PREVALENCE OF PULMONARY TUBERCULOSIS AMONG DIABETICS

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This study was performed in the department of medicine, B. V. Hospital, Bahawalpur, Pakistan, between January 2001 and December 2001. Prevalence of pulmonary tuberculosis in 100 diabetic patients admitted consecutively in medical wards was calculated and compared with 100 non diabetic controls admitted consecutively during the same period. In this study the calculated prevalence of pulmonary tuberculosis among diabetic patients was 9.5% compared to non-diabetic patients who had prevalence of 2.08% (P-Value<. 002) indicating 7.5% higher risk in diabetic patients. The purpose of this study was found out the prevalence of pulmonary tuberculosis among patients with tuberculosis.

Key Words: *pulmonary tuberculosis. Diabetes mellitus. Tuberculosis and Diabetic Prevalence.*

INTRODUCTION

Tuberculosis is at least as old as mankind and mycobacteria are believed to be amongst the oldest bacteria on earth. Tuberculosis causes approximately 6% of all deaths world wide[1]. According to conservative estimates around 2 million new cases of tuberculosis are seen each year. The total number of cases of tuberculosis in the world are placed at 15-20 million. The disease is on the rise and available statistics with WHO show that annual incidence of tuberculosis may reach 300 per 100,000 inhabitants in parts of Asia[2]. Data of prevalence of tuberculosis in Pakistan is available from two surveys conducted by the Government of Pakistan and WHO in 1960-61 and 1977-78. On the basis of tuberculin reaction of 10mm +, the first survey reported the prevalence rate of 54.7% whereas the second study reported a figure of 54.4%.

Based on tuberculin reaction of 10mm + the reported number of new cases of tuberculosis in Pakistan are 1.6 million per year[3]. Diabetic patients have an increased propensity to acquire infection particularly of tuberculosis and fungus. Their frequency is reported to be four times higher than in non-diabetic patients[4]. The frequency of pulmonary tuberculosis in another study was 10 times higher among diabetic patients[5]. Diabetics the prevalence of diabetes has been shown to increase in the developing countries as they are being westernised[6]. The estimated prevalence of diabetes mellitus in Pakistan is 8%. There are at present at least 10 million diabetics in the world[7].

A study conducted in 1995, found the coexisting prevalence of diabetes mellitus and pulmonary tuberculosis in Pakistan as 19.8%[8]. Another study conducted in Dakota reported that tuberculosis was more commonly seen in elderly diabetics i.e. more favorable course and outcome of tuberculosis seen in IDDM than in NIDDM. This can be related to younger age and early diagnosis of tuberculosis in IDDM patients[9].

Other studies have shown that patients having higher glycosylated haemoglobin have more serious intoxication, more advanced disease, more prone to destruction, discharge bacteria more frequently and are more resistant to treatment. In diabetes the complications are significantly related to hyperglycaemia. Patients with good metabolic control have fewer complications compared to patient having poor control[10]. Strict plasma glucose control is being important for the prevention as well as avoidance of complications in diabetic patients[10]. Tuberculosis is the ninth most frequent cause of death in Africa[11]. A study performed in Taiwan revealed there was a higher incidence of pulmonary tuberculosis in elderly diabetic patients[12].

MATERIAL AND METHODS

A total of 200 patients were selected and they were divided into two groups:

Group 1: included diabetic patients admitted to the hospital for any reason.

Group 2: comprised of non-diabetic patients admitted to B.V hospital, Bahawalpur during the same period for any reason. Blood samples were taken from veins without stasis and frothing and sent to the central laboratory of B.V Hospital

within half an hour, for glucose estimation. Analysis of plasma was performed by oxidase method at 500nm on spectrophotometer. The diagnosis of diabetes mellitus was based on the following criteria;

(a) *Symptomatic Patients*
Single fasting plasma glucose $\geq$ 7.8mmol/L.
Or random plasma glucose $\geq$ 11.1mmol/L was considered diagnostic[15].

(b) *Asymptomatic Patients*
Criteria for the diagnosis were the same but second confirmatory test was performed[15].

Diagnosis of Pulmonary Tuberculosis

For the diagnosis of pulmonary tuberculosis sputum samples were collected, before starting anti-tuberculosis treatment, in 50ml plastic jars with screw caps. Three to five consecutive early morning sputum samples were sent to the Central Laboratory of BV hospital within one hour after collection. Zeil Neelson staining of sputum smears was carried out in the laboratory. The reporting of smears was based on the following criteria[22].

Culture of Mycobaterium Tuberculosis

Sputum samples were homogenized in the microbiology laboratory with N-acetylcestein. Decontamination of samples was carried out with 4% sodium hydroxide. Later on pH of the samples was made neutral. Cultures were inoculated on Lowen – stein Jensen medium. Reports were collected 6 weeks later[22], The diagnosis of pulmonary tuberculosis was based on the following criteria[13,14,23].

1. Sputum smear positive (3-10 bacilli per slide or more) for acid – fast bacilli at least twice.

Sputum Smears Reporting Criteria

No. of Bacilli	Report
0	No acid fast seen
1-2 per slide	Repeat specimen
3-9 per slide	+ positive
10 or more per slide	++ positive
1 or more per field	+++ positive

2. Sputum smear positive (3-10 bacilli per slide or more) for acid – fast bacilli at least twice.

3. Positive sputum culture for Mycobacterium tuberculosis once.

4. Sputum smear positive once (3-10 bacilli per slide or more) typical symptoms of tuber-culosis in the form of low grade fever for more than one week, cough for more than four weeks and chest X-ray showing cavitatory lesions or consolidation in any of the lobes of the lungs.

Exclusion Criteria

Patients, having risk factors for tuberculosis other than diabetes mellitus, were excluded on the basis of history, physical examination and necessary investigations. And those factors were; silicosis, gastrectomy, ileal bypass, chronic renal failure, high dose corticosteriods, cytotoxic drugs, HIV infection, lymphoma, leukaemia, alcoholism and malnutrition.

Study Groups
Group-I (diabetics)

A total of 100 diabetic patients were enrolled in this group and 5 patients were excluded because they did not fulfil the diagnostic criteria of pulmonary tuberculosis (table 1).

GROUP-II (Non-Diabetic)

The 100 non-diabetic matched controls were enrolled in this group and 4 were excluded because they were unable to fulfill the selection criteria (table 2).

Table 1: *Study Group-I.*

Total patients enrolled	100
Patients excluded from study	05
Remaining patients	95
Male	60
Female	35

Table 2: *Study Group-II.*

Total patients enrolled	100
Patients excluded from study	04
Remaining patients	96
Male	60
Female	36

RESULTS

In both groups the results of 191 patients were analysed. Results of our study were of statistical significance although our study groups contained a small number of patients. By using student T-test the statistical significance of prevalence of pulmonary tuberculosis in diabetics was calculated and the P value was found to be 0.002, which statistically is significant.

Prevalence of Pulmonary Tuberculosis

Group-I (table 3)

Prevalence of pulmonary tuberculosis in diabetics:

Total number of patients having diabeties and pulmonary tuberculosis = 9.

Total diabetic patients = 95.

Prevalence = 9.5%.

Table 3: *Prevalence of pulmonary tuberculosis in diabetics.*

Total diabetic patients	95
Total patients with pulmonary tuberculosis	9
Prevalence of pulmonary tuberculosis	9.5%

Group-II (table 4)

Prevalence of pulmonary tuberculosis in Non-diabetics:

Total number of patients in study group-II (Non-diabetics) = 96.

Total number of Patients with pulmonary tuberculosis in group-II = 2.

Prevalence = 2.08%.

Table 4: *Prevalence of pulmonary tuberculosis in Group-II.*

Total patient with tuberculosis	96
Total patients in group-II	02
Prevalence of tuberculosis	2.08%

Table 5: *Age grouping in diabetics.*

Ages groups (years)	No. of patients
Third decade (20-29)	11
Fourth decade (30-39)	17
Fifth decade (40-49)	25
Sixth decade(50-59)	40
Seventh decade(60-69)	02
Eighth decade (70-79)	0

Table 6: *Age distribution in diabetic tuberculous patients.*

Total patients	9
Patients in 4th & 5th decade	7
Patients in 3rd decade	2

Distribution of Age

Group-I (Diabetic Patients)

Age range was from 20-60 years but 68.42% patients were in 4th and 5th decade of life. Out of 9 patients having pulmonary tuberculosis 2 were in the 3rd decade (22-27) and rest of the 7 were in 4th and 5th decades (table 5 and 6).

Group-II (Non-diabetic patients)

In the control group again the same age group people were selected, 67.70% patients were in 4th and 5th decade of life. Out of 96 patients two patients had pulmonary tuberculosis, one was 20 years old and the other was 50 years old (table 7, 8).

Table 7: *Age grouping in non-diabetics.*

Age groups (years)	No. of Patients
3rd Decade (20-29)	11
4th Decade (30-39)	17
5th Decade (40-49)	25
6th Decade(50-59)	40
7th Decade(60-69)	02
8th Decade (70-79)	01

Table 8: *Age distribution in non - diabetic tuberculous patients.*

Total patients	2
Patients in 5th decade	1
Patients in 3rd decade	1

Sex Distribution

Group-I
Among 95 patients 60 were males and 35 were females. Only 9 patients had pulmonary tuberculosis out of which 7 were males and 2 were females (table 9).

Group-II
In 96 patients 60 were males and 36 were females. In this group only 3 patients had pulmonary tuberculosis 1 was male and the other was a female (table 10).

Table 9: *Sex distribution in tuberculous diabetic group.*

Sex	Frequency	Percent
Male	7	77.77
Female	2	22.22
Total	9	100

Table 10: *Sex distribution in tuberculous non-diabetic group*

Sex	Frequency	Percent
Male	1	50
Female	1	50
Total	2	100

Distribution of Type I and Type II Diabetics Mellitus

Among 95 diabetic patients, predominant group had Type-II diabetes mellitus. Eighty patients were with type-II diabetes mellitus (84.22%). Fifteen patients were with type-I diabetes mellitus (15.78%) (Table 11).

Radiological Findings in Diabetics Group

Radiologically lower lobe involvement and multilobe involvement, were the commonest presentations (Table 13).

Table 11: *Distribution of type type-I and type II diabetes mellitus in group-I.*

Type of diabetes	Frequency	Percent
Type-I	15	15.78
Type-II	80	84.21
Total	95	100

Table 12: *Chest X-ray findings in tuberculosis in diabetic patients.*

Lung Lobe involved	Frequency	Percent
Upper lobe involvement	2	22.22
Middle lobe involvement	1	11.11
Lower lobe involvement	3	33.33
Multilobe involvement	3	33.33
Total	9	100

DISCUSSION

Diabetes mellitus is a very common metabolic condition and is one of the major disease affecting people across all kinds of barriers. It is on the rise everywhere in Pakistan.

In Pakistan both diabetes and pulmonary tuberculosis are very common, we searched the local literature but could not find any study into the prevalence of pulmonary tuberculosis in diabetics however International studies were available for comparison. Regarding the prevalence of tuberculosis in diabetic patients, different studies have shown different results. One study performed in Addis Ababa University Hospital showed 15.8% prevalence of tuberculosis among diabetics[18]. Another study showed the relative risk of pulmonary tuberculosis among diabetics i.e 3-5 times higher than in the control group[71]. In our study the calculated prevalence of pulmonary tuberculosis among diabetic patients was 9.5 % compared with non-diabetic patients who had a prevalence of 2-8% (p-value<.002) indicating 7.5% higher risk in diabetic patients.

The present study shows higher prevalence compared to the other studies, which may be explained because of the higher prevalence of tuberculosis in developing countries like Pakistan. According to one of the WHO report on tuberculosis presented in Geneva in 1997, each year 210,700 new cases of tuberculosis occur in Pakistan[20]. In

an Ethiopian study the prevalence of tuberculosis in diabetic males was 52.7% compared to 43.3% in female diabetic patients. In our study 77.77% were males and 22.22% were females in Group-I. This sex difference may be due to less consultation, less awareness and less education to our women.

In the diabetic group with pulmonary tuberculosis 7/9 (77.77%) of our patients were in their 4th and 5th decade of life while 2/9(22.22 %) were in the 3rd decade. The age range in different studies was the same[16-18]. In our study we have observed that clinical and radiological features of tuberculosis in diabetics have a different pattern compared with a matched control. Radiologically apices are commonly involved in pulmonary tuberculosis in non-diabetics. In our study of diabetic group bilateral involvement was found in 44.44%, lower lobe in 33.33%, upper lobes in 22.22% and middle lobes in 11.11%. The lower lobe involvement in diabetic patients has been shown in different studies[19,21].

The aim of our study was to find the prevalence of pulmonary tuberculosis among diabetic patients admitted to medical wards of B.V. Hospital Bahawalpur, which is a teaching hospital affiliated with Quaid-e-Azam Medical College, Bahawalpur. The association between diabetes mellitus and pulmonary tuberculosis emphasises that this group should be a target for tuberculosis screening.

CONCLUSION

The prevalence of pulmonary tuberculosis among diabetic patients is higher than non-diabetic patients admitted to B.V. Hospital, Bahawalpur. The prevalence in male patients is higher than female patients. The major group having pulmonary tuberculosis with diabetes mellitus was in 4th and 5th decades of life. The major symptoms of tuberculosis were fever, weight loss and cough. The predominant signs in our study of pulmonary tuberculosis in diabetics were coarse crepitations and bronchial breathing. Radiologically bilateral and lower lung field involvement was the predominant finding. Our study may not get a high statistical significance because of small number of patients however this local data may help in a future broad based studies.

REFERENCES

1. Ravilglon MC, O' Brien RJ. Tuberculosis in: Fauce AS, Braunwald, Isselacher KJ, Wilson JD, Martin JB, Kaspr DL, Longo L. eds. Harrison's Principles of Internal Medicine. 14th edition. New York: McGraw-Hill Companies, 1998: 1004-1014.

2. Yad I, Pathan AJ. In: Iliyas M. eds: Community Medicine and Public Health 4 th edition. Karachi: Time Reader, 1997: 544-45.

3. Yad I Pathan AJ Iliyas M.eds: Community medicine and Public Health 4th edition. Karachi: Time Reader 1997: 548-49.

4. Marvisi M, Marani G, Brianti M, Dela PR , Pulmonary complications of diabetes mellitus. Recent progress in medicine 1996: 87 (11): 623-27.

5. Gary SM. In:Rom WN, Gary SM. eds. Tuberculosis First edition, Boston, New York: Little Brown and Company, 1996: 672-8.

6. Kerin o' dea. Environmental factors in NIDDM. Digest 1996 Mar; 9 (3): 1-15.

7. Zimmet P Globalization, Coca-Colanization and the chronic disease epidemic: can the doomsday scenario be averted. J Internal Medicine 2000, March; 247 (3): 301-10.

8. Jawad F, Shera AS, Memon R Ansari G. Glucose intolerance in pulmonary tuberculosis. JPMA-J Pak Med- Assoc 1995 Sep: 45 (9): 237-38.

9. Morley JE. The elderly type-II diabetic patients: special consideration. Diabetic Medicine 1998: 15 Suppl 4: S 41-6.

10. Hashim R, Khan AF, Khan AD, Shoukat A. Prevalence of microvascular complications in diabetic patient. JCPSP 1999 Mar; 9 (3) : 120-022.

11. Sidide EH. Main complication of diabetes mellitus in Africa. Ann Med Intern 2000 Dec; 15 (8): 624-28.

12. Liaw-YS, Yang PC; YU-CJ; WU-ZG, Chang-DB; Lee-LN; Kuo-SH; LUL-KT: Clinical spectrum of tuberculosis in older patients: J Am-Geriactric-Soc. 1995 March; 43(3): 256-60.

13. Harrues-AD, Mphasa-NB, Mundy-C, Benrjee-A, Kwanjan JH, Sulanipoini-FM. Screening tuberculosis suspects using two sputum smears. Int-J-Tuberc-Lung-Dis 2000 Jan; 4 (1): 36-40.

14. Aris-EA, Bakari-M, Chonde-TMJ, Kitinya J, Swai AB. Diagnosis of tuberculosis in sputum negative patients in Dar es Salam. East Afr Med J 1999 Nov; 76 (111): 630-34.

15. Harrus MI, Zunnet P. Classification of Diabetes Mellitus and other categories of Glucose Intolerence In: Albert KGMM. Zimmet P, DeFranzo, Kee H. eds. International Textbook of Diabetes Mellitus. 2nd edition. Chichester; Wiley, 1997: 9-23.

16. Kim SJ, Hong YP, Lew WJ, Yang Sc, Lee EG. Incidence of pulmonary tuberculosis among diabetic. Tuber Lung Dis 1995; 76(6): 529-33.

17. Kako K, Sakibarah H, Satoy M, Kamidaira M, Suet S. Actual status of the management of tuberculosis patients in university hospital without isolation wards for infection diseases. Kakku 1997; 72(6): 395-401.

18. Felk Y, Abdulkadir J. Adraye G. Prevalence and clinical features of tuberculosis patients. The role of diabetes mellitus in the higher prevalence of tuberculosis among Hispanics. East Adr Med L 1999 Jul; 76(7): 361-64.

19. Wilcke JT, Askgaard Ds, Nybo JB, Dossing M. The radiographic spectrum of adult pulmonary

tuberculosis in a develop country Respir Med 1998 Mar; 92 (3): 493-97.

20. Gunzman CP, Cruz AT, Velarda HV, Vargas MP. Progressive age related changes in pulmonary tuberculosis. Images and the effect of diabetes mellitus. AM J Respir Crit Care Med 2000; 162 (5): 173-40.

21. Kubam C, Fostin JG, Koulla SS, Akono MR. Lower lung field tuberculosis in Younde, /Cameron Cent Aft J Med 1996; 42 (3): 625.

22. Joklik WK, Wellet WP, Amos DB, Welfort CM. eds. Zinssers Microbiology 20th Edition. Connecticut: Appleton And Lange. 1992: 498-625.

23. Marciniuk DD, McNab DB, Martin WT, Vernon H, Hoeppner. Detection of Pulmonary Tuberculosis patients with a Normal chest readiograph. Chest 1999; 115: 445-52.