

Significance of the Oral Glucose Tolerance Test in Newly Detected Pulmonary Tuberculosis

R. Gandhimohan¹, K.Anbananthan²

¹(Assistant professor, Department of Nephrology, Coimbatore Medical College Hospital, Coimbatore)

²(Assistant professor, Department of Pulmonology, Coimbatore Medical College Hospital, Coimbatore)

Abstract:- Association of diabetes with tuberculosis is well known. The converse relation (i.e.) patients with tuberculosis have higher prevalence of impaired glucose tolerance was accepted later. In this study we tried to determine the prevalence rate of impaired glucose tolerance in newly detected pulmonary tuberculosis patients. In this study impaired glucose tolerance was found in 22% (11patients), diabetes mellitus found in 8% (4 patients). After two months of treatment for tuberculosis 5 patients of impaired glucose tolerance reverted to normal, 6 patients remained impaired glucose tolerant. In this study 70% (35) of patients had sputum positivity, out of 35 patients, 24 (48%) patients showed normal glucose tolerance, 11(22%) patients showed impaired glucose tolerance. As per this study there is no easy way to identify the tuberculosis patients with asymptomatic diabetes. There is significant correlation between sputum positivity and impaired glucose tolerance.

I. INTRODUCTION

The aim of present study is to determine the significance of association of impaired glucose tolerance in pulmonary tuberculosis. To determine the prevalence rate of impaired glucose tolerance in tuberculosis patients by means of oral glucose tolerance test in newly detected pulmonary tuberculosis patients, attending the TB clinic of Government Coimbatore Medical College Hospital, Coimbatore.

II. MATERIALS AND METHODS

A total of 50 patients who were attending Tuberculosis Clinic of Govt. Coimbatore Medical College Hospital who were newly detected not on Anti tuberculosis treatment previously, included in this study. Most of them belonged to lower socioeconomic status, since the Government Coimbatore Medical College Hospital itself caters mainly the middle class and lower class. All the study patients were registered with detailed history and physical examination.

A. Exclusion Criteria

- Known diabetic developed tuberculosis
- Patients who are on steroids
- Patients who are on drugs
- Age below 20 years and above 60 years
- Pregnant women
- Very sick patients
- Patients with moderate to massive haemoptysis
- Patients having body mass index less than 20

History was obtained from each subjects regarding past history of tuberculosis, previous state of diabetes mellitus and family history of diabetes. A questionnaire was completed for each subject on which age, sex, duration of illness, height without shoes and weight were measured and body mass index calculated as (Kg/m²)

The following investigations were carried out

- Mantoux test: Test was done in all patients by using purified protein derivatives (PPD) supplied by the King Institute Guindy, Madras (stabilized 1 TU, PPD). The test was read on the third day and considered positive if any induration exceeded 10 mm.
- White Blood Cell count: WBC count was done with Neubauer's chamber
- ESR estimation: ESR estimated by standard Westergren's method.
- Haemoglobin: Haemoglobin estimated by Sahli's (acid-haematin) method.
- Blood Urea, Creatinine: Urea, Creatinine were estimated by Autoanalyser.
- Sputum for AFB:

These samples of sputum were collected and examined as per RNTCP guidelines.

- X-ray: Plain x-ray chest was taken for each case with routine postero anterior view and it was read by the independent observers to avoid any bias. X-ray films were read regard to the type of the diseases, side involved (unilateral/Bilateral), zones of the lung involved and the presence or absence of fibrocavitary lesions. With regard to the type of the diseases, the cases were divided into five categories.

- Bilateral lung involvement: In the form of infiltration or consolidation.
- Extensive unilateral involvement
- Cavitation with fibrosis
- Unilateral upper zone infiltration
- Unilateral lower zone infiltration

B. Glucose Tolerance Test

The ability of the body to utilize carbohydrate may be ascertained by measuring its carbohydrate intolerance. It is indicated by the nature of intolerance. It is indicated by the nature of blood glucose curve following the administration of glucose. Thus glucose tolerance is a valuable diagnostic aid.

- GTT is Performed as Follows:
 - The patient fasts overnight (at least for 8 hrs)
 - The patient should be on normal carbohydrate diets at least for three days, prior to test, otherwise "false high" curve may be obtained.
 - No smoking is permitted.
 - All samples are preferably venous plasma.
 - A fasting blood sample for glucose is withdrawn.
 - The equivalent of 75g of anhydrous glucose dissolved in 300ml of water. Lemon can be added to make it palatable and to prevent nausea vomiting.
 - A total of five specimens of venous blood and urine are collected every half an hour up to 2 hrs (1/2 an hr, 1 hr, 1 1/2 hr, 2 hr).
 - Glucose contents of all five samples of blood are estimated qualitatively.

III. RESULTS

The age and sex distribution of patients are shown in Table 2. The mean age was 37.96 years with a range of 20-60 years. Fever as a presenting complaint was observed in 30 cases out of 50 cases (60%) and cough was noted in 39 cases (78%). Hemoptysis was noted in 17 cases in (34%).

- Loss of appetite was noted in 33 patients (66%). Polyuria was present in 4 patients (8%) Polydypsia was noted in none of the patients.
- Family H /0 diabetes noted in 3 patients (6%).
- Anemia was noted in 21 patients (42%).
- Clubbing was present in 19 patients (38%).
- Lymphadenopathy was present in 12 patients (24%)

The body mass indices of the patients were above 20. ESR was more than 25mm at the end of 1 hour in 47 cases (94%). Hemoglobin levels of (7 to 9 gms) were present in 13 patients (26%). Hemoglobin levels of 9 to 12 gms were present in 37 patients (74%) Sputum AFB was positive in 31 patients 62% shows in (Table 3). Positive Mantoux test with indurations of more than 10mm at the end of 48 hours, was observed in 43 patients 86% (Table 4). X-ray chest showed radiological lesions suggestive of tuberculosis in all 50 cases (100%) of group A and B.

Bilateral Involvement	18 (36%)
Extensive unilateral Involvement	10 (20%)
Cavitation	7 (14%)
Unilateral Upper zone Infiltration	9 (18%)
Unilateral lower zone infiltration	6 (12%)

A. Glucose Tolerance Test

GTT was done for all the 50 tuberculous patients, Prior to the commencement of anti-tuberculosis medication/The glucose tolerance test were carried out based on the recommendation of report of the WHO recommendation. The treatment Regimen for all the patients included daily Rifampicin, Isoniazid, Ethambutol and pyrazinamide. 4 drugs of intensive phase therapy for 2 months. After 2 months oral glucose tolerance test was repeated to those patients who showed impaired glucose

tolerance in the initial test. Blood glucose results were categorized as

- Normal Glucose tolerance (NGT)
- Impaired Glucose tolerance (IGT)
- Diabetic group (DM)

The results of glucose tolerance test are show in Table 5 & 6. In this study 11 cases (22%) had impaired glucose tolerance test. Repeat OGTT in the 12 cases, 5 cases reverted to normal. 6 (12%) of them had impaired glucose tolerance. The mean fasting blood sugar and mean 2 hour blood glucose level were obtained and this value does not increase significantly with age in the tuberculosis patients shown in Table 7.

Group	Subjects	Number
A	Pulmonary tuberculosis + Sputum Positive	41
B	Pulmonary tuberculosis + Sputum Negative + X-ray Positive + Strong clinical suspicion	9

Table 1:- Distribution of Subjects

AGE GROUP	MALE	FEMALE	TOTAL
21-30 Years	5	5	10
31-40 Years	20	4	24
41-50 Years	9	2	11
51-60 Years	4	1	5
Total	38	12	50

Table 2:- Age and Sex Distribution of Patients

AGE GROUP	SPUTUM POSITIVE	SPUTUM NEGATIVE	TOTAL
21-30 Years	8	2	10
31-40 Years	20	4	24
41-50 Years	8	3	11
51-60 Years	5	0	5
Total	41	9	50

Table 3:- Age and Sputum Distribution of Patients

Mx	MALE	FEMALE	TOTAL
0-5 nun	2	0	2
6-10 min	6	2	8
11-15 nun	11	10	21
16-20 mm	13	0	13
21 above mm	6	0	6
Total	38	12	50

Table 4:- Sex and Mantoux Distribution of Patients

S. No.	GTT					N/IGT /DM
	Fast	Half Hour	One Hour	One and Half hour	Two hour	
1	100	120	130	115	114	N
2	86	107	151	137	111	N
3	159	369	453	507	383	DM
4	80	105	162	140	105	N
5	103	129	180	187	165	IGT
6	127	140	154	145	141	DM
7	102	137	148	126	106	N
8	115	175	165	150	105	N
9	85	115	133	124	92	N
10	96	117	146	127	105	N
11	81	117	142	119	96	N
12	107	151	195	181	126	N
13	101	133	149	137	107	N
14	106	137	168	142	116	N
15	111	172	193	167	130	N
16	80	110	152	123	103	
17	85	115	145	135	95	N
18	106	125	185	151	130	N
19	92	142	168	107	98	N
20	95	131	165	194	185	IGT
21	90	131	136	125	98	N
22	117	152	165	154	135	N
23	111	133	155	141	124	N
24	106	153	215	185	166	IGT
25	72	122	165	149	129	N
26	117	142	172	163	130	N
27	109	149	190	201	183	IGT
28	126	152	193	177	158	DM
29	127	140	154	145	136	DM
30	115	155	203	189	168	IGT
31	77	122	172	149	129	N
32	112	167	185	170	117	N
33	11	131	154	140	122	N
34	89	144	167	108	91	N
35	83	111	150	125	105	N
36	120	151	169	190	159	IGT
37	87	127	151	135	101	N
38	125	150	190	175	155	IGT
39	103	123	132	120	111.	N
40	100	120	130	115	105	N
41	100	142	161	133	114	N
42	91	113	158	140	113	N
43	110	170	190	165	115	N
44	82	123	203	183	158	IGT
45	117	157	203	191	165	IGT
46	77	133	172	149	130	N
47	103	159	265	200	185	IGT
48	112	130	154	140	123	N
49	95	149	126	154	147	IGT
50	117	142	172	163	130	N

Table 5:- Glucose Tolerance Test Values

S.No	Fast	1/2 hours	1 hours	1% hours	2 hours	N / IGT/ DM
1	79	120	190	170	136	N
		140	160	156	132	N
3	92	128	160	190	178	IGT
4	100	150	200	182	164	IGT
5	110	152	198	184	160	IGT
6	100	124	156	164	136	N
7	90	144	120	148	134	N
8	104	146	188	196	170	IGT
9	100	156	240	210	182	IGT
10	110	146	160	172	130	N
11	114	156	200	184	162	IGT

Table 6:- Repeat Oral Glucose Tolerance Test

Mx	NGT	IGT	TOTAL
0-5 mm	1	1	2
6-9 mm	3	0	3
10-15 mm	17	7	24
16-20 mm	10	1	11
21 mm above	4	2	6
Total	35	11	46

Table 7:- IGT with Reference to Mantoux (Chi-square 5.25, P.Value > 0.05)

SPUTUM	NGT	IGT	TOTAL
Positive	24	11	35
Negative	11	0	11
Total	35	11	46

Table 8:- IGT with Reference to Sputum (Chi-Square 5.58, P. Value < 0.0192)

X-RAY	NGT	IGT	TOTAL
Bil involvement	5	1	6
Extensible Unilateral involvement	9	1	10
Cavitation	12	4	16
Unilateral upper zone	6	2	8
Unilateral lower zone	3	3	6
Total	35	11	46

Table 9:- IGT with Reference to X-Ray (Chi.square 1.87, P.value > 0.05)

Initial OGTT Sample size = (n 1) 11 Blood glucose mean value X1 = 166 S.D (S1) = 12.10	Repeat OGTT n2 = 11 X 2= 155 S.D (S2) 18.5
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Table 10:- The 't' calculated value 1.59 (less than 2.086)

IV. DISCUSSION

The evidence that diabetic patients have an increased risk of developing tuberculosis is irrefutable. The converse relation (i.e.) patients with tuberculosis have higher prevalence of diabetes was until the 1950 but less widely accepted. When however oral glucose tolerance was used in the detection of glucose intolerance, as in the study reported by Nicholas, a much higher prevalence of diabetes was found. Since then many studies shown prevalence of glucose intolerance is indeed greater in patients with tuberculosis. So the rate of glucose intolerance varied from 5.6% to 39.1% but comparison between different studies is difficult due to differing criteria for the diagnosis of impaired glucose tolerance. Now, the present study is based on the WHO criteria and recommended methodology for assessing the prevalence of glucose intolerance in patients with tuberculosis. Oral Glucose Tolerance at the time of diagnosis showed that 22 % (11) had impaired glucose tolerance and 8%(4) had diabetes mellites. Repeat oral glucose tolerance test showed that 5 cases reverted to normal, 6 cases (12%) remained impaired glucose tolerant. Statistical analysis by paired T test shows that no significant correlation between initial and repeat oral glucose tolerance test. So the impaired glucose tolerance in initial screening is reversible with effective anti tuberculosis treatment. There is no significant correlation between X-ray lesions with reference to impaired glucose tolerance. Similar result ad been reported by al-wahel et al (1997). But many authors reported that lower lobe involvement, cavitary changes were common in patients with glucose intolerance. In this study 70% (35) of patients had sputum positivity, out of 35 patients, 24(48%) showed normal glucose tolerance, 11(22%) patients showed impaired glucose tolerance, none of the sputum negative patients were showed impaired glucose tolerance. Statistical analysis showed significant correlation. Tamura et al and Lin S et al reported that sputum positivity was higher among patients with diabetes and time taken to in poorly controlled diabetes.

V. CONCLUSION

- There is no easy way of identifying the tuberculosis patient with asymptomatic diabetes
- As per this study there is no significant correlation between initial and repeat oral glucose tolerance test (i.e.) the impaired glucose tolerance found in newly detected tuberculosis patients are reversible with effective anti tuberculosis treatment.
- As per this study there is significant correlation between sputum positivity and impaired glucose tolerance.
- This needs further studies regarding the bacillary load in impaired glucose intolerance patients.

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