International Journal of Research in Medical Sciences
Chikhalikar P et al. Int J Res Med Sci. 2024 Jun;12(6):1964-1968
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20241542

Original Research Article

A comparative study of clinical profile of diabetic tuberculosis patients with non diabetic tuberculosis patients of outpatient department of tertiary healthcare centre

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Received: 27 March 2024
Revised: 05 April 2024
Accepted: 09 May 2024

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ABSTRACT

Background: The global increase in type 2 DM is recognized re-emerging risk and challenge to TB control in India. TB-T2D association is again at the frontline of risk factors for TB, with an estimated worldwide population attributable fraction of 34.5%. T2D not only increases TB risk 3-fold, but also TB treatment failure including death. And prognosis of diabetic tuberculosis patients as compared to non diabetic ones is poorer.
Methods: An comparative analytical study was done in microbiologically confirmed 50 diabetic and 50 non diabetic TB patients registered in RNTCP OPD of tertiary healthcare hospital who were followed up for 3 months.
Results: In our study we found that elderly (above 65 age group) male diabetic patients were affected more with tuberculosis as compared to young patients and data was statistically significant. Extrapulmonary involvement was seen more in diabetic patients as compared to non diabetic patients. Radiologically diabetic tuberculosis patient showed predominantly lower lobe of lung involvement as oppose to non diabetic tuberculosis patients who showed upper lobe of lung involvement and data was statistically significant. Outcomes like Multidrug Resistance and prolonged sputum positivity after intensive phase treatment was seen more with diabetic tuberculosis patients but this was not statistically significant.
Conclusions: Early screening of TB patients for DM and vice versa and early initiation of treatment will prevent unfavourable outcomes of these patients.

Keywords: Diabetic tuberculosis, Elderly, Lower lobe involvement, Multidrug resistance, Prolonged intensive phase

INTRODUCTION

The association between Diabetes Mellitus and TB has been recognised for centuries. As a consequences of urbanization as well as social and economic development there has been a rapidly growing epidemic of DM. India has second largest number of diabetic people in the world around 66 million cases. The global increase in type 2 DM is recognized re-emerging risk and challenge to TB control in India. The risk of acquiring TB in a patient with DM is 4.8% as compared to 0.8 % in general population.[1-3] The relative risk of developing pulmonary TB is 3.5 times higher in DM patients as compared to non diabetic.[4] India Tuberculosis-Diabetes Study Group screened patients with DM for TB, 254 patients out of 7218 were TB positive, 46% were sputum positive.[5]

Diabetics with uncontrolled sugar levels and requiring more than 40 units insulin per day are more prone to develop TB. Basher et al study shown that multidrug resistant TB was more common in patients with DM (36% vs 10%) as compared to those without DM.[6] DM patients have also been found to have a higher baseline

mycobacteria burden ,longer time for sputum conversion and higher treatment failure and relapse rate.

Objective of the current study was to compare clinical profile of diabetic tuberculosis patients with non diabetic tuberculosis patients of outpatient department of tertiary healthcare centre.

METHODS

This was an observational analytical study conducted at CPR Hospital, Kolhapur, Maharashtra for 3 months from 1st January 2024 to 31st March 2024. Total 100 tuberculosis patients were included. The sampling was done by simple random sampling method.

Inclusion criteria

Study included 100 microbiologically confirmed pulmonary or extrapulmonary tuberculosis patients registered under RNTCP, out of which 50 with known case or newly diagnosed cases of diabetes screened during OPD visit and 50 non diabetic tuberculosis patients and age above 18 years were included.

Exclusion criteria

Persons not willing to participate in the study were excluded.

Study tool

History taking from patients and further follow up on opd basis**.** Blood sugar levels (cut off for random blood sugar level is 140 mg/dl, further diagnosis of diabetes mellitus confirmed with fasting, post prandial blood sugar levels and serum hb1ac using ADA criteria). Sputum AFB & CBNAAT studies and line probe assays for MDR detection. Chest x-ray.

Statistical analysis

The analysis was performed by IBM SPSS version 20. Chi-square test and for smaller frequencies fishers exact test of statistical analysis is used.

RESULTS

As shown in Figure 1, occurrence of tuberculosis was more common in male patients as compared to females in both diabetic and non diabetic groups in our study.

Around 46% of diabetic tuberculosis patients were elderly (above 65 age group). Elderly diabetic patients are more affected with tuberculosis as compared to young patients and data was statistically significant as shown in Figure 2.

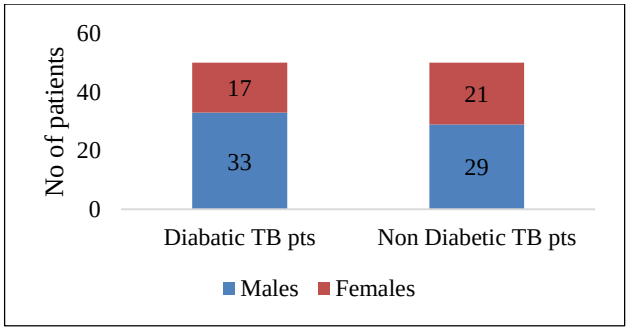

Figure 1: Gender-wise distribution.

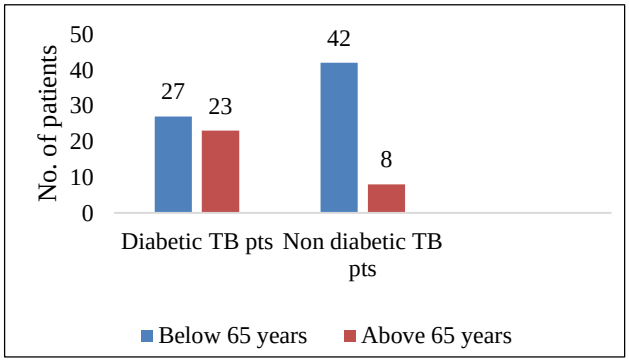

Figure 2: Age-wise distribution.

Extrapulmonary involvement was seen more in diabetic patients as compared to non diabetic patients. 20% in diabetic and 10 % in non diabetic population shown in Figure 3.

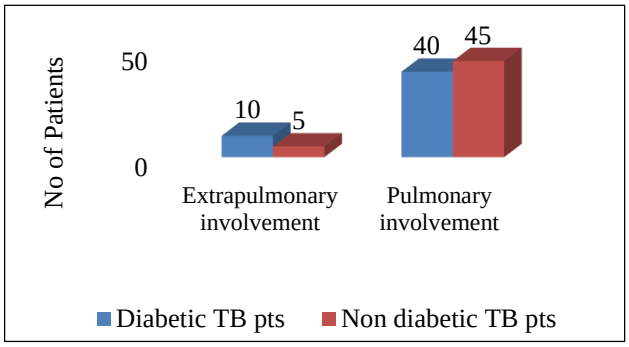

Figure 3: Pulmonary vs extrapulmonary involvement.

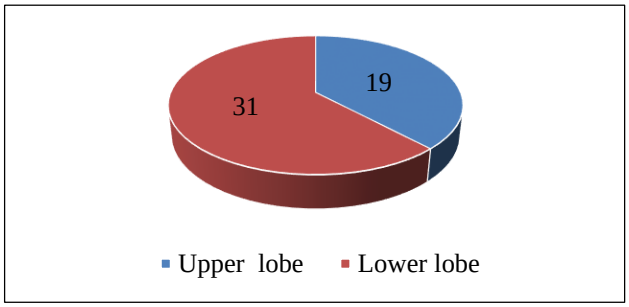

Figure 4: Lobar involvement in diabetic TB patient.

Diabetic tuberculosis patient showed predominantly lower lobe of lung involvement of tuberculosis lesion as oppose to non diabetic tuberculosis patients who showed upper lobe of lung involvement and data was statistically significant shown in Figure 4, 5 and 6.

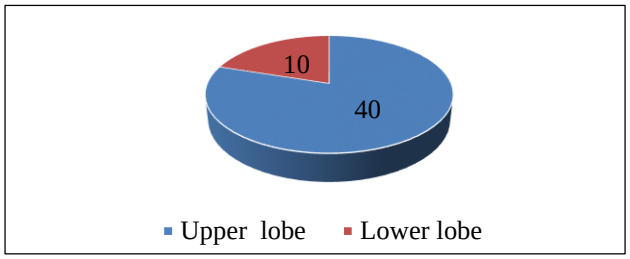

Figure 5: Lobar involvement in non diabetic TB patient.

Multidrug resistance and prolonged sputum positivity after intensive phase treatment was seen more with diabetic tuberculosis patients but this was not statistically significant (Table 1).

This Table 2 summarized results of this study along with the percentage occurrence of individual variable in diabetic and non diabetic TB patients along with the p value.

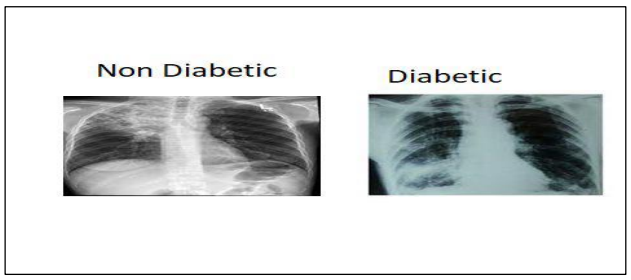

Figure 6: Chest x-ray of diabetic and non diabetic patient.

Table 1: MDR TB and prolonged IP treatment.

Clinical profile	Diabetic TB patients	Non diabetic TB patients
Multidrug resistant TB	5	2
Prolonged intensive phase treatment	10	3

Table 2: Summary of results of study.

Clinical profile (No .of pts)	Diabetic TB patients (%)	Non diabetic TB patients (%)	P value
Gender distribution			
Males	33 (66)	29 (58)	0.5368
Females	17 (34)	21(42)	
Age-wise distribution			
Above 65 yrs	23 (46)	8 (16)	0.0012
Below 65 yrs	27 (54)	42 (84)	
Extrapulmonary involvement	10 (20)	5 (10)	0.1614
Pulmonary			
Upper lobe involvement	19 (38)	40 (80)	0.0001
Lower lobe involvement	31 (62)	10 (20)	
Multidrug Resistant TB	5 (10)	2 (4)	0.4360
Prolonged intensive phase treatment	10 (20)	3 (6)	0.0713

DISCUSSION

Hyperglycemia has indirect effect on macrophage, lymphocytes, chemotaxis, phagocytosis and antigen presentation in response to mycobacterial infection. Interferon-alpha production by T cells, growth and function of T cells are adversely affected by DM. Thickened alveolar epithelium and pulmonary basal lamina, altered diffusion of lungs and lung volume along with reduced elastic recoil of lungs are known to increase susceptibility of TB in DM patients. Non enzymatic glycosylation of tissue proteins and alteration in connective tissue in lungs in DM is thought to be the pathogenetic mechanism in increased susceptibility in these patients. Autonomic neuropathy causing changes in the basal airway tone leading to reduced bronchial activity and dilated bronchus also increase the susceptibility to TB.[7]

As explanations for male-bias in TB (i.e., excess TB cases among men), many propose that men have greater susceptibility to infection or more frequent opportunities for exposure. A number of factors have been put forward as mechanisms for heightened susceptibility in men. In most countries, men smoke more cigarettes than women, and per capita smoking rates explain roughly one-third of the variation in country-level male-bias in case reports, perhaps due to toxic lung injury and reduced immune cell function leaving them more susceptible to infection. Alcohol use is also identified as a risk factor for TB disease as it may have immunosuppressive effects. These

behavioral factors and other hormonal and physiological factors likely play a role in determining sex-specific susceptibility to MTB. As mentioned in study done as Association between tuberculosis in men and social network structure in Kampala, Uganda at Miller et al, in our study we found that in both diabetic and non diabetic patients males were affected more with tuberculosis as compared to females (66% & 58% vs 34% & 42%).[8]

Table 3: Effects of hyperglycemia on immunity.

Hyperglycemia			
Effect on macrophage and lymphocytes function	Autonomic neuropathy leading to alteration in basal airway tone and dilated bronchus	Defective T cell function	Non enzymatic glycosylation of tissue proteins and alteration in connective tissue of lungs

It has long been recognised that older people are vulnerable to develop tuberculosis. Tuberculosis among older adults will pose major challenges to global tuberculosis control in the future. Tuberculosis treatment outcomes in older adults are often poorer due to delayed diagnosis, increased rates of drug-related adverse events, frequent co-morbidity and overarching poverty. Targeted efforts to improve case detection and treatment outcomes in this population are needed to achieve global tuberculosis targets. In our study, elderly diabetic patients were more affected with tuberculosis as compared to young patients. The data was statistically significant (p value <0.05) and it was comparable with the study done in Negin et al.[9]

As studied in Magee et al, nearly 15% of global TB cases are extrapulmonary tuberculosis (EPTB) cases.[10] EPTB presents challenges to TB control because it is harder to diagnose and certain forms are associated with worse outcomes. Incidence of EPTB occurs more commonly in persons with impaired innate immunity, renal disease, and HIV. Certain EPTB sites, including more severe sites such as central nervous system (CNS), are associated with HIV and lower CD4 cell count. Although immune deficiency also occurs with diabetes, little is known about the epidemiological or clinical relationship between diabetes and EPTB. Patients with diabetes are at increased risk of infections, including soft-tissue infections (*S. aureus, Candidia albicans*), group B streptococcus and genitourinary infections (Enterobacteriaceae). The immune mechanisms that place in patients with diabetes at increased risk of infections, including TB, may also increase the risk of EPTB. In our study we found that extrapulmonary involvement of tuberculosis was 10% more in diabetic population as compared to non diabetic tuberculosis patients.

Radiologically lower lung field involvement is more common in diabetic as compared to those without DM in whom upper lung involvement is more common and data was stiatistically significant (p-value <0.05) in our study. It is thought to be due to oxygen variability in lower lobe and this is comparable with study done in Singh et al.[11] Multilobar disease with multiple cavities is also more common in patients with DM with TB .

Study done in diabetes mellitus and tuberculosis treatment outcomes at Mave et al, have shown that TB patients with DM have unfavourable outcomes like MDR TB, increased mortality rates, prolonged treatment duration.[12] A early screening of TB patients for DM and vice versa will prevent unfavourable outcomes of these patients. In our study, MDR TB was seen in 10% of diabetic TB population vs 4% in non diabetic patients and prolonged intensive phase treatment seen in 20% of diabetic TB patients vs 6 % of non diabetic TB patients.

Screening of diabetics for four symptom complex of tuberculosis screening i.e. cough of any duration, fever, weight loss, night sweats should be done. It is included in NPCDCS guidelines for prevention and early diagnosis of TB in DM patients.

This study has some limitations. It is important to note that these observations are based on small sample size and may not be generalised to large population.

CONCLUSION

With our study we would like to conclude that diabetic tuberculosis patients have less favourable clinical outcome as compared to non diabetic patients. Elderly male diabetics are at higher risk of developing tuberculosis. Extrapulmonary involvement and radiologically lower lung involvement was more common in diabetic tuberculosis patients as compared to non diabetic tuberculosis patients.

MDR TB and prolonged sputum positivity in intensive phase of TB treatment is seen more commonly with diabetic tuberculosis patients as compared to non diabetic patients. Hyperglycemia in DM patients increases susceptibility for developing tuberculosis by altering patients immunological response to mycobacterium and hence sugar control is of utmost important. Early screening of TB patients for DM and vice versa and early initiation of treatment for controlling progression of both of the diseases will prevent unfavourable outcomes of these patients.

ACKNOWLEDGEMENTS

Authors would like to thank all the teaching and non teaching staff of department of medicine in RCSM GMC and CPR Hospital, Kolhapur for supporting this research.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Chikhalikar P, Bansode MV, Paritekar A, Bafna V. A comparative study of clinical profile of diabetic tuberculosis patients with non diabetic tuberculosis patients of outpatient department of tertiary healthcare centre. Int J Res Med Sci 2024;12:1964-8.