

Modifiable and Non-modifiable predisposing Risk Factors of Myocardial Infarction -A Review

Sadia Huma¹, Rabia Tariq¹, Dr Fatima Amin¹, Dr. Khawaja Tahir Mahmood²

¹Department of Pharmacy, Lahore College for Women University, Lahore

²DTL, Lahore, Pakistan

Abstract:

Myocardial infarction is a key component of the burden of cardiovascular crises which is a common presentation of ischemic heart disease. It is a disease with serious consequences in mortality, morbidity, and cost to the society. It is characterized by chest pain, epigastric discomfort, general malaise, sweating and anxiety. These symptoms may affect by different modifiable and non modifiable predisposing risk factors like hypertension, diabetes, physical activity, alcohol use, age, family history, abnormal lipids, obesity, high risk diet, smoking and psychosocial stress. This review has considered these predisposing risk factors. Smoking followed by hypertension, abdominal obesity and diabetes are the most important risk factors. Fruits and vegetables consumption is characterized among less common factors while alcohol is a protective risk factor. Various uncommon factors block coronary artery thus causing an MI. A healthy life style and proper physical activity can reduce the occurrence of MI in normal or otherwise healthy patients. While morphine sulphate subcutaneously or intravenously, reperfusion with direct angioplasty and coronary angiography should be considered for patients without identifiable mechanical complications.

Keywords: Myocardial Infarction, Modifiable predisposing factors, Non modifiable predisposing factors

INTRODUCTION

Myocardial infarction (MI) is a pathological process due to a compromise in the blood supply of such severity to an area of myocardium that adequate oxygen cannot be obtained even after prolonged rest. [1] Acute coronary syndrome has two subtypes which refer to acute myocardial infarction, namely non-ST-elevated myocardial infarction and ST-elevated myocardial infarction, which are not always but most frequently a manifestation of coronary artery disease (CAD). [2]

Coronary artery disease is a chronic disease with stable and unstable periods. During unstable periods patients may develop MI with the involvement of activated inflammation in vascular wall. A myocardial infarction may be the first manifestation of CAD and in patients with established disease, it may occur repeatedly. [3]

MI means, a part of heart muscle loses its blood supply due to sudden formation of blood clot in coronary artery, leading to death of the affected part if no prompt treatment is devised. It may sometimes call as coronary thrombosis or more commonly heart attack. [4][5]

SIGNS AND SYMPTOMS

Classical symptoms of acute MI include shortness of breath, sudden chest pain (typically radiating to the left side of the neck or left arm), nausea, vomiting, diaphoresis, or generalized sweating, weakness, palpitations and sense of impending doom or anxiety. [6][7] Jaw pain, toothache, headache, upper

back pain, arm pain, epigastric discomfort, general malaise, indigestion fatigue or stress is also included in symptoms of MI.

Levine's sign has classically been thought to be predictive of cardiac chest pain. In which, by clenching the fist over sternum, patients localizes the chest pain. Anyhow, it had a poor positive predictive value according to prospective observational study. And approximately one fourth of all MI are termed to be silent i.e. without any symptoms even chest pain. [8][9] Anyhow, heart attacks producing no symptoms or only mild symptoms can be just as serious and life-threatening as heart attacks that cause severe chest pain.

COMPLICATIONS OF MI

Complications of MI are failure of reperfusion (ischemic), cardiac rupture, thrombosis and emboli, heart failure, psychological complications including depression and pericarditis. Severe left ventricular dysfunction or other mechanical causes most of the deaths following myocardial infarction. [10][11][12] The pumping ability of heart is reduced if a large area of heart muscle is damaged. This causes occurrence of other complications after myocardial infarction because less blood is pumped around body. These complications include heart failure, swollen ankles, tiredness and breathlessness. If electrical activity of heart is affected abnormal heart rhythms, sudden, fast or chaotic heart beats may occur. An immediate electrical shock treatment given by defibrillator is needed. If further buildup of

atheroma continues or coronary arteries are badly affected, there is more likely to be the occurrence of myocardial infarction in future. [13]

DIAGNOSIS OF MI

The diagnosis of MI is based on the history, evaluation of electrocardiographic changes and the clinical findings. A provisional diagnosis of myocardial infarction is suggested in patient presenting an oppressive, severe pain over lower sternum or more extensively over the anterior chest lasting for 30 minutes or more and not relieving by nitrites or rest. Elevation of erythrocyte sedimentation rate, fever and leukocytosis and CPK levels are clinical signs which support the diagnosis. [14]

TREATMENT

Treatment of MI is based on relief of anxiety and pain, rest during healing period and rehabilitation of patient and his family. [15] For a successful treatment of an acute myocardial infarction Time to treatment is the most important factor. Reality shows, precious time is wasted from onset of symptoms until treatment. Delays are caused by the patient's hesitance to call for help as well as by ambulance response and journey times and slow in-hospital procedures. One of the most successful modern treatments for an acute myocardial infarction is Thrombolytic therapy. It is considered safe in view of the serious nature of the disease, is available in all hospitals and is easy to apply.

Relief of pain is the primary objective in therapy. If the pain is severe Morphine sulfate 10 to 15 mg subcutaneously is given at onset and if pain is excruciating or unrelieved it is given intravenously. Morphine is used because its euphoric action helps allay anxiety. [16]

Reperfusion with direct angioplasty and coronary angiography should be considered for patients without identifiable mechanical complications. [17]

PREDISPOSING RISK FACTORS FOR MI

Predisposing risk factors for myocardial infarction are generally divided into two categories.

Nonmodifiable risk factors include age, sex, family history of premature coronary heart disease, male-pattern baldness. [18] While **modifiable risk factors** include smoking or other tobacco use, diabetes mellitus (with or without insulin resistance), obesity, hypertension, Hypercholesterolemia, hypertriglyceridemia, including inherited lipoprotein

disorders, dyslipidemia, obesity, sedentary lifestyle and/or lack of exercise, psychosocial stress, poor oral hygiene, type A personality. [19]

INTERHEART study views:

According to INTERHEART study, risk factors for MI are divided into 2 categories i.e.; emerging risk factors (homocysteine, glucose abnormalities, nutritional factors, abdominal obesity and psychosocial factors) and conventional risk factors (hypertension, diabetes, smoking and elevated cholesterol) between people of varying geographic and ethnic origin. However, these known risk factors would explain only about 50% of cases of heart disease. Moderate or strenuous exercise, consumption of alcohol (≥ 3 times per week) and daily consumption of fruits and vegetables prove to be protective. [20] Nine different factors predispose the risks of MI worldwide.

- Smoking followed by hypertension, abdominal obesity and diabetes are the most important risk factors.
- Less important factors include fruits and vegetables consumption.
- While, alcohol proves to be a protective risk factor for MI. [21]

MODIFIABLE PREDISPOSING RISK FACTORS

Smoking:

Smoking is considered as strong risk factor for myocardial infarction, premature atherosclerosis and sudden cardiac death. Smoking results in early STEMI especially in otherwise healthier patients. Smoking causes an average of 7 years earlier and more likely twice the chances of infarction than non smokers. [22]

Physical activity:

Inactive people with multiple cardiac risk factors are more likely to develop MI. To get benefit, these individuals should start from modest exercise training. There should be aggressive risk factor modification before performance of vigorous activity. [23]

LDL and triglyceride levels:

Elevated triglyceride levels and dense, small LDL particles act as predisposing risk factors for MI. Non fasting triglyceride levels appear to be a strong and independent predictor of future risk of MI, particularly when the total cholesterol level is also elevated. The reason behind it is that decreased HDL-C levels and increased triglyceride levels cause metabolic perturbations thus causing adverse consequences. To identify high risk individuals,

elevated triglyceride levels may become markers. [24]

Obesity/ Body mass index (BMI):

Increased BMI is directly related to incidence of MI. Infarction is greatly enhanced by extreme obesity because it is a recognized risk factor for MI. To reduce the population burden of MI in US, strategies are devised to promote optimal body weight. [25]

Diabetes mellitus (DM):

Significant differences in parameters measured were noted when all diabetic and non-diabetic patients were compared to the control group. It was found that in men with myocardial infarction there are significant differences between diabetic and non-diabetic patients with respect to certain risk factors such as age, hypertension and hypertriglyceridemia in diabetic patients while smoking and family history are predominant factors in non diabetic patients. However, newly diagnosed diabetic men have similar risk profiles to their known diabetic counterparts. [26]

Hypertension:

Hypertension is strong and independent risk factor for MI. It is major risk factor of causing atherosclerosis in coronary blood vessels, result in heart attack or MI. Hypertension and MI are closely linked. [27]

Psychosocial Stress:

Chronic life stress, social isolation and anxiety increase the risk of heart attack and stroke. [28]

NON -MODIFIABLE PREDISPOSING RISK FACTORS

Increasing Age

Older adults are more likely to die of heart disease. About 80% of heart disease deaths occur in people aged 65 or older.

Gender

Men tend to have heart attacks earlier in life than women. Women's rate of heart attack increases after menopause but does not equal men's rate. Even so, heart disease is the leading cause of death for both men and women. [28]

Heredity/Family history:

Increased risk if a first degree blood relative has had coronary heart disease or stroke before the age of 55 years for male relative and 65 years for female relatives. [28]

Genetic factor:

Coronary artery disease and myocardial infarction are the most frequent causes of death. Even nowadays, every second myocardial infarction is

lethal and hits the patients unexpectedly without previous signs or symptoms. . A comprehensive analysis using molecular genetic testing including the cardiovascular risk factors showed that 1. This myocardial infarction locus is unique and does not overlap with chromosomal loci for well-established risk factors, 2. Cardiovascular risk factors, such as LP (a), diabetes mellitus, serum lipids, or arterial hypertension have strong genetic components. These findings do not exclude a role of cardiovascular risk factors or candidate genes in the pathogenesis of myocardial infarction, but rather demonstrate that risk factors may act as surrogates of specific underlying disease mechanisms. It is thus necessary to perform a comprehensive analysis of complex polygenic diseases, such as myocardial infarction, including both, established cardiovascular risk factors and genomic data. [29]

LESS IMPORTANT FACTORS:

Fruits and vegetable consumption

According to epidemiological studies fruits and vegetables has negative effect on coronary heart disease mortality. But this is not always true. Recent studies show that this always occur due to antioxidant vitamins. However, it is also true that vegetables and fruits have high content of folate. Folate tends to lower plasma homocysteine levels. A slight elevation in plasma homocysteine level act as strong risk factor for arteriosclerosis of cerebral, peripheral or coronary arteries. Thus increases the incidence of MI. [30]

Sexual activity

Sexual activity predisposes the onset of myocardial infarction but chances to develop condition are relatively low. Moreover, this triggering can be reduced by regular exercise and proper physical activity. It is also found that relative risk is not increased in patients with prior history of cardiac disease. These findings are useful for decreasing the fear of sexual activity by counseling because this fear prevents complete rehabilitation from cardiovascular disease. [31]

Uncommon factors:

Various other uncommon conditions can block a coronary artery and cause an MI. For example inflammation of the coronary arteries (rare); a stab wound to the heart; a blood clot forming elsewhere in the body (for example, in a heart chamber) and traveling to a coronary artery where it gets stuck; taking cocaine which can cause a coronary artery to

go into spasm; complications from heart surgery and some other rare heart problems. [32]

Rosiglitazone vs. pioglitazone:

Studies have suggested that the use of rosiglitazone may be associated with an increased risk of serious cardiovascular events compared with other treatments for type 2 diabetes. Compared with prescription of pioglitazone, prescription of rosiglitazone was associated with an increased risk of stroke, heart failure, and all-cause mortality and an increased risk of the composite of AMI, stroke, heart failure, or all-cause mortality in patients 65 years or older. [33]

Effect of calcium:

Calcium supplements (without co administered vitamin D) are associated with an increased risk of myocardial infarction. As calcium supplements are widely used these modest increases in risk of cardiovascular disease might translate into a large burden of disease in the population. A reassessment of the role of calcium supplements in the management of osteoporosis is warranted. [34]

Psoriasis:

Psoriasis may confer an independent risk of MI. Psoriasis is the most common T-helper cell type 1 (T_H1) immunological disease. Evidence has linked T_H1 diseases to myocardial infarction (MI). Psoriasis has been associated with cardiovascular diseases but risk is greatest in young patients with severe psoriasis. [35]

Low bone mineral density (BMD):

Lower BMD was associated with an increase in MI risk for both men and women. Women had consistently lower hazard ratios compared to men in all models. Adjusting for smoking, hypertension, hypertriglyceridemia, and diabetes did not distinctively weaken these associations. [36]

Consumption of cocaine:

Myocardial infarction is increasingly recognized as a complication of cocaine abuse. A significant number of persons suffering from myocardial infarction associated with cocaine abuse do not have significant coronary atherosclerosis, and the mechanism for infarction in these patients has remained obscure. Studies describe people with angiographically normal coronary arteries; cocaine abuse produces coronary artery spasm leading to coronary thrombosis and infarction. [37]

CONCLUSION

Myocardial infarction is affected by a number of modifiable and non modifiable predisposing factors.

Among these smoking followed by hypertension, abdominal obesity and diabetes are the most important risk factors. Fruits and vegetables are less important while alcohol is a protective one. Besides, various uncommon factors are also associated with MI to some extent.

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