Journal of Cardiovascular Disease Research
ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

TITLE: CLINICO-RADIOLOGICAL SPECTRUM OF PULMONARY TUBERCULOSIS IN DIABETICS AND NON-DIABETIC PATIENTS AT TERTIARY CARE CENTRE''

Dr Jagmohan SV[1], Dr Sreenath[2], Dr Niveditha S[3], Dr Vivek Jayan[4], Dr Pradeep T S[5]

[1]Assistant Professor, Department of TB & Respiratory Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

[2]Senior Resident, Department of General Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

[3]Associate Professor, Department of General Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

[4]Final year, Post Graduate Student, Department of Community Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

[5]Assistant Professor, Department of Community Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

Corresponding Author:
Dr Vivek jayan, Final year, Post Graduate Student, Department of Community Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar

Abstract:

Background: Diabetic individuals have three times more risk of developing tuberculosis. Clinical presentation and response to treatment both have a different course in diabetic individuals in comparison with non-diabetes individuals. The aim of the study was to determine the clinic - radiological spectrum of pulmonary tuberculosis in diabetics and non-diabetic patients.

Methods: The study was conducted in the department of General Medicine at R.L. JALAPPA hospital, Kolar. The study included two groups; one group consisted of diabetic patients with pulmonary tuberculosis, and another group comprised of non-diabetic pulmonary tuberculosis patients. Informed consent was obtained from all participants.

Results: A total of 163 subjects were included in the final analysis, with 79 participants in the diabetic group and 84 participants in the non-diabetic group. The radiological appearance was Cavitary for 19% participants, Consolidation for 39.2% participants, Fibro cavitary for 13.9% participants in the diabetic group. Out of 84 participants in the non-diabetic group, the radiological appearance was Cavitary for 10.7% participants, Consolidation for 29.8% participants, Fibro cavitary for 9.5% participants

Conclusion: This study found clinical presentation symptoms almost similar between diabetic patients with tuberculosis and non-diabetic patients with tuberculosis. The radiographic spectrum of tuberculosis was found to be different in diabetic patients. Diabetic

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

patients were found to have more cavitation and involvement of lower lobe of lung as against upper lobe in non-diabetic patients

Keywords: tuberculosis, diabetic, non-diabetic, pulmonary tuberculosis, consolidation

Introduction:

Pulmonary Tuberculosis is an airborne disease caused by Mycobacterium tuberculosis that usually affects the lungs leading to severe coughing, fever, and chest pains. Globally, tuberculosis is one among the top 10 causes of mortality. In the year 2017, "10.4 million cases" of TB were reported and 1.8 million death according to the World Health Organization. India accounts for 24% of the total global TB burden and 29% of mortality. In India, the prevalence of DM in 2016 was 61 million.[1] In India, diabetes accounts for 14.8% of pulmonary TB and 20.2% of smear-positive TB in the year 2000.[2]

Age, immune status, immunization status to the bacillus Calmette-Guerin, co-existing diseases, the virulence of the infecting organism and host-microbe interaction are the factors that determine the clinical manifestations of tuberculosis. The commonest clinical presentation in tuberculosis patients is the cough. The frequency of fever in tuberculosis patients is identified between 37 to 80%.[3, 4] The other common symptoms involved in tuberculosis are the loss of appetite, weight loss, weakness, night sweats and malaise.[5] VAlavi SM. et al[6], performed a study in which the sputum, hemoptysis and dyspnea were identified more prominent in TB with DM (69.4%, 33.4%, 44.5%) as compared to TB without DM (36.6%, 9.8%, 20.5%).

Human immunodeficiency virus, diabetes mellitus, smoking and malnutrition are the risk factors that can lead to tuberculosis mortality. The risk of TB among DM patients is three times higher as compared to those without DM.[1] The most commonly used methods for the diagnosis of pulmonary TB are the direct sputum smear microscopy and mycobacterial culture.[7] The diagnosis of TB is confirmed by performing the culture of M. tuberculosis. Chest radiography also plays a major role in the screening and diagnosis of pulmonary TB. Poorly defined nodules, linear opacities, focal or patchy heterogeneous consolidation involving the apical and posterior segments of upper lobes and the superior segments of lower lobes were the typical radiographic findings of pulmonary TB in immunocompetent hosts.[8, 9] In a cross-sectional hospital-based observational study conducted by Das S, et al[10], in which the cavitary lesion, infiltration, consolidation, non-homogenous opacity and military shadow were the X-ray pattern of TB patients with 41.66%, 25%, 18.3%, 13.3% and 1.6% in who were suffering from diabetes mellitus.

The risk of tuberculosis is two to five times greater in patients with diabetics as compared to non-diabetics. Many studies depict that pulmonary tuberculosis in a patient with type 2 DM have some different and specific presentations. The aim of the study was to determine the clinic - radiological spectrum of pulmonary tuberculosis in diabetics and non-diabetic patients

Materials and methods: A cross-sectional study was conducted in the department of General Medicine at R.L.JALAPPA hospital, Kolar. All the Pulmonary tuberculosis patient, with or without diabetes aged more than 18 years in the department of General Medicine at R.L.JALAPPA hospital, Kolar were considered as the study population.The sample size of

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

this study was 163 subjects with tuberculosis.The data collection for the study was done between January 2018 to June 2019 for a period of 1.6 years. Pulmonary tuberculosis patient, with or without diabetes aged more than 18 years were included in the study.Patients only with extrapulmonary tuberculosis, diabetic patients with HIV co-infection, patients on chemotherapeutic drugs and any immunosuppressive therapy and chronic kidney disease were excluded from the study.Study was approved by the institutional human ethics committee. Informed written consent was obtained from all the study participants, and only those participants willing to sign the informed consent were included in the study.

Methodology: A pre-structured case record form were used to collect the data. A detailed history and thorough clinical examination were done. Pulmonary tuberculosis were diagnosed by detailed history, clinical examination, sputum examination for acid-fast bacilli, chest radiography and CB- NAAT. Diabetes mellitus was diagnosed using the national diabetes data group and WHO diagnostic criteria:

1. Symptom of diabetes plus "random blood sugar > 11.1 mmol/L" (200 mg/dl) or
2. "Fasting plasma glucose > 7.0 mmol/L (126 mg/dl)" or
3. "Two-hour plasma glucose > 11.1 mmol/L (200 mg/dl) "during and oral glucose tolerance test.

Investigations such as Complete hemogram**,** Chest x-ray**,** HbA1C, Erythrocyte sedimentation rate, Fasting blood sugar, Postprandial blood sugar, Sputum AFB**,**Total leukocyte count, CB-NAAT

Statistical Methods:

Hemoglobin, Neutrophils, Total Count, Lymphocytes, Fasting Blood Sugar, Post Prandial Blood Sugar, Hba1c, Side of the lesion, lung fields and radiological appearance were considered as primary outcome variables. Age, gender, past history, presenting complaints, general physical examinations, vital sign examinations, respiratory system examinations were considered to study relevant variables. The association between categorical explanatory variables and the quantitative outcome was assessed by comparing the mean values. Independent sample t-test was used to assess the statistical significance of normally distributed variables, and the Mann Whitney U test was used to assess the statistical significance of non-normally distributed variables. Odds ratio, along with 95% CI, is presented. Chi square test was used to test statistical significance. P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.[11]

Results:

A total of 163 subjects were included in the final analysis with 79 participants were diabetic and 84 participants were non-diabetic. Demographic details among the two groups are represented in table1.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Table 1: Comparison of demographic parameters between study group (N=163)

Parameter	Study group		P value
	Diabetic (N=79)	Non Diabetic (N=84)	
Age	55.76 ± 12.6	44.27 ± 18.04	<0.001*
Gender (N (%))			
Female	25 (31.65%)	27 (32.14%)	0.946†
Male	54 (68.35%)	57 (67.86%)	
General physical examinations (N (%))			
Pallor	3 (3.8%)	1 (1.2%)	0.355‡
Icterus	0 (0%)	0 (0%)	§
Cyanosis	0 (0%)	0 (0%)	§
Clubbing	5 (6.3%)	1 (1.2%)	0.109‡
LN	0 (0%)	0 (0%)	§
Edema	2 (2.53%)	0 (0%)	§

*: Independent Samples t-test, †: Chi-Square test, ‡indicates fisher's exact test p value. §No statistical tests was applied due to 0-subjects in one of the cells.

The difference in mean age between study groups was statistically significant (P Value<0.05) while the difference of gender between the study group was not statistically significant (P Value>0.05). The difference in proportion of general physical examinations (pallor and clubbing) between study group was not statistically significant (P Value>0.05). (Table 1)

Table 2: Comparison of presenting complaints and past history between study group (N=163)

Parameters	Study Group		Chi square	P value
	Diabetic (N=79)	Non Diabetic (N=84)		
Presenting Complaints				
Cough	67 (84.81%)	72 (85.71%)	0.027	0.871
Fever	60 (75.95%)	69 (82.14%)	0.946	0.331
Dyspnea	25 (31.65%)	34 (40.48%)	1.375	0.241
Anorexia	27 (34.18%)	34 (40.48%)	0.690	0.406
Loss Of Weight	32 (40.51%)	38 (45.2%)	0.372	0.542
Hemoptysis	4 (5.06%)	7 (8.33%)	0.692	0.406
Chest Pain	5 (6.33%)	7 (8.3%)	0.240	0.624
Night Sweats	10 (12.66%)	12 (14.29%)	0.092	0.761
Past history				
Hypertension	6 (7.6%)	6 (7.1%)	0.012	0.912

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Ischemic heart disease	6 (7.6%)	1 (1.2%)	4.063	0.058
Smoking	17 (21.5%)	14 (16.7%)	0.622	0.430
Family History of PTB	0 (0%)	2 (2.4%)	*	*

**No statistical tests was applied due to 0-subjects in one of the cells.*

The difference in proportion of all the presenting complaints and the past history between study groups was not statistically significant (P Value>0.05). (Table 2)

Table 3: Comparison of clinical parameters between study group (N=163)

Parameter	Study group (Mean± SD)		P value
	Diabetic (N=79)	Non-Diabetic (N=84)	
Vital signs examinations			
Pulse (per min)	82.49 ± 11.76	81.07 ± 11.29	0.432*
Systolic Blood Pressure (mm/hg)	123.96 ± 20.49	121.43 ± 21.63	0.444*
Diastolic Blood Pressure (mm/hg)	78.61 ± 10.47	76.31 ± 11.49	0.185*
Respiratory Rate (cycles per min)	18.00 (16.00 to 18.00)	16.00 (16.00 to 18.00)	0.262†
Lab investigations			
Total Count	9.0 (7.68 to 11.6)	9.0 (7.25 to 10.0)	0.443†
Lymphocytes	34.5 (28.5 to 39.2)	36.0 (30.2 to 39.2)	0.583†
Fasting Blood Sugar (mg/dl)	230 (199 to 278)	106.0 (93.3 to 113.8)	<0.001 †
Post Prandial Blood Sugar (mg/dl)	312 (256 to 355)	139.0 (126.0 to 160.0)	<0.001 †
Hba1c	9.7 (8.3 to 12.4)	5.4 (5.2 to 5.8)	<0.001 †
Haemoglobin (g/dl)	13.69 ± 2.31	13.46 ± 2.12	0.505*
Neutrophils	72.21 ± 14.03	71.95 ± 12.49	0.901*

**: Independent Samples t-test, †: Mann Whitney U test*

The difference in investigations of Total Count and Lymphocytes, Haemoglobin and Neutrophils was not statistically significant between study group (P Value>0.05) while it was statistically significant for the investigations of Fasting Blood Sugar, Post Prandial Blood Sugar and Hba1c level (P Value<0.05). (Table 3)

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Table 4: Comparison of Respiratory system examinations between study group (N=163)

Respiratory system examinations	Study Group		Chi square	P value
	Diabetic (N=79)	Non Diabetic (N=84)		
Fibrosis	20 (25.3%)	38 (43.2%)	7.049	0.008
Cavitatory	43 (54.4%)	23 (27.4%)	12.362	<0.001
Consolidation	31 (39.24%)	25 (29.8%)	0.887	0.346
Pl. Effusion	2 (2.5%)	2 (2.4%)	0.004	0.950
Others	9 (11.39%)	8 (9.5%)	0.765	0.382

The difference in proportion of Fibrosis and Cavitatory between the study group was statistically significant (P Value<0.05) while for Consolidation, Pl. Effusion and others, the difference in proportion was not statistically significant between study group (P Value>0.05). (Table 4)

Table 5: Comparison of chest x-ray between study group (N=163)

Chest x-ray	Study Group		Chi square	P value
	Diabetic (N=79)	Non Diabetic (N=84)		
Side Of Lesion				
B/L	34 (43.0%)	25 (29.8%)	*	*
L	22 (28.8%)	22 (26.2%)		
Normal	2 (2.5%)	15 (17.9%)		
R	21 (26.6%)	21 (25.0%)		
Upper	0 (0%)	1 (1.2%)		
Lung Fields				
lower	16 (20.3%)	11 (13.1%)	*	*
Middle	1 (1.3%)	3 (3.6%)		
Multilobar	35 (44.3%)	12 (14.3%)		
Normal	2 (2.5%)	15 (17.9%)		
P.ef	0 (0%)	1 (1.2%)		
Upper	25 (31.6%)	42 (50%)		
Radiological appearance				
Cavitatory	15 (18.99%)	9 (10.71%)	17.168	*0.004*
Consolidation	31 (39.24%)	25 (29.76%)		
Fibrocavitatory	11 (13.92%)	8 (9.52%)		
Fibrosis	9 (11.39%)	21 (25%)		
Normal	2 (2.53%)	14 (16.67%)		

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Others	11 (13.92%)	7 (8.33%)		

**No statistical test was applied due to 0-subjects in one of the cells.*

Out of 79 participants in diabetic group, the side of lesion was B/L for 34 (43.0%) participants, L for 22 (28.8%) participants, Normal for 2 (2.5%) participants, R for 21 (26.6%) participants and upper for no participant. Out of 84 participants in non-diabetic group, the side of lesion was B/L for 25 (29.8%) participants, L for 22 (26.2%) participants, Normal for 15 (17.9%) participants, R for 21 (25.0%) participants and upper for 1 (1.2%) participant. Out of 79 participants in diabetic group, the lung field was lower for 16 (20.3%) participants, Middle for 1 (1.3%) participant, Multilobar for 35 (44.3%) participants, Normal for 2 (2.5%) participants and upper for 25 (31.6%) participant. Out of 84 participants in non-diabetic group, the lung field was lower for 11 (13.1%) participants, Middle for 3 (3.6%) participant, Multilobar for 12 (14.3%) participants, Normal for 15 (17.9%) participants, P.ef for 1 (1.2%) participant and upper for 42 (50%) participants. The difference in proportion of radiological appearance between study group was statistically significant (P Value<0.05). (Table 5)

Discussion:

This study aimed to study the clinical spectrum of pulmonary tuberculosis in Diabetic and non-Diabetic patients, to study the radiographic spectrum of pulmonary tuberculosis in Diabetic and non-Diabetic patients, to study the difference in presentation among Diabetic and non-Diabetic patients.

A total of 163 subjects were included in the final analysis, with 79 participants were diabetic, and 84 participants were non-diabetic. The mean age of diabetics was found to be higher than non-diabetics in the study participants. This finding is similar to that found in three similar studies, one by Alavi Syed Mohammed., et al[6], other by Baghaei, P., et al[12], and third by Ezung, T et al[13], and can be attributed to two reasons. First is the incidence of diabetes increases with age, and second is the risk of developing TB infection or reactivation of latent infection also increases with age.

In the present study, the symptoms of cough, fever, dyspnea, anorexia, loss of weight, hemoptysis, chest pain and night seats are found to be more in non-diabetic patients than in diabetic patients which is contrary to the findings in similar studies where these symptoms and precisely dyspnea and hemoptysis where found to be more in diabetic patients than in non-diabetic patients. Studies by Baghaei, et al[12], and Stevenson, C, R., et al[2], demonstrated incidence of above mentioned symptoms more in diabetic patients than in non-diabetic patients.

Atypical radiographic pattern and distribution are observed for pulmonary tuberculosis in Patients of DM. Involvement of lower lobe of the lung was greater in “diabetic patients” with tuberculosis, whereas it is mainly upper lobe infiltration in non-diabetic patients. The cavitary radiological appearance was found to be more in diabetic patients when compared with non-diabetics. This is in confirmation with the finding that the risk of cavitation is increased in diabetic patients, particularly when there is poor glycemic control. Poor glycemic control reduces expression of The-related cytokines. This similar finding was found in a study by

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Baghaei, et al[12], reported that diabetic patients had a higher prevalence of typical presentations along with cavitary lesions and in another study by Qazi, M, A., et al.[14] it was reported that Radiological signs of PTB are more pronounced in diabetics, 30 In patients with PTB alone, cavitation is less common with increasing age, while in diabetics of all ages, frequency of cavitation/LLF is high.

Diabetic patients usually have more severe features of tuberculosis like increased lung cavitation, increased involvement of lower lung fields and longer periods of smear positivity.[15] In the present study, lower lung involvement was more in diabetic patients, and upper lung infiltration was more in non-diabetic patients which is similar to that reported in several studies. In a study by Mohammed A shaikh., et al[16], the PTB DM group of patients had increased frequency of lung lesions confined to lower lung field compared to PTB group. The PTB DM group of patients had a significantly higher frequency of cavitary lung lesions compared to PTB group. Also, cavitary lesions were more frequently confined to lower lung field in PTB DM group compared to PTB group. In another study by Siddiqui, [17] lower lobe involvement was found in 72% of diabetic patients against 53% of non-diabetic patients with tuberculosis and cavities were found in 68% of diabetic patients against 54% of non-diabetic patients. In another study by Anasuya, M et al[18], cavitation was observed more in diabetic patients with tuberculosis and in another study by Ikezoe, J et al[19], it was observed that there was a high prevalence of nonsegmental distribution and multiple small cavities within any given lesion in lungs of diabetic patients with tuberculosis. Multilobar cavities were significantly more reported in diabetics in a study by Roghieh, G., et al.[20]

Our study limitations were that we used only a small number of diabetic patients for the study, and all the patients are from a single hospital, and hence the results obtained cannot be generalized. Further we recommend increased education for diabetes patients about tuberculosis symptoms for better diagnosis and timely treatment.

Conclusions: This study found clinical presentation symptoms almost similar between diabetic patients with tuberculosis and non-diabetic patients with tuberculosis. The radiographic spectrum of tuberculosis was found to be different in diabetic patients. Diabetic patients were found to have more cavitation and involvement of lower lobe of lung as against upper lobe in non-diabetic patients. Hence the study concludes that radiographic assessment is best for diagnosis of tuberculosis in diabetic patients.

Reference:

1. Pande T, Huddart S, Xavier W, Kulavalli S, Chen T, Pai M, et al. Prevalence of diabetes mellitus amongst hospitalized tuberculosis patients at an Indian tertiary care center: A descriptive analysis. PloS one. 2018;13(7):e0200838.

2. 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.

3. Arango L, Brewin AW, Murray JF. The spectrum of tuberculosis as currently seen in a metropolitan hospital. Am Rev Respir Dis. 1973;108(4):805-12.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

4. Kiblawi SS, Jay SJ, Stonehill RB, Norton J. Fever response of patients on therapy for pulmonary tuberculosis. Am Rev Respir Dis. 1981;123(1):20-4.
5. Wani RLS. Clinical manifestations of pulmonary and extra-pulmonary tuberculosis. South Sudan Med J. 2013;6(3):52-6.
6. Alavi SM, Khoshkho MM, Salmanzadeh S, Eghtesad M. Comparison of epidemiological, clinical, laboratory and radiological features of hospitalized diabetic and non-diabetic patients with pulmonary tuberculosis at razi hospital in ahvaz. Jundishapur J Microbiol. 2014;7(9):e12447.
7. WHO. Early detection of tuberculosis: an overview of approaches, guidelines and tools [Internet]. World Health Organization; 2011 [cited 2020 Oct 30]. Available from: https://apps.who.int/iris/handle/10665/70824.
8. Leung AN. Pulmonary tuberculosis: the essentials. Radiology. 1999;210(2):307-22.
9. Krysl J, Korzeniewska-Kosela M, Müller N, FitzGerald J. Radiologic features of pulmonary tuberculosis: an assessment of 188 cases. Can Assoc Radiol J. 1994;45(2):101.
10. Das S, Sen S, Debnath A, Das P, Basuthakur S, Saha PK, et al. A Cross Sectional Study on X-Ray Pattern of Patients of Pulmonary Tuberculosis with Diabetes Mellitus in a Tertiary Care Hospital in Tripura. J Med Sci Clin Res. 2018;6(2):1-7.
11. IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
12. Baghaei P TP, Abrishami Z, Mirsaeidi M, Faghani YA, Mansouri SD Comparison of pulmonary TB patients with and without diabetes mellitus type II. Tanaffos. 2010;9(2):13-20.
13. Ezung T DN, Singh T, Singh TN. Pulmonary tuberculosis and diabetes mellitus--a study. J Indian Med Assoc.100(6):378-9.
14. QAZI MA SHARIF N WM, IMRAN A, HAQUE I AU, GARDEZI MA, CHAUDHARY GM. Radiological Pattern of Pulmonary Tuberculosis in Diabetes Mellitus ANNALS. 2009;15:71-4.
15. Shital P, Anil J, Sanjay M, Mukund P. Tuberculosis with diabetes mellitus: clinical-radiological overlap and delayed sputum conversion needs cautious evaluation-prospective cohort study in Tertiary Care Hospital, India. J Pulm Respir Med. 2014;4(2):1-5.
16. Singla R, Khan N, Al-Sharif N, Ai-Sayegh MO, Shaikh MA, Osman MM. Influence of diabetes on manifestations and treatment outcome of pulmonary TB patients. Int J Tuberc Lung Dis. 2006;10(1):74-9.
17. Siddiqui AM. Do Diabetics Have Different Radiological Presentations from Non-Diabetics in Pulmonary Tuberculosis? Middle East J Fam Med. 2010;99(289):1-3.
18. Anusuya M. Study the Prevalence of Tuberculosis among Diabetic Patients [Internet]. Chengalpattu: Chengalpattu Medical College; 2017 [cited 2020 Sepp 5]. Available from: http://repository-tnmgrmu.ac.in/4375/.
19. Ikezoe J TN, Johkoh T, Kohno N, Tomiyama N, Kozuka T. CT appearance of pulmonary tuberculosis in diabetic and immunocompromised patients: Comparison with patients who had no underlying disease. Am J Roentgenol. 1992;159(6):1175–9.
20. Roghieh G, Elham G, Rahim RS, Hamid G, Aida M. Diabetes mellitus and pulmonary tuberculosis, association or co-incidence? Pak J Med Sci. 2011;27(4):819-22.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022