DOI: https://doi.org/10.53350/pjmhs221610863

**ORIGINAL ARTICLE**

# Determine the Frequency of Silent Cardiac Ischemia in Type II Diabetes Mellitus Patients

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## ABSTRACT

**Objective:** The purpose of this study was to ascertain the prevalence of silent cardiac ischemia in diabetic patients with type II diabetes.

**Study Design:** Cross-sectional

**Place and Duration:** This study was conducted at Fazaia Medical College, Islamabad from January, 2022 to June, 2022.

**Methods:** Total 115 patients of type-II diabetes mellitus were presented in this study. After taking a thorough medical history, the patient had electrocardiography (ECG) both before and after exercise tolerance testing. This was done in addition to recording their height, blood pressure, weight, and fasting blood sugar levels (ETT). Changes in the electrocardiogram were analysed, and the patient was classified as having silent cardiac ischemia or not depending on the results of the ECG. SPSS 22.0 was used to analyze all data.

**Results:** There were 75 (65.2%) males and 40 (34.8%) females in this study. The mean age was 51.13± 10.29 years and had mean BMI 26.7±8.44 kg/m$^2$. Mean fasting blood sugar was 171±22 mg/dl. Frequency of hypertension was found in 47 (40.9%) cases and 38 (33.04%) patients were smokers. We found that 50 (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).

**Conclusion:** We observed that silent cardiac is quite frequent in our population, which necessitates immediate measures to diagnose this issue early for the sake of improved results in the future.

**Keywords:** Type II diabetes mellitus, BMI, Silent cardiac ischemia, Hypertension

## INTRODUCTION

According to a 2014 estimate, the global incidence of diabetes mellitus is rising, already impacting 8.5% of people. By far the vast majority (90–95%) of persons with diabetes have type 2 Diabetes. The characteristic of Type 2 diabetes (T2DM) is insulin resistance, which dramatically raises the risk of vascular inflammation and atherogenesis, leading to significant micro- and macro-vascular consequences such cardiovascular ischemia. Patients with type 2 diabetes mellitus (T2DM) are more likely to die from their first myocardial infarction, making it crucial to screen these patients for the existence of silent ischemia or hidden ischemia, as CAD might stay asymptomatic in these people. There is no subjective indication of ischemic symptoms in people with silent myocardial ischemia. Ischemic alterations on the electrocardiogram (ECG), abnormalities in wall motion during echocardiogram (ECHO), and errors in myocardial perfusion on SPECT scan are all possible in the absence of chest discomfort and other signs of cardiovascular ischemia [2]. Ischemic heart illnesses can often manifest in unusual ways, and silent myocardial ischemia is one such example. Patients with type-2 diabetes have an about 55% frequency of heart problems. Increasing age raises the likelihood of cardiovascular ischemia and, by extension, silent myocardial ischemia. Patients with quiet myocardial ischemia and patients with real silent myocardial ischemia were evaluated combined in the DIAD (Detection of Ischaemia in Assymptomatic Diabetics) research [5, 6], the biggest study to date to investigate the prevalence of silent myocardial ischemia in diabetic patients. Careful analysis of the data reveals that fourteen percent of the individuals assigned to undergo stress myocardial perfusion imaging screening suffered from actual silent myocardial ischemia. Unfortunately, the study lacked a control group of non-diabetic people, therefore it is impossible to tell how frequently asymptomatic diabetes patients have deficits of myocardial perfusion in contrast to the non-diabetic population.

Cardiovascular autonomic neuropathy (CAN) refers to damage to the autonomic nerve fibres that innervate the heart and blood vessels, leading to anomalies in heart rate regulation and vascular dynamics, and is one of the most underappreciated of the major consequences of diabetes.

Increased risk of ischemic heart disease has been linked to diabetes mellitus [6, 7]. (IHD). According to [7]coronary artery disease causes [8]80% of deaths in people with type 2 diabetes. Type 2 diabetes is considered as a cardiovascular disease comparable both the American Heart Association and the European Society of Cardiology. In the absence of chest pain or other angina-like symptoms, the existence of objective evidence of myocardial ischemia is considered to be diagnostic of silent myocardialischemia (SMI). An increase in coronary risk has been linked to silent ischemia, however this may be reversed with the right treatment. Eighteen percent of coronary events [8] are the first symptom of coronary disease, and more than half of all sudden fatalities occur in people with no known history of coronary heart disease. Myocardial ischemia and infarction can occur without any symptoms in up to 50% of people with diabetes, according to a recent study. [9,10] No one knows for sure why certain cases of myocardial ischemia are accompanied with the onset of angina whereas others show no symptoms at all.

**The following are examples of mechanisms:** One, 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 the synthesis of anti-inflammatory cytokines and beta-endorphins, which together block pain transmission pathways and raise the nerve activation threshold, and so on. The increased prevalence of silent ischemia in diabetics may be attributable to autonomic neuropathy involving cardiac afferent neurons.

However, looking back, several investigators found no discernible difference in the prevalence of silent ischemia in diabetes patients compared to non-diabetic controls. Since there is a dearth of credible statistics from the Pakistani population on the subject of cardiac ischemia in diabetic patients, this study was conceived to ascertain the prevalence of silent cardiac ischemia in people suffering from type II diabetes mellitus. In light of its future outcomes, it would aid us in raising public awareness of the issue so that we may implement screening strategies to increase people's longevity and lessen the impact of diseases on their daily lives.

## MATERIAL AND METHODS

This cross-sectional study was conducted Fazaia Medical College, Islamabad from January, 2022 to June, 2022 and comprised of 115 patients of type-II diabetes mellitus. Following the acquisition of informed written consent, full demographic information for each patient that was enrolled was documented. Exclusion criteria included individuals having a history of acute coronary syndromes (unstable angina, NSTEMI, STEMI), heart failure, cerebrovascular accident, uncontrolled cardiac arrhythmia or AV block, current pregnancy, Liver illness (AST, ALT > 40 IU/L), or taking digitalis treatment or beta-blockers.

The research comprised 20–60-year-old men and women with type II diabetes mellitus (DM) for ≥ 5 years and a normal resting (baseline) ECG. Allama Iqbal Medical College Pathology Laboratory performed haemoglobin and fasting lipid profile tests. All individuals received a baseline twelve-lead resting ECG. Before exercise testing, patients were assessed for co-morbidities. Obesity, hypertension, duration of diabetes mellitus, hyperlipidemia, family history of coronary heart disease, and smoking history were recorded. Asymptomatic participants with no history of coronary heart disease were tested for ischemia alterations using a Precor® treadmill. At peak exertion and after exercise, ECG tracings were collected. Exercise tolerance test subjects had their blood pressure and electrocardiograms checked two minutes, five minutes, and ten minutes into their recovery period. Analyses of the ECG recordings focused on the maximal ST-segment change that occurred 80 ms after the Jpoint. A positive result for silent cardiac ischemia was classified as a horizontal or down-sloping ST-segment depression of >1mm or an up-sloping of >1.5mm. SPSS version 22.0 was used to analyse the gathered data. By applying the chi-square test, we were able to see how age, gender, hypertension, blood sugar levels, body mass index, and smoking (>5 packs per year) influenced the overall prevalence of silent cardiac ischemia. Significant results were defined as those with a p-value of 0.05 or lower.

## RESULTS

There were 75 (65.2%) males and 40 (34.8%) females in this study. The mean age was 51.13± 10.29 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) | 51.13± 10.29 | |
| 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 | 75 | 65.2 |
| Female | 40 | 34.8 |

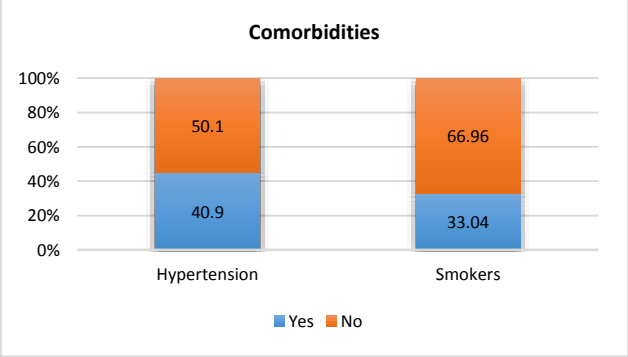


Figure-1: Frequency of smokers and hypertension among all cases

Frequency of hypertension was found in 47 (40.9%) cases and 38 (33.04%) patients were smokers.(figure-1)

We found that 50 (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 | 50 | 43.5 |
| No | 65 | 56.5 |
| Risk Factors | | |
| increasing age | 17 | 14.8 |
| prolonged duration of diabetes mellitus | 13 | 11.3 |
| smoking history | 7 | 6.1 |
| hypertension | 6 | 5.2 |
| increased body mass index | 7 | 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 115 patients of type-II diabetes mellitus were presented. There were 75 (65.2%) males and 40 (34.8%) females in this study. The mean age was 51.13± 10.29 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 50 (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 observed that silent cardiac is quite frequent in our population, which necessitates immediate measures to diagnose this issue early for the sake of improved results in the future.

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