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Pulmonary Tuberculosis with Diabetes Mellitus: A Profile Study

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Abstract

Aim & Objective: To study the clinical profile and radiological patterns of 60 pulmonary tuberculosis patients with Diabetes mellitus.

Materials & Methods: 60 consecutive patients with pulmonary tuberculosis and Diabetes mellitus attending department of pulmonary medicine, Andhra Medical college, Visakhapatnam, from January 2017 to October 2017.

Results: Most of the diabetics are above the age of 40 years (91.66%) with peak incidence in age group of 40-60 years. Male preponderance observed in the study with a total of 44(73.33%) males. Cough in 58 cases (96.66%) and breathlessness in 33 cases (55%) along with fever in 49 cases (81.66%) and haemoptysis in 5 cases (8.33%) are the most common symptoms. 35% are smokers, 21.66% are ex-smokers and 43.33% are non- smokers. New cases are more than relapses accounting for 71.66% and 28.33% respectively. Radiologically, infiltrates are the most commonly observed accounting for 88.33%. Cavitatory lesions are seen in 51.66%, consolidation seen in 5%. 16 cases were diagnosed with Diabetes mellitus de-novo and remaining 44 cases were already on treatment for previously diagnosed diabetes mellitus. Of 60 sputum smear for AFB positive cases, 50 had sputum smear conversion at the end of intensive phase. Successful treatment outcome was observed in 52 cases of which 46 were cured and 6 completed the treatment.

Conclusion: In the present study most of the patients with pulmonary tuberculosis and diabetes patients are males, smokers, with cough, breathlessness, fever as the most common symptoms. Most common radiological findings noticed are infiltrates and cavities. Most of the patients had successful treatment outcomes.

Keywords: Diabetes, Pulmonary Tuberculosis

Introduction

Tuberculosis is one among the top ten causes of the death and leading cause from a single infectious agent (above HIV/AIDS) worldwide. As per the estimates in 2017, among HIV negative people, TB caused about 1.3 million (range 1.2 -1.4 million) deaths and an additional 3,00,000 deaths from TB (range 2,66,000-3,35,000) among HIV positive people. Globally,10 million people (range 9.0 million -11.1 million) developed TB disease in 2017 in which 5.8 million are men,3.2 million are women and 1.0 million are children. Worldwide TB incidence is falling at about 2 % per year. The number of TB deaths among HIV negative people has fallen to about 1.3 million in 2017.

The TB mortality rate is falling at about 3% per year, and overall reduction in period of 2000-2017 was 42% [1]. The coexistence of tuberculosis and diabetes in a human and their synergistic role in causing disease and suffering was known for decades and many prospective and retrospective studies were conducted in this regard [2].

The incidence of tuberculosis in India including the HIV is about 27,90,000 people and the mortality due to TB (excluding HIV) is about 4,23,000 people. The incidence of HIV-TB is about 87,000 people and the mortality due to HIV-TB comorbidity is about 12,000 people. The incidence of MDRTB/RR is about 1,47,000 people [3].

WHO projects that diabetes will be the seventh leading cause of death in 2030.Globally an estimated 422 million adults who were living with diabetes in 2014 as compared to 108 million in 1980.The global prevalence of diabetes has nearly doubled since 1980 which increased from 4.7% to 8.5% in adult population. Over the decades, the prevalence of diabetes has risen in low and middle-income countries than in high income countries. Diabetes caused about 1.5 million deaths in 2012. Higher than optimal blood glucose caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other diseases. About 43% of these 3.7 million deaths occur before the age of 70 years. Majority of people with diabetes are affected by type 2 diabetes. This used to occur entirely among adults only, but now it occurs in children too. The percentage of deaths due to high blood glucose or diabetes which occurs prior to age 70 is higher among low and middle-income countries than in high income countries [4].

The rate of diabetes in patients with TB is 2.0-4.6 times higher than in general population. New cases of DM accounts for about 64% of all the cases of DM in TB [5]10% of people with TB are linked to diabetes. People with diabetes have a 2-3fold high risk of developing TB and relapse during and after anti tubercular therapy [2] The stress of the severe chronic infection may enhance the existing insulin resistance and may unmask the underlying beta cell deficiency which leads to hyper glycemia which possibly increase the risk of DM among people with TB, especially in the presence of the other underlying predisposing factors.

As a metabolic disorder which weakens the immune system, DM is one of the most important risk factor for developing the active TB disease. Lung is the target organ in DM and pulmonary involvement is also very closely related to other vascular complications. DM causes basal membrane thickness which decrease the lung elasticity and neuropathy, which may affect basic lung function. Due to the cellular and the humoral immunity defects in the diabetic patients, both the acute and the chronic lung infections including the TB are frequently seen in DM patients. DM also increases the risk of treatment failure, relapse and death [6].

DM is known to modify the clinical features and radiological manifestations of pulmonary tuberculosis [7]. The prevalence of DM increases so rapidly not only in the high- income countries but also in the low and the middle-income countries which are having the high burden of tuberculosis [8].

The absolute number of TB cases are falling and the prevalence of diabetes is projected to be doubled. Half of the people with diabetes are undiagnosed and the vast majority of this diabetic population lives in the developing world countries which are well known to be endemic for tuberculosis. So awareness and screening for DM in the TB patients should be raised. The looming DM epidemic is a threat to the TB control, adequate knowledge on the interaction of these two old disorders is critical[9].

Aims And Objectives

- To know the clinical manifestations in patients of pulmonary tuberculosis with diabetes mellitus
- To know the radiological patterns in patients with concomitant pulmonary tuberculosis and diabetes mellitus.
- To assess the outcomes in patients of pulmonary tuberculosis with diabetes mellitus

Patients And Methods

Study design: Hospital based prospective study

Study setting: Department of pulmonary medicine, Andhra Medical College/ Government hospital for chest and communicable diseases, Visakhapatnam, Andhra Pradesh.

Sample size: A total of 60 consecutive PTB cases were enrolled into the study according to inclusion and exclusion criteria.

Inclusion Criteria

- All cases of pulmonary tuberculosis with proven type 2 diabetes mellitus.
- Patient aged > 18 years.
- Patients willing to participate in the study.

Exclusion Criteria

- Patient aged <18 years
- Non co-operative patients
- Patients with type 1 diabetes mellitus
- Patients with associated HIV.
- Other infectious diseases of lung.

Methodology

The following data was recorded:

❖ A detailed history of every case was obtained including

➢ age, sex, socioeconomic status, rural/urban(address),

➢ past medical history, family history and treatment history of Diabetes mellitus,

➢ date of PTB and T2 DM diagnosis,

➢ presenting symptoms of PTB,

➢ date of commencement of ATT,

➢ complaints after using ATT.

❖ Physical examination was conducted

➢ To find the presentation of PTB in T2 DM,

➢ to detect drug related adverse events.

❖ Investigations were carried out and recorded in all subjects (at regular intervals) are:

➢ Sputum for acid fast bacilli (AFB)

➢ Chest radiography (PA view) to study the radiological pattern

- Atypical presentations (lower lung field involvement)
- Pleural effusions/ cavity/ infiltrates

➢ Fasting blood glucose

➢ 2 hrs postprandial blood sugar test

➢ Other routine investigations like complete blood picture and complete metabolic profile.

Case of Pulmonary tuberculosis.

A bacteriologically confirmed TB case is one from whom a biological specimen is positive by smear microscopy, culture or WRD (such as Xpert MTB/RIF). All such cases should be notified, regardless of whether TB treatment has started.

A clinically diagnosed TB case is one who does not fulfil the criteria for bacteriological confirmation but has been diagnosed with active TB by a clinician or other medical practitioner who has decided to give the patient a full course of TB treatment. This definition includes cases diagnosed on the basis of X-ray abnormalities or suggestive histology and extrapulmonary cases without laboratory confirmation. Clinically diagnosed cases

subsequently found to be bacteriologically positive (before or after starting treatment) should be reclassified as bacteriologically confirmed.

WHO Criteria for Diagnosis Of Type 2 Diabetes:

- FBS ≥ 126 mg/dl or
- 2 hour post oral glucose tolerance test ≥ 200 mg/dl or
- HbA1C ≥ 6.5%

Observations and Results

Age distribution

In this study, most of the patients with pulmonary tuberculosis and diabetes mellitus are above the age of 40 years (91.66%) The peak incidence was in the age group between 41-50 and 51-60 years. 85% of total patients were within this age group. Only 4 patients were of age more than 60 years and 5 were of age less than 40 years.

The mean age of the study population is 51.30 ± 8.5 years

Gender distribution

Male preponderance was observed in this study. Out of 60 patients with pulmonary tuberculosis and diabetes mellitus 44 were males and 16 were females.

Smoking status

In this study, 56.66% of patients with pulmonary tuberculosis and diabetes mellitus are either current or ex-smokers compared to 43.33% of patients being never a smoker.

Clinical symptoms

Patients in this study presented with symptoms like cough (96.66%), breathlessness (55%), fever (81.66%), hemoptysis (8.33%) with varied frequency.

Duration of symptoms

Most of the patients with pulmonary tuberculosis and diabetes mellitus presented to hospital after 2 weeks of symptom duration. 75% of patients presented to hospital within 2-8 weeks of symptom duration. Only 10% of patients presented to hospital within 2 weeks of symptom duration.15% presented after 8 weeks of symptom duration.

Classification of PTB

Patients in this study were categorized in to new case and relapse cases according to WHO TB case definitions.

In the present study, 43 patients were new cases of PTB, 17 patients were PTB relapse cases.

Diabetes status

Among all patients with pulmonary tuberculosis, 16(26.66%) are diagnosed to have diabetes mellitus de-novo while 44(73.33%) already diagnosed to have diabetes mellitus. Among 16 patients diagnosed de-novo with diabetes mellitus 11 patients (68.75%) are new cases of pulmonary tuberculosis. Among 44 patients who are already diagnosed to have diabetes mellitus 28 patients (63.63%) are new cases of pulmonary tuberculosis.

Duration of diabetes mellitus

18 patients with pulmonary tuberculosis had diabetes mellitus with 1year duration which also includes denovo diagnosed diabetes. Majority (61.66%) of the patients had duration of diabetes mellitus between 1-5 and 6-10 years. Only 5 patients had more than 10 years duration of diabetes mellitus.

Glycemic status

Blood sugar levels of the patients in this study were recorded as FBS and PPBS at the time of initiation of treatment.

The mean FBS value in patients with pulmonary tuberculosis and diabetes mellitus was 190.04 ± 83.45 with lowest value recorded being 86 mg/dl and highest value recorded being 408 mg/dl. The mean PPBS value in patients with pulmonary tuberculosis and diabetes mellitus was 288.9 ± 101.31 with lowest value recorded being 113 mg/dl and highest value

recorded being 555 mg/dl.

HbA1C was <6.5 in 27 patients, >6.5 in 33 patients.

Sputum smear microscopy

Sputum of the patients in this study was subjected to smear microscopy with Auramine O stain and smear grading was done according to WHO criteria.

In the present study, smear for AFB was found to be positive in all 60 patients.

Radiological characteristics

The most common radiological presentations in patients with pulmonary tuberculosis and diabetes mellitus in this study were infiltrates (88.33%) and cavities(51.66%). Lobar consolidation was observed in 5%.

23(38.33%) patients with diabetes mellitus have isolated lower lung field tuberculosis radiologically.

In the present study, 11 patients had lesions only on right side, 23 patients had lesions only on left side and 26 had lesions bilaterally on chest x-ray.

Sputum smear conversion

Sputum of the patients with positive smear microscopy at the time of diagnosis was subjected to smear microscopy at the end of intensive phase to look for smear conversion.

In the study population all 60 patients were sputum smear positive at the initiation of treatment. 43 patients were on cat I ATT. 17 patients were on cat II ATT. Sputum smear conversion at the end of intensive phase was observed using florescent staining. It was done at the end of 2 months in patients receiving cat I ATT and at the end of 3 months in patients receiving cat II ATT. Sputum smear conversion in sputum smear positive patients on cat I ATT was observed in 39 patients (90.69%) and in 13(76.47%) of 17 patients who were on cat II ATT. In total, sputum smear conversion was observed in 52(86.66%) of 90 patients.

Treatment outcomes

Among 43 new TB cases who used cat I ATT (Group 1), 34 were cured, 4 completed treatment, 3 died, 2 failed treatment. Among 17 previously treated PTB cases who used cat II ATT (Group 2) 12 were cured, 2 completed treatment, 1 patient died and 2 failed treatment. Overall in this study, 76.66% were cured and 10% completed the treatment.

Discussion

The proportion of diabetes among PTB patients was low in those above the age of 60 years which may be due to reduced overall survival among diabetics. Similar results were observed in the studies conducted by R. Singla et al.,[7] A.A. Viswanathan et al.,[11] Chi C. Leung et al.,[8] Jovana M Pavlovic et al.,[6]

The proportion of PTB patients with DM was more in men compared to women, which may be due to the synergistic effect of other risk factors such as smoking, tobacco use and alcohol consumption, which impact both TB and DM. In the studies conducted by R. Singla et al.,[7] A.A. Viswanathan et al.,[11] Chi. C. Leung et al.,[8] Jovana M Pavlovic et al.,[6]proportion of male patients in PTB and DM group were 75.9%, 80.9%, 74.4%, 69.3% respectively.

Under nutrition, smoking, diabetes and alcohol consumption can increase the risk of developing active tuberculosis two to threefold.

Cough in 58 cases (96.66%) and breathlessness in 33 cases (55%) along with fever in 49 cases (81.66%) and haemoptysis in 5 cases (8.33%) are the most common symptoms. In the study conducted by Jovana M Pavlovic et al.,[28] cough was observed in 78.4% whereas in study by R. Singla et al.,[7] it was observed in 85%. Fever was observed in 51.1% in study conducted by Jovana M Pavlovic et al.,[6]

Presence of diabetes mellitus does not have an effect on clinical presentation of the patients. TB patients with DM were significantly more likely to have opacity over lower lung fields when compared to TB patients without DM. The most probable explanation for development of lower lung field tuberculosis is transbronchial perforation of hilar lymphnode, with spread to the adjacent lung[37]

Thus, lower lung field disease occurs as a continuation of the primary tuberculous infection or soon afterwards in the pathogenesis of lower lung field tuberculosis. Restricted ventilation, costal and retrograde lymphatic flow from the involved hilar lymph nodes may be other possible reasons. The apical segment of lower lobe may be the first site of disease and upper and posterior part of lower lobe are second vulnerable site. in this study, 76.66% were cured and 10% completed the treatment.

BachtiAlisjahbana et al in a study of “the effect of type 2 diabetes mellitus on the presentation and treatment response of pulmonary tuberculosis” on 94 patients with tuberculosis and diabetes made similar conclusions in which the cure rate among the diabetics with tuberculosis was 74.5%[40]

Conclusion

- Most of the patients with pulmonary tuberculosis and diabetes patients are males, smokers, with cough, breathlessness, fever as the most common symptoms.
- Most common radiological findings noticed are infiltrates and cavities.
- Most of the patients had successful treatment outcomes

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