Occurrence of *Diabetes mellitus* in Pulmonary Tuberculosis Patients

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Abstract: The present research was focused to estimate the occurrence of *Diabetes mellitus*. in pulmonary tuberculosis and to study the clinical and radiological profile of pulmonary tuberculosis with *Diabetes mellitus*. Proven cases of patents with pulmonary tuberculosis were screened for the presence of. *Diabetes mellitus*. Treatment was instituted for both diabetes and pulmonary tuberculosis and followed up. Antitubercular therapy was extended beyond six months for most patients. 50% of the patients could be maintained on oral hypoglycemics alone. In conclusion, it is recommended that sputum positive cases of tuberculosis be screened for. *Diabetes mellitus*., since the prevalence of diabetes in pulmonary tuberculosis is quite high.

Key words: Pulmonary Tuberculosis · *Diabetes mellitus* · Hydropneumothorax · Liver Function Tests

INTRODUCTION

The association between pulmonary tuberculosis and *Diabetes mellitus* has been known since antiquity. These two diseases constitute a combination that should be detected early and controlled quickly. But the early diagnosis of the combination is rare. The symptoms of the complicating disease are masked by the originally existing disease. The prognosis and clinical course of each of the two conditions adversely affects the other. Diabetic patients are known to have a higher risk of developing pulmonary tuberculosis than non-diabetics [1, 2]. However prevalence of diabetes among patients of pulmonary tuberculosis was not known. Hence the present study was undertaken to study the prevalence of *Diabetes mellitus*. in pulmonary tuberculosis, after exclusion of known diabetics and immune suppressed individuals from the study population. Also the clinical profile, radiographic pattern and the response to treatment when both the conditions are present concomitantly was studied.

MATERIALS AND METHODS

The study was descriptive and prospective and carried out on subjects attending the outpatient department of tuberculosis and chest diseases from September 2002 to July 2004 in Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER). Proven cases of pulmonary tuberculosis either by sputum microscopy or by culture were taken up for the study.

The following exclusion criteria were applied:

- Patients who has taken anti tuberculosis therapy for more than one month.
- Known cases of *Diabetes mellitus*. . /family history of *Diabetes mellitus*..
- Co-existing HIV infection.
- Other causes for hyperglycemia – endocrinological, or drug induced.

Those patients, who have fulfilled the inclusion and exclusion criteria, were screened for. *Diabetes mellitus*. by evaluating fasting and 2 hrs post-prandial blood sugar levels. In our study, WHO criteria were used for the diagnosis of. *Diabetes mellitus* Fasting plasma glucose of > 126 mg/dl (or) 2 hour post prandial plasma glucose of > 200 mg/dl (fasting is defined as no caloric intake for at least 8 hrs) [3]. Sputum smear examination for acid fast bacillus was done by Ziehl Neelson method of staining [4]. Glucose estimation was done by the glucose oxidase

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method using commercially available kits from AGAPPE DIAGNOSTICS [5]. The patients who turned out to be diabetic were examined in detail and symptomatically, nutritional status, routine haematological investigations and radiological features were recorded in the pre-structured pro-forma.

Ophthalmological evaluation to look for choroiditis and diabetic retinopathy and biochemical tests to evaluate proteinuria and glycosuria were carried out. The radiological extent of the disease was analyzed. A standard 6 months daily regimen of anti-tuberculous therapy consisting of two months intensive phase of INH, Rifampicin, Ethambutol and Pyrazanamide and four months continuation phase of INH and Rifampicin was administered. The dosages were adjusted according to the body weight of the patients. The regimen was extended if necessary based upon sputum evaluation, clinical and radiological response. All patients were administered prophylactic dose of Pyridoxine (tablet) 10mg/day. Simultaneously the treatment for. *Diabetes mellitus* was instituted with either insulin or oral hypoglycemics or both, based on the blood sugar levels. The blood sugar control was assessed by periodical blood sugar estimation and the medications changed accordingly, till the completion of anti-tuberculosis therapy. After the completion of therapy, patients were advised periodical follow-up in our OPD and in diabetic clinic.

RESULTS

In this study, a total of 378 proven cases of pulmonary tuberculosis, who were hitherto unknown diabetics, were screened for the presence of. *Diabetes mellitus*. 22 of them were found to be diabetic. Prevalence of Diabetes mellitus. . in new sputum positive cases of pulmonary tuberculosis was 5.82 %. Sputum smear was positive for AFB in 21 patients and sputum culture was positive for AFB in one patient. Only one patient had type 1. *Diabetes mellitus*.

Age and Sex of the Patients Screened: The predominant age group of the population screened was 21-30 years, with 94 patients (24.9%) falling in that age group. 90 patients (23.8%) were in the age group of 31-40 years. Among the 378 patients screened, 280 (74.1%) were males and 98(25.9) % were females (Table 1).

Age and Sex of the Study Group: Among the 22 patients in the study group, 20(90.9 %) were males and 2(9.1%) were females. 8 patients (36.4%) were in the age group of

Table 1: Age and sex of the patients screened

Age / Sex	Number of patients	Percentage (%)
10-20	43	11.3
21-30	94	24.9
31-40	90	23.8
41-50	74	19.6
51-60	54	14.3
61-70	19	5.0
71-80	4	1.1
Males	280	74.1
Females	98	25.9

Table 2: Blood sugar presentation

Fasting blood sugar (mg/dl)		
Blood sugar range (mg/dl)	Number of patients	Percentage (%)
<126	2	9.1
126-200	9	41.0
201-275	5	22.7
276-350	5	22.7
>350	1	4.5
Post prandial blood sugar (mg/dl)		
<126	1	4.5
201-300	8	36.4
301-400	6	27.3
401-500	6	27.3
>500	1	4.5

Table 3: Duration of anti tuberculous therapy

Duration (in months)	Number of patients
6 (2 ETHRZ + 4 HR)	1
9 (2 ETHRZ + 7 HR)	5
12 (2 ETHRZ + 10 HR)	6
15 (2 ETHRZ + 13 R)	1
3rd month	1
4th month	4
5th month	2

Table 4: Treatment of. *Diabetes mellitus*.

Requirements	Number of Patients	Percentage (%)
Only insulin	3	15
Only oral hypoglycemics	10	50
Both insulin and oral hypoglycemics	7	35

41-50 years, while 12 patients (54.6%) were equally distributed between the age groups of 31-40 years and 51-60 years.

Blood Sugar Values: At presentation, the mean fasting blood sugar value for the 22 patients was 216 mg/dl ranging from 88 mg/dl to 412 mg/dl. Analyzing the individual values, 9 patients (40.9%) had blood sugar levels between 126-200 mg/dl. 5 patients (22.7%) had blood sugar values ranging from 201-275 mg/dl. 5 more patients (22.7%) had blood sugar values ranging from 276-350 mg/dl. Only 1 patient had a fasting blood sugar

value of > 350 mg/dl (Table 2). The mean postprandial blood sugar value was 343 mg/dl, ranging from 174 mg/dl to 539 mg/dl. Of these, 8 patients (36.4%) had values in the range 201-300 mg/dl, while 6 (27.3%) had blood sugar levels ranging from 301 – 400 mg/dl. 6 more patients had blood sugar values ranging from 401-500 mg/dl. Only one patient had postprandial blood sugar value of > 500 mg/dl (Table 2).

Treatment

Anti Tuberculous Treatment: 2 patients had lost follow up. Though sputum was negative after 8 weeks of anti tuberculous therapy, based upon clinical symptoms and radiology ATT was extended beyond 6 months for most of the patients (Table 3).

Treatment of Diabetes Mellitus: 2 patients had lost follow-up. Out of the remaining 20 patients, adequate blood sugar control was achieved with oral hypoglycemics alone in 10 patients (50%). 7 patients (35%) required insulin and oral hypoglycemics. 3 patients (15%) were being maintained on insulin alone (Table 4).

DISCUSSION

The present study was carried out in the department of tuberculosis and chest diseases in collaboration with the departments of medicine and biochemistry, JIPMER, Pondicherry, during the period between September 2002 and July 2004. In the study, sputum positive cases (smear/culture) of pulmonary tuberculosis were screened for the presence of *Diabetes mellitus* by applying WHO recommended criteria [6].

Patients who were already on antituberculous therapy were excluded from the study since Rifampicin may cause early phase hyperglycemia in humans due to augmented intestinal absorption of glucose. Also patients who were on drugs which may cause hyperglycemia like steroids, beta agonists, thiazide diuretics, were excluded from the study [7]. Patients who were known diabetics or who had family history of diabetes were also excluded from the study. All these factors may lead to false positive results while estimating the prevalence. But these criteria had to be applied to prove the concept that latent diabetes may be unmasked by active pulmonary tuberculosis [7]. Hence, the prevalence rate calculated in the present study may be a more true prevalence rate, when compared to studies which had included known diabetics.

The prevalence rate of diabetes in pulmonary tuberculosis in previous Indian studies varied from 1.5 to 20.7% [8, 9]. But it is difficult to compare our result with those studies because the criteria used for diagnosis of diabetes and pulmonary tuberculosis is not the same. Males above 40 years of age, were prone for diabetes, this is well in accordance with various studies both in India and in other countries [10], which had concluded that the association is more common among those above 40 years and that male, appear to be at a higher risk compared with females.

From our study, we are unable to draw any inferences on radiological findings, since we did not have any control group. It was also observed that there was no direct correlation between the radiological extent of the disease and the blood sugar levels, at initial presentation. So we propose that the degree of lung involvement in pulmonary tuberculosis may not have any role in the clinical severity of diabetes. The liver function tests were normal in all patients, at initial presentation. No patient had developed hepatotoxicity while treatment with ATT.

All patients had become sputum negative at the end of two months intensive phase of category I anti–tubercular therapy, after which they were switched over to continuation phase. Regarding the treatment of diabetes, all patients were put on strict diabetic diet. 3 patients (15%) are being maintained on insulin alone. 7 patients (35%) required both insulin and oral hypoglycemics for blood sugar control. 10 patients (50%) had adequate blood sugar control only with oral hypoglycemics, may be because most of them had a fasting blood sugar value between 126-200 mg/dl.

CONCLUSIONS

For every known diabetic, there are as many people with impaired glucose tolerance, latent or potential diabetes. It may be hypothesised that active tuberculosis may be an important factor to unmask latent diabetes. The coexistence of active tuberculosis against the background of malnourishment can be a trigger for precipitating overt diabetes. It is quite difficult to make recommendations so as to what to be used in tuberculous diabetics – insulin or oral hypoglycemics? Since the blood glucose control is the ultimate aim, oral hypoglycemics, insulin or combination therapy is recommended on the merit of every individual case and its response to anti-diabetic treatment.

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