

Chest X-ray findings of Pulmonary Tuberculosis with Diabetes Mellitus

Begum SA¹, Saibal AA², Mannan A³, Islam Z⁴

Abstract:

Tuberculosis (TB) is one of the most emerging public health problem worldwide. WHO estimates that daily about 880 new cases and 176 TB death occur in Bangladesh. Among all the non-communicable diseases Diabetes Mellitus (DM) becomes the pandemic. The number of diabetic patients by 2030 estimates more than 11 million. The co-existence of these two diseases are also very common. These can effect each other in terms of their clinical presentation and disease course. Radiological pattern of pulmonary tuberculosis with diabetics may be atypical. Objective of the study was to determine the radiological pattern of pulmonary tuberculosis (PTB) on Chest X-Ray (CXR). This was a prospective observational study which was conducted in BIRDEM General Hospital, Dhaka from July 2015 to Dec 2016. Total 50 DM with PTB patients were enrolled in this study. PTB was diagnosed on the basis of AFB positive sputum, history and CXR findings. CXR report was done in the department of Radiology by two Radiologists. Diabetic patients were either known diabetes or were newly diagnosed based on WHO criteria. A total of 50 patients were analyzed in which there were 30 males and 20 females. Age range was 18-70 years. Out of 50 films typical upper lung field involved in 15 (30%). Among the films Cavitory lesion, Multiple patchy opacities, Pleural effusion and Bilateral presentation was found in 15 (30%), 7 (14%), 6 (12%) and 12 (24%) respectively. Atypical presentation with lower lung field involvement was 30 (60%) and lower zone 25 (50%) respectively. So, atypical lower lung field involvement on CXR is the common mode of presentation in PTB with Diabetes.

Key words: Tuberculosis, Diabetes Mellitus, CXR findings of PTB

Introduction:

Tuberculosis (TB) is one of the most emerging infection which posing great threat globally. About one third of the world population has been infected with mycobacterium tuberculosis^{1,2}. In 2015 there were an estimated 10.4 million new cases of TB and 1.4 million TB deaths world wide^{1,2}.

Diabetes Mellitus is pandemic among all non-communicable diseases, Bangladesh has 3.2 million of diabetic subjects in 2000 and the number is expected to increase to staggering 11.1 million by 2030 placing her among the top 10 countries with diabetes^{5,6,8}. The prevalence of DM was found to be 7.2% in Bangladesh⁷.

The situation of tuberculosis of the third world country like Bangladesh is alarming. Over 3,00,000 people fall ill of tuberculosis each year and 65,000 die due to tuberculosis in Bangladesh². So, both of the diseases are emerging in Bangladesh and causing

public health problem and their coexistence also common. But the clinical presentations and radiological features are not well studied in many literature.

Post primary pulmonary tuberculosis has been classically considered as a disease of causing patchy opacities involving one or more upper lung field^{3,4,9,10}. Although diagnosis of pulmonary tuberculosis in many situation is difficult, sputum for AFB remain gold standard but strong clinical suspicion and radiological evidence is very important^{3,4}. Diagnosis of pulmonary tuberculosis become more difficult when tuberculosis and diabetes coexist^{11,12,13}. Many studies revealed atypical radiological presentations on chest x-ray of pulmonary tuberculosis when it is associated with diabetes mellitus^{11,12,14,17,18}. The aim of our study was to determine the radiological pattern on chest X-ray of pulmonary tuberculosis in patient with diabetes mellitus.

¹ Dr. Shamsi Ara Begum, Assistant Professor, Department of Radiology & Imaging, BIRDEM, Dhaka, Bangladesh.

² Dr. Md. Arif Akbar Saibal, Associate Professor, Department of Medicine, Eastern Medical College & Hospital, Comilla, Bangladesh.

³ Dr. Arifa Mannan, Medical Officer, Department of Radiology & Imaging, BIRDEM, Dhaka, Bangladesh.

⁴ Dr. Md. Zakirul Islam, Associate Professor, Department of Pharmacology & Therapeutics, Eastern Medical College, Comilla, Bangladesh.

Address of Correspondence: Dr. Shamsi Ara Begum, Assistant Professor, Department of Radiology & Imaging, BIRDEM, Dhaka, Bangladesh. Mobile: +8801716165748, Email: shamsisaika@gmail.com

Materials and Methods:

This was a prospective observational study which was conducted in the department of Radiology & Imaging in collaboration with department of Medicine in BIRDEM from July 2015 to Dec 2016. Total 50 patients of pulmonary tuberculosis with diabetes mellitus (both Type-I and Type-II) were included in this study.

Pulmonary tuberculosis was diagnosed on the basis of positive AFB sputum. Chest X-ray, ESR & Mantoux (MT) tests were done for all patients. Sputum AFB was negative for only 4 patients. Those 4 patients were diagnosed on the basis of history, clinical examinations, radiological findings, high ESR and MT positivity. Diabetic patients were either known diabetics or newly diagnosed on the basis of WHO diagnostic criteria.

A structured questionnaires was filled up while taking history, clinical examinations and investigations. Consent was taken from the patients accordingly. Three samples sputum for AFB were done in Microbiological laboratory of BIRDEM. CXR was reviewed by two Radiologists and sometimes by Physician where clinical correlation were needed. Data were collected from the selected cases. Collected data were statistically analyzed by SPSS.

Table I: Demographic & Clinical Characteristics.

Sex	Number of Patients
Male	30 (60%)
Female	20 (40%)
Age (yrs.)	
18-29	10 (20%)
30-41	20 (40%)
42-53	12 (24%)
>53	8 (16%)
DM Type	
Type-I	15 (30%)
Type-II	35 (70%)

Discussion:

Pulmonary tuberculosis is common disease worldwide, posing medical and social problem and causing high morbidity and mortality especially in the developing countries. Diabetes mellitus is emerging globally and the relation between pulmonary tuberculosis and diabetes mellitus is very old^{17,20}. It is still controversy whether tuberculosis

Results:

Total 50 patients of pulmonary tuberculosis with diabetes mellitus were included in this study. There were 30 males and 20 females. The age range was 18-70 years (Table 1). There were 35 (70%) with Type-II diabetes mellitus and 15 (30%) were Type-I diabetes mellitus.

The age distribution was as follows 18-29 years 10, 39-41years 20, 42-53 years 12, >53 years 8. Diagnosis on the basis of AFB staining was 46 patients. All patients had Chest X-ray P/A and Lateral view. Out of 50 Chest X-ray film (Table 2) right lung affected 20 (40%) patients left lung 18 (36%) and bilateral 12 (24%) patients. In terms of types of lesion non-homogenous opacities found in 12 films (24%), homogenous opacities found in 10 films (20%), cavitory lesion found in 15 films (30%), multiple patchy opacities found in 7 films (14%) and pleural effusion found in 6 films(12%).

Regarding lung field involvement (Table 2) upper lung field affected in 15 films (30%), lower lung field in 30 films (60%), both upper & lower lung field in 5 films (10%). Considering lung zone involvement upper zone affected in 12films (24%), middle zone in 13 films (26%), lower zone in 25 films (50%).

Table II: Radiological Features.

Lung Side Affected	No. of Patients
Right	20 (40%)
Left	18 (36%)
Bilateral	12 (24%)
Types of Lesions	
Non-Homogenous Opacities	12 (24%)
Cavitory lesion	15 (30%)
Homogenous Opacities	10 (20%)
Multiple patchy Opacities	07 (14%)
Pleural effusion	06 (12%)
Lung Field Affected	
Upper Lung Field	15 (30%)
Lower Lung Field	30 (60%)
Both fields	05 (10%)
Lung Zone Affected	
Upper Zone	12 (24%)
Middle Zone	13 (26%)
Lower Zone	25 (50%)

predispose to diabetes mellitus by causing insulin resistance or diabetes mellitus predispose to tuberculosis due to altered immune function²¹.

Whatever the facts, it is very important to reach the diagnosis when the two diseases co-exist. Diagnosis of pulmonary tuberculosis on the basis of AFB

staining is still gold standard but in many situation physician has to rely on Chest X-ray but the radiological presentation of the Chest X-ray of pulmonary tuberculosis with diabetes is not always typical.

Here we presented such 50 cases of PTB with DM. Demographically male and rural population are more affected by tuberculosis. This has been mostly attributed to socio-cultural factors that lead to a higher risk of exposure to mycobacterium tuberculosis in men or to a higher frequency of under-diagnosed in female^{15,16}.

In our study we also found male preponderance and rural population are affected more in comparison with urban population. The mostly affected age group of PTB with DM in our study was 39 to 41 years but Perez-Guzman et al found proportionately higher age group are affected¹⁹. This findings were not consistent with our study. May be this was due to our small study sample.

Rural people are more affected by tuberculosis in our study which is also similar by other study. This is true as because most of the people of developing countries living in rural area and they are not aware about disease. The reason for increased susceptibility of DM to PTB may be multifactorial though the exact mechanism is not known. It may be due to altered immune function or change in connective tissue or due to diabetic autonomic neuropathy causing reduced bronchial reactivity or bronchodilatation^{21,22}.

The clinical symptoms of tuberculosis that we found in our study did not modified by diabetes which is proved by other study also^{11,12,13}. Radiological signs of PTB are more pronounced in diabetic patients¹³. The most common radiographic manifestations of post-primary PTB is focal or patchy heterogeneous opacities involving the apical or posterior segment of the upper lobe^{9,10}. But various literature revealed PTB with diabetic patients did not present with such typical features.

Atypical localization is seen more often in diabetics with TB than in non-diabetics with TB^{14,17,18}. Sosman and Stidl reported a higher rate of lower lung involvement of TB in their diabetic patients¹⁴. Perez-Guzman et al. suggested that in older patients and in diabetics increased alveolar oxygen pressure in the lower lobes favors the development of lower lobe disease in these groups¹⁹. Bacakoglu et al. also reported that DM with PTB patients have more predilection to lower lobe involvement²⁰.

Multilobar involvement and pleural effusion of PTB have been reported to be more frequent in Diabetics than in general population¹⁸. In this study we found

cavitary lesion was more (30%) in comparison with other types of lesion. Multiple patchy opacities were (14%). Pleural effusion was also marked (12%) in diabetic patients.

Considering the lung field involvement upper lung was involved in 30%, lower in 60% and both in 10% cases. Regarding lung zone involvement, 50% patients had lower lung zone involvement as opposed to other zones. All these results were comparable to study conducted by others that mentioned above.

Although we conducted our study on a small group of sample and these were only on Diabetics with PTB but we could not compare with non-diabetics and these study also revealed atypical radiological presentation on Chest X-ray. In many situation we have to rely on CXR for the diagnosis of PTB but it may not be always typical and in lower lung involvement may also mimic with neoplastic lesion and consolidation of lung.

Conclusion:

In conclusion this study showed that pulmonary tuberculosis with diabetic patients have some atypical radiographic features on Chest X- ray like lower lung field involvement, multi-lobar infiltration, pleural effusion. So, extra care should be taken while diagnosis of pulmonary tuberculosis in a patient with diabetes mellitus.

Conflict of interest:

The authors have no conflict of interest to declare.

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