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## A Review on “The Impact of Comorbid Conditions in Myocardial Infarction Patient”

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### ABSTRACT

A myocardial infarction (MI), commonly known as a heart attack, occurs when blood flow decreases or stops in the coronary artery of the heart, causing damage to the heart muscle. Most MIs occur due to coronary artery disease and other risk factors include high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol intake. Diabetes mellitus (DM) represents a major cardiovascular risk factor for increased risk of coronary artery disease and myocardial infarction (MI). DM is also associated with a poorer clinical outcome in MI



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## 1) INTRODUCTION:

1.1) Myocardial Infarction usually occurs when a blood clot decrease (or) block the blood flows to the heart. Without blood, tissue loses oxygen and dies.

Types of MI: Anterior Wall Myocardial Infarction (AWMI), Inferior Wall Myocardial Infarction (IWMI), Posterior Wall Myocardial Infarction (PWMI) Lateral Wall Myocardial Infarction (LWMI), Anterio-Lateral Wall Myocardial Infarction (ALWMI), Inferio-Posterior Wall Myocardial Infarction (IPWMI).

1.2) Most of the Myocardial Infarction cases are caused by the formation of atherosclerotic plaque.

1.3) Modifiable and Non-modifiable risk factors for Myocardial Infarction. Age, Gender and Hereditary are non-modifiable risk factors. Like Hypertension, Diabetes mellitus, Smoking, Alcohol, Hyperlipidemia, Sr. creatinine, Obesity, Physical Activity and Stress are modifiable risk factors.

1.4) Myocardial Infarction (MI) is diagnosed by: ECG, Cardiac markers, and Coronary Angiogram (CAG).

### 1.4.1) CARDIAC MARKERS:

Cardiac markers are – cell contents (Troponin I, Troponin T, Myoglobin) and cardiac enzymes (Creatine Kinase-MB isoenzyme [CK-MB]), after myocardial cell necrosis these are released into the bloodstream.

### 1.5) IN HTN (Hypertension) PATIENTS

HTN → Narrowing of blood vessels → Impaired blood flow → Rupture of the arteries → Thrombus formation → Ischemia → Necrosis → Myocardial Infarction.

### 1.6) IN DM (Diabetes mellitus) PATIENTS

DM → Plaque formation in the coronary artery → Obstruction to the blood flow → Thrombus → Ischemia → Myocardial Infarction.

## **1.7) TREATMENT:**

**1.7.1) DRUG THERAPY:** Drug therapy includes Beta receptor blockers, angiotensin II receptor blockers (ARB'S), angiotensin-converting enzyme (ACE) inhibitors, aldosterone receptor antagonists. The main aim of treatment is the prevention of the LV remodeling.

### **1.7.2) THROMBOLYTIC THERAPY**

Thrombolytic therapy is used for recanalization of the blocked coronary artery. Thrombolytic therapy onset of action within 6 hours. These are inhibition of thrombus formation and dissolve the blood clots. Commonly used thrombolytics are Streptokinase, Urokinase and tissue-type plasminogen activators. Side effects are intracerebral hemorrhage and unwanted bleeding.

**1.7.3) CORONARY ARTERY BYPASS GRAFTING (CABG):** It is an effective surgical treatment. CABG did in whose The Left Main Coronary Artery and Right Coronary Arteries are completely blocked. It is mostly done in Triple Vessel Disease.

### **1.7.4) PERCUTANEOUS CORONARY INTERVENTION (PCI)**

It is a surgical procedure for remodeling of the coronary artery. Coronary artery blocked with 90% lesions then performed inject the Percutaneous Transluminal Coronary Angioplasty (PTCA), into the blood vessel, is called stent. Side effects are allergic reactions, infection at the catheter insertion area.

## **2) COMORBID CONDITIONS IN MYOCARDIAL INFARCTION PATIENTS:**

Myocardial infarction patients sometimes may have co morbid conditions like MI patients with Diabetes (DM) and hypertension, high blood cholesterol level etc.

### **Here we can discuss DM and Hypertension:**

**2.1) Diabetes mellitus:** commonly known as diabetes, is a group of metabolic disorders characterized by a high blood sugar level (hyperglycemia) over a prolonged period of time. Symptoms often include frequent urination, increased thirst and increased appetite. If left untreated, diabetes can cause many health complications. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death. Serious long-term

complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, damage to the nerves, damage to the eyes and cognitive impairment.

Three main types of diabetes mellitus: Type 1 diabetes results from failure of the pancreas to produce enough insulin due to loss of beta cells. This form was previously referred to as "insulin-dependent diabetes mellitus" or "juvenile diabetes". The loss of beta cells is caused by an autoimmune response. The cause of this autoimmune response is unknown. Although Type 1 diabetes usually appears during childhood or adolescence, it can also develop in adults.

□ Type 2 diabetes begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses, a lack of insulin may also develop. This form was previously referred to as "non-insulin-dependent diabetes mellitus" or "adult-onset diabetes". Type 2 diabetes is more common in older adults, but a significant increase in the prevalence of obesity among children has led to more cases of type 2 diabetes in younger people. The most common cause is a combination of excessive body weight and insufficient exercise.

Gestational diabetes is the third main form, and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels. In women with gestational diabetes, blood sugar usually returns to normal soon after delivery. However, women who had gestational diabetes during pregnancy have a higher risk of developing type 2 diabetes later in life.

## **2.2) Complications:**

All forms of diabetes increase the risk of long-term complications. These typically develop after many years (10–20) but may be the first symptom in those who have otherwise not received a diagnosis before that time.

The major long-term complications relate to damage to blood vessels. Diabetes doubles the risk of cardiovascular disease and about 75% of deaths in people with diabetes are due to coronary artery disease. Other macrovascular diseases include stroke, and peripheral artery disease. These complications are also a strong risk factor for severe COVID-19 illness.

The primary complications of diabetes due to damage in small blood vessels include damage to the eyes, kidneys, and nerves. Damage to the eyes, known as diabetic retinopathy, is

caused by damage to the blood vessels in the retina of the eye, and can result in gradual vision loss and eventual blindness. Diabetes also increases the risk of having glaucoma, cataracts, and other eye problems. It is recommended that people with diabetes visit an eye doctor once a year. Damage to the kidneys, known as diabetic nephropathy, can lead to tissue scarring, urine protein loss, and eventually chronic kidney disease, sometimes requiring dialysis or kidney transplantation. Damage to the nerves of the body, known as diabetic neuropathy, is the most common complication of diabetes.

### **2.3) Medications:**

#### **2.3.1) Blood pressure lowering**

Cardiovascular disease is a serious complication associated with diabetes, and many international guidelines recommend blood pressure treatment targets that are lower than 140/90 mmHg for people with diabetes. However, there is only limited evidence regarding what the lower targets should be. A 2016 systematic review found potential harm to treating targets lower than 140 mmHg, and a subsequent systematic review in 2019 found no evidence of additional benefit from blood pressure lowering to between 130 - 140mmHg, although there was an increased risk of adverse events.

**2.3.2) Glucose control:** Most medications used to treat diabetes act by lowering blood sugar levels through different mechanisms. There is broad consensus that when people with diabetes maintain tight glucose control – keeping the glucose levels in their blood within normal ranges they experience fewer complications, such as kidney problems or eye problems. There are a number of different classes of anti-diabetic medications.

**2.3.3) Aspirin:** The use of aspirin to prevent cardiovascular disease in diabetes is controversial. Aspirin is recommended by some in people at high risk of cardiovascular disease, however routine use of aspirin has not been found to improve outcomes in uncomplicated diabetes.

**2.3.4) Hypertension:** a) Hypertension (HTN or HT), also known as high blood pressure (HBP), is a long-term medical condition in which the blood pressure in the arteries is persistently elevated. High blood pressure usually does not cause symptoms. Long-term high blood pressure, however, is a major risk factor for stroke, coronary artery disease, heart

failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia.

High blood pressure is classified as primary (essential) hypertension or secondary hypertension. About 90–95% of cases are primary, defined as high blood pressure due to nonspecific lifestyle and genetic factors.

**2.3.5) Pathophysiology: i)** In most people with established essential hypertension, increased resistance to blood flow (total peripheral resistance) accounts for the high pressure while cardiac output remains normal. There is evidence that some younger people with prehypertension or 'borderline hypertension' have high cardiac output, an elevated heart rate and normal peripheral resistance, termed hyperkinetic borderline hypertension. These individuals develop the typical features of established essential hypertension in later life as their cardiac output falls and peripheral resistance rises with age. Whether this pattern is typical of all people who ultimately develop hypertension is disputed. The increased peripheral resistance in established hypertension is mainly attributable to the structural narrowing of small arteries and arterioles, although a reduction in the number or density of capillaries may also contribute.

It is not clear whether or not vasoconstriction of arteriolar blood vessels plays a role in hypertension. Hypertension is also associated with decreased peripheral venous compliance which may increase venous return, increase cardiac preload and, ultimately, cause diastolic dysfunction.

ii) Many mechanisms have been proposed to account for the rise in peripheral resistance in hypertension. Most evidence implicates either disturbances in the kidneys' salt and water handling (particularly abnormalities in the intrarenal renin-angiotensin system) or abnormalities of the sympathetic nervous system. These mechanisms are not mutually exclusive and both likely contribute to some extent in most cases of essential hypertension. It has also been suggested that endothelial dysfunction and vascular inflammation may also contribute to increased peripheral resistance and vascular damage in hypertension.

**2.3.6) Prevention:** The primary prevention of hypertension:

□ Maintain normal body weight for adults (e.g. body mass index 20–25 kg/m<sup>2</sup>)

- Reduce dietary sodium intake to <100 mmol/ day (<6 g of sodium chloride or <2.4 g of sodium per day).
- Engage in regular aerobic physical activity such as brisk walking ( $\geq 30$  min per day, most days of the week).
- Limit alcohol consumption to no more than 3 units/day in men and no more than 2 units/day in women.
- Consume a diet rich in fruit and vegetables (e.g. at least five portions per day);
- Stress reduction.

**2.3.7) Medication:** Several classes of medications, collectively referred to as antihypertensive medications, are available for treating hypertension.

First-line medications for hypertension include thiazide-diuretics, calcium channel blockers, angiotensin-converting enzyme inhibitors (ACE inhibitors), and angiotensin receptor blockers (ARBs). These medications may be used alone or in combination (ACE inhibitors and ARBs are not recommended for use in combination), the latter option may serve to minimize counter-regulatory mechanisms that act to restore blood pressure values to pre-treatment levels. Most people require more than one medication to control their hypertension. Medications for blood pressure control should be implemented by a stepped care approach when target levels are not reached. Previously beta-blockers such as atenolol were thought to have similar beneficial effects when used as first-line therapy for hypertension.

### 3) DISCUSSION

Myocardial Infarction is a common cardiovascular disease in nowadays. This study provides myocardial infarction patients to get which type of specific myocardial infarction. In six months study the response among 300 patients.

#### 3.1) 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. Identification and management of the Standard Modifiable Cardiovascular Risk Factors.

Of total study population, Male 185 (61.7%) were dominant over Females 115 (38.3%). In prognostic study of diabetes mellitus and hypertension for the mid-term outcome of patients with acute myocardial infarction who underwent percutaneous coronary intervention, a total of 300 patients males were more affected.

### **3.2) Age**

Advanced age is associated with increased mortality in acute myocardial infarction. The mechanism by which increasing age contributes so dramatically to mortality is unknown. About 80% of heart disease deaths occur in people aged 65 or older.

In total patients 40-49 years (17.33%) male patients were more affected than another age group of the patients.

### **3.3) Patients having only HTN**

Both systolic and diastolic hypertension increases the risk of myocardial infarction. It is major risk factor of causing atherosclerosis in coronary blood vessels, result in heart attack or myocardial infarction. Hypertension and myocardial infarction are closely linked. Several mechanisms can account for the increased coronary risk in hypertensive patients. Hypertension accelerates the effects of atheroma, increases shear stress on plaques, exerts adverse functional effects on the coronary circulation, and impairs endothelial function and control of sympathetic tone, reported that in Argentine population, hypertension is a strong and independent risk factor for acute myocardial infarction. The control of hypertension with strict compliance of proper medication and the adoption of lifestyle modifications reduce the risk of myocardial infarction significantly.

In total population, whose patients have only hypertension – the females (8.67%) have high risk for Anterior Wall Myocardial Infarction.

### **3.4) Patients having only DM**

Type 2 diabetes mellitus is on the verge of becoming a pandemic in India. As type 2 diabetes shares several risk factors in common with coronary artery disease (CAD), such as age, hypertension, dyslipidemia, obesity, physical inactivity and stress, an increase in the prevalence of diabetes indirectly implicates an escalating risk of CAD as well. Diabetes increases risk of coronary heart disease (CHD) by two to four times. Patients with diabetes



bear a greater risk of atherosclerotic vascular disease in the heart as well as in other vascularized areas. It is also reported that plaques are more vulnerable to rupture among patients with diabetes.

It is also reported that plaques are more vulnerable to rupture among patients with diabetes. The protective female gender effect is lost in diabetic subjects, and indeed, women with diabetes are possibly more prone to develop CAD than men with diabetes. Diabetes increases the risk of myocardial infarction because it increases the rate of atherosclerotic progression and adversely affects the lipid profile and facilitates the formation of atherosclerotic plaque. Diabetes is also a risk factor for myocardial infarction case fatality.

In total patients, patients having only diabetes – the males (5.33%) were more affected due to AWMI.

### **3.5) Patients with HTN and DM**

The study of the population, the patients having hypertension and diabetes – the males (7.33%) was more affected due to AWMI.

### **3.6) Patients without HTN and DM**

The mechanism is unknown. In total patients, nothing having hypertension and diabetes – the males (10%) were more affected due to AWMI.

### **3.7) other risk factors**

#### **3.7.1) Alcohol**

Alcohol consumption is associated with an acutely higher risk of myocardial infarction in the subsequent hour among people who do not typically drink alcohol daily. There is consistent evidence that moderate habitual alcohol consumption is associated with a lower risk of cardiovascular events in subsequent months and years and that heavy episodic drinking is associated with higher cardiovascular risk.

#### **3.7.2) Smoking**

Smoking is considered to be strong risk factor for myocardial infarction, premature atherosclerosis and sudden cardiac death. Smoking results in early STEMI especially in

otherwise healthier patients. Cigarette smoking increases the risk for AMI by multiple and complex mechanisms. Concerning atherogenesis, smoking increases serum LDL cholesterol and triglyceride concentrations and reduces serum HDL cholesterol. Furthermore, cigarette smoke promotes free radical damage to LDL, leading to accumulation of oxidized LDL-cholesterol within the arterial wall.

The study of the population, alcohol consumption patients has high risk for AAMI, than other types of myocardial infarction.

#### 4) CONCLUSION

➤ In this study we documented, in general, a myocardial infarction is a disease, that may occur with other diseases like Diabetes mellitus, Hypertension. Physical activity can reduce the risk of cardiovascular disease, and people at risk are advised to engage in 150 minutes of moderate or 75 minutes of vigorous-intensity aerobic exercise a week. Keeping a healthy weight, drinking alcohol within the recommended limits, and quitting smoking reduces the risk of cardiovascular disease. There is a large crossover between the lifestyle and activity recommendations to prevent myocardial infarction.

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