

## A study of TMT in asymptomatic type 2 diabetes mellitus

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### Abstract

Coronary artery disease (CAD) is more common in diabetics and is the leading cause of death in patients with type 2 diabetes and is often asymptomatic because of silent myocardial ischemia. It has been recognized for several decades that diabetes mellitus is an established risk factor for cardiovascular morbidity and mortality. About three-quarters of the cardiovascular deaths from diabetes result from coronary artery disease. Coronary artery disease is multifactorial in etiology and has several important risk factors, out of which diabetes is one of the important modifiable risk factor. The patients of type 2 diabetes mellitus without clinical evidence of coronary artery disease attending diabetic clinic, cardiology and medicine OPD, at medical college and hospital were enrolled in the present study. In the present study out of 102 patients, TMT was positive in 32 (31.37%) and negative in 70 (68.63%) patients. TMT was positive in 13/61 (21.31%), 9/27 (33.33%), 7/10 (70%) and 3/4 (75%) patients with duration of diabetes >5, 6 to 10, 11 to 15 and 16 to 20 years respectively.

**Keywords:** TMT, Asymptomatic, type 2 diabetes mellitus

### Introduction

Diabetes mellitus is an 'iceberg disease'. Diabetes mellitus is accepted as a worldwide epidemic with an estimated increasing prevalence from 2.8% in 2000 to 4.4% by 2030 India with its dubious distinction of being called "the diabetic capital of the world" is presently estimated to have 41 million individuals affected by this deadly disease, with every fifth diabetic in the world being an Indian. It is the commonest endocrine disease affecting mankind. The incidence of this disease continues to be on the rise all over the world. Diabetes is recognized to be common in Asian Indians. The magnitude of problem is further compounded by various catastrophic macro and microvascular complication targeting the vital organs in the body <sup>[1]</sup>.

Coronary artery disease (CAD) is more common in diabetics and is the leading cause of death in patients with type 2 diabetes and is often asymptomatic because of silent myocardial ischemia. It has been recognized for several decades that diabetes mellitus is an established risk factor for cardiovascular morbidity and mortality. About three-quarters of the cardiovascular deaths from diabetes result from coronary artery disease. Coronary artery disease is multifactorial in etiology and has several important risk factors, out of which diabetes is one of the important modifiable risk factor <sup>[2]</sup>.

Data from Framingham heart study demonstrate the increased and poor prognosis of cardiac disease is diabetes. Mortality related to cardiovascular disease is doubled in diabetic men and quadrupled in diabetic women over that in their non-diabetic counterparts <sup>[3]</sup>.

CAD is the leading cause of morbidity and mortality in diabetic patients and frequently manifests itself silently and prematurely. Thus, a classical cardiovascular risk factor is 'Hyperglycemia'. Clinical evidence demonstrates that the hyperglycemia in diabetes correlates

well with risk and severity of microvascular and macrovascular complications and improving hyperglycemia reduces this risk. Thus 'Deadly Triangle' of coronary artery disease, cerebrovascular disease and peripheral vascular disease is the major cause of morbidity and mortality in the diabetic population <sup>[4]</sup>.

The association between diabetes and asymptomatic coronary artery disease has been attributed to an autonomic neuropathy. CAD can be asymptomatic in diabetes and may present with sudden death, myocardial infarction, arrhythmia, silent myocardial ischemia or heart failure. Early detection of asymptomatic CAD in type 2 diabetes may prevent catastrophic cardiac events.

## **Methodology**

### **Study design**

The present study was a cross sectional study on the patients of type 2 diabetes mellitus without clinical and electrocardiographic evidence of coronary artery disease.

### **Source of data**

The patients of type 2 diabetes mellitus without clinical evidence of coronary artery disease attending diabetic clinic, cardiology and medicine OPD, at medical college and hospital were enrolled in the present study.

### **Sample size**

Total of 102 patients were included in the study.

The sample was calculated considering 80% of the average number of patients of type 2 diabetes mellitus without clinical evidence of coronary artery disease attending, diabetic clinic, cardiology and medicine OPD over last three years.

### **Inclusion criteria**

- Patients of type 2 diabetes mellitus without clinical evidence of coronary artery disease.
- Normal resting 12 lead electrocardiogram.
- No past history of ischemic heart disease, CVA and hypertension.

### **Exclusion criteria**

1. Myocardial Infarction.
2. Unstable angina.
3. Left Bundle Branch Block.
4. Severe Left ventricular Hypertrophy.
5. Renal Disorders.
6. Febrile illnesses.
7. Patients with severe Osteoarthritis or other disabilities.
8. Abnormal resting ECG.

### **Data collection**

All the patients attending to diabetic clinic and medicine OPD, were screened for eligibility. Informed consent was taken from the eligible patients and enrolled in the present study. The patients were interviewed and underwent thorough physical examination. Their Data comprising of name, age, sex, personal, occupational and proper history was recorded on the proforma. All of them had normal 12 lead ECG and underwent treadmill test according to modified Bruce protocol. Heart rate response to valsalva maneuver and sustained handgrip and fall in blood pressure were the tests performed for the clinical recognition of autonomic neuropathy.

The Chi-square test was used to estimate statistical significance. A P- value of < 0.05 was considered significant.

## Results

**Table 1: TMT Results**

Sex	Positive	%	Negative	%	Total
Male	19	26.03	54	73.97	73 (100%)
Female	13	44.83	16	55.17	29(100%)
Total	32	31.37	70	68.63	102(100%)

**Table 2: TMT Results and Duration of Diabetes Mellitus**

Duration of diabetes (yrs)	%	TMT Negative	%	Total
> 5	21.31	4	78.69	61(100%)
6- 10	33.33	18	66.67	27(100%)
11-15	70.00	3	30.00	10(100%)
16-20	75.00	1	25.00	4 (100%)
Total	31.37	70	68.63	102(100%)

P value <0.0001

This table shows the relation of asymptomatic coronary artery disease and duration of diabetes mellitus.

In the present study out of 102 patients, TMT was positive in 32 (31.37%) and negative in 70 (68.63%) patients.

TMT was positive in 13/61 (21.31%), 9/27 (33.33%), 7/10 (70%) and 3/4 (75%) patients with duration of diabetes >5, 6 to 10, 11 to 15 and 16 to 20 years respectively.

**Table 3: Diabetic Autonomic Neuropathy and Asymptomatic Coronary Artery Disease**

Diabetic Patients	TMT Positive (n=32)	TMT Negative (n=70)	Total (n=102)
With Autonomic Neuropathy	12(60%)	8(40%)	20(100%)
Without Autonomic Neuropathy	19(23.17%)	63(76.83%)	82(100%)

P value= 0.0012(<0.05)

12 (60%) out of 20 diabetics with autonomic neuropathy had asymptomatic coronary artery disease while 19 (23.17%) out of 82 diabetics without autonomic neuropathy had asymptomatic coronary artery disease.

This shows diabetics with autonomic neuropathy had higher incidence of asymptomatic coronary artery disease than without it (60% Vs 23.17%).

21 out of 32 TMT positive patients underwent coronary angiography and 19 were found to have significant coronary artery disease. 11 of them were found to have triple vessel disease while 8 had double vessel disease. Involvement of proximal and distal segments in the same vessel was commonly seen. All 19 patients were treated successfully by coronary artery bypass grafting.

## Discussion

Coronary artery disease is a common cause of premature morbidity and mortality in diabetics. Evaluation of asymptomatic coronary artery disease in them is always a key issue. Early detection of coronary artery disease is therefore of utmost importance. The association between diabetes and asymptomatic coronary artery disease has been attributed to an autonomic neuropathy<sup>[5]</sup>.

Among 102 patients, TMT was positive in 32 (31.37%) and was negative in 70 patients (68.63%). Out of 32 positive, 19 were males and 13 were females.

The prevalence of asymptomatic coronary artery disease in type 2 diabetes mellitus was found to be 31.37% (32/102).

This study concurs with other studies done before. One study found 31% diabetics without prior evidence of coronary artery disease had treadmill test positive and silent myocardial

ischemia was 2.2 times more common in diabetics as compared with non-diabetics.

Another study from India, reported 50% incidence of silent myocardial ischaemia in diabetics on exercise electrocardiogram and 35% on ambulatory monitoring [6].

One of the study concluded that the prevalence of silent myocardial ischaemia by using exercise ECG was 17% and angiographic coronary artery disease was found in 13% of middle aged subjects with type 2 diabetes mellitus without other cardiovascular risk factors [7].

The other study from India, found that 51 (42.5%) had evidence of silent ischemia on tread mill testing. Of these 18 underwent coronary angiography and found to have significant CAD in 15 (83.7%).

One study found that a total of 13/522 patients (22%) had silent ischemia using stress testing in asymptomatic patients with type 2 diabetes mellitus [8,9].

A study in India found that 38.3% of diabetics without prior coronary artery disease had silent myocardial ischemia on exercise test, with a greater prevalence in those with autonomic neuropathy(59%) than with those without it(20%) [10].

Another group found that 29% diabetics who were asymptomatic for coronary artery disease had silent myocardial ischemia on 24-hour ambulatory monitoring exercise electrocardiogram [11].

A similar study had shown higher prevalence of silent myocardial ischemia in diabetics as compared to non-diabetics. [12].

The other group found 12.1% of diabetics free of coronary artery disease to have silent myocardial ischemia on exercise electrocardiogram testing. [13]

One study found that silent myocardial ischemia was seen in 14 (46.7%) out of 30 diabetics by using tread mill test. [14].

Hence, the present study is in agreement with that diabetics have a higher prevalence of asymptomatic coronary artery disease.

### Conclusion

- The prevalence of asymptomatic coronary artery disease in type 2 diabetes mellitus without past history of ischemic heart disease or hypertension is 31.37%.
- Out of TMT positive patients, 26.03% were males and 44.83% were females reflecting higher preponderance of Asymptomatic CAD towards female Type 2 Diabetic
- Average age in TMT positive and negative cases was 53.84 and 42.43 years respectively. There is higher incidence of coronary artery disease in patients of diabetics with autonomic neuropathy. This study stresses the need of evaluation of diabetic patients with exercise thread-mill test for detecting asymptomatic coronary artery disease so that early intervention can reduce the morbidity.

### References

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes-estimates for the year 2000 and projections for 2030.
2. Mohan V, Madan Z, Jha R, Deepa R, Pradeepa R. Diabetes-social and economic perspectives in the New Millenium. *Int J Diab Dev Ctries*. 2004;24:29-35.
3. Joshi SR, Parikh RM. India-Diabetes capital of the World: Now heading towards hypertension. *J Assoc Physicians India*. 2007;55:323-24.
4. *Diabetes Care*. 2004;27(5):1047-53.
5. Braunwald's Heart disease, 8 th edition, 2008,1552.
6. Park K. Park's text book of preventive and social medicine. 18th Ed. Jabalpur: Banarasi Das Bhanot Publishers, 2005.
7. Kahn RC, Weir CG, King LG, Jaccbson MA, Moses CA, Smith JR. *Joslin's Diabetes Mellitus* 14th Ed. Philadelphia: Lippincott Williams and Wilkins Co., 2005.
8. Zipes PD, Libby P, Bonow OR, Braunwald E. *Braunwald's Heart Disease*, 7th Edition, Philadelphia; WB Saunders company, 2005.
9. American Diabetes Association-Clinical Practice Recommendations Diabetes care, 2004,

27(1).

10. Gupta S B teal, Indian Heart Journal 1993;44(4);227-9
11. Koistinen MJ; Br Med J 1990;301:92-5
12. Scheidt-Nave C etal, Circulation 1990;81:899-906
13. Misad Group, Am J Cardiol; 1997;79(2);134-9
14. Sukhija R etal, Indian Heart Journal 2000;52(5):540-6