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THORACIC RADIOGRAPHIC FINDINGS IN TUBERCULOSIS PATIENTS WITH DIABETES MELLITUS

DR. JESVANTHAN E[1], DR. GANGADHARAN V[2], DR. SOWMITHA SG[3], DR. JEEVANANDHAM A[4]

[1,2,3,4]DEPARTMENT OF RESPIRATORY MEDICINE, SAVEETHA MEDICAL COLLEGE & HOSPITAL, SIMATS, THANDALAM, CHENNAI, TAMIL NADU.

ABSTRACT:

INTRODUCTION: The prevalence of diabetes in India has risen from 7.1% in 2009 to 8.9% in 2019. In 2021, among the notified tuberculosis patients, 89% were screened for blood sugar, and out of screened, 8% were found to have diabetes mellitus. Many studies have been conducted to estimate the prevalence of TB in diabetes and vice versa, but limited studies are available on radiological patterns of tuberculosis in diabetes.

METHODOLOGY: We extracted data of 50 tuberculosis patients admitted in Saveetha Medical College and Hospital after satisfying inclusion criteria during the study period (September 2023 to March 2024). Data extracted from electronic medical records included demographic data, clinical history, smear for acid fast bacilli, Cartridge Based Nucleic Acid Amplification Test, biochemical analysis of pleural fluid, HbA1c, chest radiographs and then analyzed using SPSS software.

RESULTS: Total number of patients included in a study were 50. During the study period of 7 months, from the hospital medical records, a total of 432 patients were diagnosed to have Tuberculosis (Both pulmonary & extra pulmonary). Out of which 50 patients were diabetics. The number of males were 35 (70%) whereas 66% of the patients were above the age of 50.

CONCLUSION: Our study showed that 11 % of tuberculosis patients had diabetes mellitus. Lower zone predominant involvement in chest radiograph was seen in 44 %. The most common radiological pattern was lower zone predominant consolidation. Most of them were diagnosed by AFB smear & CBNAAT. Hence microbiological confirmation was the most common method. Almost all the patients had uncontrolled diabetes mellitus underscoring the importance of euglycemic control.

KEY WORDS: Tuberculosis, Diabetes mellitus, Chest radiography, Euglycemic control.

INTRODUCTION

Tuberculosis [TB] continues to afflict large number of people in the developing countries. TB affects all organ systems; however, lungs are most commonly affected and often are the first site of involvement. Imaging plays a pivotal role in screening, diagnosis as well as follow-up during treatment of pulmonary TB [1]. Postero-anterior [PA] radiograph of the chest is used as the initial imaging tool in patients suspected to have TB. It is an inexpensive, easily-available, screening modality which is often sufficient for initial diagnosis and subsequent follow up. A normal chest radiograph has a high negative predictive value for active TB. The frequency of false negative examination is approximately 1% in the adult immunocompetent population [2,3].

According to the International Diabetes Federation (IDF), 8.8% of the adult population have diabetes. Men have slightly higher rates (9.6%) than women (9.0%). The prevalence of diabetes in India has risen from 7.1% in 2009 to 8.9% in 2019. In 2021, among the notified tuberculosis patients, 89% were screened for blood sugar, and out of screened, 8% were found to have diabetes.

In India, 2021 of all the notified TB patients, 89% were screened for blood sugar, and out of screened, 8% were found to have diabetes. Out of this, 62% of patients were referred to the NCD clinics and linked to anti-diabetic

treatment. Among the NCD clinic attendees with diabetes, about 7% have been screened for tuberculosis and referred for TB testing.

METHODS

It was a retrospective descriptive study conducted on 50 cases which presented to the Department of Respiratory Medicine of Saveetha Medical College and Hospital, Chennai, India, over a period of 6 months (September 2023 to March 2024).
The data for the study were extracted from electronic medical records using search criteria.
The extracted data were demographic data, clinical history, AFB smear, CBNAAT, biochemical analysis of pleural fluid, HbA1c, chest radiographs were extracted and then analyzed.

INCLUSION CRITERIA:

Adults with Microbiologically or clinically diagnosed pulmonary and extrapulmonary tuberculosis and availability of their complete medical records, including clinical history and laboratory results.

EXCLUSION CRITERIA:

Patients with HIV and those without proper medical records, missing records were excluded.

STATISTICAL ANALYSIS:

The data was analysed by exporting into IBM SPSS version 25. Descriptive analysis of demographic data, clinical parameters were carried out.

ETHICAL CONSIDERATIONS:

Ethical review committee of the institution has approved this study. Patient identifiers and sensitive information were removed before analysis.

RESULTS

Total no of patients included in a study were 50. In a period of 7 months, from the hospital medical records, 432 patients were diagnosed to have TB. Out of which 50 patients were diabetics. The number of Males in the study were 35 (70%).66% of the patients were above the age of 50.
The most common type of TB was pulmonary TB (80%), followed by extrapulmonary TB (20%). Our study showed that consolidation was the most common presentation (100 %). Cavities were found in 36 %.
And 11 % of tuberculosis patients had diabetes mellitus in our study. According to India TB report 2021, 8 % of TB patients had diabetes mellitus. Lower zone predominant involvement in chest radiograph is seen in 44 % which was similar to a study conducted by Reisner.
There were no statistically significant differences in the chest radiographic findings between patients with controlled and uncontrolled diabetes.

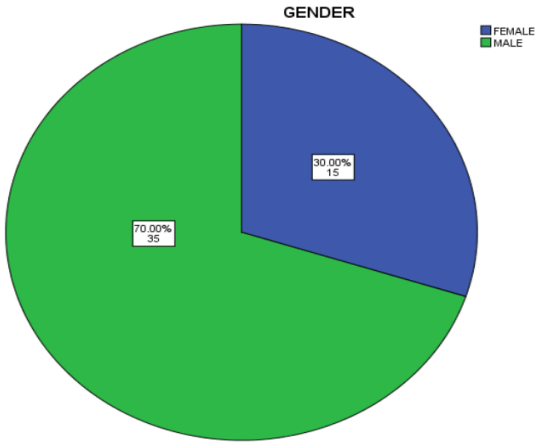
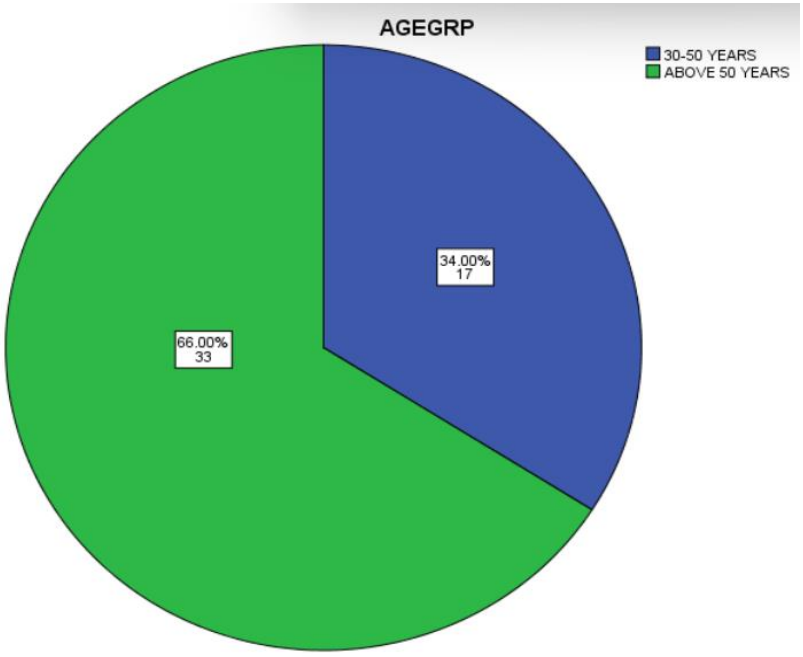
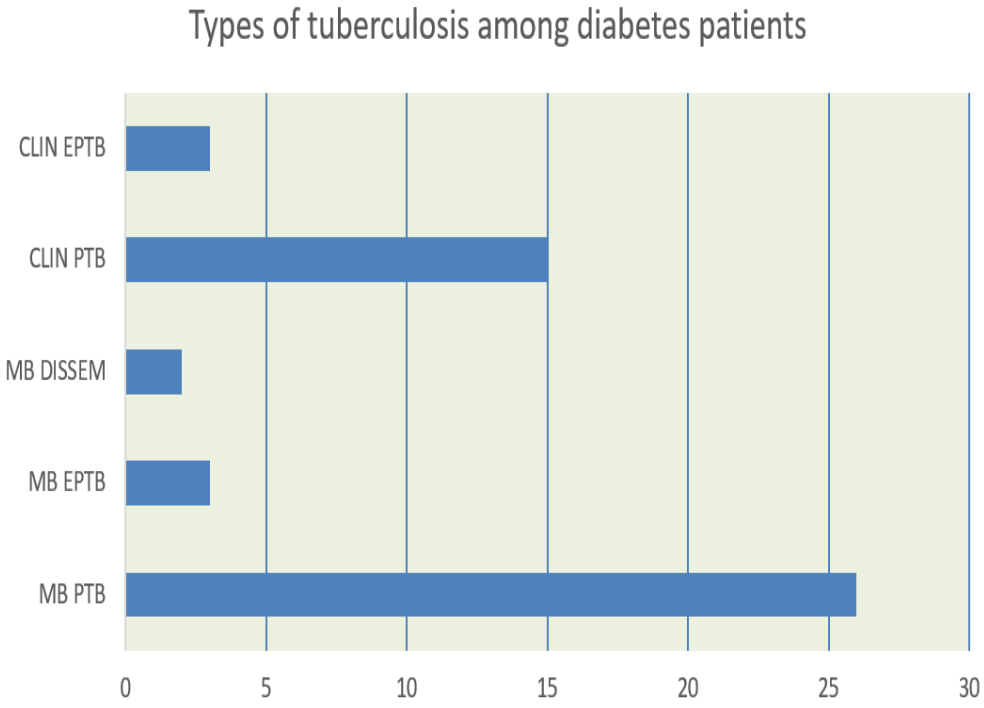


FIGURE 1 GENDER DISTRIBUTION


AGEGRP
30-50 YEARS
ABOVE 50 YEARS
34.00%
17
66.00%
33


Types of tuberculosis among diabetes patients
CLIN EPTB
CLIN PTB
MB DISSEM
MB EPTB
MB PTB
0
5
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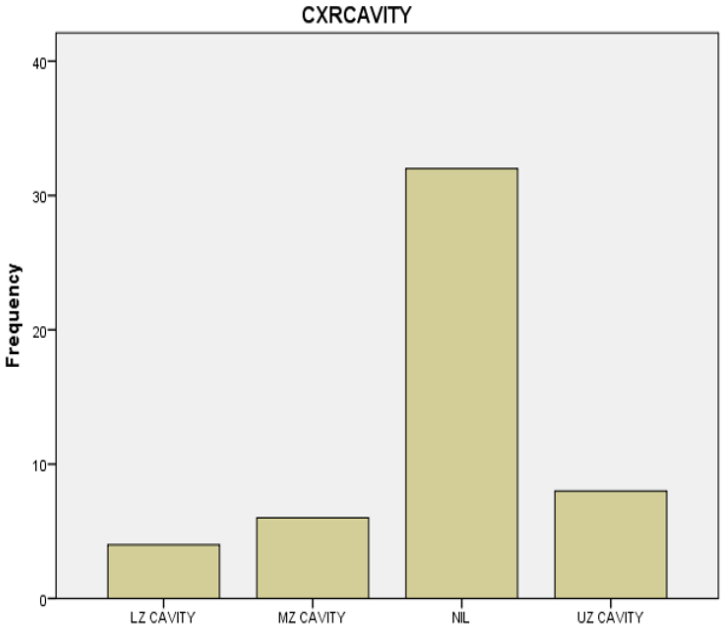
15
20
25
30



DISCUSSSION

Diabetes, especially when poorly-controlled, causes relative immunocompromise and increases likelihood of reactivation of TB. It might also lead to increased susceptibility to disease caused by M. tuberculosis via multiple mechanisms:

Direct mechanism: Hyperglycaemia and cellular insulinopenia directly increases the susceptibility to the disease.[4]

Indirect mechanism: functioning of macrophages and lymphocytes, chemotaxis, phagocytosis and antigen presentation in response to mycobacterial infection. Interferon-alpha [IFN-α] production by T-cells, the growth, function and proliferation of T-cells are adversely affected by DM. DM patients with poor glycaemic control with TB have lower production of interleukin 1-beta [IL-1b] and tumour necrosis factor-beta [TNF-b]. Thickened alveolar epithelium and pulmonary basal lamina, altered diffusion capacity of the lungs and lung volume, along with reduced elastic recoil of the lungs are known to increase the susceptibility to TB in DM patients.[5,6]

Producing local tissue acidosis and electrolyte imbalance that impair repair. Disturbed carbohydrate metabolism leading to hyperglycemia with subsequent increase of sugar, glycerol and nitrogen substances in the blood that favor the growth and viability of tubercle bacilli.

Disturbed protein metabolism with subsequent decrease of antibodies formation. Disturbed fat metabolism leading to ketosis decreasing the bactericidal effect of lactic acid, increase of glycerol in the blood that favor the growth of tubercle bacilli. Associated hepatic insufficiency as a result of fatty liver leads to hypovitaminosis A & D that decreases the integrity of epithelial tissue.[7]

Associated stress increases ACTH and the resulting increase in corticosteroids aids in flaring up of tuberculosis. Enhancing atherosclerosis disturbing pulmonary perfusion and increasing VA/Q that increases alveolar O2 tension that help organism multiplication.

Worsening of diabetic state (insulin antagonism) as lack of insulin receptors on macrophages and monocytes suppress the immunity. More extensive exudation and caseation with subsequent cavitation and toxaemia. More frequent hemoptysis and pleural effusion. Predilection to hilar and basal regions.[8]

Radiologically, lower lung field involvement is commonly observed in DM patients with TB compared to persons without DM in whom, upper lung involvement is more common. Elderly patients with DM are particularly prone for this and oxygen tension variability preferably involving lower lobe is thought to be the reason for increased lower lung field predilection.[9]

DM may also be a risk factor for hepatic toxicity of anti-TB drugs. It causes changes in oral absorption, decreased protein binding of drugs, and renal insufficiency or fatty liver with impaired drug clearance.

The genetic predisposition towards pulmonary TB is increased in the presence of DRB[1]*09 allele, while DQB[1]*05 is observed to be protective for TB in patients with DM.[10]

CONCLUSION

The most common radiological pattern was lower zone predominant consolidation. Most of them were diagnosed by AFB smear & CBNAAT. Hence microbiological confirmation was the most common method. Almost all the patients had uncontrolled diabetes mellitus emphasizing the importance of diabetic control.

Diabetes, especially when poorly controlled, causes relative immunocompromise and increases likelihood of reactivation of TB. It leads to increased susceptibility to disease caused by M. tuberculosis due to hyperglycemia.

In the co-management of DM and TB, several issues are of concern to clinicians. TB is known to worsen diabetes control. Overlapping toxicities like peripheral neuropathy due to isoniazid treatment and poor glycaemic control must be kept in mind. Rifampicin is known to cause hyperglycaemia either by direct action by or interaction with oral antidiabetic drugs. Careful monitoring of glycaemic status because of direct and indirect effect of rifampicin is a must.

REFERENCE

1. World Health Organization. Global tuberculosis report 2015. WHO/HTM/TB/2015.22. Geneva: World Health Organization; 2015.(World Health Organization 2015)
2. Korzeniewska-Kosela M, Krysl J, Müller N, Black W, Allen E, FitzGerald JM. Tuberculosis in young adults and the elderly. A prospective comparison study. Chest 1994;106:28-32.(World Health Organization 2019)
3. Hadlock FP, Park SK, Awe RJ, Rivera M. Unusual radiographic findings in adult pulmonary tuberculosis. AJR Am J Roentgenol1980;134:1015-8.(Hadlock et al. 1980)
Uno K, Nakano K, Maruo N, Onodera H, Mata H, Kurosu I, et al. Determination of interferon-alpha-producing capacity in whole blood cultures from patients with various diseases and from healthy persons. J Interferon Cytokine Res 1996;16:911-8.(Uno et al. 1996)
4. Tsukaguchi K, Yoneda T, Yoshikawa M, Tokuyama T, Fu A, Tomoda K, et al. Case study of interleukin-1b, tumor necrosis factor alpha and interleukin-6 production in peripheral blood monocytes in patients with diabetes complicated by pulmonary tuberculosis. Kekkaku1992;67:755-60.(勝彦 et al. 1992)
5. Marvisi M, Marani G, Brianti M, Della Porta R. Pulmonary complications in diabetes mellitus. Recent Prog Med 1996;97: 623-7.(Kaparianos et al. 2008)
6. Leung CC, Lam TH, Chan WM, Yew WW, Ho KS, Leung GM, Law WS, Tam CM, Chan CK, Chang KC. Diabetic control and risk of tuberculosis: a cohort study. *Am J Epidemiol*. 2008;167:1486–1494.(World Health Organization 2011)
7. Baker MA, Lin HH, Chang HY, Murray MB. The risk of tuberculosis disease among persons with diabetes mellitus: a prospective cohort study. *Clin Infect Dis.* 2012;54:818–825.(Mukundan et al. 2015)
8. Stevenson CR, Forouhi NG, Roglic G, Williams BG, Lauer JA, Dye C, et al. Diabetes and tuberculosis: the impact of the diabetes epidemic on tuberculosis incidence. BMC Public Health 2007;7:234.
9. Zhao Y, Duanmu H, Song C. Analysis of the association between HLA-DRB[1], DQB[1] gene and pulmonary tuberculosis complicated with diabetes mellitus. Zhonghua Jie He He Hu Xi Za Zhi 2001;24: 75-9.