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SILENT MYOCARDIAL ISCHEMIA IN TYPE 2 DIABETES AN OBSERVATIONAL STUDY IN A DIABETIC CLINIC IN A TERTIARY CARE CENTRE

General Medicine

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ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is the commonest endocrine disease worldwide with over 8% prevalence in India. Coronary Artery Disease (CAD) is the major cause of morbidity and mortality in diabetes. Silent myocardial ischemia(SMI) is even more dangerous entity in diabetes that endanger the life of these patients as these episodes go undetected by its own nature and can significantly increase mortality.There is a strong need to understand the risk factors for SMI. This study looks at the prevalence and associations of silent ischemia in T2DM.This study finds there is significant prevalence in silent ischemia and strong association between silent ischemia and proliferative retinopathy and microalbuminuria.Tread mill testing (TMT) and Holter monitoring are relatively cheap easy and noninvasive ways to diagnose silent Ischemia.

KEYWORDS

Silent myocardial Ischemia , Type 2 Diabetes , dyslipidemia, microalbuminuria

I. INTRODUCTION

CAD is the main cause of death and morbidity in patients with type 2 diabetes[1]. However, symptomatic events is only a tip of this iceberg and asymptomatic disease is probably at least as common with a high prevalence of silent myocardial infarction [1] and silent myocardial ischemia (SMI) [2], especially in those with additional cardiovascular risk factors [3–5]. Between one- and two-thirds of the patients with SMI also have angiographic evidence of coronary artery disease (CAD) [3]. SMI is strongly predictive of cardiovascular events and poorer outcomes [3, 6] above and beyond routine risk predictors [7]. There is a strong need for understanding the risk factors for SMI, which in turn might improve early diagnosis and treatment.

II. METHODOLOGY

II.1 Aim

To find the determinants and associations of T2DM and silent myocardial ischemia.

II.2 Methods

This study was undertaken in Government Medical College Kozhikode(GMCH Kozhikode), a teritiary care hospital in northern Kerala which caters to 5 districts in the state of Kerala, To find the prevalence of silent myocardial ischemia in T2DM subjects, 100 consecutive subjects attending diabetic clinic with T2DM were enrolled based on the following inclusion and exclusion criteria.

II.3 Inclusion Criteria

Age > 30 years
Willing to give informed consent
T2DM as per ADA criteria

II.4 Exclusion criteria

History of ketoacidosis
Subjects who had diagnosed CAD/symptomatic CAD/underwent revascularization procedures.

Subjects who cannot undergo TMT due to physical ailments
Subjects who had baseline ECG abnormalities which makes detecting silent Ischemia on TMT difficult like Electrocardiographic evidence of Q-wave myocardial infarction, ischemic ST-segment or T-wave changes, or complete left bundle branch block.

II.5 MATERIALS AND METHODS

This study was conducted at Government Medical College Kozhikode. Hundred consecutive patients attending the diabetic clinic satisfying the inclusion criteria were enrolled in the study after getting informed consent in native language, Malayalam.Study was approved by the institutional ethics committee

A detailed history and physical examination was carried out with specific enquiry regarding past and present history of ischemic heart disease or any contraindication for performing or interpreting tread mill test. A Fasting Blood Sugar (FBS), Post Prandial Blood Sugar (PPBS), HbA1c, Fasting Lipid Profile (FLP) was obtained in all subjects. All patients underwent a tread mill testing using Bruce Protocol and Holter monitoring for 24 hrs using a standard 3 channel Holter monitor with a record of activity diary. Patient was exercised on tread mill till target heart rate or maximal exercise tolerability of each subject was reached and episodes of silent ischemia were noted.

II.6 Silent ischemia

If the patient developed angina while on TMT they were excluded from the study, however if they developed significant ST depression of >1,5 mm and still did not have symptoms of angina they were considered as having silent ischemia. In Holter monitoring the same criteria of asymptomatic ST depression was used to diagnose silent ischemia and this was correlated with the activity log of the subject. If the patient had this criteria of ST depression in either Holter or TMT he was considered as having silent ischemia.

Data were entered using Microsoft excel software and analyzed using epi info software.

III. RESULTS

III.1 Patient characteristics

Base line patient characteristics of the 100 subjects are in Table 1.

Table 1 Baseline characteristics of subject population

Sex	67% males	33% females
Mean age	56.5 yrs	49.2 yrs
Mean duration of T2DM	7 yrs	8,2 yrs
Mean HbA1c	8.4%	9.2%
Retinopathy	27%	35%
BMI	25.4	28.8
Hypertension	40%	16%
Dyslipidemia	76%	57%

79% of the subjects had T2DM of >5 years duration. Mean duration of diabetes was 7.2 years (range 2-11.3 years). Only 32% subjects had acceptable ADA controlled blood glucose values.Mean FBS values were 144.76±32.17 mg% and 2hr PPBS 198.21±42.82mg% and HbA1c was 8.4±0.68%

III.2 Silent ischemia

42% subjects developed silent ischemia on TMT according to our criteria. 30% subjects developed silent ischemia on Holter monitoring according to this criteria. None of the subjects had significant arrhythmias during this monitoring. All subjects who had silent ischemia on Holter had silent ischemia on TMT.12% subjects who had silent ischemia on TMT did not have silent ischemia on Holter monitoring. This confers the fact that tread mill testing is a better screening tool for detecting silent ischemia than Holter monitoring.

Subjects had silent ischemia in various stages of exercise chart 2.The majority developed in stage 3 of Bruce protocol. The maximum number of subjects having silent ischemia were having a duration of T2DM between 5 to 10 years.

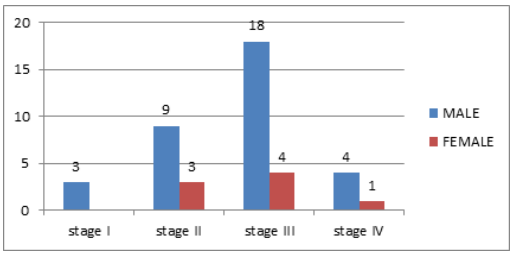

Chart 1 Silent ischemia in various stages of TMT

The duration of diabetes did not have a significant bearing on the incidence of silent ischemia. In fact most cases of silent ischemia were in the group who had diabetes of 5-10 years (TABLE 2). This might be due to the fact that more patients with longer duration of T2DM probably had overt ischemia and were excluded from the study, however this study was not powered to explain this.

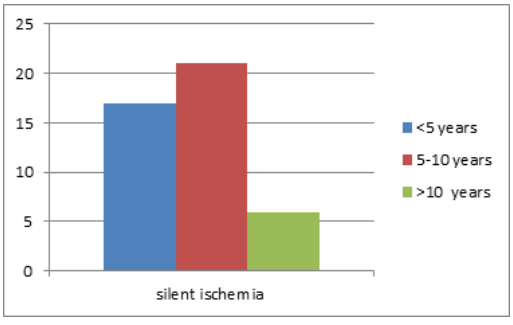

Chart 2 Silent Ischemia and duration of diabetes

The TABLE 2 looks at blood sugars and silent ischemia. It can be seen that though FBS in people with silent ischemia was numerically significantly lower, this was not statistically significant. There was no correlation with PPBS, A1C and silent ischemia.

Table 2: Silent Ischemia and control of diabetes

	FBS mg%	2PPBS mg%	A1c
Silent ischemia	146±42.15	188±21	8.52±0.54
No Silent ischemia	100±24.37	181±14.3	8.21±0.13
P value	0.39	0.79	0.62

We looked at the relationship between retinopathy and silent ischemia (TABLE 3). All subjects who had proliferative retinopathy had silent ischemia with both holter and tread mill testing.

Table 3 retinopathy and silent ischemia

	Background retinopathy n =13	Proliferative retinopathy n=9
TMT silent ischemia	4	9
Holter silent ischemia	2	9

We looked at microalbuminuria and silent ischemia TABLE 4. It was found all subjects who had microalbimunuria had silent ischemia. In this subgroup too TMT was more sensitive in picking up silent ischemia compared to Holter.

Table 4 Microalbuminuria and silent ischemia

Microalbuminuria	Absent n=77	Present n=23
TMT silent ischemia	21	23
Holter silent ischemia	18	12

IV. DISCUSSION

Our observational study assessed the prevalence of silent myocardial ischemia in 100 consecutive T2DM subjects attending diabetic clinic in a tertiary care hospital. Majority of the subjects were male (67%) and majority (79%) of the subjects had T2DM of >5 years duration. Only 32% subjects had acceptable control of blood glucose values.

42% of our subjects developed silent ischemia on TMT and 30% subjects demonstrated silent ischemia on Holter monitoring. Majority of patients with silent ischemia had a duration of diabetes of 5-10years. The duration of diabetes was not significantly associated with silent ischemia possibly because as duration increased many of these subjects developed significant symptomatic CAD which was an exclusion critera for this study. Our study findings corroborated with information available from the DIAD study[2]and the data from a study conducted by Coosan *et al* [4].

All subjects with proliferative retinopathy had silent ischemia, so did patients with microalbimunuria. Similar high prevalence of silent ischemia in patients with microalbimunuria was also noted by Young LH*et al* [6].

Mean BMI in subjects of this study was 27.1(25.4 in males and 28.8 in females).The mean BMI of subjects with silent ischemia was 26.3and this was not statistically significant. This was different from the available data[1].

V. CONCLUSION

1. The duration of diabetes was not significantly associated with silent ischemia possibly because as duration increased many of these subjects developed significant symptomatic CAD which was an exclusion critera for this study.
2. Proliferative diabetic retinopathy was a significant predictor of silent ischemia in both males and females compared with non proliferative retinopathy
3. Microalbuminura was a significant predictor of silent ischemia.23 % of subjects who had micro albuminuria had silent ischemia on TMT and Holter.
4. Over all TMT was more sensitive in picking up silent ischemia compared to holter monitoring.

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