Research Article

To study the effect of various diabetic treatment regimens on the outcome of TB

Praveen Kumar G S[*], Carlos Noel Menezes[#], Meghalatha T S[**]

[*]Professor, [**]Lecturer, Department of Biochemistry, Karpaga Vinayaga Medical College and research centre, Karpaga Vinayaga Nagar, Tamil Nadu, INDIA.
[#]Assistant Professor, Department of Biochemistry, Goa Medical College, Bambolim, Tiswadi, Goa, INDIA.
Email: gajulapk@gmail.com

Abstract

Introduction: Tuberculosis has been a major cause of suffering and death since times of immemorial**.** Similarly diabetes mellitus is also increasing rapidly. Another important challenge is the growing body of evidence suggesting diabetes as a risk factor for new as well as reactivated old TB cases. And the response to DOTS depends on the control of glucose level. **Aims and Objective:** To study the effect of various diabetic treatment regimens on the outcome of TB. **Material and Method:** in the present longitudinal study known diabetic patients who were recently diagnosed suffering from tuberculosis were followed till the completion of DOTS. Three groups were formed in the study. Group I consist of patients on only oral hypoglycemic drugs (OHA). Group II consist of patients on combination OHA and insulin. And in group III patients on only insulin were enrolled. **Results:** it was observed that maximum cure rate was of group I (100%) followed by group II (90%) and group I (80%). **Conclusion:** Outcome of tuberculosis was better in patients on insulin only as compared to other group of patients (OHA only and combination of OHA and insulin)
Keywords: Tuberculosis, oral hypoglycemic drug.

[*]**Address for Correspondence**
Dr. Praveen Kumar G S, Professor, Department of Biochemistry, Karpaga Vinayaga Medical College and research centre, Karpaga Vinayaga Nagar, Tamil Nadu, INDIA.
Email: gajulapk@gmail.com
Received Date: 16/03/2014 Accepted Date: 25/03/2014

Access this article online

Quick Response Code:

Website: www.statperson.com

DOI: 26 March 2014

INTRODUCTION

Tuberculosis has been a major cause of suffering and death since times of immemorial.[1] WHO declared tuberculosis as global emergency with one third populations is infected with mycobacterium tuberculosis recognized as single biggest killer[2]. After Introduction of Revised national tuberculosis control programme RNTCP there is significant improvements in case detection and control of TB disease[3].Persons with compromised immune system such as people with DIABETES MELLETUS, HIV, Malnutrition, Tobacco users etc., have higher risk of getting TB infection.[4]The great Indian physicion Susuartha[5] in 600AD had commented that pthisis frequently complicated madhumeha. Diabetes mellitus is a chronic metabolic disorder virtually affecting every organ system in the human body.[6]Another important challenge is the growing body of evidence suggesting diabetes as a risk factor for new as well as reactivated old TB cases[7]. As a protocol those patients with tuberculoses having diabetes should kept on insulin to achieve glycemic control and good TB treatment outcome[8].But practically majority of these patients are kept on oral hypoglycemic agents (OHA) alone. This adversely affects tuberculosis treatment outcome. There is strong interaction between OHA's[9] and anti tuberculosis drugs leading to worsening of glycemic control. Poor glycemic control results in higher levels of HbA_1c. On careful observation those patients kept on insulin alone with DOTS recovered fast from TB infection by showing early sputum conversion and achieved glycemic control. These patients showed lower level of HbA_1c as compared with other two groups[10], thus the present study was conducted with the aim to find the influence of treatment regimen of type 2 diabetes on outcome of tuberculosis.

How to site this article: Praveen Kumar G S, Meghalatha T S, Carlos Noel Menezes. To study the effect of various diabetic treatment regimens on the outcome of TB. *MedPulse – International Medical Journal* March 2014; 1(3): 114-118. http://www.medpulse.in (accessed 27 March 2014).

AIMS AND OBJECTVE

To study the effect of various diabetic treatment regimens on the outcome of TB.

MATERIAL AND METHODS

Study Design

Present longitudinal study was conducted to study the effect of various diabetic treatment regimens on the outcome of TB at Goa Medical College, Goa. TB patients with type 2 diabetes registered under RNTCP at various TB units in Bambolim district, Goa. Following inclusion and exclusion criteria was used to select the study population.

Inclusion Criteria

- Age above 30 years of either sex.
- Known case of type 2 diabetes with tuberculosis and on DOTS.
- Patients either on oral hypo glycemic (OHA) drugs or on insulin or on combination of insulin with OHA

Exclusion Criteria

- Patients were not eligible for enrollment if they are too ill or in morbid condition or with history suggestive of bleeding diathesis or fits with creatinine levels $\leq$2 mg/dl.
- The patients with end stage complications of DM such as proliferative retinopathy and nephropathy.
- Not willing to participate in the study.

Three groups were formed to conduct the study. Total 60 patients (in each group 20 patients) fulfilling the above mentioned inclusion and exclusion criteria were enrolled in the study.

Group 1: Type 2DM with Tuberculosis kept on OHA alone.

Group 2: Type 2DM with Tuberculosis kept on OHA with insulin.

Group 3: Type 2DM with Tuberculosis kept on insulin.

Detail demographic details of the eligible candidates were entered on a preseturcured and pretested proforma. **HbA_1C** and Random blood glucose level were measured at the time of enrollment. All the patients were followed as per guidelines of RNTCP till the completion of treatment. Repeat investigations were performed at the time of completion of treatment. Outcome of the DOTS after the completion of treatment was noted in terms of cured or treatment failure.

RESULTS

Table 1: Age and sex wise distribution of study population

Variable		Group I – OHA alone		Group II – OHA and insulin		Group III – Insulin alone		Total	
		No.	%	No.	%	No.	%	No.	%
Age (years)	30-40	3	15	3	15	4	20	10	16.67
	40-50	11	55	7	35	7	35	25	41.67
	50-60	4	20	5	25	4	20	13	21.67
	60-70	1	5	5	25	5	25	11	18.33
	70-80	1	5	0	0	0	0	1	1.67
Sex	Male	16	80	18	90	18	90	52	86.67
	Female	4	20	2	10	2	10	08	13.33

It was observed that majority of the study population was between 40 to60 years of age group in all three study groups. The mean age in group I (OHA alone) was 49.65 ± 12.3 yrs. For group II (OHA with Insulin) 52.45±12.3 years and for group III (insulin alone) was 51.3 ± 12.7yrs.Majority (86.67%) of the study population was male. And similar trend was observed in all the three groups.

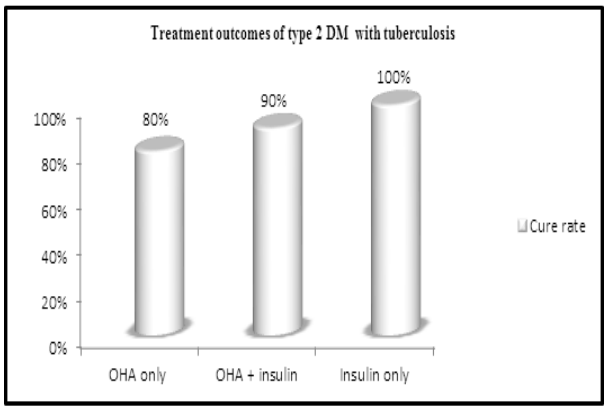
Table 2: Comparisons of random blood glucose level and HBA1c at the start and end of study

	Study variables	Group I	Group II	Group III
Random BSL	Baseline levels	321.85 ± 85.53	251.4 ± 97.05	161 ± 18.71
	Outcome levels	253.75 ± 18.42	189.7 ± 15.97	145.3 ± 14.34
HBA1c	Baseline levels	11.21 ± 1.08	8.92 ± 0.38	6.91 ± 0.57
	Outcome levels	10.06 ± 0.67	8.31 ± 0.38	6.66 ± 0.39

Random BSL at the start of study i.e. base line in group I was 321.85 ± 85.53 mg/dl. In group II it was 251.4 ± 97.05 mg/dl where as in group III it was 161 ± 18.18 mg/dl. Random BSL after completion of DOTS in group I was 253.75 ± 18.42 mg/dl, in group II was 189.7 ± 15.97 mg/dl and group III was 145.3 ± 14.34 mg/dl.HBA1c at start of study was 11.21, 8.29 and 6.91 of group I, II and III respectively. Whereas HBA1c at completion of DOTS was 10.06, 8.31 and 6.66 of group I, II and III respectively.

Table 3: Treatment outcomes of type 2 DM with tuberculosis

	Cured	Failure	Cure rate
Gr I	16	4	80%
Gr II	18	2	90%
Gr III	20	0	100%



There were total 60 patients registered in the study containing 20 each in group. Out of 20 diabetics on only oral hypoglycemic drugs 16 cured from Tb whereas 4 was treatment failure. In group II 18 were cured from TB but 2 were treatment failure. In group III i.e on only insulin all were cured from TB and no treatment failure patients were noted.

DISCUSSION

The present study was conducted to see the effect of various treatment regimen of diabetes on outcome of tuberculosis. In the study majority of the participants were between 40-60 years of age. Majority (86.67%) of the study population was male. For the study purpose three groups were formed. In each group 20 patients of type 2 diabetes were enrolled. The age and sexwise distribution in these three groups was nearly same. Thus these three groups were comparable with respect to age and sex.The random blood sugar and HBA1C was measured in all the participants of three groups. It was observed that mean random BSL of group I was 321.85 ± 85.53 mg/dl whereas same after completion of treatment was 253.75 ± 18.42 mg/dl. Whereas in group II baseline random BSL was 251.4 ± 97.05 mg/dl and after completion of treatment was 189.7 ± 15.97 mg/dl. In group III baseline random BSL was 161 ± 18.71mg/dl and it was decreased to 145.3 ± 14.34mg/dl after completion of DOTS. Similar trend was observed in the level of HBA1C. Thus we can say that levels of random blood sugar and HBA1C improve as the treatment of tuberculosis completes.When the output of DOTS in diabetic patients was compared it was observed that patients receiving only oral hypoglycemic drugs had cure rate of 80%. Patients on insulin and OHA has cure rate of 90%. Cure tare was 100% in patients of diabetes TB received only insulin. Thus showed that patients on only insulin have good response on the output of TB.The steadily growing epidemic of diabetes mellitus DM poses a threat for global tuberculosis (TB) control[11]. Many studies revealed diabetics are three fold higher risk of developing TB. Both are serious debilitating and deadly diseases. Glycemic status should be strictly watched while diabetic patients kept on DOTS. Rifampcin is strong inducer of cytocromes enzyme which rapidly metabolizes oral hypoglycemic agents. Then the oral hypoglycemic agents are rapidly eliminated. That's what oral hypoglycemic patients difficult to achieve glycemic control. Those patients kept on insulin and insulin with OHA is achieving glycemic control. Glycosylated haemoglobin are very high in the patients who kept on OHA alone.Several mechanisms have been explored for increased development of TB or increased severity of TB in patients with diabetes. In studies of dogs with pancreatectomy, tuberculous lesions contain higher bacillary counts, suggesting that the direct effects of hyperglycemia or insulinopenia contributed to diminished TB control[12]. Indirect effects on immune function likely also play a role. Patients with diabetes may have impaired chemotaxis of monocytes,[13] diminished activation of alveolar macrophages,[14] diminished interferon (IFN)-¡ levels,[15,16] or altered innate and type I cytokine expression.[17] Pharmacologic interactions between rifampin and diabetic agents and decreased absorption of rifampin by patients with diabetes further impacts concurrent treatment of the two diseases. [18, 19, it] has been shown that the severity of diabetes affects the risk of developing active TB. In one large cohort study conducted by Leung CC *et al* showed that diabetes was

associated with an increase in the risk of active pulmonary TB only in those with a hemoglobinA1C greater than 7%.[20]

CONCLUSION

Thus from the above discussion we can conclude that outcome of tuberculosis was better in patients on insulin only as compared to other group of patients (OHA only and combination of OHA and insulin.)

REFERENCES

1. Tuberculosis- second edition by prof surenra K. Sharma, prof AlladiMohan- jaypee brothers medical publishers (p) ltd- history- chapter -2 page no-7
2. World health organization- data and statics departm2010.
3. RNTCP- www.rntcp.org tbc89 india history of tab control.
4. Diabetes is a risk factor for pulmonary tuberculosis www.plosome.org by D fauhot – 2011 journal 0024.
5. Susurutha- the clinician- teacher of excellence- history of medicine- Indian Joural of chest diseases 2007 – 49 -243-244
6. Williams text book of endocrinology 10th edition section-8 disorders of carbohydrate metabolism page no -1371
7. Tuberculosis and diabetes link- the lancet www. The lancet.com/journals 61527-4
8. Protocol- person with type2 diabetes and comorbid active tuberculosis should be treated with insulin by P.V. Rao NIIMS Hyderabad INT. J. Diab. Dev. Countries 1999 0vol. 19
9. Bertram G. Katjung. Basic and clinical pharmacology 10th edition. Chapter -4 drug metabolism page no. 18
10. Study of efficacy of dots in pulmonary tuberculosis patients with associated diabetes RK. Kotokey D. Bhattacharya et.al – lung india 2007 vol-24 1-2 page no 58-60
11. Anthony D. Harries, Megan B. Murray, Christie Y. Jeon, Salah-Eddine Ottmani, Knut Lonnroth, and Mauricio L. Barreto. Defining the research agenda to reduce the joint burden of disease from Diabetes mellitus and Tuberculosis. Trop Med Int Health. 2010 Jun;15[6]:659-63
12. Steinbach MM, Klein SJ, Deskowitz M, 1935. Experimental diabete and tuberculosis in the dog. *Am Rev Tuberc 32:* 665.
13. Moutschen MP, Scheen AJ, Lefebvre PJ, 1992. Impaired immune responses in diabetes mellitus: analysis of the factors and mechanisms involved. Relevance to the increased susceptibility of diabetic patients to specific infections. *DiabeteMetab 18:* 187–201.
14. Wang CH, Yu CT, Lin HC, Liu CY, Kuo HP, 1999. Hypodense alveolar macrophages in patients with diabetes mellitus and active pulmonary tuberculosis. *Tuber Lung Dis 79:* 235–242.
15. Yamashiro S, Kawakami K, Uezu K, Kinjo T, Miyagi K, Nakamura K, Saito A, 2005. Lower expression of Th1-related cytokines and inducible nitric oxide synthase in mice with streptozotocininduced diabetes mellitus infected with *Mycobacterium tuberculosis.ClinExpImmunol 139:* 57–64.
16. Martens GW, Arikan MC, Lee J, Ren F, Greiner D, Kornfeld H, 2007. Tuberculosis susceptibility of diabetic mice. *Am J RespirCell MolBiol 37:* 518–524.
17. Restrepo BI, Fisher-Hoch SP, Pino PA, Salinas A, Rahbar MH, Mora F, Cortes-Penfield N, McCormick JB, 2008. Tuberculosis in poorly controlled type 2 diabetes: altered cytokine expression in peripheral white blood cells. *Clin Infect Dis 47:* 634–641.
18. Niemi M, Backman JT, Neuvonen M, Neuvonen PJ, Kivisto KT, 2001. Effects of rifampin on the pharmacokinetics and pharmacodynamics of glyburide and glipizide. *ClinPharmacolTher 69:* 400–406.
19. Nijland HM, Ruslami R, Stalenhoef JE, Nelwan EJ, Alisjahbana B, Nelwan RH, van der Ven AJ, Danusantoso H, Aarnoutse RE, van Crevel R, 2006. Exposure to rifampicin is strongly reduced in patients with tuberculosis and type 2 diabetes. *Clin Infect Dis43:* 848–854.
20. Leung CC, Lam TH, Chan WM, Yew WW, Ho KS, Leung GM, Law WS, Tam CM, Chan CK, Chang KC, 2008. Diabetic control and risk of tuberculosis: a cohort study. *Am J Epidemiol. 167:* 1486–1494.

Source of Support: None Declared
Conflict of Interest: None Declared