

Study of clinico-radiological profile of pulmonary tuberculosis in diabetic and non-diabetic patients at tertiary care hospital

Saxena S¹, Bhardwaj G²

Dr Sharad Saxena¹, Assistant Professor, Department of General Medicine, Government Medical College, Kota, Rajasthan, India

Dr Gaurav Bhardwaj², Assistant Professor, Department of Chest and Tuberculosis, RUHS-CMS, Jaipur, Rajasthan, India

Corresponding Author:

Dr. Gaurav Bhardwaj (drbhardwaj@gmail.com)

Address-K3 Keshav Path Ahinsa Circle C Scheme Ashok Marg Jaipur 302001(RAJ)

Abstract

Background: Occurrence and risk of tuberculosis is more among diabetes mellitus patients in relation to non-diabetic patients due to weakened immune system. As a result, affected patients have difficulty in responding to any kind of treatment when compared to healthy individuals.

Objective: To study the clinical and radiological profile of pulmonary tuberculosis among diabetic and non-diabetic patients.

Methods: The prospective study was conducted at the department of General Medicine, in Mahatma Gandhi Medical College and Hospital Jaipur a tertiary health care centre in Rajasthan. In the study patients were grouped into one having PTB with DM and other group PTB without DM. Informed written consent was obtained from all patients and their clinical, radiological features were recorded.

Results: A total of 60 patients (20 to >60 years) were enrolled in the study with equal numbers being grouped in the 2 categories. In our study majority of diabetic patients are males with more occurrence in >30 yrs age group having more sputum positivity with consolidation as major findings

Conclusions: Diabetes is a well-known risk factor for pulmonary tuberculosis. All patients of pulmonary tuberculosis should be screened for Diabetes especially above 30 years age group and early and prompt treatment should be started.

Keywords: Pulmonary tuberculosis, diabetes mellitus, consolidation

Introduction

Diabetes mellitus is one of the oldest known metabolic diseases which affect the young and elderly. It is one of the leading causes of ESRD, non-traumatic lower extremity amputation and adult blindness ^[1]. In 1997, the American Diabetes Association (ADA) defined diabetes as “a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both” ^[2].

Since time tuberculosis has inflicted upon mankind the misery and suffering in all aspects of life, social, economic and health. It is an infectious disease caused by mycobacterium tuberculosis. Classical presentation of pulmonary tuberculosis is with cough, mucoid expectoration, low grade fever, hemoptysis, dyspnea and weight loss. Patient with pulmonary tuberculosis who have cavitory lesions are important source of infections. Patients are usually smear positive. Confirmation is done by sputum smear examination and chest x-ray.

The coexistence of both diseases is not simply a coincidence. Diabetic persons are more susceptible to develop tuberculosis as non-diabetics which could be due to defective

neutrophil, low production of cytokines production, IL-1 β and TNF α in patients with poor glycemic control [3]. Diabetes mellitus is associated with reduced macrophage functions, such as chemotaxis, phagocytosis and bactericidal actions and also impairs the function and proliferation of T-helper 1 cells and their production of cytokines [4].

Poor glycemic control helps in proliferation of tuberculosis and tuberculosis itself leads to poor glucose control. Thus both deteriorate each other.

Materials and Methods

The present study was undertaken in Department of General Medicine, MGUMST, Jaipur [RAJ] from July 2015 to July 2016.

The study was carried out after taking permission from the Institutional Ethics Committee of the college. A prospective study including 60 patients of pulmonary tuberculosis was diagnosed by detailed history, clinical examination, sputum examination for acid fast bacilli, chest radiography. Diabetes mellitus was diagnosed as per ADA criteria. Patients were grouped as pulmonary tuberculosis with Diabetes Mellitus and pulmonary tuberculosis without Diabetes Mellitus. Adult patients who fulfilled the criteria were included in the study. After taking consent, patients were examined in detail and subjected to relevant laboratory and radiological investigations. A proforma was filled by interviewing the patients and clinical examination was done.

Inclusion Criteria

- Age >18 yrs.
- Diabetic on insulin or OHA or both.
- Clinical features and or radiology consistent with pulmonary tuberculosis and or positive sputum for AFB.

Exclusion criteria

- Cases (defaulter, relapse, failure).
- Pulmonary tuberculosis patients with age <18 years.
- Patients with HIV.
- Patients on steroids or any other form of immunosuppressive therapy.
- Patients not willing for regular follow up.
- All extrapulmonary tuberculosis patients.
- History of known close contacts of drug-resistant pulmonary tuberculosis and already diagnosed drug-resistant pulmonary tuberculosis patients.

Statistical method

- For different qualitative parameters mean and standard deviation calculated.
- To compare the means between two groups, student unpaired 't' test is used.

Level of significance is taken as $p < 0.05$.

- Chi square test is used to find the association between two qualitative variables.

Statistical analysis

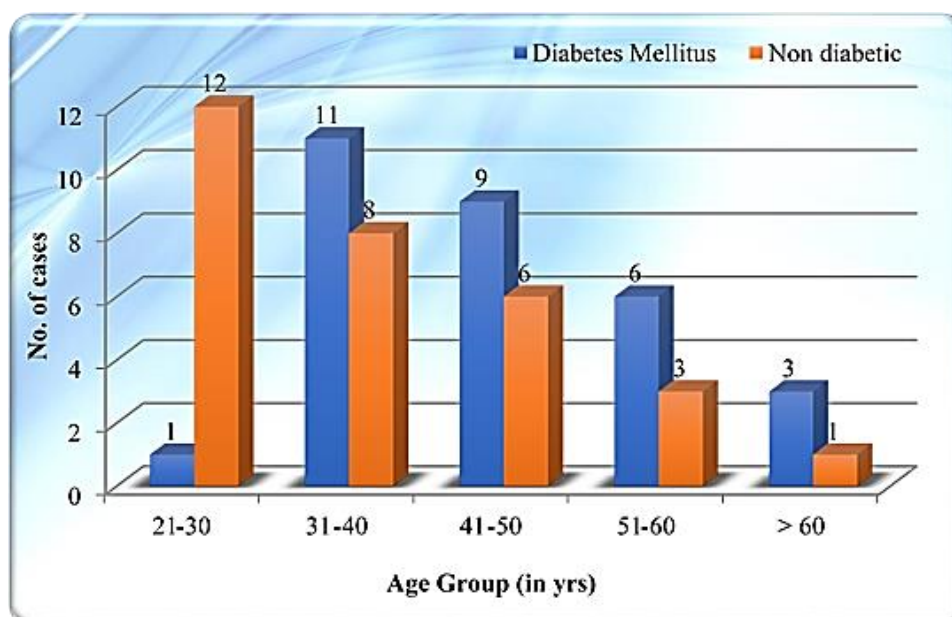
The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Descriptive statistics included computation of means and standard deviations. Level of significance was set at $p \leq 0.05$.

Observations and Results

Table 1: Distribution of cases according to age of patients

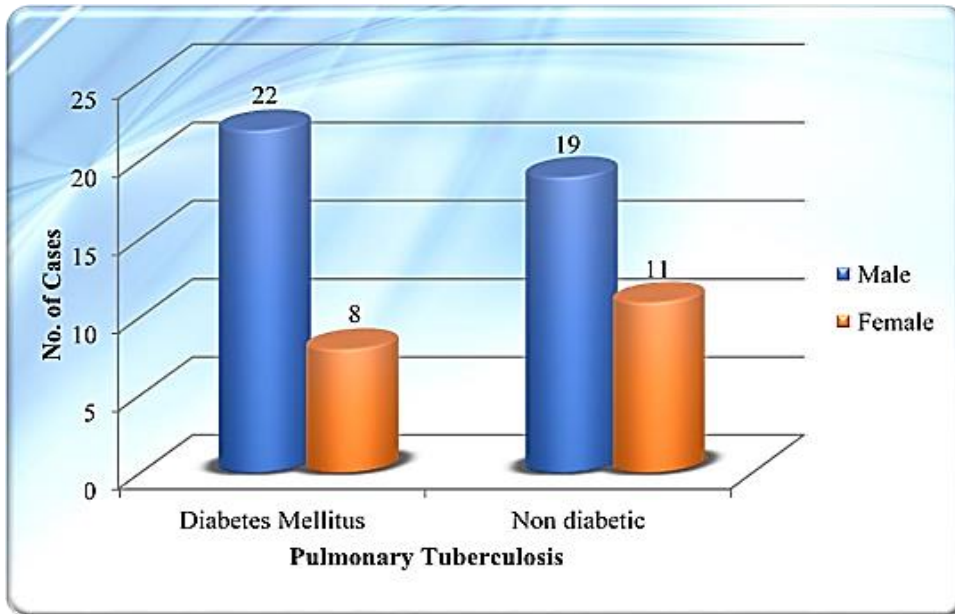
S. No.	Age Group (inyrs)	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		No	%	No.	%	
1.	21-30	1	3.33	12	40	13
2.	31-40	11	36.67	8	26.67	19
3.	41-50	9	30	6	20	15
4.	51-60	6	20	3	10	9
5.	> 60	3	10	1	3.33	4
	Total	30		30		60

The chi-square statistic is 12.3814. The p-value is .01473. The result is significant at $p < .05$.

**Graph 1:** Distribution of cases according to age of patients

Distribution of cases according to sex of patients

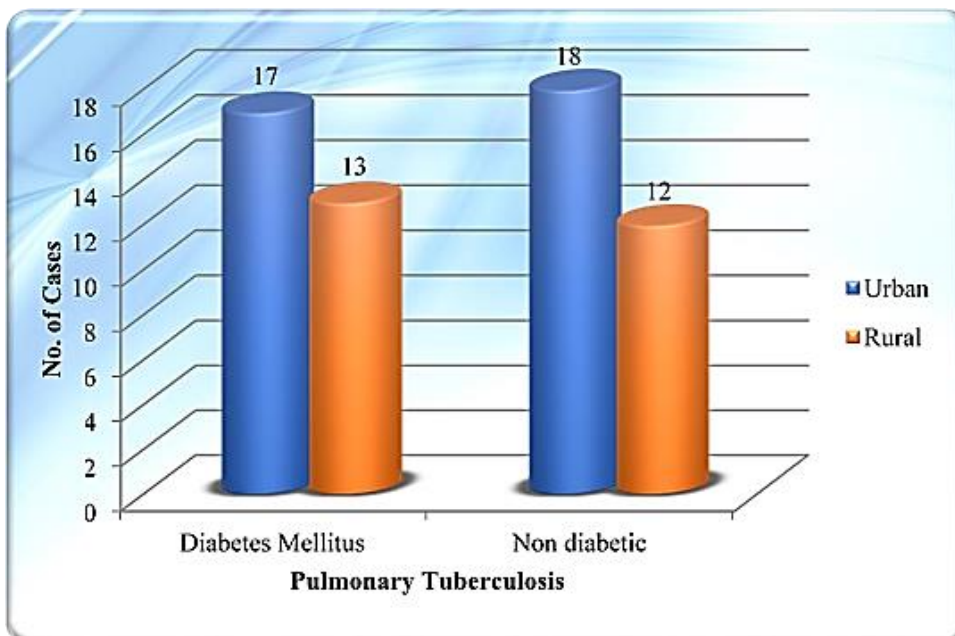
S. No.	Sex	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		Total	%	No.	%	
1.	Male	22	73.33	19	63.33	41
2.	Female	8	26.67	11	36.67	19
	Total	30		30		60



Graph 2: Distribution of cases according to Sex of patients

Distribution of cases according to residence

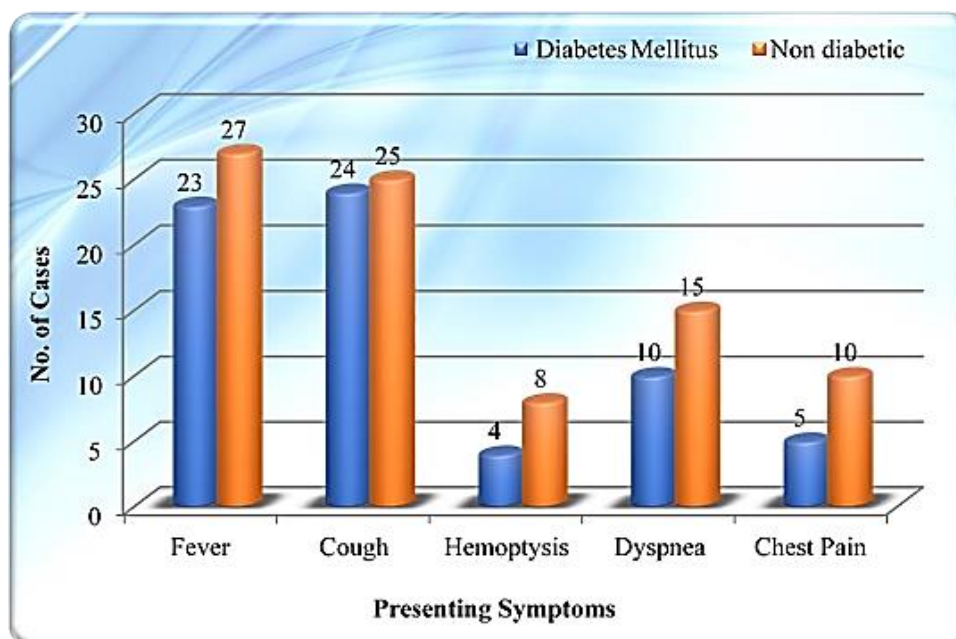
S. No.	Residence	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		Total	%	No.	%	
1.	Urban	17	56.7	18	60.0	35
2.	Rural	13	43.3	12	40.0	25
	Total	30		30		60



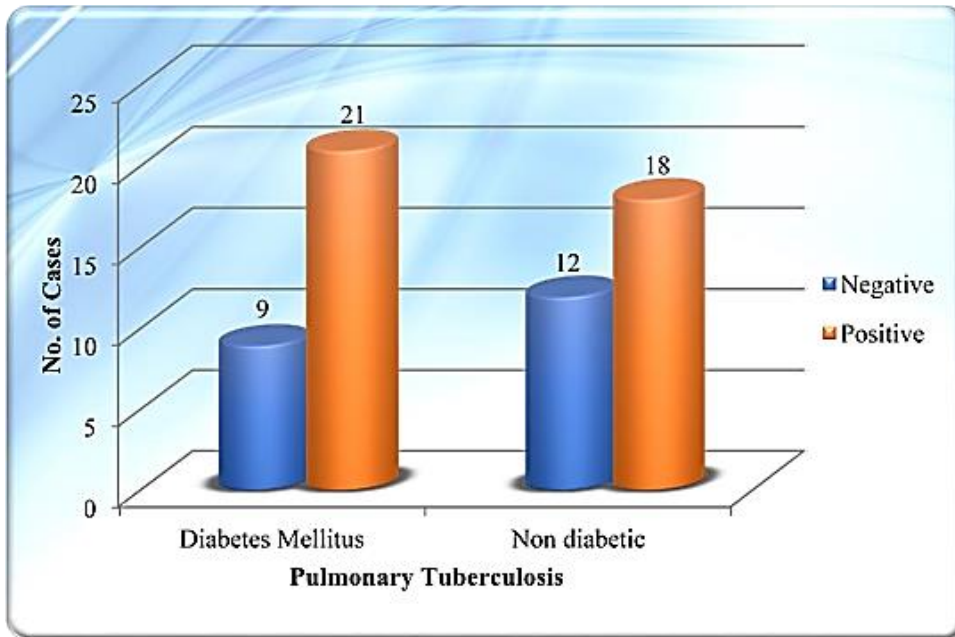
Graph 3: Distribution of cases according to residence

Distribution of cases according to presenting symptoms

S. No.	Presenting Symptoms	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		Total	%	No.	%	
1.	Fever	23	76.66	27	90.00	50
2.	Cough	24	80.00	25	83.33	49
3.	Hemoptysis	4	13.33	8	26.66	12
4.	Dyspnea	10	33.33	15	50	25
5.	Chest Pain	5	16.66	10	33.33	15

**Graph 4:** Distribution of cases according to presenting symptoms**Distribution of cases according to sputum positivity**

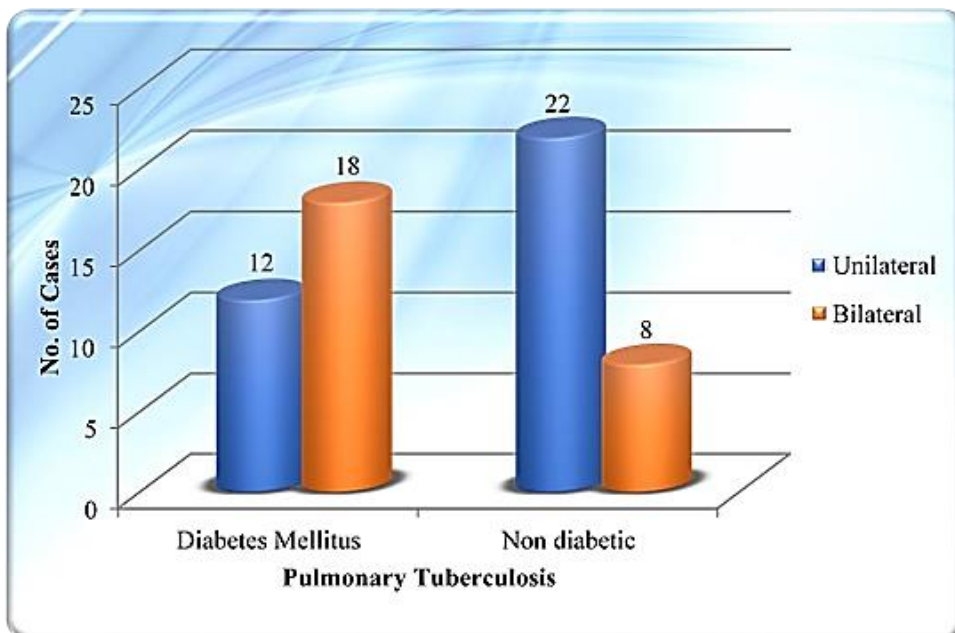
S. No.	Sputum	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		No.	%	No.	%	
1.	Negative	9	30	12	40	21
2.	Positive	21	70	18	60	39
	Total	30		30		60



Graph 5: Distribution of cases according to sputum positivity

Distribution of cases according to radiological site

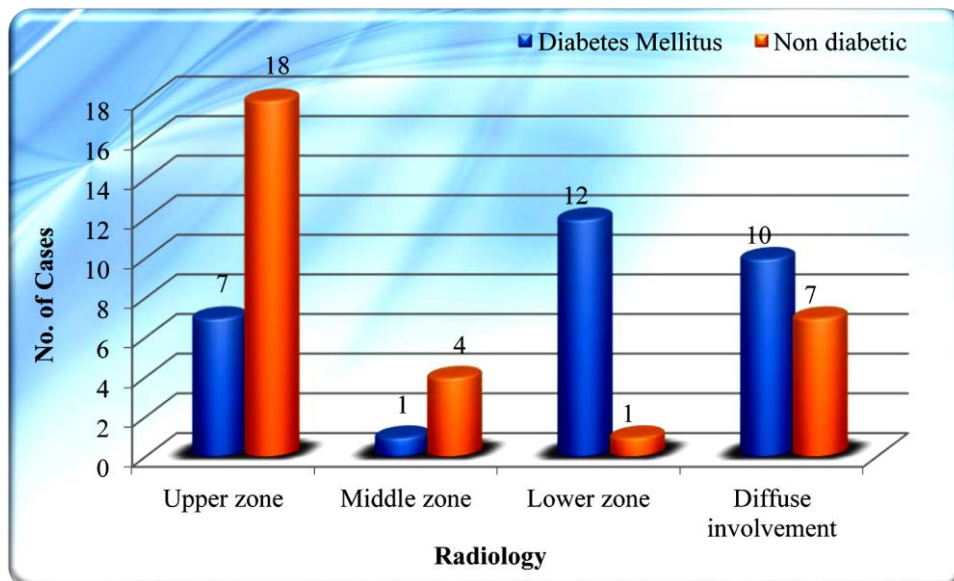
S. No.	Radiology	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		No.	%	No.	%	
1.	Unilateral	12	40.0	22	73.3	34
2.	Bilateral	18	60.0	8	26.7	26
	Total	30		30		60



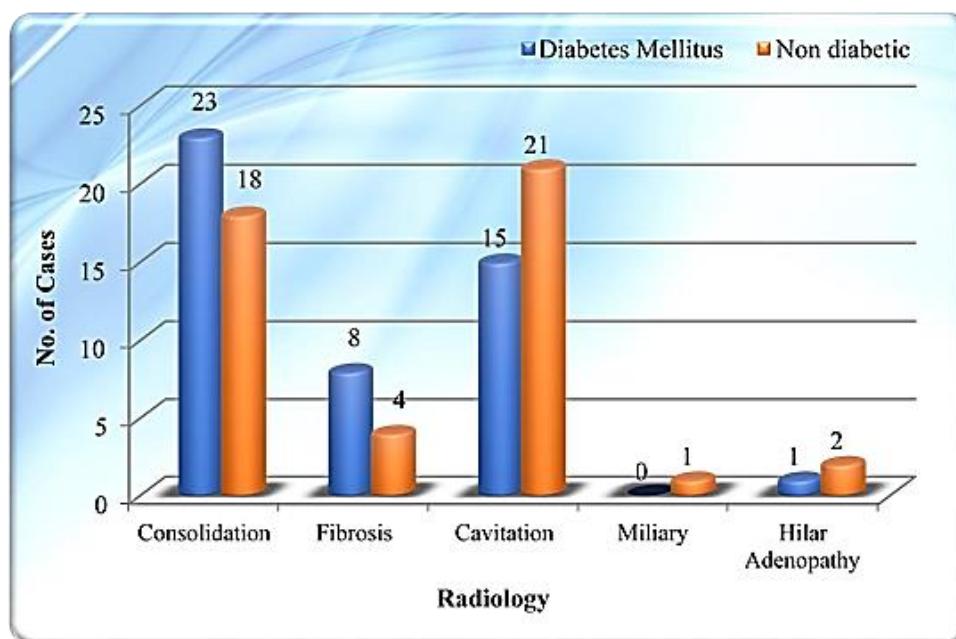
Graph 6: Distribution of cases according to Radiological Site

Distribution of cases according to Radiological zones

S. No.	Radiology	Pulmonary Tuberculosis				Total
		Diabetes Mellitus		Non diabetic		
		No.	%	No.	%	
1.	Upper zone	7	23.3	18	60	25
2.	Middle zone	1	3.33	4	13.33	5
3.	Lower zone	12	40	1	3.33	13
4.	Diffuse involvement	10	33.33	7	23.33	17

**Graph 7:** Distribution of cases according to Radiological zones**Distribution of cases according to Radiological lesion**

S. No.	Radiology	Pulmonary Tuberculosis			
		Diabetes Mellitus		Non diabetic	
		No.	%	No.	%
1.	Consolidation	23	48.93	18	39.13
2.	Fibrosis	8	17.02	4	8.69
3.	Cavitation	15	31.91	21	45.65
4.	Miliary	-	-	1	2.17
5.	Hilar Adenopathy	1	2.12	2	4.34



Graph 8: Distribution of cases according to Radiological lesion

In the present study, out of 60 patients, cases belonging to 21-30 years age group were 21.66%, 31-40 years age group were 31.66%, between 41-50 years were 25%, 51-60 years were 15% and more than 60 years were 6.66%.

Among diabetic group 11(36.67%) patients belonged to age group 31-40 yrs followed by 9(30%) in 41-50 yrs, 6(20%) in 51-60 yrs, 3(10%) in >60 yr age group.

In non-diabetic group majority of patients were in 12(40%) 21-30 yrs age followed by 8(26.67%) in 31-40 yrs, 6(20%) in 41-50yrs, 3(10%) in 51-60 yrs group.

In the present study, out of 60 cases there were 41 males and 19 females. In males with TB out of 41 patients, 22 were diabetic. In females with TB out of 19 patients, 8 were diabetic. Thus prevalence of diabetes in males with TB (73.33%) was more as compared to females with TB (26.67%).

In the present study 58.33% patients are from urban and 41.66% are from rural area. Fever was the most common presenting symptom (83.33%) in both the groups. It was seen in 23 (76.66%) in the diabetic group and 27 (90.00%) in the non-diabetic group.

Cough was second most common presenting symptom (81.66%) in both the groups. It was seen in 24 (80.00%) in diabetic group and 25 (83.33%) in non-diabetic group.

Haemoptysis was seen in 20% in both the groups i.e. 13.33% in diabetic group whereas it was 26.66% in non-diabetic group.

Dyspnea was seen in 33.33% in diabetic group and 50% in non-diabetic group.

Out of 30 patients in diabetic group 21 (70%) are sputum positive and 9 (30%) are sputum negative. Whereas out of 30 patients in non-diabetic group 18 (60%) are sputum positive and 12 (40%) are sputum negative.

Bilateral involvement of disease in chest Xray (60%) was more common in diabetic group, whereas unilateral (73.3%) was more in diabetic group.

Among the diabetic patient lower zone involvement (40%) were more common followed by diffuse (33.33%) and upper zone (23.3%);whereas in non-diabetic more than half (60%) were having upper zone involvement followed by diffuse(23.33%) and middle zone (13.33%) disease.

Among diabetic patients consolidation was most common radiological finding (48.93%) followed by cavitation (31.91%) and fibrosis (17.02%); whereas among non-diabetic cavitation was most common finding (45.54%) followed by consolidation (39.13%) and fibrosis (8.69%).

Discussion

In the present study, out of 60 patients, cases belonging to 21-30 years age group were 21.66%, 31-40 years age group were 31.66%, between 41-50 years were 25%, 51-60 years were 15% and more than 60 years were 6.66%.

In the diabetic group 1 (3.33%) cases were in age group of 21-30 years, 11 (36.67%) between 31-40 years, 9(30%) in 41-50 years, 6(20%) in 51-60 years of age and 3(10%) above 60 years of age. In the non-diabetic group 12 (40%) cases were in 21-30 years age group, 8 (26.66%) were in 31-40 years age group, 6 (20%) were in 41-50 years age, 3(10%) were in 51-60 years of age group and 1 (3.33%) were in age group above 60 years. Thus the number of cases of pulmonary tuberculosis decreased with increasing age and the prevalence of diabetes with pulmonary TB increased with age.

Similar results were found in the study done by Jawad F *et al.* [5], Roychoudhary and Sen [6], R. Singla *et al.* [7], Fengling MI *et al.* [8].

In the present study, out of 60 cases there were 41 males and 19 females. In males with TB out of 41 patients, 22 were diabetic. In females with TB out of 19 patients, 8 were diabetic.

Thus prevalence of diabetes in males with TB (73.33%) was more as compared to females with TB (26.67%). Similar findings were obtained in study by Jawad F *et al.* [5], R. Singla *et al.* [7], Fengling MI *et al.* [8], Lin S *et al.* [9].

In the present study 58.33% patients are from urban and 41.66% are from rural area. In the study done by M K Jain *et al.* impaired glucose tolerance among T.B. patients in Relation to residence was prevalent more in urban patients i.e. 32.44% whereas in rural it was 8.70% [10]. Deshmukh *et al.* found a prevalence of pulmonary TB in diabetes to be 42% in rural areas [11]. Similarly Nigam P *et al.* found prevalence to be 57.6% in rural areas [12].

Fever was the most common presenting symptom (83.33%) in both the groups. It was seen in 23 (76.66%) in the diabetic group and 27 (90.00%) in the non-diabetic group.

In the study done by R. Singla *et al.* fever was seen in 80.7% in diabetic group whereas in non-diabetic group 79% was seen [7]. Similar observation were seen with that of Siddiqui AN *et al.* [13], Hanchate L *et al.* [14].

Cough was the second most common presenting symptom (81.66%) in both the groups. It was seen in 24 (80.00%) in diabetic group and 25 (83.33%) in non-diabetic group. Similar result were seen in study done by R. Singla *et al.* [7], Siddiqui AN *et al.* [13]

Hemoptysis was seen in 20% in both the groups i.e. 13.33% in diabetic group whereas it was 26.66% in non-diabetic group.

In the study done by R. Singla *et al.* hemoptysis was seen in 13.4% in diabetic group whereas in non-diabetic group 12.1% was seen [7].

In the study done by Siddiqui AN *et al.* [13] and Alisjahbana B *et al.* [15] hemoptysis was seen more in in diabetic group.

In the present study dyspnea was seen in 33.33% in diabetic group and 50% in non-diabetic group.

In the study done by Siddiqui AN *et al.* [13], Alisjahbana B *et al.* [15] dyspnea was more in diabetic group. Similar study done by Hanchate L *et al.* dyspnea was equally present in both the groups [14].

Chest pain was seen in 16.66% in diabetic group and 33.33% in non diabeticgroup. In the study done by Siddiqui AN *et al.* [13], Hanchate L *et al.* [14] chest pain was seen more in diabetic group [13].

In our present study out of 30 patients in diabetic group 21 (70%) are sputum positive and 9 (30%) are sputum negative. Whereas out of 30 patients in non-diabetic group 18 (60%) are sputum positive and 12 (40%) are sputum negative.

The observations of the study are consistent with those of by Shital P *et al.* [16], R. Singla *et al.* [7], Fengling MI *et al.* [8].

Bilateral involvement of disease in chest Xray (60%) was more common in diabetic group, whereas unilateral (73.3%) was more in non-diabetic group.

In the study done by Fengling Mi *et al.* unilateral involvement more was seen in (48.91%) in diabetic group whereas bilateral involvement more (65%) in non-diabetic group ^[8]. In the study done by Mugushi *et al.*, found bilateral lung involvement in 47.2% of cases in diabetics ^[17].

The observations of the present study are consistent with those of Hanchate L *et al.* ^[14] and Lakra D *et al.* ^[18].

Among the diabetic patient lower zone involvement (40%) were more common followed by diffuse (33.33%) and upper zone (23.3%); whereas in non-diabetic more than half (60%) were having upper zone involvement followed by diffuse (23.33%) and middle zone (13.33%) disease, in the study done by Vellalacheruvu BN *et al.* lower zone involvement was seen in 62.5% in diabetic group whereas in non-diabetic group 34.4% have lower zone involvement ^[19].

Similar study done by Hanchate L *et al.* involvement of upper zone 33.33%, middle zone 56.66% and lower zone 20% was seen in diabetic group whereas in non-diabetic group involvement of upper zone 60%, middle zone 30% and lower zone 10% ^[14].

In the study done by Lakra D *et al.* the lower zone involvement was seen in (72.7%) patients in cases of diabetic group ^[18].

In the present study consolidation was seen in 48.93% in diabetic group and 39.13% in non-diabetic group. Similar study done by Hanchate L *et al.* consolidation was seen in 20% in diabetic group and 23.33% in non-diabetic group ^[14]. The observations of the present study are consistent with those of by Nigam P *et al.* ^[12], Vellalacheruvu BN *et al.* ^[19].

Fibrosis was seen in 17.02% in diabetic group and 8.69% in non-diabetic group. The observations of the present study are consistent with those of by Nigam P *et al.* ^[12].

Cavitation was seen in 31.91% in diabetic group and 45.65% in non-diabetic group. In the study done by Nigam P *et al.* cavitation was seen in 10% in diabetic group and 8% in non-diabetic group ^[12]. Similar study done by Hanchate L *et al.* cavitation was seen in 56.66% in diabetic group and 36.33% in non-diabetic group ^[14]. In our study cavitation is observed more in non-diabetic group whereas in other study cavitation is more observed in diabetic group.

In the present study miliary pattern was seen 2.17% in non-diabetic group. In the study done by Nigam P *et al.* miliary was seen in 2% in diabetic group and 4% in non-diabetic group ^[12].

In the study done by Vellalacheruvu BN *et al.* miliary was seen in 3.1% in diabetic as well as in non-diabetic group ^[19].

Conclusion

In our study majority of diabetic patients are males with more occurrence in >30 years age group having more sputum positivity, more bilateral disease, lower zone involvement of lungs with consolidation as major findings.

People with age more than 30 years were at high risk for dual disease (DM-TB) Symptoms were almost the same in both groups except that hemoptysis, chest pain, dyspnea was observed more in non-diabetes with TB. Tuberculosis patients should be screened for fasting blood sugar estimation that will help in the early detection of diabetes.

Optimal treatment should be provided to patients with both diseases.

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