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Prevalence of Myocardial Infarction in Young Diabetic Patients (20-39 Years) Living in North Sinai Governorate

OSAMA M. ABOBAKR, M.D.

The Department of Cardiology, Faculty of Medicine, Arish University, El-Arish 45511, Egypt

Abstract

Background: Myocardial infarction MI is the leading cause of death all over the world. One of the most important risk factors for MI is diabetes mellitus especially if presented with other risk factors as smoking, hypercholesterolemia and hypertension. The higher level of HgA1c is associated with increasing complications of MI.

Aim of Study: This study aimed to study the prevalence of MI in young diabetic patients (20-39 years) living in North Sinai governorate.

Patients and Methods: This study was carried-out on 100 patients aged 20-39 years, patients suffering from diabetes mellitus either Type 1 or type 2 or, recently diagnosed DM or long time diabetic patients, on oral hypoglycemic medications or insulin treatment. All patients were subjected to standard 12 lead electrocardiogram (ECG), full echocardiography and full laboratory investigations.

Excluded from the study were patients with ischemic heart disease diagnosed by history, cardiac enzymes, ECG and/or echocardiography. All patients underwent the following, full history, Chest pain analysis, ECG, echocardiographic, evidence of gross segmental wall motion abnormality.

Results: The study indicated that diabetes increase the prevalences of myocardial infarction. Also, the results indicated that dyslipidemia, hypertension, and smoking were risk factors for myocardial infarction, The main symptoms of cardiac infarction includes chest pain. The best methods of diagnosis includes clinical presentation of TCP, ECG, and increasing level of cardiac troponin with increasing level of HgA1C, with increasing complications of MI.

Conclusion: The prevalence of myocardial infarction in young diabetic patients (20-39 years) was 17% and the main symptoms of cardiac infarction was typical chest pain. The higher level of HgA1c was associated with increasing complications of MI as HF.

Key Words: *Myocardial infarction - Young diabetic patients – North Sinai governorate.*

Correspondence to: Dr. Osama M. Abobakr, The Department of Cardiology, Faculty of Medicine, Arish University, El-Arish 45511, Egypt

Introduction

MYOCARDIAL infarction (MI), colloquially known as “heart attack,” is caused by decreased or complete cessation of blood flow to a portion of the myocardium. Myocardial infarction may be “silent” and go undetected, or it could be a catastrophic event leading to hemodynamic deterioration and sudden death. Most myocardial infarctions are due to underlying coronary artery disease (CAD). MI is the leading cause of death all over the world **[1]**.

As stated above, MI is closely associated with CAD. INTERHEART is an international multicenter case-control study which delineated the following modifiable risk factors for CAD that includes: Smoking, abnormal lipid profile/blood apo lipoprotein (raised Apo B/ApoA1), hypertension, diabetes mellitus, abdominal obesity (waist/hip ratio) (greater than 0.90 for males and greater than 0.85 for females),psychosocial factors such as depression, loss of the locus of control, global stress, financial stress, and life events including marital separation, job loss, and family conflicts, Lack of daily consumption of fruits or vegetables, and Lack of physical activity **[2,3]**.

Diabetes is a major risk factor for the development of CAD with a higher incidence of MI in patients with DM than those without. In addition, following MI, diabetic patients have higher rates of morbidity, mortality and re-infarction than non-diabetics, with one-year mortality rates of nearly 50% **[4]**.

Acute MI is often associated with dynamic changes in the ECG waveform. Serial ECG monitoring can provide important clues to the diagnosis if the initial ECG is non-diagnostic at initial presentation **[5]**.

A large and prompt reduction in ST-segment elevation is usually seen in reperfusion in STEMI patients [1].

Regional wall motion abnormalities induced by ischemia can be detected by echocardiography almost immediately after the onset of ischemia when greater than 20% transmural myocardial thickness is affected [5]. Cardiac MRI provides an accurate assessment of myocardial structure and function [5].

Lambed meat is an essential component of diet in the populations of North Sinai governorate. It contains high amount of fat which could linked to insulin resistance, and higher incidence of DM. Population of North Sinai have more stressful life style which can predispose to diabetic mellitus and/or CAD [6,7].

Aim of the work: This study aimed to study the prevalence of myocardial infarction in young diabetic patients aged 20-39 years of age, living in North Sinai governorate in Egypt.

Patients and Methods

This study was carried-out on 100 patient aged 20-39 years patients suffering from diabetes mellitus, either Type 1 or type 2 DM, recently diagnosed or long time diabetic patients, on oral hypoglycemic medications or insulin treatment. The patients were collected from Alarish Hospitals and Alarish University, North Sinai governorate, Egypt from April 2022 to March 2023.

This study was subjected to the ethical standards of Cardiology at the Faculty of Medicine, Al-Arish University.

The purpose and design of the study were explained to the patients, and the family members. The confidentiality of information obtained was maintained and revealed only to the doctor/ auditor involved in the study and to the regulatory authorities.

Design of study and participants All patients included in our study subjected to standard 12 lead ECG, full echocardiographic data and full laboratory investigations.

Inclusion criteria:

Patients with diabetes mellitus and age 20-39 years old.

Exclusion criteria:

Non Diabetic and ischemic heart disease patients.

All patients underwent the following:

Full History and clinical examination.

Age, sex, diabetes and other risk factors like hypertension, smoking, and hyperchlestermia.

Chest pain analysis:

Onset, location, duration, aggravation factors, radiation site, character (stabbing, burning, compressing, stitching), at rest or with effort, other symptoms as dyspnea vomiting and nausea.

ECG:

STEMI, ST segment depression, T wave changes, ventricular tachycardia, ventricular fibrillation, and heart blocks.

Echocardiographic evaluation for the Measurement of LV systolic function using conventional techniques and gross segmental wall motion abnormality, any structural complications like ventricular septal rupture and, papillary muscle rupture

Laboratory investigations include serial cardiac enzymes, renal functions, liver functions, complete blood picture, serum electrolytes, coagulation profiles, glycated hemoglobin, fasting blood glucose, post prandial blood glucose, lipid profile, Erythrocyte sedimentation rate, C reactive protein.

Patients with confirmed diagnosis of MI underwent Coronary angiography plus percutaneous coronary intervention or were referred for Coronary artery bypass graft.

Statistical analysis:

Numerical variable were expressed as mean ± SD. Number is percentage for continuous variable. Chi^2-test were used for comparison of qualitative data prevalence among the patients with myocardial infarction and those without. Also, *t*-test was used for comparison of the quantitative data between the patients with myocardial infarction and those without. The statistical analysis was made using SPSSPC + version 28 - Computer program. Differences were considered to be significant at $p<0.05$.

Results

Patients were divided into two groups:

- Group 1: Diabetic patients with myocardial infarction.
- Group 2: Diabetic patients without myocardial infarction.

Demographic characters:

Table (1) shows the demographic characteristics of the study population. There were 17 patients in

group (1) with MI, their mean ± SD age was 35.7 ±2.8 year versus 35±5 year in group (2) (p<0.02). The male to female ratio was 3:2 in the whole study population, with male gender domesticity in the group (1) (53% male versus 47% female).

Risk factors:

Table (2) shows that, the main factors affecting the prevalence of MI included diabetes, hypertension, smoking, dyslipidemia, obesity, level and family history of IHD. Group (1) MI patients were 17 patient, all patients were diabetic and group (2) non MI patients were 83 patient, all patients also were diabetic.

Our results indicated that there was statistically significant differences (p<0.05) between the patients with MI and those without.

The smoking differed significantly (p<0.01) among the patients as in group (1) 12 (70.6%) patients were smoker and in group (2) 8 (9.6%). Patients were smoker.

The prevalence of dyslipidemia differed significantly as in group (1) were 14 (82.3%) patients and in group (2) were 11 (13.2%) patients.

The prevalence of hypertension differed significantly as in group (1) were 11 (64.7%) patients and in group (2) were 20 (24%) patients.

The family history of IHD differed significantly as observed in 12 (70.6 %) patients of group (1) and 4 (4.8 %) in patients without myocardial infarction.

Table (1): Demograhic characters of patients under the study.

	Patients		Test of significance	Probability
	Group (1) With myocardial infarction	Group (2) Without myocardial infarction		
Number of myocardial patients	17 (17%)	83 (83%)	t=2.26	0.02*
Age	35.7±2.8	33±5		
Sex:				
Male (n=64)	p-value 0.03	(66.2%)	Chi^2=10.66	0.03*
	(53%)	(33.8%)		
Female (n=36)	(47%)			

* = Significant at (p<0.05. ** = Significant at (p<0.01).

Table (2): Risk factors of myocardial infarction.

Item	Patients		Test of significance	p-value
	Group (1) With myocardial infarction	Group (2) Without myocardial infarction		
Diabetic	17 (100%)	83 (100%)	Chi^2 = 0.01	0.15 NS
HTNsive:				
No	6 (35.3%)	63 (76%)	Chi^2 = 3.69	0.002*
Yes	11 (64.7%)	20 (24%)		
Smoker:				
No	5 (29.4%)	75 (90.4%)	Chi^2 = 5.70	0.0001***
Yes	12 (70.6%)	8 (9.6%)		
Dyslipdemic:				
No	3 (17.65%)	72 (86.7%)	Chi^2 = 6.78	0.0014***
Yes	14 (82.35%)	11 (13.2%)		
Family history of IHD:				
No	5 (29.4%)	79 (95.2%)	Chi^2 = 9.50	0.000***
Yes	12 (70.6%)	4 (4.8%)		

NS = Non-significant at (p>0.05).
* = Significant at (p<0.05).
** = Significant at (p<0.01).
*** = Significant at (p<0.001).

Glycated Hemoglobin (HGA1c):

The level of HgA1C level in patients with myocardial infarction higher than its level in patients without cardiac infarction as its level in myocardial infarction patients was 10.8 and in patients without myocardial infarction was 7 ±1.2, respectively. (p<0.000) (Table 3).

Complications and cardiac arrest:

The results observed in Table (4) showed that the complications and cardiac arrest of MI differed significantly (p<0.01) between the patients with cardiac infarction and those without.

The complications including congestive heart failure, ischemic mitral regurgitation, ventricular arrhythmias, mechanical complications as ventricular septal rupture, papillary muscle rupture and up to cardiac arrest were observed in about half of group (1) patients (myocardial infarction patients) 8 (47%).

The cardiac arrest observed only in one (94.1 %) patients of group (1).

Table (3): Glycated Hemoglobin (HGA1c).

Item	Patients		Test of significance	p-value
	Group (1) With myocardial infarction	Group (2) Without myocardial infarction		
HGA1c (normal range below 6)	10.8±2	7± 1.2	t=10.30	p=0.000***

*** = Significant at (p<0.001).

Table (4): Complications Diagnosis items of myocardiac infarction.

Item	Patients		Test of significance	p-value
	Group (1) With myocardial infarction	Group (2) Without myocardial infarction		
Complication:				
No	9 (52.9%)	83 (100)	Chi^2 = 10.52	0.000***
Yes	8 (47%)	0 (0)		
Cardiac Arrest:				
No	16 (94%)	83 (100)	Chi^2 = 8.50	0.000***
Yes	1 (5.9%)	0 (0)		

*** = Significant at (p<0.001).

Discussion

The results on the demographic characters showed that, the age of patients in group (1) with myocardial infarction was older and significantly different (35.6 years old) than those of group (2) without myocardial infarction (33 years old). Also, prevalence of MI in the male was 9 (52.9%) and in female was 8 (47%). These results attributed to the higher age are more susceptible to MI than the young age and the male is frequently under pressure of life that causing a higher risk for MI. These results agreed with the results of Mendis and Malik **[8,9]** where they reported that, the older age and the male patients are of a high risk to myocardial infarction.

The risk factors of myocardial infarctions were higher in patients with MI than those without that includes diabetes, hypertension, smoking, obesity dyslipidemia, and family history of IHD. All the patients in group (1) and group (2) suffering from diabetes and prevalence of MI in our all Diabetic patient was 17%.

Also our results agreed with those of Duncan [10]who showed that obesity is common in patients with DM, particularly T2DM, and is associated with an increased risk of CAD. One possible mechanism linking DM and obesity with subsequent CAD is low-grade inflammation. Also, Mooradian [11]reported that, diabetic patients are at increased risk of developing dyslipidemia. One mechanism underlying this connection is increased free fatty-acid release present in insulin-resistant fat cells. High levels of free-fatty acids promote triglyceride production, which in turn stimulates the secretion

of apolipoprotein B (ApoB) and very LDL (VLDL) cholesterol. High levels of ApoB and VLDL have both been tied to increased risk of CAD. In addition to high ApoB and VLDL, hyperinsulinemia is associated with low high-density lipoprotein (HDL) cholesterol levels **[11]**.

These results agreed with those of Mendis and Malik **[8,9]** where they reported that, the chest pain, sweating, nausea, epigastric abdominal pain, dyspnea, and syncope, are the main symptoms of myocardial infarctions.

Thygesen and Weil **[5]** reported that, Cardiac troponins (I and T) also a good marker for myocardial infarction detection but elevated serum levels of cardiac troponin are not specific to the underlying mode of injury (ischemic vs other cardiac and non cardiac causes). Also, CK MB isoform can also be used in the diagnosis of MI, but it is less sensitive and specific than cTn level. Thygesen, **[5]** reported that, using cardiac MRI is a good and accurate method for cardiac infarction diagnosis and identification.

Our results showed The level of HgA1C increased in myocardial infarction patients and the higher level of HgA1C associated with increasing complications of MI as congestive heart failure and even cardiac arrests which recorded in one patient of group (1).

Our results showed that, the complications were observed in about half of the patients in group (1) with MI.

This results agreed with those of Shalby 2023 **[12]** where they reported that, cardiogenic shock remains the most common cause of death in hospitalized MI patients specially if were diabetic patients.

The results of this study agreed with those of Lindholm and Luo **[13,14]** where they reported that, the cardiogenic shock progresses about 2-3 times higher among diabetics patients with acute myocardial infarction. Unfortunately, those patients had greater risks of mortality and adverse cerebrovascular events than non-diabetic patients. Diabetes is commonly associated with obesity, hypertension and dyslipidemia which magnify its risk for adverse cardiac events. Still, diabetes' impact on the prognosis of patients with cardiogenic shock needs further studies for clarification. Understanding the treatment characteristics and clinical outcomes in this subset of patients at our center may give valuable insights into the existing practices and unmet needs in our regional systems of care for those patients presenting with MI especially if they were diabetic.

Conclusion:

The prevalence of MI in the studied group of young diabetic patient living in North Sinai Governorate is 17%. The main symptoms of MI includes typical chest pain. The higher level of HgA1C was associated with increasing complications of MI.

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معدل انتشار جلطة بالشرايين التاجية للقلب فى مرضى السكر صغار السن (الشريحة العمرية من عشرين إلى تسعة وثلاثين عام) والمقيمين بمحافظة شمال سيناء

تمت هذه الدراسة بجامعة العريش كلية الطب ومستشفى العريش العام قد تبين منها أن معدل حدوث جلطة القلب لمرضى السكر الذى يتراوح عمرهم من ٢٠ إلى ٣٩ عام المقيمين بمحافظة شمال سيناء نسبتهم ١٧٪ وتبين أنه كلما زاد عدم انتظام السكر تزايدت نسبة السكر التراكمى وبالتالى ارتفع معدل حدوث الإصابة بجلطات القلب حيث أن عدم انتظام السكر هو احداهم وعوامل الخطورة المسببه لجلطات القلب.

تمت هذه الدراسة فى الفترة من بين ابريل ٢٠٢٢ إلى ٢٠٢٣ مارس و قد تم تشخيص الإصابة بجلطات القلب عن طريق التاريخ المرضى للمريض والشكوى المرضية ورسم القلب وارتفاع انزيمات القلب والموجات الصوتية للقلب وتم عمل قسطرة تشخيصية وعلاجية لجميع المرضى الذين تم تشخيصهم بجلطات القلب.