Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i3.6036

SILENT MYOCARDIAL INFRACTION AMONG PATIENTS WITH TYPE II DIABETES MELLITUS

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Abstract

Objective: To determine the frequency of silent myocardial infraction (SMI) among patients with type II diabetes mellitus.

Material And Methods Setting: This cross-sectional study was conducted at the Cardiology Department of Liaquat University Hospital in Hyderabad from March 2020 to August 2020. The study included patients diagnosed with type II diabetes mellitus for over 5 years, aged between 40 and 60 years, of both genders, with a respiratory rate more than 20/minute, and confirmed cases of myocardial infarction. Silent myocardial infarction was diagnosed based on established criteria, including ECG changes indicative of myocardial ischemia, imaging evidence of myocardial scar or regional wall motion abnormalities consistent with prior infarction, and the absence of typical symptoms of acute coronary syndrome. All data were entered into SPSS version 16.0 for analysis.

Results: In this study mean of patients was 59.29±12.96 years, mean systolic blood pressure was 134.82±33.57, mean diastolic blood pressure was 82.11±17.98. Males were 54.4% and females were 45.6%. Mean HbA1c level was 11.30±2.90, mean cardiac troponin was 46.0±136.98. However mean duration of diabetes was 11.30±7.46 years. Majority of the patients 61.0% were presented with non-St Elevation MI, while 39.0% were diagnosed as ST elevation MI. Frequency of silent myocardial infarction, 44.1% patients had silent myocardial infarction and 55.9% were without silent myocardial infarction. Frequency of silent myocardial infarction was statistically insignificant according to age, gender, duration of disease, HbA1c and blood pressure, p-values were quite insignificant.

Conclusion: In the conclusion of this study the frequency of silent myocardial infarction was highly prevalent (42.1%) among patients of myocardial infarction with diabetes mellitus type II. However, this prevalence was statistically insignificant according to age, gender, HbA1c, duration of disease and blood pressure

Key words: Type II DM, Silent, Myocardial infarction

INTRODUCTION

Diabetes is a prevalent and severe condition that can result in long-term macrovascular and microvascular complications that are often irreversible.[1] coronary artery disease stands as the primary cause of mortality among individuals with Type II Diabetes Mellitus. It frequently manifests without symptoms and can unexpectedly manifest as Acute Myocardial Infarction, Arrhythmia, Heart Failure, or sudden death.[1] The diabetes epidemic is still on the rise, with current prevalence figures showing around 12% among adults in the United States.[2] While type 2 diabetes is linked to a two- to fourfold increased likelihood of cardiovascular disease, this risk varies widely among individuals.[2] Between 2017 and 2045, it is projected that the adult diabetic population will increase by nearly 50%, indicating a forthcoming escalation in the worldwide burden of diabetes and SMI.[3] It is traditionally defined as the presence of myocardial ischemia in patients who do not experience any subjective symptoms of ischemia.[4]

Silent coronary artery disease occurs when the blood flow to the heart muscle is decreased, often due to the narrowing of coronary arteries as a result of atherosclerosis, but without causing any pain, discomfort, or distress.[5] Additionally, factors such as restricted coronary artery flow reserve, endothelial dysfunction, and abnormal microcirculation can also contribute to decreased blood flow to the heart muscle.[5-7] In many instances, diabetic neuropathy, which alters pain perception, is considered the primary cause of asymptomatic coronary artery disease in diabetic individuals. However, the exact mechanisms behind this condition are not fully understood.[5] Consequently, these unnoticed mechanisms result in undiagnosed cases where affected individuals do not receive appropriate care, ultimately leading to premature death.[3] Global research findings indicate a wide variability in the prevalence of SMI among diabetic populations, ranging from 12% to nearly 57%.[8,9] However, there is a need for more precise characterization of the high-risk clinical features associated with these patients. In Pakistan, the prevalence of silent cardiac ischemia was determined to be 45.1%. Factors such as advancing age, longer duration of diabetes mellitus, smoking history, high blood pressure, and higher body mass index were found to be significantly associated with silent cardiac ischemia.[10] However, in Pakistan, there is a lack of precise data regarding the true incidence of silent myocardial infarction (MI). Some studies have reported varying rates of silent cardiac ischemia among diabetic populations, with one study identifying 50 cases (43.5%) of diabetes patients exhibiting silent cardiac ischemia,[11] while another found SMI present in 34 patients (41.9%) with Type 2 diabetes mellitus and microalbuminuria, as confirmed by exercise treadmill testing (ETT).[12] Additionally, Ali FS et al. discovered a lower frequency of silent carotid artery stenosis (CAS) in diabetic patients, around 28.92%.[13] Given these discrepancies observed in recent national studies, this study aims to evaluate the incidence of silent myocardial infarction among individuals having diabetes mellitus at LUMHS Jamshoro.

MATERIAL AND METHODS

This cross-sectional study was conducted in department of the Cardiology at Liaquat University hospital Hyderabad. Study was done during a period of 6 months from March 2020 to August 2020. The sample size of 136 patients' calculation was done using the raosoft software by using the proportion (silent myocardial infraction 5% to 10% among diabetic population), with confidential level of 95% and margin error 4%. Non probability consecutive sampling techniques was used. All the patients of type II diabetes mellitus with history of diabetes duration >5 years, presented with myocardial infarction, aged 40 to 60 years, both gender and respiratory rate more than 20/minute were included. Patients unwilling to participate in the study, those with a history of any other cardiac disease, type I diabetes mellitus (insulin-dependent, with disease onset before 15 years of age according to patients' history), a history of previous myocardial infarction, or known cases of respiratory diseases were excluded. The study was conducted following approval from the Hospital's ethical committee, and written consent was obtained from all participants and their attendants after explaining all risks associated with the disease. Detailed medical histories were recorded, and baseline investigations were performed for all patients. Diagnosis of silent myocardial infarction was based on established criteria, including ECG changes indicative of myocardial ischemia (such as

pathological Q waves, ST-segment elevation or depression), imaging evidence of myocardial scar or regional wall motion abnormalities consistent with prior infarction, and absence of typical symptoms of acute coronary syndrome (e.g., chest pain or discomfort). Interpretation of diagnostic tests and confirmation of SMI diagnosis were performed by experienced cardiologists blinded to the patients' clinical information. All of the data was entered on predesigned proforma attached with. All the data was entered into SPSS 16.0 version and was analyzed by using the same software. The quantitative data like age, duration of diabetes, HbA1c, systolic BP and diastolic BP were presented in form of mean ± S.D. Simple frequency and percentage were computed for the gender, type of MI, residential status, socioeconomic status and silent myocardial infarction. Stratification with respect to effect modifier like age, gender, diastolic and systolic BP and duration of diabetes with outcome were done. Chi square test was applied by taking P- value of ≤0.05 was considered significant.

RESULTS

In this study mean age of patients was 59.29±12.96 years, mean systolic blood pressure was 134.82±33.57, mean diastolic blood pressure was 82.11±17.98. Table.1 Out of all study cases males were 54.4% and females were 45.6%. Mean HbA1c level was 11.30±2.90, mean cardiac troponin was 46.0±136.98. However mean duration of diabetes was 11.3±7.46 years. Majority of the patients 61.0% were presented with non-St Elevation MI, while 39.0% were diagnosed as ST elevation MI. Furthermore, the residential status and socioeconomic status are presented in table. 1

According to the frequency of silent myocardial infarction, 44.1% patients had silent myocardial infarction and 55.9% were without silent myocardial infarction. Fig: 1

Frequency of silent myocardial infarction was statistically insignificant according to age (p=0.782), gender (p=0.568), residential status (p=0.923) and HbA1c (p=0.385). However, frequency of silent myocardial infarction was statistically significant according to the duration of diseases (p=0.009). Table. 2

Table.1 Demographic characteristics of the study subjects n=136

Variables		**Statistics**
Age	Mean	59.29±12.96 years
Gender	Males	74(54.4%)
	Females	62(45.6%)
Residence	Urban	47(34.6%)
	Rural	89(65.4%)
Socioeconomic status	Poor	90(66.2%)
	Middle	46(33.8%)
	Upper	00
Blood pressure	Systolic	134.82±33.57 mm Hg
	Diastolic	82.11±17.98 mm Hg
Duration of disease	Std. Deviation	11.98±7.46 years
BMI	Std. Deviation	27.33±3.44 kg/m²
Hb, level	Std. Deviation	11.30±2.9 mg/dl
Cardiac troponin	Std. Deviation	46.0±136.98 mg/dl
Types of MI	STEMI	53(39.0%)
	NSTEMI	83(61.0%)

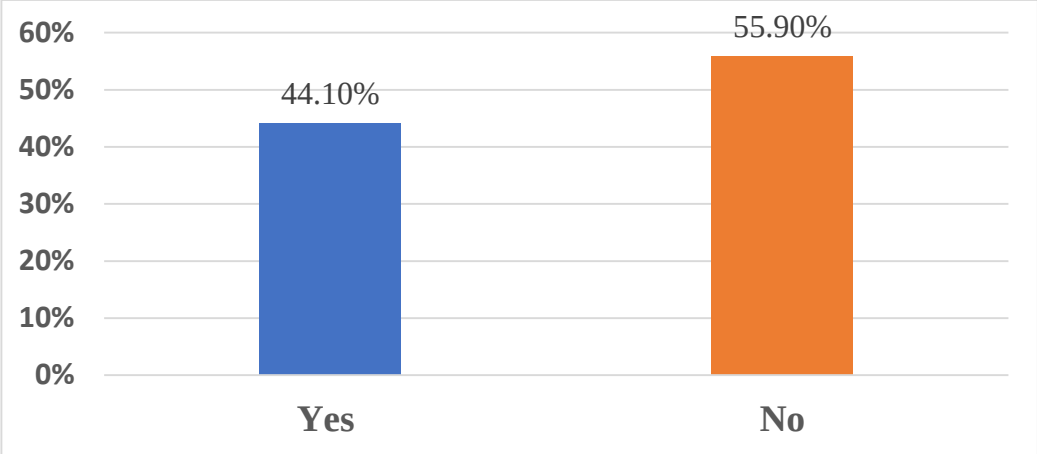

Fig: 1. Frequency of salient myocardial infarction in DM patients n=136

Table.8. Frequency of silent myocardial infarction accordingto age (n=136)

VARIABLES		Silent MI		P-value
		Yes	No	
Age groups	40 – 50 years	13	15	0.782
	51- 60 years	47	61	
Gender	Male	31	43	0.568
	Female	29	33	
Residence	Rural	21	26	0.923
	Urban	39	50	
Hba1c	6-10	23	37	0.385
	11-15	27	31	
	>15	10	8	
Duration of diabetes	1-5 years	8	28	0.009
	5-10 years	25	21	
	10-15 years	14	9	
	>15 years	13	18	

DISCUSSION

Silent myocardial ischemia poses a notable concern for individuals with diabetes. It's believed that diabetic patients may experience impaired symptom perception, such as a lack of recognition of chest pain, due to partial or complete autonomic denervation. Moreover, in type 2 diabetes mellitus, silent myocardial ischemia may indicate an underlying susceptibility to developing progressive kidney diseases and serve as an indicator of an increased risk for generalized cardiovascular disease.[14] The current study involved 136 diabetic patients with myocardial infarction (MI) to assess the prevalence of silent MI. The average age of the patients was 59.29 ± 12.96 years, and the mean duration of diabetes was 11.98 ± 7.46 years. In this study, males constituted 56.1% of the sample, while females accounted for 43.9%. Similarly, Khan HA et al,[12] reported a mean patient age of 49.72 ± 6.75 years, with males representing 60.5% and females 39.5% and, in their study, the mean duration of type 2 diabetes mellitus (T2DM) was 12.52 ± 4.71 years. These findings were consistent with those of Memon S et al,[15] where the mean age was 49.93 ± 9.91 years, with males comprising 58.2% and females 41.8%. Conversely, Zia N et al,[10] found a mean age of 54.9 ± 5.9 years, with all 144 male patients and 93 female patients and they found mean duration of T2DM in their study population 10.0 ± 2.6 years. The male predominance observed in these studies may be attributed to higher rates of smoking and stress among males in our country compared to females. Additionally, other hormonal factors could also contribute to the higher prevalence among males.

In our study, we found that 44.1% of patients exhibited silent myocardial infarction, while 57.9% did not show signs of silent myocardial infarction. This is consistent with findings from Eastern India by Prasad DS et al,[16] where the prevalence of SMI among type 2 diabetic patients was higher in males

(28.4%) compared to females (17.3%). Additionally, a national study conducted by Zia N et al[10] reported a frequency of silent cardiac ischemia at 45.1%. Furthermore, Sadiq T et al[11] found that 50 (43.5%) cases had silent cardiac ischemia. Our study adds to the growing body of evidence suggesting a higher prevalence of SMI in diabetic individuals compared to non-diabetics. Specifically, one study revealed that 31% of diabetics without prior evidence of coronary artery disease tested positive for SMI during treadmill tests, indicating a 2.2 times higher incidence in diabetics compared to non-diabetics.[17] Silent myocardial infarction (SMI) in diabetic patients poses a significant clinical challenge due to its asymptomatic nature. Studies have consistently shown that diabetic individuals are at an increased risk of developing SMI compared to non-diabetics. This heightened risk can be attributed to various factors, including underlying diabetic neuropathy, autonomic dysfunction, and altered pain perception, which may mask typical symptoms of myocardial ischemia such as chest pain or discomfort. In comparison to our study, Ihsan A et al[18] found that out of 90 asymptomatic type 2 diabetic patients, 36.7% exhibited SMI. Among these patients, the frequency of silent myocardial ischemia was 57.6% in males and 42.4% in females.[18] Contrary to our findings, Sharrack N et al[19] reported a lower prevalence of silent ischemic heart disease (IHD), with the highest occurrence observed in diabetic patients (31.3%). However, Hafsa F et al[20] also reported a prevalence of SMI in 146 (44.9%) patients detected by exercise treadmill testing. In comparison to our study, an Egyptian study found a lower prevalence of SMI, with 24.5% of diabetic patients showing regional myocardial perfusion abnormalities.[21] This indicates a lower occurrence of SMI compared to our findings. International studies consistently demonstrate a reduced frequency of SMI compared to national studies, including our own. These differences may stem from variations in patient demographics, study methodologies, or diagnostic criteria employed. Factors such as higher levels of education and regular cardiac checkups in international populations of developed countries, contrasted with lower awareness and neglect in our population, could also contribute to these disparities. The detection of SMI in diabetic patients presents a clinical dilemma as these individuals may remain undiagnosed and untreated, leading to adverse cardiovascular outcomes including heart failure, arrhythmias, and increased mortality. Moreover, the absence of symptoms may delay timely intervention, resulting in missed opportunities for secondary prevention measures. Routine screening for SMI in diabetic patients remains controversial, as there is limited evidence regarding the effectiveness of such strategies in improving clinical outcomes. Additionally, challenges in accurately diagnosing SMI, particularly in the absence of symptoms, underscore the need for novel diagnostic modalities and risk stratification tools tailored to diabetic populations.

CONCLUSION

In conclusion, a higher prevalence of silent myocardial infarction (SMI) was observed among patients with type 2 diabetes mellitus and myocardial infarction. These findings suggest that the occurrence of SMI in diabetic patients with myocardial infarction may be influenced by a complex interplay of multiple factors beyond those assessed in our study. Regarding the challenges in accurately diagnosing silent myocardial infarction, particularly in the absence of symptoms, it underscores the need for the development of new diagnostic methods and risk assessment tools specifically tailored for individuals with diabetes

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