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Original Research Article

Prevalence and clinical predictors of silent myocardial ischemia in asymptomatic type 2 Diabetes Mellitus patients at Puducherry, India

K. Shaik Anwar Hussain*

Department of Medicine, Shree Venketeswaraa Medical College Hospital and Research Centre, Ariyur, Puducherry, India

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***Correspondence:**
Dr. K. Shaik Anwar Hussain,
E-mail: drdanfi@yahoo.co.in

ABSTRACT

Background: Silent MI is common among diabetics due to autonomic dysfunction and loss of pain alert mechanism. There are various risk factors associated with silent MI in diabetes which needs screening earlier to prevent unanticipated cardiovascular mortality. The objective of the present investigation was to study the prevalence and clinical factors associated with silent myocardial ischemia as diagnosed by TMT among type 2 diabetics who had no previous history or symptoms of cardio-vascular disease.
Methods: A total of 200 type 2 diabetes affected subjects with duration of diabetes for at least 6 months, above 18 years of age, attending to the diabetology OPD, during the time period June 2017 to May 2018 were included in the study. Blood investigations and TMT were done for all the participants and documented in a proforma.
Results: Silent MI was documented by using TMT in 36.5% (n=73) of patients with type 2 diabetes mellitus. The factors like age (59.1±16.3 years), duration of diabetes (8.2±2.6 years), obesity (BMI=29.6±4.7 kg/m^2), Glycated haemoglobin (9.7±2.8 %), lipid levels and post-prandial blood sugar levels (236±11.8 mg/dl) associated well with silent MI as predicted by TMT. Fasting blood sugar did not show significant association with Silent MI.
Conclusions: The prevalence of silent MI was higher among the type 2 diabetic individuals compared to non-diabetics. Age, duration of diabetes, HbA1c levels, BMI, dyslipidemia and post prandial blood glucose levels were associated significantly with incidence of silent MI in patients with type 2 diabetes.

Keywords: Type 2 diabetes mellitus, Tread mill test, Silent Myocardial ischemia

INTRODUCTION

Coronary artery disease (CAD) is the major reason for 70-80% of deaths in patients with diabetes.[1] In diabetes, CAD is progressive and usually asymptomatic, which is the cause for remaining as an undiagnosed part of the clinical iceberg.[2]

Diabetes can cause autonomic neuropathy which can blunt any pain alert mechanism contributing towards higher incidence of painless myocardial infarctions among the persons suffering from diabetes.[3]

American Diabetes Association (ADA) recommends that all patients with diabetes and either a family history of coronary artery disease or cardio-vascular risk factors should be screened using a tread mill test (TMT) or a coronary artery angiography.[4]

The hidden risk of CVD in diabetes can only be deliberated by a routine screening program or the silent myocardial damage can engulf major mortality proportions in diabetes considering the transition in lifestyle and diet.

The screening for early myocardial ischemia helps in preventing worsening of the cardiac disease especially in high risk groups who had family history of cardiovascular deaths.

Thus, this study aimed at studying the prevalence and clinical factors associated with silent myocardial ischemia as diagnosed by TMT among type 2 diabetics who had no previous history or symptoms of cardio-vascular disease.

METHODS

This hospital-based descriptive study was conducted from June 2017 to May 2018 at Diabetes OPD, Department of General Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Puducherry.

Inclusion criteria

- type 2 diabetic patients with duration of diabetes for at least 6 months
- above 18 years of age
- willing to undergo blood investigations and with residence in South India.

Exclusion criteria

- patients with previously known cardio-vascular diseases
- symptoms of CVD
- ECG evidence of Q wave MI.
- ischemic ST- segment or T wave abnormality or complete LBBB or clinical features suggestive of heart failure
- those not willing for blood investigations or TMT.

A total of 200 diabetic subjects who satisfied the inclusion criteria attending to the diabetic OPD during the study period were included in the study. The patients were interviewed, socio-demographic details were collected, history and clinical examination including blood pressure measurement was done and findings were recorded in a proforma.

The patients were then referred for blood investigations including lipid profile, HbA1c levels, blood glucose levels, urine examination for Microalbuminuria and ECG and Treadmill test.

Statistical analysis

The collected data was entered and analyzed by using SPSS (Statistical Package for Social Sciences) version19.0 for windows. The findings are expressed in terms of proportions or percentages. Student Independent t-test was used to find any significant difference between mean values and Chi-square test was used to check significant associations between categorical variables.

A p- value <0.05 was considered as statistically significant.

RESULTS

The study included 200 diabetic subjects among whom 64% (n=128) were males and 36% (n=72) were females.

Table 1: Baseline characteristics of the study participants (n=200).

Clinico-demographic variables	n (%)
Age (mean±SD) years	48.1±6.4
BMI (mean±SD) Kg/m^2	28.3±3.7
Duration of Diabetes (mean±SD) years	7.8±2.1
Gender	
Male	128 (64)
Female	72 (36)
Smoking status	
Yes	56 (28)
No	144 (72)
Family history of diabetes	
Yes	107 (53.5)
No	93 (46.5)
Family history of hypertension	
Yes	33 (16.5)
No	167 (83.5)
HbA1c >9	
Yes	81 (40.5)
No	119 (59.5)

The factors like age (59.1±16.3 years), duration of diabetes (8.2±2.6 years), obesity (BMI=29.6±4.7 kg/m^2), Glycated haemoglobin (9.7±2.8 %), lipid levels and post-prandial blood sugar levels (236±11.8 mg/dl) associated well with silent MI as predicted by TMT.

Fasting blood sugar did not show significant association with Silent MI (Table 2). The baseline characteristics and duration of diabetes is given in Table 1.

The major risk factors like family history of diabetes (53.5%) and hypertension (16.5%) were present in the study subjects.

Obesity was also documented as it is recorded by the mean BMI (28.3±3.7 Kg/m^2) showing majority were grade 1 obese on treatment.

Table 2: Clinical factors associated with silent MI (n=200).

Clinical variables	TMT result	Mean ± SD	95% confidence Interval		p-value*
			Upper limit	Lower limit	
Age (years)	Positive	59.1±16.3	56.8	61.4	<0.001
	Negative	48.7±11.5	47.1	50.3	
	Total	45.6±11.1	44.1	47.1	
Duration (years)	Positive	8.2±2.6	7.8	8.6	<0.001
	Negative	5.2±1.1	5.0	5.4	
	Total	7.8 2.1	6.9	7.5	
BMI (kg/m^2)	Positive	29.6±4.7	28.9	30.3	<0.05
	Negative	25.6±5.7	24.8	26.4	
	Total	28.3±3.7	27.8	28.8	
HbA1c (%)	Positive	9.7±2.8	9.3	10.1	<0.05
	Negative	8.1±1.9	7.8	8.4	
	Total	8.3±3.2	7.9	8.7	
Cholesterol (mg/dl)	Positive	209±20.6	206.1	211.9	<0.001
	Negative	156±28.2	152.1	159.9	
	Total	176±11.9	174.4	177.6	
TG (mg/dl)	Positive	171±10.3	169.6	172.4	<0.05
	Negative	145±9.6	143.7	146.3	
	Total	162±22.9	158.8	165.2	
LDL (mg/dl)	Positive	159±20.6	156.1	161.9	<0.001
	Negative	108±9.9	106.6	109.4	
	Total	158±28.3	154.1	161.9	
FBS	Positive	178±21.8	175.0	181.0	>0.05
	Negative	164±18.5	161.4	166.6	
	Total	160 12.3	158.3	161.7	
PPBS	Positive	236±11.8	234.4	237.6	<0.05
	Negative	212±12.5	210.3	213.7	
	Total	226±13.4	224.1	227.9	

DISCUSSION

Autonomic neuropathy in diabetes mellitus is proposed as the reason for loss of pain alert during a myocardial ischemia.[3] The presence of silent MI was documented by using TMT in 36.5% (n=73) of patients with diabetes mellitus in the present study. The results were similar to the prevalence recorded by Swaminathan and Gayathri in their study which showed Treadmill test was positive in 30% (n=15) of the type 2 diabetic cases.[5] The study also showed increased prevalence of silent MI as the duration of diabetes increased. Tread mill test was positive in 4/26 (27%), 3/9 (20%), 5/7 (33%) and 3/5(20%) patient with duration of diabetes ≤5, 6 to 10, 1 to 15, and 16-20 years respectively.[5]

There was a significant difference (p<0.001) of mean duration of diabetes among those with TMT documented silent MI (8.2±2.6 years) than those without silent MI (5.2±1.1 years) (Table 2). In the present study authors found that the serum triglyceride levels, LDL and cholesterol levels were significantly higher in the TMT positive group compared to the TMT negative group.

Similar results were documented by Swaminathan et al in their study.[5] This was also in line with the study done by DeLuca et al. which found that dyslipidemia was common among the individuals with type 2 diabetes and the most common abnormality was elevated serum triglyceride levels (73.3%).[6] Yet another Indian study by Gautam et al also proved the above fact by showing had strong correlation of TMT positive diabetics with elevated levels of triglycerides (0.82) and low HDL (-0.81).[7]

In the present study there was a significant difference (p<0.05) in glycemic variability as expressed by HbA1c levels among the TMT positive group (9.7±2.8%) compared to the TMT negative group (8.1±1.9%). In the earlier study, the average HbA1C (%) in Treadmill test positive and negative cases were 9.7and7.7 respectively.[5] Another similar study there was an increasing trend of HbA1c levels with the augmenting number of coronary vessels involvement with CAD (p<0.001).[8] There are several studies which put forth magnetic resonance imaging as the ideal modality for screening myocardial tissue for hidden ischemia.[9-11] In Indian context, MRI is an expensive method and TMT is a preliminary cost-

effective screening tool with better sensitivity to detect silent MI.

CONCLUSION

The study clearly showed that the prevalence of silent MI was higher among the type 2 diabetic individuals compared to non-diabetics. Age, duration of diabetes, HbA1c levels, BMI, dyslipidemia and post prandial blood glucose levels were associated significantly with incidence of silent MI in patients with type 2 diabetes. It is highly recommended to screen every high-risk patient with type 2 diabetes with TMT once a year to prevent loss of life to cardio-vascular mortality.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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