Case Series: ***Original Article***

TUBERCULOSIS AND DIABETES MELLITUS:

A Case Series of 100 Patients

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ABSTRACT

Introduction: Tuberculosis and Diabetes mellitus are two public health problems which not only often coexist but have serious implications on each other. DM has an impact on symptomatology, radiological presentation, diagnosis and management of TB. TB has a significant impact on DM, causing unmasking of DM and poor control because of stress or because of drug treatment for TB. Present study attempts to assess this coexistence with regard to the age predisposition, sex preponderance, duration and glycemic control of diabetes and the radiological presentations.

Materials and Methods: 100 patients presenting to the Department of Tuberculosis and Chest Diseases, Government Medical College, Patiala, who were suffering from both Tuberculosis and Diabetes Mellitus, were studied. Various parameters considered included age, sex, history of diabetes with regard to the duration and the glycemic control and the radiological presentations.

Results: It was found that majority were males (61/100). The age group most commonly involved was the 40-60year group (76/100). Majority had their Diabetes diagnosed before the diagnosis of Tuberculosis (57/100), 23 had diagnosis after TB diagnosis, and 20 simultaneously with TB diagnosis. Out of these 57 diagnosed diabetics, 11 patients had controlled diabetes whereas 46 (87.1%) had uncontrolled diabetes. 32 patients had the typical radiological lesions while 68 had atypical presentations with either lower lobe involvement, multi lobe involvement, cavitations or shadows fanning out from the hilum.

Conclusion: TB and DM often coexist together and adversely effect each other. Both need to be managed properly in order to achieve favorable treatment outcome.

Key Words: TB, DM

INTRODUCTION

Incidence of tuberculosis is greatest among those with conditions impairing immunity[1], such as human immunodeficiency virus (HIV) infection and diabetes.

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Diabetes mellitus significantly contributes to the burden of incident TB cases. In a study in India, DM accounted for 14.8% of pulmonary TB and 20.2% of smear positive TB.[2] It has also been postulated that transitory changes in carbohydrate metabolism in patients with DM may lead to persistent hyperglycemia, increasing the chances of development of TB. The global burden of diabetes is increasing, and recent estimates highlight the importance of this disease in India. There were an estimated 20–30 million people in India with diabetes in 2000 (estimates vary with study methodology)[3,4], and projections suggest prevalence will rise to almost 80 million people by 2030. The

co existence of these two conditions has serious implications with regards to the clinical presentations and radiological findings, the management and the final treatment outcomes.[4]

Present study attempts to assess this coexistence with regard to the age predisposition, sex preponderance, duration and glycemic control of diabetes and the radiological presentations.

MATERIALS AND METHODS

100 patients presenting to the Department of Tuberculosis and Chest Diseases, Government Medical College, Patiala, who were suffering from both Tuberculosis and Diabetes Mellitus, were studied. Various parameters considered included age, sex, history of diabetes with regard to the duration and the glycemic control and the radiological presentations.

RESULTS

It was found that majority were males (61/100). The age group most commonly involved was the 40-60year group (76/100).

Table 1: showing relation between diagnosis of DM and TB

Diabetes before TB	Diabetes with TB	TB before Diabetes
57 (57%)	20 (20%)	23 (23%)

Majority had their Diabetes diagnosed before the diagnosis of Tuberculosis (57/100), 23 had diagnosis after TB diagnosis, and 20 simultaneously with TB diagnosis.

Table 2: showing relation between treatment and control of DM with TB

Regular treatment and Controlled DM with TB	Irregular OHA's and Uncontrolled DM with TB	Alternate system of Medication and Uncontrolled DM with TB	Regular treatment and Uncontrolled DM with TB
11(19.3%)	34 (59.6%)	3 (5.3%)	9 (15.8%)

Out of these 57 diagnosed diabetics, 11 patients had controlled diabetes whereas 46 (87.1%) had uncontrolled diabetes. Out of these, 34 were on oral irregular hypoglycemic, 3 on alternate system of medicine and 9, despite of having regular medication, had uncontrolled diabetes.

Table 3: showing radiological features

Typical radiological features	Atypical radiological features			
32 (32%)	68 (68%)			
	Fanning out from hilum	Lower lobe involvement	Pneumonia like picture	Any combination
	11 (16.2%)	32 (47.1%)	7 (10.3%)	18 (26.4%)

32 patients had the typical radiological lesions while 68 had atypical presentations with either lower lobe involvement, multi lobe involvement, cavitations or shadows fanning out from the hilum.

DISCUSSION

The association of Tuberculosis and Diabetes has been studied since long. In 1964, Richard Morton's *Phthisiologia: or a treatise on consumption* stated the association even in Roman times. In the latter half of the 19th century, Root stated that the diabetic patient appeared doomed to die of pulmonary TB if he succeeded in escaping coma. Half a century ago, expert clinics were established for "tuberculous diabetics".[5]

TB is a stressful condition which can worsen the diabetes and can lead to the higher requirement of the anti diabetic agents. As per the correlation between the ventilation and perfusion, since the perfusion is more in the middle and lower lobes, TB bacilli find a more congenial environment for the growth in the glucose rich blood in uncontrolled diabetics.

Present study attempts to assess this coexistence with regard to the age predisposition, sex preponderance, duration and glycemic control of diabetes and the radiological presentations.

Diabetes mellitus has been found to be associated with progressive shift of male predominance in pulmonary tuberculosis.[6] *Yamagishi et al*., also found a male predominance among 352 tuberculosis patients with diabetes.[7] Similar were the findings from our study showing male predominance (61/100). Although the cause of this discrepancy is unclear, it is possible that genetic or socio-cultural differences among the populations might affect the way in which diabetes mellitus influences the gender distribution in pulmonary tuberculosis.

Swai et al prospectively followed 1250 African patients with Diabetes mellitus for several years. In 25.7%, Tuberculosis was diagnosed prior to onset of Diabetes mellitus, and in 45.7%, subsequently. In 20.6%, Tuberculosis and Diabetes were diagnosed simultaneously.[8] Our study was comparable to this study with majority of the patients having their Diabetes diagnosed before the diagnosis of Tuberculosis (57/100), 23 diagnosed after TB diagnosis, and 20 with TB diagnosis.

Prevalence of Tuberculosis was greater in those with poorly controlled Diabetes Mellitus.[8] In our study 46/57 = 80.7% of the diagnosed diabetics were uncontrolled. They were either on oral irregular hypoglycemics or alternate system of medicine or their diabetes was not controlled even after regular medications.

An increased susceptibility of patients with diabetes mellitus to develop tuberculosis could be due to neutrophil dysfunction & important cytokines production.[9] Interferon alpha producing capacity of WBC culture has been found to be reduced in patients of diabetes mellitus as well as tuberculosis patients.[9] Tsukaguchi et al[10] found a significant lowered production of IL-1β & TNFα by peripheral blood monocytes in patients with tuberculosis and co existing diabetes mellitus compared to patients with tuberculosis who do not suffer from diabetes mellitus. Production of IL-1β & TNFα was significantly lower in patients with poor glycemic control.[10] Increased susceptibility to tuberculosis is also due to thickened alveolar epithelium & pulmonary basal lamina, decrease pulmonary diffusion capacity, lung volume and elastic recoil in patients with diabetes mellitus. Pathogenesis of these changes is currently thought be due to non enzymatic glycosylation of tissue proteins inducing an alteration in connective tissue in diabetes mellitus.[11] This thickening in alveolar epithelium may decrease the bacillary growth because of the lower oxygen availability for the TB bacilli. But the alveolar thickening may not be that much to lead on to sufficient fall in oxygen levels that decrease the growth. Or as earlier stated, the locally higher glucose levels due to hyperglycemia may overpower this decreased oxygen content and become more significant to cause the bacillary proliferation. Further diabetic autonomic neuropathy also leads to abnormal basal airway tone due to alteration in vagal pathways and thus causing reduced bronchial reactivity and bronchodilation.[11]

The degree of hyperglycemia has been found to have a distinct influence on the microbicidal function of macrophages, with even brief exposures to blood sugar level of 200 mg% significantly depressing the respiratory burst of these cells.[12,13] This is borne out by the observation that in poorly controlled diabetics, with high levels of glycated haemoglobin, tuberculosis follows a more destructive course and is associated with higher mortality.

Pulmonary tuberculosis occurs predominantly in lung apices. It has been suggested that in patients with diabetes mellitus, tuberculosis occur predominantly in lower lobe with frequent cavitary lesions.[14] In other studies also, cavitary disease and multi-lobe involvement was found to be more common in patients with pulmonary tuberculosis and diabetes.[15]

However, in recent case control study, distribution of lesions including cavitary lesions was found to be similar in chest radiographs of tuberculosis patients with or without diabetes mellitus.[16] Our study showed that 68 patients had atypical presentations with either lower lobe involvement, multi lobe involvement, cavitations or shadows fanning out from the hilum. The atypical images of pulmonary tuberculosis in diabetic patients have been vaguely attributed to an immune abnormality and perfusion differences. It is known that diabetes mellitus causes a decrement in the activity of lymphocytes and a diminution in the number of monocytes and macrophages with abnormalities

in their chemotactic and phagocytic activities.[10] Moreover, diabetes also produces dysfunction of polymorphonuclear leukocytes, with a reduction in their bactericidal activity. Whilst more research is needed to clarify the role (if any) of leukocytes, the 'premature aging' of the lung induced by diabetes seems to be the main factor responsible for the development of the 'atypical' radiological pattern.

CONCLUSION

The atypical radiological images like lower lobe involvement, fanning out from hilum or pneumonia like picture could mask the diagnosis of tuberculosis in diabetic patients, making the clinician think of diagnostic possibilities other than tuberculosis, with a consequent delay in the administration of proper treatment, causing far advanced or disseminated TB. Patients with TB and diabetes usually have uncontrolled diabetes. In patients of TB, diabetes may get enmasked because of the stress and infection and patients started on ATT with rifampicin containing regimens may, require increased doses of oral hypoglycemics. In a patient of diabetes having poor control and symptomatology suggestive of TB, TB should be suspected. Patients put on rifampicin containing regimens should have their oral hypoglycemic doses modified for proper and strict glycemic control. To achieve the target level of control, drugs rather than diet should be used. Also a high index of suspicion is required in reading the X-ray films, before making the diagnosis, especially in immunocompromised states like Diabetes mellitus. Proper control of diabetes is important as it can act as a double edged weapon leading to pulmonary TB and delay in diagnosis because of atypical presentations.

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