Predisposing Risk Factors of Acute Coronary Syndrome (ACS): A Mini Review

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Abstract:-
Cardio Vascular Diseases (CVDs) constitute a major issue in the global health scenario and is a leading cause of mortality in developed countries. Among the CVDs, Acute Coronary Syndrome (ACS) is observed to be the most frequent. ACS is a condition in which an atherosclerotic plaque builds up inside the coronary artery and restricts coronary blood flow to the heart. It is characterized by chest pain, shortness of breath, diaphoresis and nausea. ACS is related to life style and individual behavior. Behavioral risk factors such as smoking, alcoholism, hypertension, Diabetes Mellitus and high blood cholesterol can increase the risk of ACS. Age, gender and family history are considered as non modifiable risk factors for ACS. The purpose of this article is to review the various modifiable and non modifiable factors that have an influence on the risks for developing Acute Coronary Syndrome.

Abbreviations:- Acute Coronary Syndrome, Diabetes Mellitus, Cardio Vascular Disease, Angina Pectoris, Myocardial Infarction

INTRODUCTION

Cardio Vascular Diseases (CVD) are currently the preceding reason of death in industrialized countries and are likely to become so in developing countries by 2020. Among these, coronary artery disease (CAD) is the major clinical manifestation and is associated with higher incidence rate of mortality and morbidity[1].CAD is the foremost condition causing death worldwide. 17.7 million People die each year from CVD, an estimated 31% of all deaths worldwide. 80% of all CVD deaths are due to heart attack and stroke. More than 75 percentage of CAD deaths occur in low and middle income countries.[2]

World Health Organization (WHO) indicates that CVD accounts for half the mortality among non communicable diseases, which constitute 53 % of mortality in India.[3]Ischemic heart disease is becoming a more common cause of death in the developing world. It is said that, in India, ischemic heart disease is the prime reason of death and it accounts for 1.46 million deaths (14% of total deaths).[4]

ACUTE CORONARY SYNDROME (ACS)

Acute coronary syndromes (ACS) encircle a wide range of clinical disorders that shared by more than one physiologic derangement: an acute or sub acute imbalance between the oxygen demand and supply of the myocardium. The symptoms and eventual diagnosis of a patient presenting with an ACS are dependent on the duration and degree of inadequate oxygenation, making the diagnosis challenging.[5]

Definition of Acute Coronary Syndrome (ACS)

The term acute coronary syndrome is used to collectively describe acute myocardial infarction (heart attack) and unstable angina (chest pain occurring at rest, new onset of pain with exertion, or angina that is more frequent, longer in duration or lower in threshold than before).

- *Acute myocardial infarction* or *heart attack* occurs when a plaque within one of the coronary arteries rupture and forms a clot that completely blocks blood flow to the heart muscle (myocardium).

- *Angina* occurs when plaque or blood clot only results in narrowing the blood vessel, and may happen as a precursor to a heart attack or remain stable for long periods.[6]

Categorization of ACS

A critical distinction between types of ACS is made on 12 lead ECG to differentiate patients with ST segment elevation myocardial infarction (STEMI) from those with non ST segment elevation acute coronary syndromes (NSTEACS). Patients presenting with NSTEACS are diagnosed as either Unstable Angina (UA) or Non ST Elevation Myocardial Infarction (NSTEMI). This is caused by the partial occlusion of the coronary artery whereas; STEMI is due to the complete blockage of the coronary artery. Worldwide more than three million people have STEMIs and four million have NSTEMIs in a year[7].
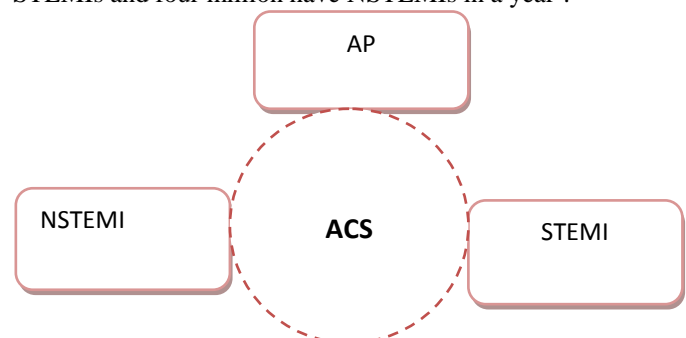

Figure 1:- Classification of Acute Coronary Syndrome

RISK FACTORS FOR ACS

Risk factors are certain characteristics or exposure of an individual that can increase the chance of having a disease. Risk factors for ACS are generally divided in to two. These are modifiable and modifiable risk factors. Non modifiable risk factors are age, sex and family history. Modifiable risk factors include elevated serum cholesterol, presence of type II DM, cigarette smoking, obesity, a sedentary lifestyle and hypertension.[8] Non modifiable risk factors are irreversible.

NON MODIFIABLE RISK FACTORS

- **Increasing Age**

  Age is a well known traditional risk factor, which is generally considered to be non-modifiable for obvious reasons.[9] Nearly 80% of heart disease death happens in humans aged above 65[10] .

- **Gender**

  Gender is also associated with CVD risk, because CVD risk is different in men and wome.[11] Although older men and women are equally likely to be in fair or poor health, women are more likely to have difficulty with social and physical activity.[12]Therefore, gender should be considered in studies of CVD risk factors. Men are prone to heart attacks during young age than women. Even though the heart attack rate for women goes up after menopause, it is still less than mens rate. But heart disease continues to be the major cause of death for humans[13].

- **Heredity/Family history:**

  Epidemiological studies indicate that family or parental history of myocardial infarction is a major cause risk factor for coronary heart disease (CHD). [14]The probability of getting a heart disease is high if there is an increased risk if a first degree blood relative has had coronary heart disease or stroke before the age of 55years for male relative and 65 years for female relatives.[15]

MODIFIABLE RISK FACTORS

Smoking, hypertension, elevated serum cholesterol levels, physical inactivity, obesity and diabetes mellitus constitute the modifiable risk factors for ACS. These factors can be modified or reduced by life style changes and treatment. The more risk factors a person has, the greater risk of CHD. Reduction of risk is based on control of the modifiable risk factors. Table 1 summarizes the modifiable risk factors of Acute Coronary Syndrome (ACS).

Smoking

Smoking is regarded as the fundamental cause considered as a strong risk factor for myocardial infarction. Numbers of studies have shown a strong positive correlation between atherosclerosis, smoking and myocardial infarction. Smoking leads to premature atherosclerosis and cardiac death. One in every 5 deaths in the United States each year is due to cigarette smoking. Risk is more in women who smoke and who are under birth control pills.[16]

Nicotine increases the release of epinephrine and nor epinephrine, which increases peripheral vasoconstriction and resulting in an increase in blood pressure and heart rate thereby greater oxygen consumption and increased likely hood of disarrythmias. In addition nicotine stimulates platelets and induces proliferation of smooth muscle cells in the coronary arteries[17]. Smoking is considered as a main risk factor for Peripheral Artery Disease (PAD). It is a condition in which the plaque forms in the arteries that carry blood to the head, organs and limbs. So the people who have PAD are at a greater chance for heart attack and stroke.[18]

Non smokers who are exposed to second hand tobacco smoke at home or work may also be having higher death rate from CHD.[19] Giving up smoking is the single most effective contribution a patient can make to his or her future. The success of smoking cessation can be increased by supportive advice and pharmacological therapy. The chances of CHD is lowered by 50% after 1 year of quitting smoking.[20]

Alcohol

Consuming a small volume of alcohol on a regular basis is considered as a beneficial activity[21]. Whereas consuming too much alcohol is a risk condition as this leads to increased atherosclerotic progression. It can cause an irregular heartbeat by direct damage on the heart muscle. A number of mechanisms have been postulated to show the association between heavy alcohol consumption and atherosclerosis including weight gain, high triglycerides and high blood pressure.[22] Atherogenic and antiatherogenic properties may establish a major pathophysiological link between cardiovascular diseases and alcohol intake. However; this hypothesis is still challenged due to the lack of epidemiological follow up in this field.[23]

Hypertension

Systolic blood pressure becomes a more important predictor of the risk of cardiovascular disease. It is detrimental to the coronary arteries and enhances the risk of myocardial infarction.[24] It increases the work pressure of the heart by increasing after load, enlarging and weakening the left ventricle overtime. As blood pressure increases, the probability risk of serious cardiovascular events also surgesescalates.[25] Literature confirms that the chance of developing heart disease is higher in people with comorbid diseases like hypertension, obesity, tobacco use, high cholesterol level, and diabetes, than the normal people. Hypertension can be prevented by maintaining a healthy body weight, reducing salt intake, managing stress, avoiding smoking and alcohol. If these preventive measures fail there are medicines to reduce elevated blood pressure. Although hypertension cannot always be arrested prevented, it should be treated to lower the risk of CHD and premature death.[26]

Diabetes Mellitus

People with diabetes are more prone to coronary heart disease. CVD is a major complication of diabetes and is the primary reason for death among people with Diabetes, about 65 percent of people with diabetes die from heart disease and stroke. People with diabetes have two to four fold higher incidence rates from all forms of CHD[27]. People with type 2 diabetes also have higher rates of blood pressure, lipid problems, and obesity, which contribute to their high rates of CVD. Smoking doubles the risk of CVD in people with diabetes. People with diabetes and a raised cholesterol level are more vulnerable to heart disease compared to people without diabetes with the same level of cholesterol.[28]

Blood Cholesterol

The risk of CHD increases as blood cholesterol levels increase. The risk increases further when other risk factors are present. Cholesterol deposit on the walls of coronary arteries leads to damage and blockage of arteries resulting in myocardial ischemia.[29]when the level of LDL is higher, they deposit in the artery wall where they are oxidized and

taken up by foam cells. This process leads to the development and progression of atherosclerosis. Whereas, higher level of HDL is healthy, because they oppose the progression of atherosclerosis by inhibiting the oxidation of LDL and by limiting the inflammatory processes that underlie atherosclerosis[30]. HDL aids to remove excess cholesterol from the tissues to the liver. Thus, low levels of HDL considered as a predictor for heart disease. Cholesterol lowering food plan and drug treatment are very essential to control and manage blood cholesterol levels.[31]

Obesity:

Obesity is directly associated with the occurrence of Myocardial Infarction (MI). Obesity is a multifactorial chronic disease characterized by an accumulation of visceral and subcutaneous fat, which leads to a predisposition toward cardio metabolic diseases.[32] People who are obese are more likely to have high blood pressure, diabetes and high blood fats. Mechanisms which link between obesity and atherosclerosis are abnormalities in lipid metabolism, insulin resistance, inflammation, endothelial dysfunction and adipokinase imbalance.[33] Modest weight loss can reduce risk but weight loss must be maintained.[34] Reducing the intake of fat (especially saturated fat) sugar and alcohol, being more physically active and reducing mental stress are the effective ways of reducing weight.[35]

MODIFIABLE RISK FACTORS

Smoking:- Increases risks of cardiovascular disease, especially in people who start the habit at early age and who are heavy smokers. Passive smoking is an additional risk.

High blood pressure: - Major risk for heart attack.

Physical inactivity: - Increases risk of heart disease by 50%.

Abnormal blood lipids: - High total cholesterol, LDL-cholesterol and triglyceride levels, and low levels of HDL-cholesterol increase risk of coronary heart disease.

Obesity:- Major risk for coronary heart disease and diabetes.

Diabetes mellitus:- Major risk for coronary heart disease and stroke

Alcohol use:-Heavy drinking damages the heart muscle.

Table 1: The modifiable risk factors of Acute Coronary Syndrome

Physical Inactivity

Physical inactivity is an important contributor of heart disease. Physically inactive people with several cardiovascular risk factors are more likely to develop Myocardial Infarction. Regular exercise has many advantages on cardiovascular system which reduce elevated blood pressure, weight lose and reduced waist circumference all of which help to reduce the risk of heart disease.[36] The American Heart Association recommends 30 to 60 minutes of physical activity on most days of the week. At least 2½ hours per week of moderate activity is recommended. Walking, jogging, swimming, cycling and dancing are all excellent choices.[37]

CONCLUSION

Acute Coronary Syndrome (ACS) is a major health problem in India & worldwide and is associated with many risk factors. These are modifiable and non-modifiable, non-modifiable risk factors are irreversible. Modifiable risk factors can be prevented or controlled by stopping smoking, reducing the level of cholesterol and blood pressure, eating a healthy diet and increasing physical activity. Health promoting lifestyle interventions can decreases the incidence rate of coronary heart diseases.

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