Features of Pulmonary Tuberculosis in Patients With Diabetes Mellitus: A Comparative Study

Gülfem Yurteri, MD; Sema Saraç, MD; Orhan Dalkılıç, MD; Hacer Ofluoğlu, MD; Ö. Ferit Demiröz, MD

Heybeliada Chest Hospital, İstanbul, Turkey

Abstract

This retrospective study was designed to compare the demographic features, radiological findings and the response to anti-tuberculous therapy of diabetic pulmonary tuberculosis patients with nondiabetic tuberculosis patients. Records of 85 diabetic and 84 nondiabetic patients diagnosed as pulmonary tuberculosis at Heybeliada Chest Hospital between 1995-2000 were reviewed.

Male/female ratio of the 85 diabetic patients with tuberculosis were 45/40. Male patients showed a peak in the 50 to 60 age group and the females in the over 60s. The nondiabetic group included 32 males and 52 females with a homogenous distribution between 20-50 years of age in males and a peak in the 20-30 age group in the females. Tuberculosis was diagnosed within the first 5 years of the diagnosis of diabetes in 33 (38%) of the patients. Lower lung field involvement was present only in 3 (3.5%) diabetic patients. Fifty seven (67%) diabetic and 58 (69%) nondiabetic patients had cavitary disease. Thirty one of the 66 (47%) smear (+) diabetic patients became negative by the end of the initial therapy, while 62 of the 82 (76%) nondiabetics were bacteriologically cured at this time. The number of patients who showed regression in their lesions on follow-up chest X-rays were similarly high in both groups.

The results indicate that tuberculous disease tends to occur at a more advanced age in diabetics, that there is a tendency to develop tuberculosis in the first years of the diagnosis of diabetes mellitus, that the diabetic state does not alter the radiological features of tuberculosis significantly and while radiological improvement is similar in both groups, the bacteriological cure rate is significantly higher in the nondiabetics.

Turkish Respiratory Journal, 2004;5:(1):5-8

Keywords: *pulmonary tuberculosis, diabetes mellitus*

Introduction

Diabetes mellitus (DM) is known to be an important predisposing factor in the development of pulmonary tuberculosis. The frequency of tuberculosis in diabetics is reported to be four times higher than in nondiabetics. The clinical course of tuberculosis is also more stormy in diabetics, especially in poorly controlled cases.

This study was designed to compare the demographic features, radiological findings and response to antituberculosis therapy of diabetic patients with tuberculosis (TBDM) with nondiabetic patients.

Materials and Methods

The records of 85 (45 male, 40 female) pulmonary tuberculosis patients with diabetes mellitus and those of 84 nondiabetic patients with tuberculosis, who were all diagnosed at our center between 1995 and 2000 were reviewed.

All patients were newly diagnosed pulmonary tuberculosis cases. Demographic information including age and sex, information on

Corresponding Author: *Dr. Gülfem Yurteri*
Heybeliada Göğüs Hastalıkları Hastanesi,
İstanbul, Türkiye

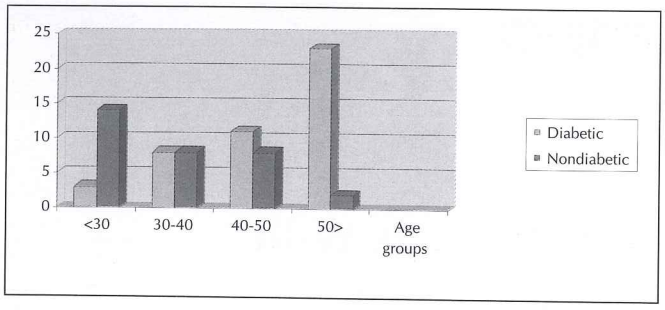

Figure 1. *Distribution of male diabetic and nondiabetic patients by age groups.*

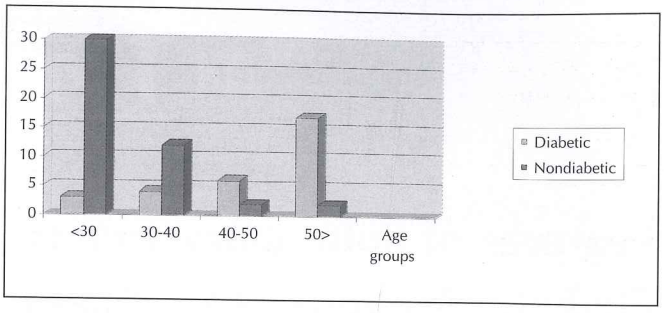

Figure 2. *Distribution of female diabetic and nondiabetic patients by age groups.*

Table 1. Distribution of patients by time interval between the diagnosis of DM and of pulmonary TB

Time interval between the diagnosis of DM and TB	*No. of patients*	*%*
Synchronic	15	17,6
Less than 1 year	4	4,7
1-5 years	33	38,8
6-10 years	18	21,1
11-15 years	7	8,2
16-20 years	4	4,7
More than 20 years	1	1,2
Unknown	3	3,5

Table 2. Radiological findings in diabetic and nondiabetic tuberculous patients

INVOLVEMENT	*Diabetics*		*Nondiabetics*	
	cavitary	noncavitary	cavitary	noncavitary
Confined to one lung	37	16	28	16
Bilateral	20	12	30	10

symptoms, time interval between the diagnosis of diabetes mellitus and onset of tuberculosis, antidiabetic medications used, bacteriological and radiological findings at the initial stage and after 2 months of therapy were amassed from each record. Proportion of negative smears after 2 months of antituberculosis therapy were assessed statistically in the two sexes. The SPSS (Statistic Package for Social Sciences) Program for Windows 7.0 was used for the statistical analyses. Chi square test, Fisher chi square test and univariate arranged chi square test were used for comparing the qualitative data. Results were assessed in 95% reliability interval. A p value of less than 0.05 was considered significant.

Results

Twenty one of the diabetic tuberculous patients were IDMM and 64 were NIDMM. Forty five of these patients were males (mean age 49 years, range 17-71) and 40 were females (mean age 56 years, range 23-73). Of the nondiabetic controls, 32 were males (mean age 33 years, range 19-60 years) and 52 were females (mean age 29 years, range 17-80). Age distribution of the patients are shown in figures 1 and 2. Significant differences ($p<0.001$) in age distribution between the diabetic and nondiabetic groups were found in both sexes, especially in the under 30 years and over 50 years age groups.

Diabetic patients were evaluated with respect to the time interval between the diagnosis of the two diseases. The proportion of patients who developed tuberculosis within the first 5 years of the diagnosis of DM was relatively high (38%). Diagnosis of both DM and pulmonary tuberculosis were synchronic in 15 patients. A decrease in the incidence of TB was observed with age (Table 1).

Radiological findings revealed that 32 patients in the study group presented with bilateral lung involvement. Cavitary disease was present in 57 (67%) patients.The proportion of patients with lower lung lesions was 3.5% (noted in only in 3 patients; involving the basal segments of the lower lobes in 2 and the median lobe in 1). In 40 of the nondiabetic patients the lesions were bilateral and 58 of patients in this group (69%) had cavitary disease (Table 2).

Sputum smear results were not available in 7 of the 85 diabetic patients. Three of these patients were diagnosed as tuberculous pleurisy, 1 with concomitant pericarditis. Sputum could not be obtained due to inability to expectorate in 4 patients. The smears were positive in 77.6% of the patients initially. In one case with cervical lymphadenitis, besides pulmonary involvement, aspiration of the lymph node also proved to be positive. In the nondiabetic group, the number of cases who were smear positive on admission were 82 (97.6%).

Fourty seven percent of the smear- positive cases in the diabetic group became negative by the end of the second month of antituberculous therapy. Follow-up smear results were not available in 15 patients: 9 were lost to follow-up, 2 had been discharged too soon of their own will, 1 had been sent to another medical center and 3 were not able to expectorate. Of patients who continued to be smear positive, 2 had isoniazide and rifampisin resistance. In 18 patients, clearing of the smear took longer than 2 months.

In the nondiabetic group, out of 82 initially smear positive patients 62 (75.6%) were found to be negative on repeated

Table 3. Time required for the smear to become negative in diabetic and nondiabetic patients in whom the initial smear was positive for acid fast bacilli

Duration of time required for conversion		*Number of patients*	*%*
1 month	Diabetics	12	18
	Nondiabetics	40	49
2 months	Diabetics	19	29
	Nondiabetics	22	27
3 months	Diabetics	14	21
	Nondiabetics	4	5

sputum examinations after 2 months. The bacteriological status for 16 patients was uncertain, since 10 patients were not able to expectorate and 6 left the hospital before obtaining the follow-up smears. No patient in this group had drug resistance. Sputum negativity was achieved at the end of 3 months in 4 patients. As Table 3 indicates, bacteriological cure rate at the end of two months of tuberculous chemotherapy was higher in nondiabetic patients than in the diabetics (76% vs 47%) The difference between the two groups was found significant ($p<0.001$)

An obvious regression was observed on the chest roentgenograms taken two months after the initiation of chemotherapy in 72 out of 80 (90%) diabetic and in 76 out of 78 (97%) nondiabetic patients whose follow-up chest X-rays were available.

Discussion

Diabetic patients have an increased susceptibility to infections, particularly to tuberculosis and pulmonary fungal diseases, attributed to an alteration in the chemotactic phagocytic and bactericidal activity of polymorphonuclear leukocytes(1).

In Yamagishi's study on diabetes mellitus patients with active pulmonary tuberculosis, the prevalence in males was found to be higher than that in females, particularly in the 40 to 50 years age group (2). Perez-Guzman et al reported that TBDM patients were older than nondiabetic tuberculosis patients (3).

In our study, we observed that 38% of the male diabetic patients with tuberculosis were in the 50s age group and 42.5% of the females were over 60 years, while 44% of the male and 58% of the female nondiabetics were under 30 years in age. In both sexes age differences between diabetic and nondiabetic groups were highly significant.

Another noteworthy finding in the present study was the strikingly high number of patients (38%) developing tuberculosis within the first 5 years of DM diagnosis. Also, prevalence of tuberculosis showed a decrease inversely proportional with the duration of DM, a finding which can be attributed to the relatively short life-time related to the complications of diabetes particularly in poorly controlled diabetic patients. A more accurate interpretation warrants prospective studies investigating the association between the time of diagnosis of the two diseases.

Morris et al, quoting Sosman and Steidl who, in 1927, suggested that tuberculosis in diabetics tended to occur predominantly in the lower lobes and defined lower lung field tuberculosis as "tuberculosis involving the middle lobe, the lingular lobe or one or both lower lobes", noted that lower lung tuberculosis was present in only 10% of their diabetic patients with tuberculosis (4). Frequency of diabetic patients in their respective series of lower lung tuberculosis was reported to be 25% by Özsöz, 15% by Eranıl and 12% by Özesmi (5,6,7). Yaman et al observed unusual lung involvement in 8% of their 124 diabetic tuberculous patients (8). Perez-Guzman et al speculated that in older patients and in diabetics, the increased alveolar oxygen pressure in the lower lobes favors development of lower lobe disease in these groups (9). Bacakoğlu et al also concluded that diabetes was associated with lower lung field disease only in older patients(10). In our diabetic group of 85 patients lower lung were seen only in 3 (3.5%).None of the patients in the control group had atypical radıologic images of pulmonary tuberculosis.Lower lung lesions are most likely the result of transbronchial perforation of a hilar node with spread to the adjacent lobe.

Al-Wabel et al stated that contrary to previous reports and beliefs lung involvement including cavitary disease was similar in both diabetic and nondiabetic patients(11). In some reports, it has been suggested that pulmonary TB patients with DM were less symptomatic in spite of the progressive lesions. Nakamato et al reported that 36.8% of their diabetic tuberculous patients had no symptoms and that tuberculosis was detected by chest X-ray abnormalities during a routine periodic examination in these patients (12). On the other hand, neither Bacakoglu (10), nor Al-Wabel (11) found no statistical difference in frequency of respiratory or constitutional symptoms between the two groups although fewer diabetic patients were smear (+) in the former study. Similarly, in this present study, the frequency of symptomatic patients were comparable in the diabetic and nondiabetic patients, while the prevalence of smear (+) cases was lower in the diabetic group.

In Nakamato's study, cavitary disease was more frequent in diabetics than in nondiabetics. However, both Morris and Al-Wabel have reported similar rates in both groups of patients (4, 11). Diabetics and nondiabetics had similar rates of cavitary disease in Bacakoglu's study, but a significant number of the diabetic patients in this series were type 1 diabetics (10). Our study also confirms that there is no difference in frequency of cavitary lesions between the diabetics and nondiabetics (67% vs 69%).

Wada et al suggested that relapse rate was higher in patients with DM than in patients without (13). All the patients in our study were new cases so we can offer no comments on this issue.

Bashar et al found a significant association between diabetes

and multidrug resistant tuberculosis (MDR-TB) (14). Only two of our diabetic patients proved to be MDR-TB.

In the present study, the proportion of nondiabetic patients who had become smear (-) for acid fast bacilli after the initial phase of antituberculosis therapy was significantly higher than that in the diabetics, contrary to Bacakoglu's findings (10). On the other hand, radiologic improvement was similar in both groups.

In conclusion, our findings indicate that pulmonary tuberculosis coexisting with diabetes mellitus shows a peak in frequency in the 50-60 years age group in males and in the over 60 years age group in females. Diabetic tuberculous patients are older than the nondiabetic ones. Patients develop tuberculosis mostly within the first 5 years of diagnosis of DM and the diabetic state does not have much effect on the radiological features of tuberculosis. Radiologic improvement is similarly satisfactory in both diabetics and nondiabetics, but the bacteriologic response to the initial antituberculosis therapy is better in the nondiabetics.

References

1. Marvisi M, Marani G, Brianti M, et al; Pulmonary complications in diabetes mellitus. Recent Progr Med 1996;12:623-7.
2. Yumagishi F, Suzuki K, Sasaki Y.et al; Prevalence of coexisting diabetes mellitus among patients with active pulmonary tuberculosis. Kekkaku 1996;71;569-72.
3. Perez-Guzman C, Torres-Cruz A, Villareal-Velarde H et al. Atypical radiologic images of pulmonary tuberculosis in 192 diabetic patients. Int J Tuberc Lung Dis 2001;5:455-61.
4. Morris JT, Seaworth BJ, Mc Allister CK. Pulmonary tuberculosis in diabetics.Chest 1992;102:539-41
5. Ozsoz A, Gulerce G, Acar S et al. 286 aktif akciğer tüberkülozu olgusunda atipik parenkimal yerleşim.İzmir Göğüs Hastanesi Dergisi 1994;8:11-15:
6. Eranıl E, Perim K, Yuksel M et al. Atipik yerleşimli akciğer tüberkülozu. İzmir Göğüs Hastanesi Dergisi 1988;6:57-60.
7. Ozesmi M. Bazal tüberküloz. Tüberküloz ve Toraks 1992:40-2.
8. Yaman M, Gulbas Z, Atikcan S. Diabetiklerde erişkin akciğer tüberkülozunun olağan dışı radyografik lokalizasyonu.Cerrahpaşa Tıp Fak Der 1984;15:272-277.
9. Perez-Guzman C, Torres Cruz A, Villareal-Velarde H et al. Progressive age related changes in pulmonary tuberculosis images and the effect of diabetes. Am J Resp Crit Care Med 2000;162:1738-40.
10. Bacakoglu F, Basoglu OO, Cok G et al. Pulmonary tuberculosis in patients with diabetes mellitus.Respiration 2001;68:595-600.
11. Al-Wabel AH, Teklu B, Mahfouz AA, et al. Symptomatology and chest roentgenographic changes of pulmonary tuberculosis among diabetics.East Afr Med J 1997;74:62-4.
12. Nakamoto A, Saito A. Diagnosis and management of tuberculosis in diabetics.Nippon Rinsho 1998;12:3205-8.
13. Wada M, Yoshiyama T, Ogata H et al. Six months chemotherapy (2HRZS or E/4HRE) of new cases of pulmonary tuberculosis. Six year experiences on its effectiveness, toxicity and acceptability.Kekkaku 1999;74:353-60.
14. Bashar M, Alcabes P, Rom WN et al. Increased incidence of multidrug-resistant tuberculosis in diabetic patients in the Bellevue Chest Service, 1987 to 1997. Chest 2001;120:1514-9.