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Clinical Study of Pulmonary Tuberculosis in Diabetes Mellitus

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ABSTRACT

Tuberculosis and diabetes are major health problems in developing country like ours. Patients with diabetes mellitus are at a higher risk of developing tuberculosis. Presentation of tuberculosis in diabetes varied. Thus clinician should have strong degree of suspicion and investigate accordingly to institute early treatment. Objectives: To study clinical profile of pulmonary tuberculosis in diabetic patients. To study the radiographic patterns of pulmonary tuberculosis in diabetic patients. Total population studied was 100, with male preponderance of 72% with mean age group 54.9 years. Anorexia and cough were predominant symptoms with 59% and 51% respectively. Mean duration of diabetes was 6.6 years. Mean FBS was 234.4 mg/dl and PPBS being 345.5 mg/dl. Sputum positivity was less in age group >40 years. Cavitatory lesions were seen in 53% and fibrosis in 32%. There was a linear relation between the duration of diabetes mellitus and the development of tuberculosis. Poorly controlled hyperglycemia is associated with development of tuberculosis. Lower lung field tuberculosis was more common in diabetics. All the diabetics with abnormal weight loss, unexplained cough or sudden increase of insulin requirement should have sputum examination and chest x-ray done thus helping in early diagnosis and treatment.

Keywords: Pulmonary tuberculosis, Diabetes mellitus, lower lung field tuberculosis.

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INTRODUCTION

Tuberculosis is one of the major public health problem in the developing countries of the world today, has made its impact felt through ages. No other disease has so much sociological, economic and health significance as tuberculosis has.

Tuberculosis can be traced back to the early history of mankind. In our country it has been since the vedic ages, that is about 5000 years ago. It is worldwide in distribution and strikes both the rich and the poor, all races in both the sex. Despite all efforts to eliminate tuberculosis, it continues to be one of the most prevalent infections in the world.

90% of the infected persons do not develop disease in their life time because of immunity that they develop against it or immunisation with BCG vaccine. Even with this situation, there are more than 20 million active TB cases in the world and 85% of the burden of the TB cases in the poor developing countries and of this India bearing 50% of the cases. According to WHO, an estimate of 3 million people die due to Tb each year. People in the productive age group that is young adult 15-45 years of age are most affected. Thus badly affects the social and economic development of the country.

The seriousness of the association of pulmonary TB and Diabetes Mellitus was first noted by the great Arab physician Avicenna nearly 1000 years ago.

The link between Diabetes Mellitus and Pulmonary Tuberculosis has been talked at various fora but never occupied the centre stage of discussions. Presently, an epidemic of diabetes is on both in developed and developing nations.

With the recognition of this explosive, increase number of people diagnosed with diabetes mellitus all over the world, a whole new field of issues related to interaction between diabetes mellitus and pulmonary tuberculosis has been laid open.

The global figure of people with diabetes is projected to raise from the current estimate of 366 million in 2011 to 552 million by 2030 [1] Most cases will be of type II diabetes, which id characterized by insulin resistance and/or abnormal insulin secretion.

The diabetic epidemic, although apparent across the world, has been most pronounced in non European population. The potential for increase in number of cases of diabetes mellitus is greatest in Asia. Type II diabetes in children, teen ages and adolescents is a serious new aspect to the epidemic and is an emerging public health problem of significant proportions.

Based on compilation of studies from different parts of the globe, the WHO has projected that the maximum increase in Diabetes mellitus would occur in India [2] Considering the large population and the high prevalence, the burden of Diabetes mellitus could be enormous. With an estimated 23 million today and the number set to increase to 57 million by 2025, the increasing prevalence of diabetes mellitus reflects sedentary life style, excessive

energy intake, reduced physical activity and obesity. Studies conducted in India in the last decade are highlighted that not only is the prevalence of diabetes mellitus is high, but also that it is increasing in the urban population. There is also a wide urban rural difference in the prevalence of diabetes mellitus pointing to the major role urbanisation may be playing in the causation of the disease.

Patients with diabetes mellitus are also at higher risk of tuberculosis. This has been highlighted by several retrospective and prospective studies.

In a study in Mumbai tuberculosis was found to be the most common complicating illness (5.9%) in a large cohort of over 8000 patients in diabetes.

The prevalence of pulmonary tuberculosis in diabetes was 8.3% [3]. Various studies show that incidence of tuberculosis in diabetes mellitus patients vary from 1.6 – 8.4%. Early diagnosis of the combination is rare. At the time of diagnosis , a large majority of cases have severe diabetes and far advanced tuberculosis.

In a recent study from the regional institute of medical sciences Imphal, the prevalence of pulmonary tuberculosis in diabetes mellitus was found to be 27% by radiological diagnosis and 6% by sputum positive. [4]

A raising prevalence of tuberculosis in diabetes mellitus has been seen with age. Mortality rates in these patients are reported to be several times higher than in non diabetic pulmonary tuberculosis patients.

In a study from Congo, diabetes appeared to have an induction and aggravating affect on tuberculosis. Tuberculosis was found to be more frequent in diabetics, had more pronounced radiological signs, treatment failure and deaths were also more frequent. [5]

Aims and Objectives-

1. To study the clinical profile of pulmonary tuberculosis in diabetes mellitus patients.
2. To study the radiographic pattern of pulmonary tuberculosis in diabetes mellitus patients.

MATERIALS AND METHODS

Source of data

The study was undertaken on 100 patients with diabetes mellitus and pulmonary tuberculosis of the both sex admitted to Sree Siddhartha Medical College and Hospital, during time period of June 2012 to June 2013.

Method of collection of data

Pulmonary tuberculosis was diagnosed by detailed history, clinical examination, sputum examination for acid fast bacilli, chest radiography.

Diabetes mellitus was diagnosed using the National Diabetes Data group and WHO

Diagnostic criteria-

1. Symptoms of Diabetes plus random blood sugar >200 mg/dl or
2. Fasting plasma glucose > 126 mg/dl or
3. 2 hours plasma glucose >200 mg/dl during an oral glucose tolerance test.

Adult patients who fulfilled the above criteria were included in the study. After taking consent, patients were examined in detail and subjected to relevant laboratory and radiological investigations.

The clinical profile which was evaluated in this study include age and sex distribution, symptom of presentation, past history of tuberculosis, duration of diabetes mellitus, incidence of smoking, incidence of clubbing, haemoglobin level, erythrocyte sedimentation rate, total leucocytes count, lymphocyte percentage, blood sugar levels(Fasting blood sugars, PPBS, HBa1C), lipid profile, blood urea, serum creatinine, fundoscopy, sputum AFB results and radiological pattern.

The results of the above clinical profile, relevant tests and radiological findings were tabulated and analysed.

Inclusion criteria-

Adult patients with diabetes mellitus with pulmonary tuberculosis.

Exclusion criteria-

- Diabetic patients with extra pulmonary tuberculosis.
- Pulmonary tuberculosis patients not having diabetes.

RESULTS

The total number of cases studied were 100. Among them males were 72 (72%) and females were 28 (28%). The maximum incidence of pulmonary tuberculosis was noted above the age of 40 years. The peak incidence was in the age group of 40-49 and 60-69 years. The mean age for males was 54.9 years and females was 46.0 years. The predominant symptoms noted were cough (73%), fever (56%), anorexia (80%) in the age group >40 years. Other symptoms noted were hemoptysis (11%), loss of weight (43%), dyspnea (18%), chest pain (14%)

and night sweats (29%). 18% had past history of tuberculosis. 12% had associated hypertension and 7% had ischemic heart disease. Among males 45 (62.5%) were smokers. Clubbing was observed in 10 patients (10%). 53% of the patients had a duration of diabetes between 6-10 years and 19% between 2-5 years and 8% less than 1 year. 20% had diabetes more than 10 years. 41% had fasting blood sugar value between 201-300 mg/dl , 30% between 151-200 mg/dl and 23% had value above 300 mg/dl. Mean fasting blood sugar value was 234.4 mg/dl. 45% had a post prandial blood sugar value above 350 mg/dl, 38% had values between 25 mg/dl and 17% between 200-250 mg/dl. Mean post prandial blood sugar value in the study group was 341.5 mg/dl. 65% had poor glycemic status. Anemia was noted in 51%. Erythrocyte sedimentation rate was found 100 mm/hr in 8%, 51-100 mm/hr in 44% and 20 mm/hr in 17% of the patients. 20% of tubercular diabetes have non-proliferative diabetic retinopathy and 6% had proliferative retinopathy. Choroid tubercle not found in any of tubercular diabetics. 52% had normal fundus picture. Sputum AFB was demonstrated in 81% of cases <40 years and in 52% of cases >40 years. Right sided lung lesions were noted in 37% of the cases and left sided lesions in 33% of the cases. Upper lobe lesions were noted in 68% of the cases and bilateral lesion in 30% of the study group. Lower lung field lesions were noted in 32% of the cases. Chest x-ray showed cavitary lesions in 53%, fibrosis in 39% of the patients and infiltrative lesion in 38% of the patients. Other lesions noted are consolidation (6%), pleural effusion (8%), hydropneumothorax (4%), aspergilloma (3%) and bronchiectasis (6%).

HB1AC	No of patients	Percentage
<7	15	15
7-9	38	38
9-12	37	37
>12	10	10

Table 1: Glycosalated Haemoglobin in Tuberculosis Diabetics.

| ESR (mm/hr)	No of patients	Percentage
<20	17	17
20-50	31	31
51-100	44	44
>100	8	8

Table 2: Erythrocyte Sedimentation Rate in tubercular diabetics.

Triglycerides (mg/dl)	No of patients	Percentage
100-150	17	17
151-200	38	38
201-299	45	45
>300	4	4

Table 3: Triglyceride levels in tubercular diabetics.

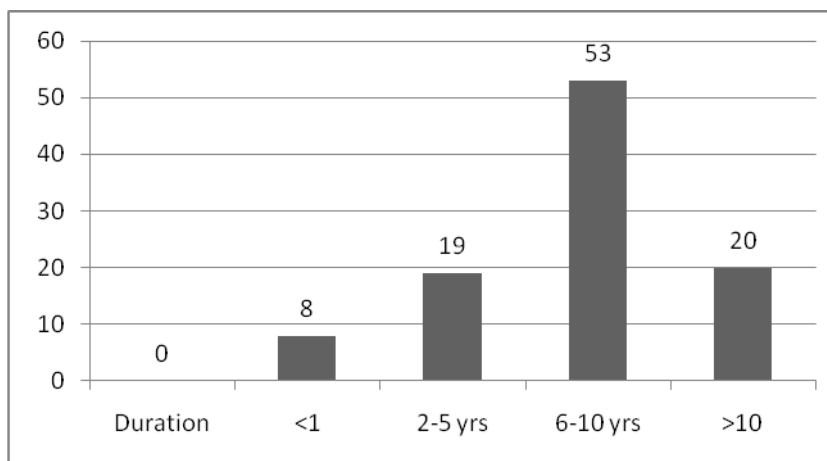| Fundoscopic picture	No of patients	Percentage
Proliferative diabetic retinopathy	10	10
Nonproliferative diabetic retinopathy	38	38
Choroid tubercle	0	0

Table 4: Fundoscopic Examination in tubercular diabetics
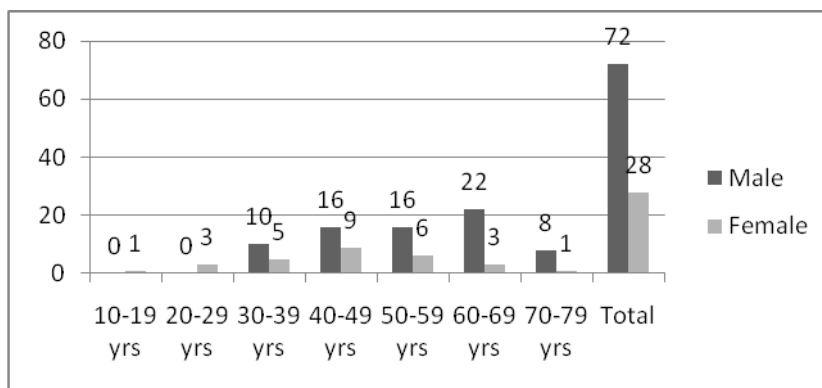
Figure 1 : Age wise and Sex wise distribution.
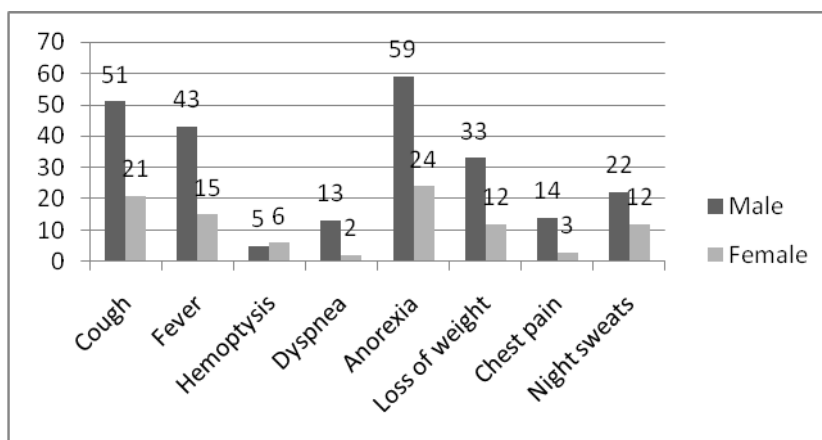
Figure 2 : Distribution of Symptoms.
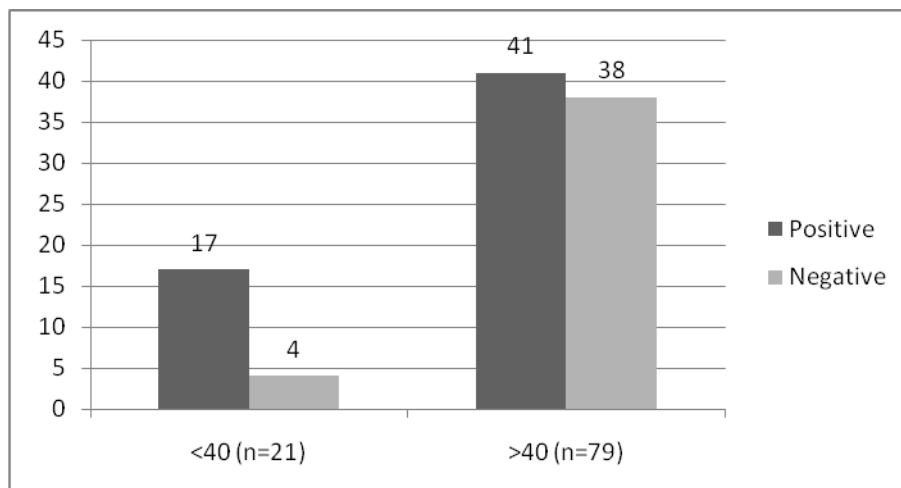

Figure 3: Duration of Diabetes.
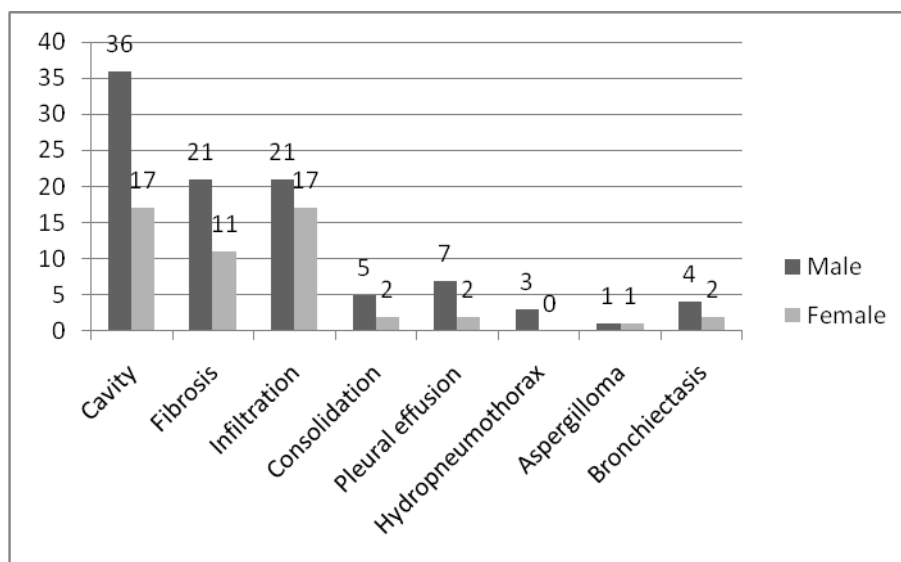
Figure 4: Sputum AFB results.

Figure 5: Radiological results.

DISCUSSION

A clinical and radiological evaluation of 100 cases of pulmonary tuberculosis with DM was done.

In our study the total number of males was 72% and females was 28%. The male to female ratio was 2.6:1. Other studies have shown that, the prevalence and incidence of TB is higher among males than females, the ratio varying from 3:1 to 5:1. In a study of 2434 cases of pulmonary TB by Deshmukh et al, it was reported that 62.9 % were males and 37.1% were females. Among the 138 cases of diabetes with pulmonary TB, 72.4% were males and 27.53% were females [6]. The high incidence of disease in males is possibly due to the fact that both TB

and DM are more common in males. Another reason could be that a number of male patients getting admitted to the hospital are more than females.

In the present study the number of patients above the age of 40 were 79% and the peak in cadence was in the age group of 40-49 and 60-69. 25% of the total cases were in this age group. Deshmukh reported that majority of cases of Tuberculous Diabetics belong to the age group of 45 years and above which was 82.6%. [6] Brij Kishore observed that 57.1% of the patients were above the age of 40 years.

The predominant symptoms noted in the present study were anorexia (80%), cough (73%), fever (56%) and night sweats (29%) in both patients less than 40 years and more than 40 years. Loss of weight is also more in both age groups. In a study done in Euthopian diabetic patients with TB, 3 most common symptoms of TB were fever (80.5%), sweating (80.4%) and cough (70.5%). [7]

Considering the past history, Tuberculosis was found in 15 males and 3 females accounting for 18% of study group. Past history of hypertension was found in 12% and Ischemic heart disease in 7%.

45 out of 72 males were smokers in our study and smoking may be a contributing factor in developing TB in these patients. It has been shown that in patients of both sex over the age of 30 with pulmonary TB, there is a highly significant deficiency of non smokers and light smokers and an excess of moderate and heavy smokers compared to controls of same age suffering from other diseases. [8]

Clubbing was noted in 10% of the patients in our study. Of these 85% had far advanced TB as evidenced by clinical and radiological examination. Macfarlane showed an incidence of 21%. He also reported that finger clubbing was associated with more severe pulmonary damage. Gross clubbing occurs with long standing TB. [9]

The difference in the incidence of clubbing in our study and the other study may be due to:
1. The selection of patients
2. The stage of TB in the study group.
3. Other associated diseases which the patient may be having which can also produce clubbing.
4. Chemotherapy: most of early studies were done prior to advent of anti tuberculosis therapy.
5. Inter observer variation.

44% of patients in this study group showed an ESR between 51-100 mm/hr and 31% had values between 20-50 mm/hr. Values above 100 were noted in 8% of patients. The ESR is non specific test and it can be elevated in numerous conditions. It is not of any diagnostic value. It is a manifestation of generalised disease or of tissue destruction. Active TB will show an elevated

value of ESR and we assume 52% of patients who have shown ESR value above 50 mm/hr may be having active TB.

The total white cell count in our study showed an average value of 10655. Few patients who had far advanced TB showed a normal blood count and certain others with mild to moderately advanced TB had a higher white cell count. So there was no correlation noticed between the severity of TB and total white cell count.

The study of the duration of diabetes in relation to the onset of TB showed that in most cases, DM was diagnosed before the development of TB. [10] Prior to the onset of TB, 53% patients had duration of DM between 6-10years, 19% of patients had duaration of DM between 2-5 years and 8% of the patients less than 1 year. The average duration of DM in this study was 6.6 years with SD±3.4. The duration of DM is significant because there is an increased opportunity for infections with increased duration of DM. The result of the present study is comparable to other studies.

The fasting blood sugar value of 200-300 mg% was noted in 41% of the patients and values above 300mg% were noted in 23% of the cases. Mean FBS was 234.4 with a standard deviation of ±64.5. Post prandial blood sugar value at 2 hours was above 350mg%in 45% of patients. Mean PPBS was 341.5. This showed that in most of the cases blood sugar was not in controlled. In a study done by Sachdeva AK et al, it was shown that high incidence of pulmonary tuberculosis was associated with hyperglycemia. [11]

81% of patients <40 yrs and 52% of the patients >40 yrs were sputum positive for acid fast bacilli. P value was 0.02 which was significant .

In patients >40 yrs, cavitation and fibrosis were more compared to <40 yrs patients. Cavitary lesions though maintained high bacterial population; less smear positivity is noted in diabetes. This may be related to muscle weakness due to uncontrolled hyperglycemias and less effective expectoration.

The examination of the chest radiograph revealed that 70% of the patients had unilateral lesions and 30% of the patients had bilateral lesions. In both these groups, predominant lesions were noted in upper zone.32% of patients in our study had lower lung field involvement. It was more common in the age group >40 yrs. P value <0.05 which was significant.

Cavitary lesions (53%) were the most common type of lesion followed by fibrosis (39%), infiltration (38%) in the age group > 40 yrs. But in the age group <40 yrs, again cavitation was more common (52%) followed by infiltration (38%). Fibrosis was very less in this group compared to patients >40 yrs of age.

As reported in many studies, tuberculosis in diabetic patients is associated with extensive cessation of lung tissue and cavitory lesions and little pleural involvement. In our

study also, cavity and fibrosis is more compared to other lesions. Multiple cavitations were seen in many patients. Our study correlates with most of the above radiological studies in regards to the side, site and extent of lesion as well as nature of radiological patterns.

CONCLUSION

A clinical and radiological study of pulmonary tuberculosis in diabetes mellitus was done. Male preponderance of the disease was noted and peak incidence of the disease was noted in the age groups of 40-49 and 60-69. There was a linear relationship between the duration of diabetes mellitus and the development of pulmonary tuberculosis. Majority of our patients had poorly controlled blood sugars, suggesting that severe hyperglycemia is associated with development of pulmonary tuberculosis. Sputum positivity was more in patients aged <40 yrs. Cavitation and fibrosis were more common in patients aged >40 yrs. Lower lung field tuberculosis was more common in patients aged >40 yrs and in female gender.

Early diagnosis and properly monitored treatment regimen is the only time tested answer to this problem. So the following measures should be taken:

1. All diabetics at the initial diagnosis and every year must have a chest x-ray done.
2. All diabetics with abnormal weight loss, unexplained cough or sudden increase of insulin requirement should have sputum examination and chest x-ray done.

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