

## Diabetes mellitus and pulmonary tuberculosis, association or co-incidence?

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### ABSTRACT

**Objectives:** To evaluate the effect of Diabetes Mellitus (DM) on clinical and diagnostic methods and radiological features of pulmonary TB, in comparison to non diabetic pulmonary TB patients, in Golestan province, Northeast of Iran.

**Methodology:** In this retrospective cross-sectional study during 2004-2008, medical records of patients with definite diagnosis of pulmonary TB were reviewed. Demographic data, clinical & diagnostic method and radiological findings were studied. Radiological data and lung High Resolution computed tomographic scan (lung HRCT) were done by two different radiologists. After data entry into SPSS-16, Fischer's exact test and chi-square test were used to compare the two groups (TB with DM & without it). P-value <0.05 was considered significant.

**Results:** Among 200 patients with pulmonary TB, 80 (40%) had TB and concurrent DM (PTDM group). The mean age of two groups was not significantly different. Coincidental TB and DM were seen significantly more in female (P-value < 0.01). There was a significant difference between the two groups as regards fever, dyspnea, weight loss and hemoptysis. Positive sputum smear was the most frequent diagnostic method in both groups (PT, PTDM), no significant difference was shown (P-value > 0.05). Multilobar cavities were significantly more reported in diabetics (p-value = 0.014). No statistical differences were seen between two groups radiologically.

**Conclusion:** Tuberculosis could be more invasive in diabetic patients especially females hence they should be given more attention.

**KEY WORDS:** Diabetes mellitus, Tuberculosis, Radiologic findings.

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### INTRODUCTION

Patients with Diabetes mellitus (DM) are at high risk for some infectious diseases like tuberculosis (TB) due to the insufficient host defense. This could affect the trend of treatment in all coexisting conditions.

The high incidence of tuberculosis (TB) in patients with diabetes mellitus (DM) has been a great concern for several years.<sup>1-5</sup> This could be more prominent especially in developing countries such as Iran which is located in an endemic area (Middle East) for TB. The reported prevalence of TB in Iran in 2008-9 was 13.4 per 100000 populations; this rate is reported 44.8 per 100,000 general population in Golestan province, Northeast of Iran.<sup>6</sup> National

reports show a prevalence of 2.4% for DM in males and 3.67% in females.<sup>7</sup>

On the other hand, nearly 6% of the general population in Iran is thought to have DM (4.2 million). One study in Golestan province reported that DM was the most frequent coexisting disease in pulmonary TB patients (24.3%).<sup>2</sup>

According to the high prevalence of TB in this area, this study was designed to evaluate the effect of DM on clinical and diagnostic methods and radiological features of pulmonary TB in comparison to non diabetic pulmonary TB patients in Golestan province, Northeast of Iran.

## METHODOLOGY

In this retrospective cross-sectional study, medical records of patients with definite diagnosis of pulmonary TB admitted to 5-Azar Hospital were studied (An academic hospital affiliated to Golestan University of Medical Sciences, Northeast of Iran) during 2004-2008. Demographic data, clinical & diagnostic method and radiological findings were extracted from the patients' medical files. New cases of diabetes mellitus were diagnosed by a random plasma glucose > 200 mg/dl or fasting plasma glucose (FPG) > 126 mg/dl repeated two times.

In some patients diagnosis of diabetes was recorded in their medical files and they were on glucose-lowering agents. Pulmonary tuberculosis was defined based on the World Health Organization (WHO) classifications.<sup>8-9</sup> Exclusion criteria included pure pleural involvement, miliary TB, being on corticosteroid therapy or diagnosed collagen vascular diseases, malignancy, and positive HIV test.

Radiological data were gathered from Chest-X-Ray reports and lung High Resolution computed tomography scan (HRCT) reported by two expert radiologists. Ethical approval was taken from the local

Ethics committee. Patients included in the study were divided into two groups:

1. co-existing pulmonary TB and DM, (PTDM) or study group.
2. pulmonary TB (PT) or control group.

*Statistical analysis:* The Statistical Package for the Social Sciences (SPSS, Inc, Chicago, IL Version 15) was used to analyze data. Fischer's exact test and chi-square test were used to compare two groups. P-value < 0.05 was considered significant.

## RESULTS

Among 200 patients with pulmonary TB, 80 (40%) had TB and concurrent DM (PTDM group). Table-I presents demographic characteristics of two groups. The mean age was not significantly different between the 2 groups (P-value > 0.05). Coincidental TB and DM were seen significantly more in female (P-value < 0.01). In PT group, female to male ratio was 0.37:1 versus 1.96:1 in PTDM group. Opium addiction had a higher rate in diabetic patients but no significant relationship was seen (P-value > 0.05).

Cigarette smoking was significantly more frequent in PT group (P-value = 0.003). Table-I. The clinical manifestations of patients are presented in Table-II, there was a significant difference between the two groups as regards fever, dyspnea, weight loss and hemoptysis. Positive sputum smear was the most frequent diagnostic method in both groups, but comparing two groups did not show significant differences as regards diagnostic methods (P-value > 0.05). Table-III.

Radiological findings are provided in Table-IV. Parenchymal infiltration, lower lobe involvement and cavitory lesions had a higher rate in diabetic patients (P-value > 0.05). Multilobar cavities were significantly more reported in diabetics as compared to non-diabetics (p-value = 0.014). But no statistical differences were seen between two groups as regards the frequency or location of parenchymal infiltration, pleural effusion or nodular pattern.

Table-I: Demographic data of the Tuberculosis patients.

Variable	PT N=120 (60%)	PTMD N= 80 (40%)	P-value
Age mean±SD (range)	49± 108 (14-80)	53± 2.4 (16-84)	> 0.05
Sex:			
Female	33(27.5%)	53 (66.3%)	
Male	87(72.5%)	27(33.8%)	< 0.01
Opium addiction	27 (22.5%)	41(51.9%)	> 0.05
Cigarette Smoker	58 (48.7%)	22(27.5%)	0.003

Table-II: Clinical manifestations of Tuberculosis cases.

Symptoms	PT = n(%) 120 (60)	PTDM=n(%) 80 (40)	P-Value
Fever	106 (88.3)	43 (53.8)	< 0.01
Cough	109 (91.6)	65 (85)	> 0.05
Dyspnea	87 (72.5)	71 (89.9)	0.003
Night sweating	73 (60.8)	47 (59.5)	>0.05
Weight loss	56 (46.7)	49 (61.3)	0.043
Hemoptysis	26 (21.8)	33 (41.8)	0.003

Table-III: Diagnostic methods of pulmonary TB.

Method	PT n (%)	PTDM n (%)	P - Value
Positive smear	68 (56.6)	38 (47.5)	> 0.05
Positive smear and culture	27 (22.7)	16 (20)	>0.05
Clinical and radiological findings plus response to treatment	25 (21)	26 (32.5)	> 0.05

**DISCUSSION**

Concurrent Diabetes mellitus and Tuberculosis is known as one of the most frequent Co morbidities.<sup>2-4,10-14</sup> Present results showed that 40% of patients with TB had DM simultaneously. In a study in Saudi Arabia, this rate was 36.3% and 22.6% in immigrants and native Saudi patients, respectively.<sup>15</sup> In two studies in Iran and turkey, TB and DM were found coincidentally in 23.4% and 30% of patients, respectively.<sup>2,16</sup>

In our study, mean age of PTDM (53± 2.4 years) was higher than PT group (49± 1.8 years), but no significant relationship was seen (P-value > 0.05). This data was supported by other studies.<sup>16-18</sup> It means that elderly people have more coexistence of DM and TB; it could be explained by the summation of accumulative effects of age and DM on decreasing the function of Immune system.

Comparing the two studied groups in our study, females were significantly prominent in PTDM group (P-value <0.01). Various studies reported a higher prevalence of coexisting TB and DM in females comparing to males.<sup>2,4,19</sup> Conversely, some studies showed a higher frequency of male in PTDM group.<sup>15-16,19</sup>

Our data showed that opium addiction in PTDM group and cigarette smoking in PT group was more frequent which was statistically significant in the former (P - Value 0.003). This data has not been defined in other researches yet and may need more attention.

In the present study, cough (100%), dyspnea (79.4%), fever (74.5%), night sweating (60.3%), weight

loss (52.8%) and hemoptysis (29.8%) were the most frequent clinical findings. Frequency of the mentioned symptoms was similar in other studies.<sup>20-21</sup> We found that positive sputum smear of mycobacterium tuberculosis was the most frequent diagnostic method in both groups. Although positive sputum smear was found more in non diabetic patients, the difference was not significant (P-value 0>0.05). Several studies showed positive sputum smear as the most frequent diagnostic method, similar to our study; with no significant differences between two studied groups.<sup>16,20-22</sup> Various studies found a significant higher frequency of positive sputum smear in diabetic patients who have pulmonary TB.<sup>15-16,18,23</sup>

Cavitary lesions and upper lobe involvement are well- known radiologic patterns of pulmonary tuberculosis. Involvement of middle or lower zone of the lung was defined as atypical localization.<sup>16</sup> This pattern is frequently reported in diabetic patients.<sup>20-22,24-25</sup> In our study multi lobar cavities had a significant frequency in diabetic patients (P-value = 0. 014). This is expected due to the deficient immune system in diabetics. Frequent cavitary lesions in diabetic patients with pulmonary tuberculosis had been shown in several studies.<sup>17,24,26-28</sup> Other studies have reported the same rate of lung cavity in PT and PTDM patients.<sup>18,28-29</sup>

We showed a higher rate of upper lobe involvement in non diabetics (15.8% vs. 6.3%) and more frequent lower lobe involvement in diabetic Patients (13.8% vs. 7.5%) (P-value> 0.05). similar results were shown by others.<sup>17,30</sup> Other imaging findings including parenchymal infiltration, frequency and location of cavity, nodular pattern and pleural effusion had similar rate in both groups of our patients; these data are supported by other studies.<sup>18,24-25</sup>

**CONCLUSION**

Diabetic patients especially females are more prone to pulmonary tuberculosis with greater frequency of dyspnea, weight loss, hemoptysis and multilobar cavitary lesions in comparison to non diabetics. This means that TB could be more invasive in diabetic patients. More frequent atypical lung involvement

Table-IV: Radiological findings in PT and PTDM group.

Finding	Parenchymal infiltration			Cavity			Nodular pattern	Pleural effusion					
	no	Upper lobe	Lower lobe	Multi lobar	no	Upper lobe	Lower lobe	Multi lobar	no	RT side	LT side	Bilateral	
PT N(%)	10(58.3)	19(15.8)	9(7.5)	22 (18.3)	57(47.5)	19(15.8)	26(21.7)	18(15)	43(35.8)	52(43.3)	37(30.8)	19(15.8)	12(10)
PTDM N(%)	49(61.3)	5(6.3)	11(13.8)	15(18.8)	23(28.8)	16(20)	16(20)	25(31.3)	23(28.8)	37(46.3)	14(17.5)	15(18.8)	14(17.5)
P- value		<0.05				<0.05			0.014	>0.05			>0.05

was reported in diabetic patients with pulmonary tuberculosis. This means that a higher possibility of pulmonary tuberculosis in diabetic patients must be kept in mind, and due to the more invasive tuberculosis possibility in these cases, primary tests like sputum smear or culture and chest x-Ray or lung HRCT could be helpful in earlier diagnosis and of course better outcome. It could be concluded that there is an association between pulmonary TB and underlying conditions like diabetes mellitus with relatively suppressed immune system.

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