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ORIGINAL ARTICLE

Frequency of Silent Cardiac Ischemia in Type II Diabetes Mellitus Patients

TAHIR ANGEZ KHAN[1], ARSHAD NAEEM[2], MUHAMMAD IQBAL QASIM[3], MUHAMMAD ARSHAD[4], MUHAMMAD SADIQ[5], HUMA NAEEM TAREEN[6]

[1]*District Medical Specialist, DHQ Hospital Haripur*
[2]*Assistant Professor, Internal Medicine, King Abdullah Teaching Hospital Mansehra*
[3]*Associate Professor Medicine, Frontier Medical College, Kath Mansehra*
[4]*Assistant Professor and Consultant Cardiologist Cardiology, King Abdullah Teaching Hospital Mansehra*
[5]*Senior Registrar, Medicine, King Abdullah Teaching Hospital Mansehra*
[6]*Associate professor Cardiology, BMCH Quetta*
Correspondence to: Muhammad Iqbal Qasim, Email: driqbalqasim2000@gmail.com

ABSTRACT

Objective: Finding out how often silent cardiac ischemia is in type II diabetic individuals was the aim of this investigation.
Study Design: Descriptive/Cross-sectional
Place and Duration: King Abdullah Teaching Hospital Mansehra during from April 2023 to September 2023.
Methods: A total of 230 individuals with type II diabetes mellitus were included in this investigation. Following a comprehensive medical history assessment, the patient underwent electrocardiography (ECG) before to and subsequent to exercise tolerance testing. This was performed alongside the documentation of their height, blood pressure, weight, and fasting blood glucose levels (ETT). The EKG alterations were evaluated, and the patient was categorized as having silent cardiac ischemia based on the ECG findings. All data were analyzed using SPSS version 23.0.
Results: The study comprised 150 males (65.2%) and 80 females (34.8%). The average age was 50.13 ± 11.34 years, with a mean BMI of 26.7 ± 8.44 kg/m². The mean fasting blood sugar level was 171 ± 22 mg/dl. The prevalence of hypertension was observed in 94 cases (40.9%), while 76 patients (33.04%) reported smoking status. A total of 100 cases (43.5%) were identified as having silent cardiac ischemia. A significant correlation was observed between silent cardiac ischemia and factors including advancing age, extended duration of diabetes mellitus, smoking history, hypertension history, and elevated body mass index (p-value 0.05).
Conclusion: We made the observation that silent cardiac is fairly common in our community, which calls for prompt action to be taken in order to initiate the diagnosis of this problem at an early stage for the purpose of achieving better outcomes in the future.
Keywords: Silent cardiac ischemia, Hypertension, Type II diabetes mellitus, BMI,

INTRODUCTION

As of 2014, 8.5% of individuals worldwide had diabetes mellitus, a growing rate. Most diabetics (90–95%) have type 2 diabetes. Insulin resistance in Type 2 diabetes (T2DM) greatly increases the risk of vascular inflammation and atherogenesis, which can cause cardiovascular ischemia. Type 2 diabetes mellitus (T2DM) individuals are more likely to die from their first myocardial infarction, hence they should be screened for silent or hidden ischemia. CAD may remain asymptomatic in these patients. Silent myocardial ischemia has no subjective signs. If chest pain and other symptoms of cardiovascular ischemia are absent, ECG, ECHO, and SPECT scan ischemic changes, wall motion abnormalities, and myocardial perfusion errors can occur[2]. Silent myocardial ischemia is an uncommon symptom of ischemic heart disease. About 55% of type-2 diabetics have cardiac issues. Age increases the risk of silent myocardial ischemia and cardiovascular ischemia. The DIAD (Detection of Ischaemia in Assymptomatic Diabetics) study[5,6] was the largest to examine silent myocardial ischemia in diabetics. Careful data analysis shows that 14% of stress myocardial perfusion imaging screening participants had silent myocardial ischemia. Unfortunately, the study did not include a comparison group of non-diabetics, therefore it is hard to determine how often asymptomatic diabetes patients have myocardial perfusion deficiencies.

Diabetes's most unappreciated consequence, cardiovascular autonomic neuropathy (CAN), causes heart rate regulation and vascular dynamics to abnormalize due to damage to the autonomic nerve fibers that innervate the heart and blood vessels.

Diabetes increases ischemic heart disease risk[6,7]. (IHD). 80% of type 2 diabetes fatalities are caused by coronary artery disease[7]. The American Heart Association and European Society of Cardiology classify type 2 diabetes as a cardiovascular illness. Objective evidence of myocardial ischemia without chest pain or other angina-like symptoms is indicative of silent MI. Silent ischemia increases coronary risk, but therapy can reverse it. 18% of coronary events[8] are the first sign of coronary disease, and almost half of sudden deaths occur in persons without a history of CHD. Recent research suggests that 50% of diabetics may experience myocardial ischemia and infarction without symptoms[9,10]. No one knows why some myocardial ischemia situations cause angina and others don't.

Here are Several Mechanisms:

1 A decreased pain threshold during an ischemic event.
2 Fewer and milder ischemia events.
3 A greater pain threshold.
4 A more pervasive inability to register pain.
5 an impaired early warning system for angina.
6 A rise in anti-inflammatory cytokines and beta-endorphins, which block pain transmission pathways and raise nerve activation threshold, etc. Diabetics may have more silent ischemia due to cardiac afferent neuropathy.

Looking back, multiple researchers showed no difference in silent ischemia prevalence between diabetics and non-diabetics. This study was designed to determine the prevalence of silent cardiac ischemia in type II diabetics in Pakistan due to a lack of accurate statistics. Given its future results, it would help us raise public awareness so we can apply screening measures to boost people's longevity and reduce disease's impact on their everyday lives.

MATERIAL AND METHODS

Two hundred and thirty-three individuals with type II diabetes mellitus participated in this cross-sectional study that ran from April to September 2023 at King Abdullah Teaching Hospital Mansehra. Each patient's complete demographic information was recorded once informed written consent was obtained. Anyone with a history of unstable angina, non-ST-elevation myocardial infarction (NSTEMI), heart failure, cerebrovascular accident, uncontrolled cardiac arrhythmia, AV block, being pregnant at the time of study,

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liver illness (AST, ALT > 40 IU/L), or being treated with digitalis or beta-blockers was not eligible to participate.

The study included males and females aged 20-60 who had type II diabetes mellitus (DM) for at least five years and a normal resting electrocardiogram (ECG) as a baseline. The pathology lab at Allama Iqbal Medical College measured hemoglobin and fasting lipid profiles. Before anything else, a twelve-lead resting electrocardiogram was taken from every single participant. Patients were evaluated for co-morbidities prior to exercise testing. The following health conditions were documented: obesity, hypertension, smoking history, hyperlipidemia, duration of diabetes mellitus, and family history of coronary heart disease. We used a Precor® treadmill to look for changes indicative of ischemia in asymptomatic individuals who had no prior history of coronary heart disease. During and after exercise, electrocardiogram tracings were recorded. At two, five, and ten minutes into the recovery period following an exercise tolerance test, participants' electrocardiograms and blood pressure were assessed. The maximum ST-segment change, which happened 80 ms after the Jpoint, was the primary focus of the ECG analysis. A horizontal or downsloping ST-segment depression of >1mm or an upsloping of >1.5mm was considered a good outcome for silent cardiac ischemia. The data was analyzed using SPSS version 23.0. Silent cardiac ischemia was analyzed using the chi-square test to determine the effects of age, gender, hypertension, blood sugar levels, BMI, and smoking (>5 packs per year) on the overall prevalence. Findings with a p-value of less than 0.05 were considered statistically significant.

RESULTS

There were 150 (65.2%) males and 80 (34.8%) females in this study. The mean age was 50.13± 11.32 years and had mean BMI 26.7±8.44 kg/m^2. Mean fasting blood sugar was 171±22 mg/dl. Mean weight of the patients was 80.3±6.19 kg and mean height was 64.1±6.8 inches.(table 1)

Table-1: Details of the Enrolled Patients' Baseline Status

Variables	Frequency	Percentage
Mean age (years)	50.13± 11.32	
Mean BMI (kg/m^2)	26.7±8.44	
Mean Fasting Blood (mg/dl)	26.7±8.44	
Mean weight (kg)	80.3±6.19	
Mean height (Inches)	64.1±6.8	
Mean Duration of diabetes (years)	4.10±6.18	
Gender		
Male	150	65.2
Female	80	34.8

Frequency of hypertension was found in 94 (40.9%) cases and 76 (33.04%) patients were smokers.(figure-1)

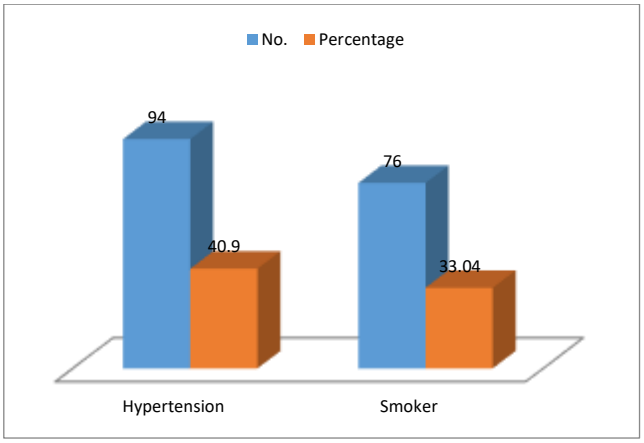

Figure-1: Frequency of smokers and hypertension among all cases

We found that 100 (43.5%) cases had silent cardia ischemia. There was a strong correlation between silent cardiac ischemia and factors such as increasing age, prolonged duration of diabetes mellitus, a smoking history, a history of hypertension, and an increased body mass index (p-value 0.05).(table 2)

Table-2: Frequency of silent cardia ischemia and risk factors

Variables	Frequency	Percentage
Silent Cardiac Ischemia		
Yes	100	43.5
No	130	56.5
Risk Factors		
increasing age	34	14.8
prolonged duration of diabetes mellitus	26	11.3
smoking history	14	6.1
hypertension	12	5.2
increased body mass index	14	6.1

DISCUSSION

Given the striking similarities between the incidences of cardiac ischemia, MI, and sudden death, as well as their decrease by use of -blockers, the idea that silent cardiac ischemia is connected to significant and life-threatening cardiac events seems physiologically feasible. Studies on the histopathology of the heart provide further evidence that repeated episodes of ischemia may cause permanent changes in the heart, such as the development of scarred or fibrotic myocardium, which in turn may trigger the onset of potentially fatal arrhythmias or even congestive heart failure[11]

In our study 230 patients of type-II diabetes mellitus were presented. There were 150 (65.2%) males and 80 (34.8%) females in this study. The mean age was 50.13± 11.32 years and had mean BMI 26.7±8.44 kg/m^2. Mean fasting blood sugar was 171±22 mg/dl. Findings were comparable to the previous studies[12,13] Our findings corroborate recent studies that show diabetes's micro- and macro-vascular problems share similar pathogenic mechanisms independent of traditional risk factors[14]. Despite the lack of certainty around shared pathogenic pathways, there is mounting evidence linking DR and systemic vascular problems genetically[15]. Microvascular and macrovascular problems of diabetes are accompanied by endothelial function, platelet disorder, oxidative, inflammation, and advanced glycation end[16].

We found that 100 (43.5%) cases had silent cardia ischemia. There was a strong correlation between silent cardiac ischemia and factors such as increasing age, prolonged duration of diabetes mellitus, a smoking history, a history of hypertension, and an increased body mass index (p-value 0.05). A treadmill test was performed to check for the occurrence of silent myocardial ischemia in a comparable observational research with 338 participants. 23% of cases of asymptomatic myocardial ischemia were discovered. It was shown that males were more likely than females to experience silent myocardial ischemia. It has been demonstrated that hypertriglyceridemia and hypercholesterolemia are important predictors of silent myocardial ischemia in diabetics over the age of 50.[17] In a different investigation, diabetics who were asymptomatic had SPECT scans performed to look for silent myocardial ischemia. The incidence of silent myocardial ischemia caused by stress-induced perfusion abnormalities was 37%. It was discovered that the usage of insulin, nephropathy, and neurotoxicity were significant predictors of quiet myocardial injury in asymptomatic diabetic individuals (p 0.005).[18] Depending on the baseline traits of the participants, many investigations have discovered that the incidence of silent myocardial ischemia varies from around 20% to 60%[19,20]. Due to the risk of underlying silent myocardial ischemia, as demonstrated by our study, patients with a positive family history of coronary artery disease, long-standing T2DM, and concomitant comorbidities such hypertension, nephropathy, neurotoxicity, dyslipidemia, etc. should undergo screening.[21]

The discovery of silent ischemia shed light on many of the pathophysiological processes underlying the development of cardiovascular disease. Over time, it has been obvious that identifying acute or silent ischemia may be of great diagnostic and prognostic utility when the medical population being studied is well-defined. In addition, the search of silent ischemia must have the highest clinical relevance possible by carefully selecting the research population and detection tools. The prevalence rate of SCI vary greatly depending on the research population, the parameters used to diagnose silent ischemia, and the technique of ischemia detection used. Thirteen participants in the Framingham study cohort with normal electrocardiograms and no evidence of coronary artery disease at baseline were followed for 30 years with clinical evaluation and ECG every two years.

CONCLUSION

We made the observation that silent cardiac is fairly common in our community, which calls for prompt action to be taken in order to initiate the diagnosis of this problem at an early stage for the purpose of achieving better outcomes in the future.

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