"PREVALENCE OF TB IN PATIENTS WITH DM UNDER REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME"

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Conflict of interest: Nil

Abstract

Background: DM has been shown to be an independent risk factor for TB, and there is evidence showing high DM prevalence in TB patients in studies mainly from the southern part of India. This strong association between DM and TB raises the question as to whether TB patients should be routinely screened for DM. Many studies have been conducted to establish the relation between TB and DM using fasting blood glucose as the parameter.

Objective: The primary objective of this study was to detect the prevalence of Diabetes Mellitus in the newly diagnosed TB patients by HbA1C and Fasting Blood Glucose.

Design: This was a Cross Sectional study.

Duration: The present study was conducted from January 2015 to June 2016.

Setting: Shadan Institute of Medical Sciences, Hyderabad.

Participants: 280 patients diagnosed with tuberculosis at the chest clinic of Shadan Institute Of Medical Sciences, Hyderabad.

Methods: 140 out of the 280 patients who were diagnosed as TB underwent blood tests for Fasting Blood Glucose and HbA1C along with the routine investigations like CBP, ESR, Chest X ray, ECG, Sputum examination. The data of patients with TB and DM and patients with only TB was compared. The data of pulmonary and extra pulmonary TB groups was compared. The data of sputum positive and sputum negative groups was compared. Student's *t* test was performed for normally distributed continuous variables and a *p* value was derived.

Results: 38(27%) out of 140 patients had abnormal HbA1c i.e. > 6.5% having a strong association with male gender and age more than 45 years. The majority of the patients who had diabetes in this study, also had sputum positive TB(57%). This study showed a significant difference in mean age between the two groups of TB with diabetes(44.88 ± 5.721) and TB without DM(34.598 ± 10.56).

Conclusion: There was a high prevalence of DM amongst the TB patients registered under RNTCP. Diabetes makes a substantial contribution to the burden of incident tuberculosis in India, and the association is particularly strong for the infectious form of tuberculosis. The current diabetes epidemic may lead to a resurgence of tuberculosis in endemic regions, especially in urban areas. This potentially carries a risk of global spread with serious implications for tuberculosis control.

Keywords: Tuberculosis, Diabetes Mellitus, Blood Glucose, Sputum.

INTRODUCTION

India is a country with 1.2 billion people (17.5% of the world's population). India is the second most populated country in the world and one fourth of global incident TB cases occur in India annually. According to WHO Global TB Report 2015, out of the 9.6 million annual global incidence of TB, 2.2 million were estimated to have occurred in India. India is also

the diabetes capital of the world. With economic development and lifestyle changes in our country, there is also a rising epidemic of diabetes mellitus (DM), also among the poor. It is estimated that there are over 60 million people with DM in our country with the number expected to increase to 80 million by 2030. This increase in the prevalence of DM has been noted in both urban and rural areas. DM has been shown to be an independent risk factor for TB,

and there is evidence showing high DM prevalence in TB patients in studies mainly from the southern part of India. This strong association between DM and TB raises the question as to whether TB patients should be routinely screened for DM. Patients with TB would merit being screened for DM, given the high burden of both the diseases in our country and immune suppression in DM affecting the course and treatment outcome of TB. Many studies have been conducted to establish the relation between TB and DM using fasting blood glucose as the parameter. This study includes screening of TB patients for DM by HbA1C and FBG to determine the prevalence of DM in newly diagnosed cases of TB.

MATERIALS AND METHODS

Place of Study: Shadan Institute Of Medical Sciences, Hyderabad.

Type of Study: This was a Cross Sectional study.

Sample Collection: Sample Size: 140

Sampling Methods: Consecutive Patients.

Inclusion Criteria:

1. TB patients attending chest OPD.
2. TB patients admitted in IPD.
3. Age more than 20 years.

Exclusion Criteria:

1. Patients with history of DM.
2. Age less than 20 years.
3. TB and HIV.

Statistical Methods: The data of patients with TB and DM and patients with only TB was compared. The data of pulmonary and extra pulmonary TB groups was compared. The data of sputum positive and sputum negative groups was compared. Student's *t* test was performed for normally distributed continuous variables and a *p* value was derived.

OBSERVATIONS AND RESULTS

The total number of patients participating in the study was 140 out of which, 82(58%) were males and 58(41%) were females. Out of the 140 patients, 105(35%) were pulmonary TB and 35(25%) were EPTB. In the PTB, 83(69%) were sputum positive and 22(31%) were sputum negative.

MEAN AGE OF PATIENTS IN PTB AND EPTB

Table 1: Mean Age of Patients in PTB and EPTB

	PULMONARY TB	EXTRAPULMONARY TB
MEAN AGE OF PATIENTS	43.47 ± 6.36	34.598 ± 1056
		p < 0.001

Mean age of patients with abnormal HbA1C (n = 38) was 43.47 ± 6.36 and that of normal HbA1C (n = 102) was 34.598 ± 10.56 which was statistically significant (p < 0.001).

MEAN HbA1C IN PTB AND EPTB

Table 2: Mean Hba1c in PTB and EPTB

	PULMONARY TB	EXTRAPULMONARY TB
MEAN HbA1C	6.5031 ± 0661	6.2162 ± 0781
		p = 0.2109

Mean HbA1C for total subjects (n=140) was 6.39 ± 0.710. For PTB (n=105) group it was 6.5031 ± 0.661 and 6.2162 ± 0.781 for EPTB (n=35) group which was statistically insignificant (p = 0.2109).

MEAN HbA1C IN SPUTUM POSITIVE AND SPUTUM NEGATIVE

Table 3: Mean Hba1c in Sputum Positive and Sputum Negative

	SPUTUM POSITIVE	SPUTUM NEGATIVE
MEAN HbA1C	6.5091 ± 0.695	6.1846 ± 0.636
		p = 0.365

Mean HbA1C for SPUTUM POSITIVE (n= 83) group was 6.5091 ± 0.695 and for SPUTUM NEGATIVE (n=57) group it was 6.1846 ± 0.636. The difference was statistically not significant (p = 0.365).

NUMBER OF PATIENTS WITH CONTROLLED AND UNCONTROLLED DM

Table 4: Number of Patients with Controlled and Uncontrolled DM

No OF PATIENTS WITH HbA1C > 7	No OF PATIENTS WITH HbA1C BETWEEN 6.5-7	No OF PATIENTS WITH HbA1C < 6.5
21	17	102

Total number of subjects with uncontrolled DM(HbA1C > 7) were 21. Number of subjects with HbA1C < 7 were 119.

MEAN FBS IN PTB AND EPTB

Table 5: Mean FBS in PTB and EPTB Groups

	PULMONARY TB	EXTRAPULMONARY TB
MEAN FASTING BLOOD GLUCOSE	116.3 ± 34.4	106.96 ± 64.61
		p = 0.3134

Mean fasting blood glucose for total subjects (n = 140) was 111.75 ± 33.42. For PTB (n= 105) group it was 116.3 ± 34.4 and for EPTB (n= 35) group it was 106.96 ± 64.61[p = 0.3134 (Not significant)].

MEAN FBS IN SPUTUM POSITIVE AND SPUTUM NEGATIVE

Table 6: Mean FBS in Sputum Positive and Sputum Negative Groups

	SPUTUM POSITIVE	SPUTUM NEGATIVE
MEAN FASTING BLOOD GLUCOSE	121.12 ± 34.10	98.34 ± 49.21
		p = 0.0019

Mean fasting blood glucose for SPUTUM POSITIVE (n= 83) group was 121.2 ± 34.10 and for SPUTUM NEGATIVE (n= 57) group it was 98.34 ± 49.21[p = 0.0019 (Statistically significant)].

DISCUSSION

There is a high prevalence of DM amongst the TB patients registered under RNTCP. This was significantly associated with males and age above 45 years. The major concern was that 21 out of the 38 diabetics had HbA1C more than 7 indicating uncontrolled DM. This is as per the recommended glycemic goals for non-pregnant adults by American Diabetes Association.

In this study, 38(27%) out of 140 patients had abnormal HbA1c i.e. >6.5% and a strong association in males and age more than 45.

These findings were similarly seen in a study from Kerala by Balakrishnan et al, who screened 552 TB

patients for Diabetes Mellitus out of which 44%(243) had DM. Of the 243 diabetics, 128(23%) had a previous diagnosis of DM and 115 (21%) were newly diagnosed to have DM with HbA1C >6.5 and a significant association with males and age more than 50.¹

The majority of the patients who had diabetes in this study, also had sputum positive TB(57%) seen also in the study by Kumpatla et al who screened 7083 DM patients among which 38 already had TB. Of the remainder, 12 were newly diagnosed with TB. Of the 50 TB patients, 64% had smear-positive pulmonary TB (PTB).³

Kirani et al⁴ screened 50 cases of known TB cases for DM and detected 20(40%) diabetics which was similar to this study where 37% of TB cases had diabetes.

Another study which showed an association of sputum positivity and diabetes is by Kumar et al who screened six DM clinics in tertiary hospitals across India. In the three quarters, 26% of 7218, 52% of 12237 and 48% of 11691 patients with DM were screened for TB. A total of 254 patients were identified with TB, of whom 46% had smear positive pulmonary disease.⁵

Another study which showed a strong association of sputum positive TB and DM is by Stevenson et al who constructed an epidemiological model using data on tuberculosis incidence, diabetes prevalence, population structure, and relative risk of tuberculosis associated with diabetes. Diabetes accounts for 14.8% (uncertainty range 7.1% to 23.8%) of pulmonary tuberculosis and 20.2% (8.3% to 41.9%) of smear-positive (i.e. infectious) tuberculosis.⁹

This study showed a significant difference in mean age between the two groups of TB with diabetes(44.88 ± 5.721) and TB without DM(34.598 ± 10.56) which is also seen in a study by Alisjahbana et al, who screened 737 patients with pulmonary TB in Indonesia. DM was diagnosed in 14.8% of patients with TB and was associated with older age.⁷

Another study which showed a significant difference in mean age between the two groups of TB with DM and TB without DM is by Alavi et al who reviewed the medical files of documented tuberculosis cases and divided it into 2 groups of DM-TB and non-DM-TB. The data in the two groups were compared. One hundred and forty eight TB cases [36 (24.3%) DM cases with the mean age of 56.6±12.7 years, and 112 (75.7%) non-DM with mean age of 44.8±18.3 years]

were studied. The estimated odds ratio (OR) of the association between DM and tuberculosis was 2.65.⁸

Kishan et al studied 100 patients suffering from both TB and DM. It was found that majority were males (61/100). The age group most commonly involved was the 40-60 year group (76/100). Out of these 57 diagnosed diabetics, 11 patients had controlled diabetes whereas 46 (87.1%) had uncontrolled diabetes.¹⁰ This study by Kishan et al had similar findings to the present study where the majority were males and age group involved was 40-60 and majority had uncontrolled DM(56%).

These findings were also seen in a study by Cordeiro et al studied 11 317 TB patients, that were recorded in the national data. There was a male predominance in patients both with and without DM (71.1% and 69.7%, respectively). Patients with DM were significantly older ($p < 0.001$), with half being aged > 60 years.¹⁵

Higher incidence in males and significant age difference between TB with diabetes and TB without DM was also noted by Nissapatorn et al who studied 1,651 non HIV-infected patients registered for tuberculosis treatment. A total of 241 tuberculosis patients with diabetes (TBDM group) were included. Diabetes mellitus was confirmed by at least two-serum fasting glucose levels over 140 mg/dl. An additional group of 1,410 patients with only tuberculosis (TB group) were included and used as control. Patients in the TBDM group were significantly older (51.5 ± 12.02 years, range 18-88) than in the TB group (37.5 ± 15.4 years, range 14-95) and had a higher male: female ratio (2.2:1 vs 1.9:1).¹⁶

The strengths of this study are that screening was implemented within the routine system with existing staff.

The limitation of the study is that a follow up data could not be generated because all the patients once diagnosed with TB in the medical college would be dispensed to collect the medicines of RNTCP elsewhere nearby their homes.

CONCLUSIONS

There was a high prevalence of DM amongst the TB patients registered under RNTCP. Diabetes makes a substantial contribution to the burden of incident tuberculosis in India, and the association is particularly strong for the infectious form of tuberculosis. The current diabetes epidemic may lead

to a resurgence of tuberculosis in endemic regions, especially in urban areas. This potentially carries a risk of global spread with serious implications for tuberculosis control. Advocacy and the political will to deploy more effective and affordable point-of-care diagnostics at DM clinics might assist in the diagnosis and management of both of these diseases. This is urgently required if we are to move forward in making TB screening routine in DM clinics.

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REFERENCES

1. Balakrishnan S, Vijayan, Sanjeev Nair et al High Diabetes Prevalence among Tuberculosis Cases in Kerala India, Plos ONE 7(10): e46502. doi 10.1371/journal.pone.0046502.
2. P. Dave, A. Shah, M. Chauhan et al, Screening patients with tuberculosis for diabetes mellitus in Gujarat, India, International Union Against Tuberculosis and Lung Disease Vol 3 Supplement 1 Published 4 November 2013.
3. S. Kumpatla, A. Sekar, S. Achanta et al, Characteristics of patients with diabetes screened for tuberculosis in a tertiary care hospital in South India, International Union against Tuberculosis and Lung Disease, Vol 3 Supplement 1 Published 4 November 2013.
4. K.R.L. Surya Kirani, V. Santha Kumari and R. Lakshmi Kumari, Co-existence of Pulmonary Tuberculosis and Diabetes Mellitus: Some Observations, Ind J Tub, 1998, 45. 47.
5. Kumar A, Jain DC, Gupta D et al, Screening of patients with tuberculosis for diabetes mellitus in India, Trop. Med. Int. Health 2013, 18(5):636-45.
6. Qing Zhang, Heping Xiao, Ismu Sugawara, Tuberculosis complicated by Diabetes Mellitus at Shanghai Pulmonary Hospital, China, Jpn. J. Infect. Dis. 62, 390-391, 2009.
7. Bachti Alisjahbana, Edhyana Sahiratmadja, Erni J. Nelwan et al, The Effect of Type 2 Diabetes Mellitus on the Presentation and Treatment Response of Pulmonary Tuberculosis, Clinical Infectious Diseases 2007; 45:428-35.
8. Seyed Mohammad Alavi and Mohammad Mehdi Khoshkhoy, Pulmonary tuberculosis and diabetes mellitus: Co-existence of both diseases in patients admitted in a teaching hospital in the southwest of Iran, Caspian J Intern Med 2012; 3(2): 421-424.
9. Catherine R Stevenson, Nita G Forouhi, Gojka Roglic et al, Diabetes and tuberculosis: the impact of the diabetes epidemic on tuberculosis incidence, BMC

- Public Health 2007, 7:234 doi:10.1186/1471-2458-7-234.
10. Kishan J and Garg K, Tuberculosis and Diabetes Mellitus: A case series of 100 patients, SAARC J. TUBER. LUNG DIS. HIV/AIDS 2010 VII(2) 34-38.
11. Stine Byberg, BoletteSoborg, Mikael Andersson et al, Diabetes is a risk factor for tuberculosis in the Inuitpopulation of Greenland, EuropeanRespiratory Journal Volume 40 Number 5.
12. Said Amin, Muhammad IshaqKhattak, Ghulam Shabbier et al, Frequency of Pulmonary Tuberculosis in PatientsWithDiabetes Mellitus, Gomal Journal ofMedical Sciences July- December 2011, Vol. 9, No. 2.
13. Darsun Tatar, GunesSenol, Serpil Alptekin et al,Tuberculosis in Diabetes: Features in an endemic are, Jpn. J. Infect. Dis. 62,423-427,2009.
14. Swai AB., McLarty DG., Mugusi F: Tuberculosis indiabetic patients in Tanzania: Trop Doct. 1990, 20,147-50.
15. JoãoCordeiro da Costa, Olena Oliveira, LuísBaía et al, Prevalence and factors associated with diabetes mellitus among tuberculosis patients: a nationwide cohort EurRespir J 2016; 48: 264–268.
16. V Nissapatorn, I Kuppusamy, I Jamaiah et al, Tuberculosis in Diabetic Patients: A Clinical Perspective, SoutheastAsian J Trop Med Public Health, Vol 36 (suppl 4) 2005.
17. Ezung T, Devi NT, Singh NT et al, Pulmonary tuberculosis and diabetes mellitus--a study, J Indian Med Assoc.2002 Jun;100(6):376,378-9.
18. Hamid Ullah, Zafar Iqbal, Zia Ullah et al,Frequency of pulmonary tuberculosis in patients presenting with diabetes, Vol 15, No 4 (2009), Pakistan journal of chest medicine.
19. Walker C, Unwin N, Estimates of the impact of diabetes on the incidenceof pulmonary tuberculosis in different ethnic groupsin England. Thorax (2010).
20. N. M. Baldé, A. Camara, L. M. Camara et al, Associated tuberculosis and diabetes in Conakry,Guinea: prevalence and clinical characteristics, INT J TUBERC LUNG DIS 10(9):1036-2006.
21. Alisjahbana, R. van Crevel, E. Sahiratmadja et al, Diabetes mellitus is strongly associated withtuberculosis in Indonesia B, INT J TUBERC LUNG DIS 10(6):696–700 2006.