

Original Research Article

Study of pulmonary tuberculosis in diabetes mellitus

Vinay Kumar A.*, Raj Kumar K., Nithin Kumar Reddy R.

Department of Pulmonary Medicine, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India

Received: 25 April 2018

Accepted: 22 May 2018

***Correspondence:**

Dr. Vinay Kumar A.,

E-mail: saisamratk.78@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: To study the clinical profile of pulmonary tuberculosis in diabetic patients and to study the radiographic patterns of pulmonary tuberculosis in diabetic patients.

Methods: The study was undertaken on 100 patients with diabetes mellitus and pulmonary tuberculosis of both sexes admitted to Chalmeda Anand Rao Institute of Medical Sciences, Bommakal, Karimnagar.

Results: The fasting blood sugar value showed a definite co-relation with pulmonary tuberculosis. 41% of the patients had fasting blood sugar value between 201 to 300mg/dl and 30% had value between 151-200mg/dl and 23% of the patients had value above 300mg/dl. Mean fasting blood sugar value was 234.4mg/dl. 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.

Conclusions: Uncontrolled diabetes mellitus patients are more prone to develop pulmonary tuberculosis compared to non diabetics. Sputum examination tends to be positive in diabetics compared to non diabetics.

Keywords: Diabetes mellitus, Fasting blood sugar, Pulmonary tuberculosis, Post prandial blood sugar, Sputum examination

INTRODUCTION

Tuberculosis (TB) and diabetes mellitus (DM) are both important health issues. The link of DM and TB is more prominent in developing countries where TB is endemic and the burden of diabetes mellitus is increasing. The association between diabetes and tuberculosis may be the next challenge for global tuberculosis control world wide.

Tuberculosis (TB) continues to infect an estimated one-third of the world's population, to cause disease in 8.8 million people per year, and to kill 1.6 million of those afflicted.¹ The global burden of diabetes mellitus (DM) is expected to rise from an estimated 180 million prevalent cases currently to a predicted 366 million by 2030 with the greatest increase projected in the developing world.² DM increases the risk of active TB with an

approximately three fold risk of developing active TB been reported.³

Tuberculosis supervening on preexisting diabetes often is devoid of the early warning signs and symptoms. The patient may attribute malaise, loss of appetite and weight loss to an exacerbation of his diabetic state. The patient usually attributes cough with expectoration and fever to frequent respiratory tract infection he is prone to develop.

Eventually, these alterations are attributed to improper control of diabetes mellitus and the onset of tuberculosis is masked long enough for the disease to get established when the florid signs and symptoms become manifest. Similarly tuberculosis patients attribute their worsening of conditions to diabetes and hence fail to suspect diabetes mellitus.

Tuberculosis should be considered in patients with diabetes who have weight loss, fever, generalised debility that cannot be fully explained by poor diabetic control alone. General or constitutional symptoms are due to liberation of products from diseased foci into the bloodstream and include lassitude and malaise, loss of appetite, loss of weight, anaemia, sweating, tachycardia, pyrexia, digestive disturbances. The other common symptoms of tuberculosis include cough, hemoptysis, chest pain and dyspnea.

METHODS

The study was undertaken on 100 patients with diabetes mellitus and pulmonary tuberculosis of both sexes admitted to Chalmeda Anand Rao Institute of Medical Sciences, Bommakal, Karimnagar.

Period of study was from December 2014 to October 2016. Permission to conduct the study was obtained from Institutional Ethics committee (IEC), Chalmeda Anand Rao Institute of medical Sciences, Bommakal, Karimnagar. Informed oral was consent obtained from all patients. Pulmonary tuberculosis was diagnosed by detailed history, clinical examination, sputum examination for acid fast bacilli and chest radiography. Diabetes mellitus was diagnosed using the national diabetes data group and WHO diagnostic criteria:

- Symptom of diabetes plus random blood sugar ≥ 11.1 mmol/L (200mg/dl) or
- Fasting plasma glucose ≥ 7.0 mmol/L (126mg/dl) or
- Two-hour plasma glucose ≥ 11.1 mmol/L (200mg/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.

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. As show in Table 1, number of males in this study group were 72 (72%) and females 28 (28%). Since type I diabetes mellitus (<30yrs) cases were less, patients were divided into 2 groups.

- First group: Age less than or equal to 40 yrs- 21 patients (21%).

- Second group: Age more than 40 yrs -79 patients (79%).

Table 1: Sex distribution

Male	Female	Total
72	28	100

Table 2: Duration of diabetes.

Duration (yrs)	Number of patients	Percentage
≤ 1	8	8
2-5	19	19
6-10	53	53
>10	20	20
Total	100	100

Table 3: Fasting blood sugar in tuberculous diabetics.

Fasting blood sugar (mg/dl)	No. of patients	Percentage
126-150	6	6
151-200	30	30
201-300	41	41
>300	23	23

Table 4: Post prandial blood sugar values in tuberculous diabetics.

Post prandial blood sugar (mg/dl)	No. of patients	%
200-250	17	17
251-350	38	38
>350	45	45

Table 5: Sputum AFB-results.

Sputum AFB	≤ 40 Yrs (n = 21)	>40yrs (n =79)
Positive	17 (81%)	41 (52%)
Negative	4 (19%)	38 (48%)

As shown in Table 2, 53% of the patients had a duration of diabetes between 6-10 yrs and 19% of the patients had a duration of diabetes between 2-5 yrs and in 8% of the patients, duration of the diabetes was less than 1yr. 20% of the patients had diabetes more than 10yrs.

As shown is Table 3, the fasting blood sugar value showed a definite co-relation with pulmonary tuberculosis. 41% of the patients had fasting blood sugar value between 201 to 300mg/dl and 30% had value between 151-200mg/dl and 23% of the patients had value above 300mg/dl. Mean fasting blood sugar value was 234.4mg/dl.

As shown in Table 4, 45% of the patients had a post prandial blood sugar value above 350mg/dl, 38% had values between 251-350 mg/dl and only 17% of the

patients had value between 200-250mg/dl. Mean post prandial blood sugar value in the study group was 341.5mg/dl.

As shown in Table 5, sputum AFB was demonstrated in 81% of cases ≤40 yrs and in 52% of cases >40 yrs.

Table 6: Side of lesion (right/left/bilateral).

Side	≤ 40		> 40 yrs		Total
Involved	Male	Female	Male	Female	
Left	2	2	24	5	33
Right	4	5	21	7	37
Bilateral	5	4	15	6	30

Table 7: Lower lung field tuberculosis.

Age	≤ 40 (n = 21)	> 40 (n = 79)	P value
No. of patients	3	29	P <0.05 (Sig.)

As shown in Table 6, 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.

As shown Table 7, lower lung field lesions were noted in 32% of the cases. Of these 3 cases were observed in age group ≤40 yrs and 29 cases above age of 40 yrs.

DISCUSSION

A clinical and radiological evaluation of 100 cases of pulmonary tuberculosis with diabetes mellitus was done. The high incidence of tuberculosis in diabetic patients, reported by western and Indian workers suggest a significant association between these two diseases.^{4,5}

Sex distribution

In our study the total number of males were 72% and females were 28%. The male to female ratio was 2.6:1. Other studies have shown that, the prevalence as well as incidence of tuberculosis is higher among males than among females, the ratio varying from 3:1 to 5:1.

In a study of 2434 cases of pulmonary tuberculosis by Desmukh and others, it was reported that 62.9% were males and 37.1% were females. Among the 138 cases of diabetes with pulmonary tuberculosis, 72.4% were males and 27.53% were females.⁶ Patel JC showed a similar ratio of male:female. In the 179 cases he studied, 76% were males and 24% were females.⁷ Morris and others also in their study observed that male population outnumbered the females.⁸ Tripathy and Kar reported that 78% of their patients were males.⁹

All the above studies showed an increased incidence of the disease in males as compared to females and our study also noted the same. The high incidence of disease in males is possibly due to the fact that both tuberculosis and diabetes are more common in males.

Duration of diabetes

The study of the duration of diabetes in relation to the onset of tuberculosis showed that in most cases, diabetes mellitus was diagnosed before the development of tuberculosis.¹⁰

Prior to the onset of tuberculosis, 53% patients had duration of diabetes between 6-10 yrs, 19% of the patients had duration of diabetes between 2-5 yrs and 8% of the patients less than 1yr and 20% of the patients had diabetes more than 10 years. The average duration of diabetes in this study was 6.6 yrs with standard deviation ±3.4. The interval between detection of diabetes and the onset of pulmonary tuberculosis was studied by Tripathy and others. They reported that it varied from several months to 15 yrs, mean interval being about 6 yrs.^{9,11}

In another study, diabetes was detected before tuberculosis in 70% of cases. 32% of patients had diabetes for 1-5 yrs, 32% had it for 6-10 yrs and 20% more than 10 yrs.¹²

The duration of diabetes is significant because there is an increased opportunity for infections with increased duration of diabetes. The result of the present study is comparable to other studies. Some studies have reported that there is no correlation between the duration of diabetes and the development of pulmonary tuberculosis.^{6,13}

Fasting and post prandial blood sugar in tuberculous diabetics

The fasting blood sugar value of 200-300mg% 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 controlled.

In a study done by Sachdeva AK and others, it was showed that high incidence of pulmonary tuberculosis was associated with severe hyperglycemia.¹³ Deshmukh PA also had made a similar observation.⁶

In a study in 180 cases of diabetics, daily dose of more than 100 units of insulin was needed in 88.7% of tuberculous diabetics and in 25.2% of non-tuberculous diabetics.¹³ The finding in this study is consistent with the

proposal that there is correlation between infection and plasma glucose levels.¹⁴

Sputum examination

There were 81% of patients <40 yrs and 52% of the patients >40yrs were sputum positive for acid fast bacilli. P value was 0.02 which is significant in that sputum positivity is more in patients aged <40yrs.

In patients >40yrs, cavitation and fibrosis were more compared to <40yrs patients. Cavitory lesions though maintain high bacterial population, less smear positivity is noted in diabetes. This may be related to muscle weakness due to uncontrolled hyperglycemia and less effective expectoration.¹⁵ In our study also in patients >40 yrs, sputum positivity was less, and the results are comparable to other studies.

Radiological examination

The examination of chest radiograph revealed that 70% of the patients had unilateral lesions and 30% of the patients had bilateral lesions. In both these group, predominant lesions were noted in the upper zone.

In our study, right sided lesion was noted in 37% and left side in 33% and rest of the lesions were bilateral. The increased incidence of bilateral disease is due to the rapid dissemination of tuberculosis in diabetics. 32% of patients in our study had lower lung field involvement. It was more common in age group >40 yrs. (29 out of 79 cases). In study done by Bacakoglu F and others, it was reported that in tuberculous diabetics lower lung field tuberculosis was significantly associated with female gender, and in patients older than 40 yrs.^{16,17} In study done by Ravindran P and others, the lower lung field tuberculosis among diabetic tuberculous patients was 13.81%.¹⁸

In our study also, lower lung field involvement was more in patients aged >40 yrs and female gender and results are comparable to other studies. Lower lung field involvement is an atypical presentation of pulmonary tuberculosis that often confuses the diagnosis. Lower lung tuberculosis is more common in females than males. Lower lung field tuberculosis is defined as tuberculous disease found below an imaginary line traced across the hila and including the parahilar region on a standard PA chest radiograph.

CONCLUSION

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 greater than 40 yrs. Lower lung field tuberculosis was more common in patients aged >40 yrs and in female gender.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health Organization. Tuberculosis Fact Sheet. Fact Sheet No.104. 2007. Available at <http://www.who.int/mediacentre/factsheets/fs104/en/print.html>. Accessed 25 September 2007.
2. World Health Organization. Diabetes fact sheet No. 312. 2006. Available at: <http://www.who.int/mediacentre/factsheets/fs312/en/index.html>. Accessed 12 March 2008.
3. Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. *PLoS medicine*. 2008 Jul 15;5(7):e152.
4. Vishwanath R. History of tuberculosis. In: Rao KN, Vishwanath R, Deshmukh MD, editors. *Textbook of tuberculosis*. 2nd edition Vikas publishing house; 1981:2-3.
5. Davies PDO, Girling DJ, Grange JM. Tuberculosis and its problems in developing countries. In: Weatherall DJ, Ledingham GG, Warrell, editors. *Oxford Textbook of Medicine*. Oxford University Press;1996;3:638.
6. Deshmukh PA, Shaw T. Pulmonary tuberculosis and diabetes mellitus. *Ind J Tub*. 1984;31:114.
7. Patel JC, Desouza, Cheryl, Jigjini SS. Diabetes and tuberculosis. *Ind J Tub*. 1977;24:155-8.
8. Morris JT, Seaworth BJ, McAllister CK. Pulmonary tuberculosis in diabetics. *Chest*. 1992;102:539-41.
9. Tripathy SR, Kar KP, Chakraborty DC, Majumdar AK. Diabetes mellitus and pulmonary tuberculosis- A prospective study. *Ind J Tub*. 1984;31:122.
10. Feza B, Ozen KB, Gursel C, Abdullah S, Mahmut A. Pulmonary tuberculosis in patients with diabetes mellitus. *Respiration*. 2001;68:595-600.
11. Nihalani KD, Menon P. Diabetes association with pulmonary tuberculosis. *J Diabetes Assoc India*. 1978;18:79.
12. Anand AL. Pulmonary tuberculosis and diabetes mellitus-radiological consideration. *Ind J Tub*. 1984;31:91.
13. Sachdeva AK, Arora RC, Misra DN. Clinicoradiological study of pulmonary tuberculosis in diabetics. *J Assoc Physicians India*. 1984;32:30.
14. Oluboyo PO, Erasmus RT. The significance of glucose intolerance in pulmonary tuberculosis. *Tubercle*. 1990 Jun 1;71(2):135-8.
15. Banerjee S, Banerjee M. Diabetes and tuberculosis interface. *J Indian Med Assoc*. 2005;103:318-22.

16. Bacakoglu F, Basoglu O, Cok G, Sayiner A, Ates M. Pulmonary tuberculosis in patients with diabetes mellitus. *Respiration*. 2001;68(6):595-600.
17. Perez GC, Torres CA, Villarreal VH, Vargas MH. Progressive age-related changes in pulmonary tuberculosis images and the effect of diabetes. *Am J Respir Crit Care Med*. 2000;162(5):1738-40.
18. Ravindran P, Joshi M, Sundaram P, Joseraj R, Parameshwaran K. Lower lung field tuberculosis. *Ind J Tub*. 1992;39:29.

Cite this article as: Vinay KA, Raj KK, Reddy NKR. Study of pulmonary tuberculosis in diabetes mellitus. *Int J Res Med Sci* 2018;6:2375-9.