ORIGINAL ARTICLE

Frequency of Asymptomatic Myocardial Ischemia in Type 2 Diabetic Patients with Microalbuminuria

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ABSTRACT

Background: Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Silent (asymptomatic) myocardial ischemia is the most common manifestation of coronary heart disease (CHD).
Aim: To determine the frequency of silent MI in asymptomatic Type 2 diabetic patients with microalbuminuria.
Method: The present cross sectional study was conducted at Diabetes Clinic and Medical OPD of our hospital. Non-probability purposive sampling technique was used. A total of 325 Patients of both genders with age between 30 - 60 years were included. Informed consent was taken from each patient fulfilling the inclusion and diagnostic criteria mentioned in operational definition and were ensured of complete confidentiality.
Results: Mean age of the patients was 49.92±5.55 years; there were 60.3% males whereas 39.7% were females. Mean duration of diabetes in the patients was 10.04±4.61 years. The Silent Myocardial Ischemia was found in 146 (44.9%) patients detected by ETT. Statistically significant difference was found between silent MI and age of the patients (P value=0.006). Similarly significant difference was observed between silent MI and duration of diabetes
Conclusion: It was observed that the frequency of Silent Myocardial Ischemia in diabetic patients is high. Screening for cardiac conditions in such patients should be done keeping in view the higher prevalence.
Keywords: Myocardial Ischemia, Asymptomatic, Type 2 Diabetic, Microalbuminuria

INTRODUCTION

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. A consequence of this is hyperglycemia.[1] It is estimated that 347 million people have Diabetes worldwide.[2] WHO predicts that Diabetes will be the seventh leading cause of death in the year 2030[3]. Type 2 diabetes comprises 90% of people with diabetes around the world.[1] Prevalence of Diabetes Mellitus type 2 in Pakistan is 9.1%[4].

According to one study, myocardial infarction is a common occurrence among even asymptomatic diabetics comprising from 20% to >50% of cases.[5] However, another study claims that the incidence of ischemic heart disease in asymptomatic diabetics is only 2.9%[6]. Cardiovascular disease is responsible for between 50% and 80% of deaths in people with diabetes. Diabetic nephropathy (DN) causes significant morbidity and mortality and is perhaps the most common cause of end stage renal disease (ESRD) in developed countries[7].

Pakistan has a 24.2% prevalence of Diabetic Nephropathy[8]. Micro albuminuria occurs before overt nephropathy and it is a marker of predilection for generalized cardiovascular disease.

Myocardial disease is silent in a large number of cases. In one study, the prevalence of Silent Myocardial Ischemia (MI) in microalbuminuric and normalbuminuric asymptomatic type 2 diabetic patients was 30% and 6.6% respectively. Even with maximum exercise, myocardial ischemia may be completely asymptomatic in type 2 diabetic patients[9].

The rationale of this study is that the data regarding percentage of myocardial ischemia in asymptomatic diabetic individuals is scanty and inconclusive. The purpose of this study is to find the frequency of asymptomatic myocardial ischemia is our population. If the frequency of asymptomatic myocardial ischemia turns out to be high, then early management and intervention will be done to reduce mortality and morbidity. The present study aimed to determine the frequency of silent myocardial ischemia in asymptomatic Type 2 diabetic patients with microalbuminuric disorder.

MATERIALS AND METHODS

The present Cross-sectional study was conducted at the Diabetes Clinic and Medical OPD of our hospital. Sample size was calculated according to WHO sample size calculator. Prevalence of silent myocardial ischemia in type 2 diabetic patients (p) was 30%. Keeping 5% margin of error (e) the sample size (n) was calculated to be 325. Non-probability purposive sampling was done.

All patients with type 2 DM with microalbuminuria of both genders, aged between 30 and 60 were included. The Patients were already diagnosed as diabetic according to laboratory criteria as per operational definition, were taking any anti-diabetic drugs as determined by history and were having normal ECG. Patients with congestive heart failure (diagnosed by Echocardiographic findings), urinary tract infection (diagnosed by urine examination), fever (as documented on history) overt kidney disease (assessed on laboratory findings) and pregnant women (as assessed on history) were excluded from the study. Silent Myocardial Ischemia was determined by exercise tolerance test (ETT) according to Bruce Protocol which defines an ischemic ECG response to exercise test as:

1. At least 1mm horizontal ST segment depression
2. 1.5mm down sloping ST segment depression measured at the J point.

Exercise tolerance test was considered positive at low and high work load, according to whether the defined abnormalities appear in the first 2 stages or the 3rd and subsequent stages respectively. Only patients fulfilling the above criteria on ETT were considered as positive.

All patients for the study were selected on the basis of history of Diabetes Mellitus for more than 5 years taking treatment. Micro albuminuria was defined as urinary albumin excretion rate of 30-300 mg/24 hours collection or 30-300 microgram/mg of creatinine in a spot collection.

A total of 325 patients were included in the study. A detailed proforma was devised to record the findings of study. Informed consent was taken from each patient fulfilling the inclusion and diagnostic criteria mentioned in operational definition. All the patients included in the study were ensured of complete confidentiality. The patients were explained the details and procedure of the study and that no harm was come to them as a result of the study. The cases were selected from the patients visiting Diabetic Clinic and Medical OPD of a tertiary care hospital. Patients were sent to the Cardiology department after definitely ruling out any obvious symptoms regarding myocardial ischemia for Exercise Tolerance test (ETT).

Confounding variables like age and gender were controlled by stratification. All data was entered using software SPSS version 16. Mean and standard deviation was calculated for age and duration of diabetes. Frequencies and percentages were calculated for gender, type of treatment of diabetes and presence or absence of silent ischemia. Data was stratified according to age and gender, duration of diabetes and type of treatment of diabetes to deal with effect modifier. Post stratification Chi-Square was applied to see the significant difference with p value ≤0.05 taken as significant.

RESULTS

Total 325 cases were enrolled in the present study. Mean age of the patients was 49.92±5.55 years (range: 40.0-60.0) (Table 1). The study results revealed that 60.31% males were predominant being 60.31% whereas 39.69% patients were females (Table 1). Mean duration of diabetes in patients was 10.04±4.61 (range: 5.0-20.0), (Table 1). Frequency of silent Myocardial Ischemia was 146 (44.9%) while it was not found in 179(55.1%) patients (Table 1).

Data was cross tabulated for potential confounders including age, gender and duration of diabetes (Table 2). For the purpose of comparison, patients were grouped as <45 and >45 years of age, <10 and >10 years of diabetes and gender. Age wise stratification of the data revealed that silent MI was significantly high (P = 0.006) in patients above 45 years of age. It was 129(49.4%) vs. 25(31.3%) in above and below 45 years of age patients respectively (Table 2).

Sex of the patients was not a significant contributor in incidence of silent MI (P = 0.49) (Table 2). On the other hand, duration of diabetes had highly significant effect on silent MI (P <0.001), Table 2. It was observed that the patients with <10 years of diabetes had 66 (35.5%) rate of silent MI while it was 80 (57.6%) in patients with duration of diabetes >10 years (Table 2).

Table 1: Demographics of study population

Characteristics	Frequency	%age
Gender		
Male	196	60.3
Female	129	39.7
Mean age: 49.92 ± 5.55 (range: 40.0-60.0)		
Mean Duration of diabetes: 10.04± 4.61 (range: 5.0-20.0)		
Silent Myocardial Ischemia:		
No	179	55.1
Yes	146	44.9

Table 2: Distribution of Silent MI with respect to confounding variables

Potential Confounders	Silent MI		P value
	Yes	No	
Age in category			
<45 years (n=80)	25(31.3%)	55 (68.7%)	0.006
>45 years (n=245)	121(49.4%)	124(50.6%)	
Gender			
Male(n=196)	85(43.4%)	111(56.6%)	0.49
Female(n=129)	61(47.3%)	68 (52.7%)	
Duration of Diabetes			
<10 years (n= 186)	66(35.5%)	120(64.5%)	<0.001
>10 years (n=139)	80(57.6%)	59 (42.4%)	

DISCUSSION

This present study was conducted at Diabetes Clinic and Medical OPD of a tertiary care hospital to determine the frequency of silent myocardial ischemia in asymptomatic Type 2 diabetic patients with microalbuminuria. The high mortality rate after a clinical MI and after revascularization is well documented in patients with type 2 diabetes, but less well after a silent MI[10]. Microalbuminuria is associated with silent coronary artery disease in people with type 1and type 2 diabetes[11,12].

Most predictors of clinical MI also predicted silent MI, although the associations appeared more modest for silent events. Microalbminuria (MA) is defined as urinary albumin excretion rate of 30-300 mg/24 hours (20-200 microgram/minute), and results from glomerular hyperfiltration and elevated intraglomerular pressure[13].

Microalbuminuria in non-insulin dependent diabetes mellitus (NIDDM) reflects an underlying predisposition to developing progressive kidney disease as well as serving as a marker of predilection for generalized cardiovascular disease.

In our study the mean age of the patients was noted as 49.92±5.55 years. It has been suggested that in patients over 60 years of age with type 1 or type 2 diabetes, autonomic neuropathy and other cardiovascular risk factors, such as development of microalbuminuric, should be screened for silent myocardial ischaemia[14].

In our study silent Myocardial Ischemia was found in 146(44.9%) patients while it was not found in 179(55.1%) patients. A number of studies have confirmed the presence of silent ischemia in diabetic patients. The reported prevalence of myocardial ischemia varied between studies from 6% to 59%[15-19].

Abdul Zahrah F et al concluded in their study that the prevalence of SMI in asymptomatic microalbuminuric and normalbuminuric type 2 diabetic patients were 30% and 6.6% respectively. Even with a maximum exercise, myocardial ischemia might be completely asymptomatic in

type 2 diabetic patients[20].

Inoguchi T et al. (Japan), recorded a prevalence of SMI (45.3%) in their studied asymptomatic type 2 diabetic patients above 60 years of age.[21] The Fremantle Diabetes Study of 1269 patients detected silent MI in 3.9% of patients, 43.9% of all MIs.[22] Another study claims that the incidence of ischemic heart disease in asymptomatic diabetics is only 2.9%[6].

Rubler et al found that ST-segment change during treadmill exercise testing in diabetes had a low sensitivity (50%) and high specificity (83%) in the prediction of CHD events[23]. Vanzetto et al. [24] recently studied high-risk subjects with T2D, a third of whom had evidence of baseline CHD. In one study, the prevalence of Silent Myocardial Ischemia in microalbuminuric and normal buminuric asymptomatic type 2 diabetic patients was 30% and 6.6% respectively. Even with maximum exercise, myocardial ischemia may be completely asymptomatic in type 2 diabetic patients[9].

Exercise stress test is the most widely available, inexpensive and commonly used test used to detect coronary artery disease. Our study results showed that the detection of myocardial Ischemia was observed in 44.92% patients by ETT while it was not observed in 55.08% patients using ETT as detection. In a prospective study 203 diabetic patients without angina and with normal resting ECG were screened with exercise ECG test (stress nuclear imaging was used if exercise ECG was contraindicate or inconclusive). Sixteen percent had abnormal stress test whereas 9% had silent coronary artery disease as defined by angiography[25].

In a study which evaluated 206 higher risk asymptomatic type 2 diabetes patients with peripheral arterial disease and at least 2 cardiovascular risk factors, 19% had an abnormal test and the positive predictive accuracy of the exercise ECG was 79%. These studies collectively support the notion that among higher-risk cohorts of asymptomatic patients with type 2 diabetes nearly 1/3 may have unrecognized coronary artery disease and exercise ECG may be useful in identifying these patients[26].

A study was performed on 180 asymptomatic adult-onset diabetic patients referred to exercise myocardial perfusion imaging to detect asymptomatic obstructive coronary artery disease)[27].

CONCLUSION

It was observed in our study that the frequency of Silent Myocardial Ischemia in diabetic patients is high. Such patients should be screened of cardiac conditions so that early management and intervention can be advised to reduce mortality and morbidity.

Conflict of Interest: The authors have no conflict of interest

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