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Original Research Article

Diabetes changes the outcome of tuberculosis?

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ABSTRACT

Background: Diabetes has become a global epidemic affecting children, adolescents, and adults. It is recognized as a group of heterogeneous disorders with the common elements of hyperglycemia and glucose intolerance, due to insulin deficiency, impaired effectiveness of insulin action, or both. Diabetes mellitus (DM) is classified on the basis of etiology and clinical presentation of the disorder into four types: type 1 diabetes, type 2 diabetes, gestational diabetes, and other specific types. Failures, deaths, relapse rates and favorable outcomes (cured/treatment completed) were comparable in pulmonary tuberculosis (TB) patients with or without DM. It is also documented that in well-controlled diabetes the course of pulmonary tuberculosis is not different from that in patients without diabetes.
Methods: Diabetic patients visiting the outpatient department/diabetic clinic of our facility were enrolled after taking written informed consent. The data on socio-demographic and diabetic parameters and examination findings were recorded on proforma as attached.
Results: X-ray findings at start of treatment showed that proportion of patient of group I was higher than group II in left site (26.00% versus 8.00%) and proportion of patient of group II was higher than group I in right site (58.00% versus 48.00%) and bilateral (34.00% versus 26.00%), though left side was affected in higher proportion of group I patients as compared to group II but this difference was not found to be statistically significant.
Conclusions: Our study concluded that even though the state in which patient presented that is diabetic or non-diabetic the outcome of treatment didn't change but the earlier one was more associated with complications and also the healing took more time in patients with diabetes.

Keywords: Diabetes, Tuberculosis, X-ray

INTRODUCTION

Diabetes has become a global epidemic affecting children, adolescents, and adults. It is recognized as a group of heterogeneous disorders with the common elements of hyperglycemia and glucose intolerance, due to insulin deficiency, impaired effectiveness of insulin action, or both. Diabetes mellitus (DM) is classified on the basis of etiology and clinical presentation of the disorder into four types: type 1 diabetes, type 2 diabetes, gestational diabetes, and other specific types.[1,2] Over the last four decades, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people.[3] Given this proposed higher risk of tuberculosis among diabetic patients, it is often conceived as to whether diabetic status of a patient has some role in determining the outcome of treatment for

tuberculosis. There are schools of thoughts that state that DM may have a negative impact on the outcome of TB treatment: higher failure rates, higher rates of all-cause mortality and death specifically related to TB. Some studies have also reported higher relapse rate of tuberculosis in patients with diabetes.[4] On the contrary, few recent studies have shown that the association of diabetes did not alter the response of pulmonary TB to treatment.[5] Failures, deaths, relapse rates and favorable outcomes (cured/treatment completed) were comparable in pulmonary TB patients with or without DM. It is also documented that in well-controlled diabetes the course of pulmonary tuberculosis is not different from that in patients without diabetes.[5] Hence, the present study was planned with an aim to carry out a screening for tuberculosis among diabetic patients and to evaluate the impact of diabetic status on the outcome of tuberculosis treatment.

Aim

Aim of the research was to study the effect of diabetes mellitus on the radiological and biochemical analysis and treatment for pulmonary tuberculosis.

METHODS

Site of study

The present study was carried out at Rohilkhand Medical College, Bareilly, a 650-bedded multi-specialty services hospital in northern India, catering to the population in and around Bareilly. The facility also receives referrals from neighboring state of Uttarakhand and adjoining landlocked country Nepal. The hospital provides its services mainly to lower-middle and middle income groups across all religions, castes and creeds. Thus, it provides a cross-section glimpse of population.

Study population

The study population consisted of diabetic patients.

Study design

The design of the study was cross-sectional.

Sample size with justification

The sample size projections were based on the study by Nandakumara et al who reported the rate of unfavourable outcomes in PTB-DM cases to be 17% in their study.[6] The sample size was calculated using the following formula by Snedecor and Cochran.[7]

$$n = z^2\,[(p(1-p))/e^2]$$

Where "p" is the sample proportion i.e. prevalence, e is the error allowance (at 10% allowance its value is 0.1) and z is the constant at a certain confidence level (its value at 90% confidence limit and 80% power is 1.72). Targeting an unfavourable outcome rate of 17%, at 90% confidence interval, 10% error and 80% power, the calculated sample size was 42. However, in order to enhance the power and confidence of the study, we targeted a sample size of 50 after providing scope for contingency.

Period of study

The study period was one year i.e. from June 2018 to August 2019.

Data type

The type of data was qualitative as well as continuous.

Inclusion criteria

The study included diabetic (both type 1 and type 2) patients with newly diagnosed pulmonary tuberculosis of age >18 years.

Exclusion criteria

The study excluded patients diagnosed as diabetic by glycosuria but not confirmed by blood glucose levels; patients on steroids, thiazide diuretics; HIV positive patients; sputum smear negative cases; and previously diagnosed pulmonary tuberculosis cases.

Data collection

Diabetic patients visiting the outpatient department/ diabetic clinic of our facility were enrolled after taking written informed consent. The data on socio-demographic and diabetic parameters and examination findings were recorded on proforma as attached.

All the willing patients were screened for tuberculosis through detailed history, examination and laboratory investigations. Newly diagnosed tuberculosis cases were enrolled in the study and were admitted and treated with recommended RNTCP guidelines. They were subsequently followed up for the treatment outcomes.

At the time of enrolment the following investigations were carried out: blood investigation – haemoglobin (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), erythrocyte sedimentation rate (ESR), fasting blood sugar (FBS), post-prandial blood sugar (PPBS), random blood sugar (RBS), blood urea, serum creatinine, lipid profile (if required), glycosylated haemoglobin (HbA_{1C}) (if required); sputum for acid-fast bacillus (AFB)/culture and sensitivity; chest X-ray (PA view); electrocardiography (ECG); and urine routine.

Follow up

All the patients were followed up at 2, 3 and 6 months intervals for outcome of tuberculosis treatment.

Ethical clearance

Ethical committee of Rohilkhand medical college approved the study.

Statistical analysis

The data was analyzed using statistical package for social sciences (SPSS), version 15.0. Chi-square test, independent samples t-test and analysis of variance (ANOVA) was used to compare the data. A p value less than 0.05 was considered to be statistically significant.

RESULTS

Out of 100 cases of pulmonary tuberculosis included in the study, 50 (50.00%) having DM as co-morbidity were grouped as group I and rest 50 (50.00%) cases without any co-morbidity were grouped as group II. In group 1 (DM) group, 2 patients were suffering from type 1 DM and was taking insulin previously, 10 patients had previously diagnosed type 2 DM and were taking oral hypoglycemic drugs, and in rest of the patients diabetes mellitus was diagnosed at time of sputum positive pulmonary tuberculosis.

As Table 1 shows the comparison of hematological/biochemical variables. Hemoglobin levels of patients of group II (10.20±2.28 g/dl) was found to be higher than that of group I (9.93±1.71 g/dl) but difference between the two groups was not found to be statistically significant (p=0.502).

Total leucocyte counts in group II (12.54±4.47×103) were found to be statistically significantly higher (p=0.006) than that in group I (10.32±3.40×103).

Polymorph counts in group II (84.64±7.60) were found to be statistically significantly higher (p=0.002) than that in group I (79.96±7.31).

Lymphocyte counts in group I (13.86±7.16) were found to be statistically significantly higher (p=0.003) than that in group II (9.78±6.24).

Levels of serum glutamic-oxaloacetic transaminase (SGOT) and serum creatinine in group I were higher than that in group II, and levels of serum glutamic pyruvic transaminase (SGPT) and blood urea in group II were higher than that in group I but differences were not found to be statistically significant.

As shown in Table 2, X-ray findings at start of treatment showed that proportion of patient of group I was higher than group II in left site (26.00% versus 8.00%) and proportion of patient of group II was higher than group I in right site (58.00% versus 48.00%) and bilateral (34.00% versus 26.00%), though left side was affected in higher proportion of group I patients as compared to group II but this difference was not found to be statistically significant.

Zone was unspecified in 7 cases, all these cases were from group I. Upper zone was affected in statistically significantly higher proportion of patients of group II (74.00%) as compared to group I (24.00%). Proportion of patients was higher in group I as compared to group II for rest of the zones i.e. unspecified (14.00% versus 0.00%), middle (18.00% versus 12.00%) and upper and middle (20.00% versus 8.00%) zones.

At 6 month follow up, TB resolved in 92.00% patients each from group I and group II. Out of rest of the 4 patients of group I, 2 expired, 1 was referred to video-assisted thoracoscopic surgery (VATS) and trachea shifted to right side in 1 patient. While of 4 patients of group II, 1 was defaulter, in 1 patients PE resolved opacity was resolving and in 2 patients' cavity persisted. Difference in X-ray findings of group I and group II was not found to be statistically significant (p=0.238) as shown in Figure 1.

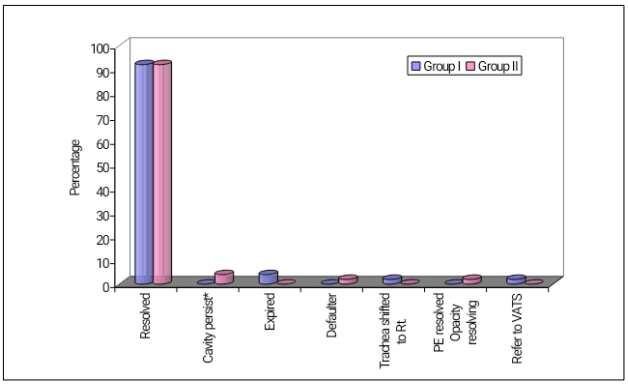

Figure 1: 6 months follow up in both patients.

Table 1: Comparison of hematological and biochemical variables in study population.

Variables	Group I (n=50)			Group II (n=50)			Statistical significance	
	No.	Mean	SD	No.	Mean	SD	't'	'p'
Hb	50	9.93	1.71	50	10.20	2.28	-0.674	0.502
TLC ('000)	50	10.32	3.40	50	12.54	4.47	-2.797	0.006
DLC (polymorphs)	50	79.96	7.31	50	84.64	7.60	-3.138	0.002
DLC (lymphocytes)	50	13.86	7.16	50	9.78	6.24	3.037	0.003
DLC (eosinophils)	50	2.00	2.51	50	1.38	1.77	1.428	0.156
DLC (monocytes)	50	3.48	2.34	50	4.00	2.36	-1.107	0.271
DLC (B)	0			47	0.23	0.70		

Continued.

Variables	Group I (n=50)			Group II (n=50)			Statistical significance	
	No.	Mean	SD	No.	Mean	SD	't'	'p'
SGOT	50	31.26	23.21	50	28.70	8.79	0.729	0.468
SGPT	50	30.42	21.55	50	33.20	8.37	-0.850	0.397
Blood urea	50	33.82	20.09	50	35.31	20.42	-0.367	0.714
Seum creatinine	50	1.07	0.34	50	0.96	0.28	1.808	0.074

Table 2: Comparison of X-ray findings at start of treatment in study population.

X-ray findings	Total	Group I (n=50)		Group II (n=50)		Statistical significance	
		No.	%	No.	%	χ^2	p
Site							
Right	53	24	48.00	29	58.00	5.770	0.056
Left	17	13	26.00	4	8.00		
Bilateral	30	13	26.00	17	34.00		
Zone							
Not specified	7	7	14.00	0	0.00	29.527	<0.001
Upper	49	12	24.00	37	74.00		
Middle	15	9	18.00	6	12.00		
Upper and middle	14	10	20.00	4	8.00		
Lower	10	9	18.00	1	2.00		
Lower and middle	5	3	6.00	2	4.00		

DISCUSSION

Lymphocyte counts in group I (13.86±7.16) were found to be statistically significantly higher (p=0.003) than that in group II (9.78±6.24) while levels of group II were statistically significantly higher as compared to group I for TLC (12.54±4.47×103 versus 10.32±3.40×103) and polymorphs (84.64±7.60 versus 79.96±7.31). Hemoglobin, monocyte counts, SGPT, blood urea levels of group II were found to be higher than that of group I but differences were not found to be statistically significant. Eosinophil counts, SGOT levels, serum creatinine levels of group I were found to be higher than that of group II but differences were not found to be statistically significant. Our study is at par with Morris et al where the earlier found no statistical difference in patients with tuberculosis.[8]

Though left side was affected in higher proportion of group I (26.00%) patients as compared to group II (8.00%) but this difference was not found to be statistically significant. Right side was affected in 48.00% of group I and 58.00% of group II patients and rest of the patients of both the groups effect was seen both sides (bilateral). Upper zone was affected in statistically significantly higher proportion of patients of group II (74.00%) as compared to group I (24.00%). Proportion of patients was higher in group I as compared to group II for rest of the zones i.e. unspecified (14.00% versus 0.00%), middle (18.00% versus 12.00%) and upper and middle (20.00% versus 8.00%) zones. In majority of patients of both the groups X-ray findings of follow up at 2 months and 4 months showed TB to be resolving and at 6 months TB resolved in majority of the patients. At 2 months higher resolving of TB was found in group I (98.00%) as compared to group II (92.00%). At 4 months, resolving was found in 94.00% each of patients of group I and group II and at 6 months TB resolved in 92.00% patients each of group I and group II. This contradicts with study by Wu et al where they have found computed tomographic (CT) findings of tuberculosis in diabetic patients are different from those in non-diabetic patients, with a higher occurrence of non-segmental distribution and multiple cavities within a tuberculous lesion.[9] By follow-up re-examination, diabetic patients show a slower and unobvious therapeutic response on CT scans compared to non-diabetic patients.

CONCLUSION

Our study concluded that even though the state in which patient presented that is diabetic or non-diabetic the outcome of treatment didn't change but the earlier one was more associated with complications and also the healing took more time in patients with diabetes.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Fowler MJ. Microvascular and Macrovascular Complications of Diabetes. Clin Diabet. 2008;26(2):77-82.
2. International Diabetes Federation (IDF). IDF Diabetes Atlas, Sixth Edition, 2013. Available at: https://idf.org/e-library/epidemiology-research/diabetes-atlas.html. Accessed on: 14 December 2020.

3. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007;125:217-30.
4. Mboussa J, Monabeka H, Kombo M, Yokolo D, Yoka-Mbio A, Yala F. Course of pulmonary tuberculosis in diabetics. Rev Pneumol Clin. 2003;59(1):39-44.
5. Singla R, Khan N, Al-Sharif MO, Al-Sayegh MA. Shaikh MM, Osman. Influence of diabetes on manifestations and treatment outcome of pulmonary TB patients. Int J Tuberc Lung Dis. 2006;10(1):74-9.
6. Nandakumar KV, Duraisamy K, Balakrishnan S, Sunilkumar M, Jaya Shankar S, Sagili KD, et al. Outcome of Tuberculosis Treatment in Patients with Diabetes Mellitus Treated in the Revised National Tuberculosis Control Programme in Malappuram District, Kerala, India. PLoS One. 2013;8(10):e76275.
7. Snedecor GW, Cochran WG. Statistical Methods. 8th Ed. Ames: Iowa State Press. 1989.
8. Morris CDW. The Radiography, Haematology and Biochemistry of Pulmonary Tuberculosis in the Aged. Int J Med. 1989;71(3):529-35.
9. Wu H, U.K. UK, Wu J, Zhang G, Zhang G, Lu X. CT findings of TB in diabetic and non-diabetic patients: A comparison before and after anti-tuberculous therapy. Radiol Infect Dis. 2016;3(1):15-22.

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