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Research Article

Painless ischemia in diabetes mellitus

Jabbar Mhawes Habeeb  

Al-Husain Teaching Hospital, Iraq

 Corresponding author: mhmdkas@mu.edu.iq

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Abstract

The main purpose of the current research work was to study the importance of the clinical identification of persons with painless ischemia in diabetes mellitus and discuss potential treatment interventions. The current study was conducted on articles published during the previous 15 years. Furthermore, recent references to retrieved research articles were studied. Unfortunately, over the last decade or two, another trend has emerged: the prevalence of obesity and diabetes mellitus has increased. The world's population is aging, and older people are more likely to have trouble maintaining appropriate glucose levels during fasting or postprandial periods. These developments add to the world's population's ongoing burden of diabetes and heart disease. The research article reviews a study related to painless ischemia in diabetes mellitus. This data covers obesity and other diabetes mellitus antecedents in middle-aged and elderly people all around the world. We resulted that painless ischemia in diabetes mellitus Preinfarct angina and classic myocardial infarction chest discomfort is usually absent. 3) They usually have congestive heart failure, which is frequently accompanied by painless myocardial ischemia during stress testing. Painless ischemia was more common in diabetics regardless of the severity of ischemia, but painless ischemia was less common in non-diabetics with severe ischemia. As a result, diabetic individuals with neuropathy and retinopathy should be managed with extra care.

Keywords Painless, Ischemia, Diabetes Mellitus

Introduction

Diabetes patients are more likely to experience silent ischemia. People with diabetes are more likely to develop coronary artery disease (CAD), which occurs when plaque narrows the coronary arteries feeding the heart muscle, preventing oxygen-rich blood from reaching the heart muscle. In individuals with symptomatic coronary artery disease, silent myocardial ischaemia is now well-known. Though reduced sensitivity to pain is likely to be one of the processes involved, its aetiology remains unknown. Because diabetic individuals typically have cardiovascular autonomic dysfunction. Silent myocardial ischemia is clinically significant because it is linked to a poor prognosis following an event such as unstable angina or myocardial infarction (Scheidt et al., 1990). Several surveys have been used to determine the prevalence of diabetes mellitus across the world.

It has been assumed to exist in people who have sudden cardiac death as a result of coronary artery disease. Silent ischemia during exercise has also been identified in survivors of cardiac arrest and patients with life-threatening arrhythmias. Silent ischemia's pathophysiologic foundation has yet to be determined. It was postulated that quiet myocardial ischemia reflected less severe ischemia based on the finding that individuals with stable angina might experience many more painless than painful bouts of ST-segment depression. However, In a recent study that looked at the significance of chest pain in patients with coronary artery disease who had a high a priori likelihood of inducible ischemia, researchers discovered that the differences in objective measurements of ischemia (made using ambulatory electrocardiographic monitoring and thallium-201 single-photon emission computed tomography exercise testing) between patients with angina and patients with silent ischemia were insignificant. Peripheral neuropathy may play a role in

the development of silent ischemia in diabetic individuals; abnormalities in autonomic nerve function have also been seen in non-diabetic patients with silent myocardial ischemia (Nihoyannopoulos et al., 1995). Silent ischemia, on the other hand, can be seen in many non-diabetic people who don't have any signs of neuropathy. Invasive animal research has mostly been used to discover the anatomical channels for the transmission of adequate peripheral painful impulses. The brain linkages controlling visceral pain perception and the emotional reaction to it, however, remain unknown beyond the thalamic level. Patients with diabetes mellitus are more likely to have a heart attack, develop myocardial infarction, and die from a significant acute myocardial infarction (Callahan et al., 1989).

The inability to recognise ischemic discomfort might make it difficult to diagnose myocardial ischemia or MI. However, the processes of painless myocardial ischemia are complicated and poorly understood. Afferent cardiac autonomic nerve fiber dysfunction, altered pain thresholds, and subthreshold ischemia not sufficient to generate pain have all been proposed as plausible explanations. According to a recent study that employed positron emission tomography to detect regional cerebral blood flow as an indication of regional neuronal activity, autonomic dysfunction leads to decreased afferent signalling and failed signal transmission from the thalamus to the frontal cortex. Although evidence for a mechanistic relationship between diabetes and painless myocardial ischemia may not entail autonomic dysfunction, as some have argued, the results of the Detection of Ischemia in Asymptomatic Diabetes study are difficult to dismiss (Rosen et al., 1996).

Diabetic studies In the Ischemia in Asymptomatic Diabetics study, which included 1123 people with type 2 diabetes, autonomic dysfunction was a strong predictor of ischemia. In addition, a meta-analysis of 12 research found a continuous link between CAN and the occurrence of mild myocardial ischemia (Gębka et al., 2018). According to the Mantel-Haenszel calculation, the pooled prevalence rate risk for silent myocardial ischemia was 1.96, with a 95 percent confidence interval of 1.53–2.51 (P = 0.001; n=1468 total 2 people). As a result, people with CAN require extra care. Cardiovascular autonomic function testing might be an essential part of a diabetic patient's risk assessment for coronary artery disease (Garces et al., 2011).

Results and Discussion

Painless ischemia detected in high-sensitive troponin patients:

An (almost) normal coronary angiography does not rule out acute coronary syndrome, according to the third universal definition of myocardial infarction from 2012. The mechanism of type 2 myocardial infarction was characterized by the recommendations as secondary to ischemia imbalance generating myocardial damage with necrosis, with diseases other than coronary contributing to the imbalance between

myocardial oxygen supply and/or demand. Hypertrophied myocardium, coronary microvascular dysfunction, tachycardia, and an elevated LVOT gradient are all possible mechanisms of myocardial ischemia in HCM (Chipkin et al., 1987). Over half of the patients in our sample had a positive hs-TnI test result, with around 25% having silent ischemia and 25% having painful angina pectoris (the median hs-TnI value in this group was elevated > 5 normal value, suggesting a significant level). These data are both alarming and important. In patients with HCM, stress echocardiography has recently been proposed to have significant prognostic importance, with ischemic endpoints displaying a greater predictive accuracy than hemodynamic endpoints.

Mortality Rate due to ischemia in diabetes mellitus

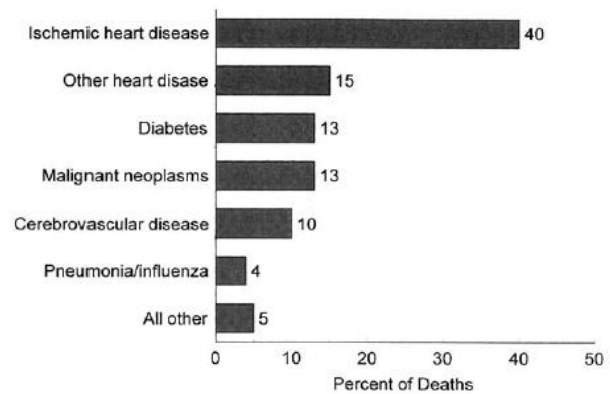


Fig. 1 shows the approximate distribution of causes of mortality in diabetics based on research conducted in the United States. (Source: Geiss LS, Herman WH, Smith PJ: Geiss LS, Herman WH, Smith PJ: Geiss LS, Herman WH Non-insulin-dependent diabetes is associated with a higher risk of death (Maser & Lenhard, 2005)

Table 1. Baseline Characteristics of the painless ischemia in diabetes mellitus patients (Sadagat et al., 2018)

Age (Years)	78.8±2.5
Sex (male. %)	88.8
Hypertension (%)	50.0
Smoker (%)	22.2
Stroke (%)	22.2
Renal insufficiency (%)	38.8
DM (%)	47.0
BMI (kg/m ²)	23±1.2

Between January 2003 and December 2005, patients with MI who were admitted to the coronary care unit were re-evaluated retrospectively. MI was diagnosed when the blood concentration of creatine kinase (CK) exceeded twice the upper limit of the normal range. Even though CK values were elevated, patients with catecholamine cardiomyopathy or my

ocarditis were excluded (Quek et al., 1992; Wilson, 1998). A patient who had a myocardial infarction and a cerebral infarction at the same time was also eliminated, as was a patient who had a MI while under general anaesthesia. A total of 149 patients were enrolled using these criteria. Painless MI was defined as MI that did not cause unpleasant symptoms such as chest pain, back pain, shoulder pain, chest pressure, or chest discomfort. Heart failure-related dyspnea was not previously regarded to be a bothersome symptom. Eighteen of the 149 patients were diagnosed with painless MI, and their symptoms are listed in Table 2.

Sadagat et al., 2018 examined 44 diabetic individuals with angiographically confirmed coronary artery disease, and positive treadmill tests were studied for painless myocardial ischemia. They were 26 years old when they were diagnosed with diabetes and 18 years old when they were not. The lack of chest discomfort with 1 mm or greater ST-segment depression during exercise stress testing was characterised as painless myocardial ischemia (Assmann & Schulte, 1989; Wilson, 1998). The amplitude of the ST segment depression was used to estimate the severity of ischemia. Painless myocardial ischemia was detected in 18 of the 26 diabetics (69%) and three of the 18 non-diabetics (17%). (p less than 0.005). Painless ischemia was more common in diabetics regardless of the severity of ischemia, but painless ischemia was less common in non-diabetics with severe ischemia. With a level of 2.5 mm ST depression, 11 of 12 diabetics (92%) were pain-free, compared to four of 11 non-diabetics (36%). (p less than 0.01). In diabetics, the absence of chest pain during exercise testing was not associated with earlier angina, but in non-diabetics, both clinical and exercise-induced angina occurred at the same time. When compared to those who developed chest discomfort, diabetic individuals without chest pain had a greater prevalence of three major diabetes complications: neuropathy, nephropathy, and retinopathy (p less than 0.025). Painless myocardial ischemia is often detected during exercise stress testing in diabetics, and its incidence is rather a high independent of the severity of ischemia (Titus & Sherman, 1991).

Quek et al., 1992 observed that latent myocardial ischaemia in individuals with symptomatic coronary artery disease is now well-known though reduced pain sensitivity is likely to be one of the processes involved, its aetiology remains unknown. We hypothesize that because cardiovascular autonomic dysfunction is common in diabetes individuals, it leads to painless myocardial ischaemia. The study included forty diabetes (type II) male patients and ten healthy volunteers. 14 of the diabetic males were found to have definite autonomic neuropathy using five previously established noninvasive tests for autonomic dysfunction (at least 2 abnormal tests) (Sukhija et al., 2000). The 50 participants were then put on a motor-driven treadmill and exercised until they were either exhausted or had chest problems. Thirty-three diabetic patients were found to have considerable (more than 1 mm) ST segment depression in at least two adjacent leads. 18 of them were linked to normal angina, whereas the other 15 had to quit due

to tiredness or exhaustion (ie painless). Thirteen of the thirteen participants with confirmed autonomic neuropathy (AN+) showed positive exercise ECG testing, ten of whom had painless ischaemia and only three of whom developed angina (Tanaka et al., 1990; Agoas et al, 1990).

Table 2. Symptoms painless ischemia in diabetes mellitus patients

	N
None	2
Loss of consciousness	1
Dyspnea	9
Hypotension	1
Dizziness	2
Nausea	2
Appetite loss	1

Renal Insufficiency is Related to Painless Ischemia in Diabetes Mellitus

In individuals with renal insufficiency, both autonomic and sensory nerve function are disturbed. Heart-rate variability, the Valsalva manoeuvre, hand grip exercise, the reaction to orthostasis, the cold pressure test,10 and mental assessments have all shown abnormalities in autonomic nervous system function in these individuals. Such anomalies, on the other hand, are seen in both diabetic and non-diabetic patients (Saito et al., 2004; Blanc et al., 1990; Selwyn et al., 1981). One study found autonomic nervous system dysfunction in those with mild to severe renal insufficiency, defined as a blood creatinine concentration of 1.4–4.2 mg/dl. Sensory nerve function has also been proven to be faulty using electrophysiological tests such as membrane potential, stimulus-response, wave amplitude, and conduction velocity.

Conclusion

The world's population is aging, and older people are more likely to have trouble maintaining appropriate glucose levels during fasting or postprandial periods. These developments add to the world's population's ongoing burden of diabetes and heart disease. The research article reviews a study related to painless ischemia in diabetes mellitus This data covers obesity and other diabetes mellitus antecedents in middle-aged and elderly people all around the world. We resulted that painless ischemia in diabetes mellitus Preinfarct angina and classic myocardial infarction chest discomfort are usually absent. They usually have congestive heart failure, which is frequently accompanied by painless myocardial ischemia during stress testing. Painless ischemia was more common in diabetics regardless of the severity of ischemia, but painless ischemia was less common in non-diabetics with severe ischemia. As a result, diabetic individuals with particular neuropathy and retinopathy should be managed with extra care.

Conflict of Interest

The author hereby declares no conflict of interest.

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Ethical Considerations

The study was approved by the institutional ethical committee

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