-cavitary lung lesions were almost equal, with a greater number of patients with cavitary lesions in the study group compared to the control group.

70% of study group patients (n=42) had cavitary lesions compared to 33.33% of the control group (n=20) having cavitations on chest X-ray, which is statistically significant. (P<0.05)

It is observed in our study that uncontrolled diabetic people have more cavitations compared to diabetics with controlled sugar levels. 74.2% of uncontrolled diabetics have cavitary lesions compared to 65.5% of those with controlled blood sugars.

In the present study, the percentage of individuals with unilateral lung lesions on x-ray was 60%, and those with bilateral pulmonary lesions was 40%. In the control group, the percentage of patients with unilateral to bilateral pulmonary lesions are 41.67% and 58.33% respectively(Figure 2)

Figure 2: Distribution of lesion according to zones



The involvement of upper zones is almost similar in both study and control groups. It is 91.67% in the study and 93.33% in control groups. Lower zone involvement is more in the study group compared to the control group. 61.67% of diabetics have lower zone involvement, whereas only 46.67% of non-diabetics have lower zone involvement. (P<0.05) When compared the zone of involvement with the level of sugar control, it is noted that the upper zone was involved in most of the individuals irrespective of their level of blood sugars. The lower zone is involved in 65.51% of individuals with controlled sugars and in 58.06% with uncontrolled sugars.

DISCUSSION

The mean age of the study group was 51.3 ± 8.5 , and the control group was 41.4 ± 14.4 . In Jagdish Rawat et al., mean age group in patients with co-existing tuberculosis and diabetes was 53.34 ± 14.06 , and it was 44.35 ± 18.14 in controls without diabetes mellitus.⁹

Similar observations are made by Nissapatorn et al., where 75.3% of cases fall in age group >45 years¹⁰. This male predominance was also observed in each of the study and control groups. Similar findings were observed in Mohammad et al. (58), Jagdish Rawat et al⁹, Nissapatorn et al¹⁰.

71.67% of cases in the study group were new cases, whereas 28.33% of subjects were re-treatment cases. In the control group, 71.67% were new cases, 26.67% were retreatment cases, and 1.67% were treatment after default.

V Nissapatorn et al. interpreted similar results were no statistical difference in diabetic and non-diabetic patients with tuberculosis regarding categorization of cases as new and relapse.¹⁰

Viswanathan AA et al¹¹ also found similar presentation in their study extensive lesions (moderate and far advanced) are far more common in the diabetic group (86.66%) compared to the non-diabetic group (56.66%)

Chen-Yuan Chiang et al. TB patients with DM were significantly more likely to have opacity over lower lung fields and extensive parenchymal lesions (moderately or far advanced) compared to those without DM. In their study, 70.9% of diabetics have extensive lesions in contrast to 62.8% in non-diabetics.¹² Bachtal et al¹³, similar observations are made.

In the present study, it was also observed that patients with uncontrolled diabetes with high HbA1C >7 had more extensive lesions (93.54%) than those with controlled sugar levels (79.3%) within the study group.

The association between diabetes control level and clinical manifestations was mentioned by two studies so far, Chen-Yuan et al¹⁴ and Park et al¹⁵ in their respective studies. The percentage of individuals with unilateral lung lesions on x-ray was 60%, and those with bilateral pulmonary lesions were 40%. In the control group, the percentage of patients with unilateral to bilateral pulmonary lesions are 41.67% and 58.33% respectively. Jabbar et al¹⁶ observed more unilateral involvement than bilateral in tubercular diabetics, which was similar to our study. In their observation among 77 tubercular diabetics, 41 (53%) had unilateral lesions, while 36 individuals have bilateral lesions accounting for 47%. (59). Qazi MA et al. also observed similar differences in their study. 82% of individuals have unilateral involvement compared to 17% had bilateral involvement

CONCLUSION

The extent of the disease is more among diabetics with tuberculosis in comparison to their non-diabetic counterparts. The bacillary load in diabetics is also more in comparison to non-diabetic tuberculosis cases. If the diabetic patients presenting with tuberculosis will not properly be managed with adequate anti-diabetic treatment, there are chances of development of more cavitory and extensive tubercular lesions, and also they may land in ATT failure and consequently multidrug-resistant tuberculosis. However, with good glycemic control, the cure rate will be as good as the cure rate seen in non-diabetics.

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