Prevalence and impact of cardiovascular risk factors among patients with acute coronary syndrome: a review

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ABSTRACT

A dramatic increase in the number of deaths related to coronary artery disease has been observed world-wide, from 7.3 million deaths in 2008 to 11.1 million deaths in 2020 (estimated). The trend is believed to be due, in part, to the steeply increasing incidence of CAD in developing countries undergoing rapid westernization. This article provides a selective review of the effects of cardiovascular risk factors on the onset of acute coronary syndrome (ACS). ACS is a complex, multifactorial disorder in which interactions among various genetic and environmental influences play an important role. Coronary atherosclerosis results from excessive inflammatory and fibro proliferative responses to various forms of insults to the endothelium and smooth muscle of the artery wall, responses in which a large number of growth factors, cytokines, and vasoregulatory molecules participate. In this review, the prevalence of cardiovascular risk factors and their impact on patients presenting with ACS are discussed. Some of the known risk for ACS includes smoking, high blood cholesterol, physical inactivity, diabetes, high blood pressure, being overweight or obese, depression and social isolation. These were the risk factors that can be reduced by specific preventative methods, such as pharmacotherapy and lifestyle changes. Age, gender and a family history of coronary heart disease are some risk factors which cannot be reduced. The more the cardiovascular risk factor a patient has the higher the risk of ACS. Lack of knowledge and changes in the life style, food habits, psychological factors contribute to the progression of ACS. By providing patient education the quality of life can be improved and thereby preventing the ACS morbidity and mortality.

Key words: Acute coronary syndrome, Myocardial infarction, Risk factors.

INTRODUCTION:

One of the leading cause of mortality and morbidity in the world is coronary artery disease (CAD).Acute coronary syndrome (ACS), which encompasses unstable angina (UA), non ST segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI) is a subset of coronary artery disease. The commonest cause of mortality in patients with coronary artery disease is ACS. Due to the introduction of both invasive and non-invasive therapeutic strategies, the mortality caused by ACS has been significantly reduced in the world. In India the mortality remains high.ACS describes the spectrum of clinical manifestations which follow disruption of coronary arterial plaque, complicated by thrombosis, embolization and varying degrees of obstruction to myocardial perfusion. ACS typically arises from atherosclerotic plaque rupture with subsequent coronary thrombosis. This will result in myocardial ischemia.The current understanding of atherosclerosis suggests that the disease begins early in life and it will progress until clinical symptoms develop. By the presence of chronic disease or

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modifiable risk factors is considered as an important mechanism of the atherosclerotic disease progression.

INCIDENCE AND PREVALENCE OF ACS IN INDIA:

Compared with other populations around the world, CAD occurs in Indians 5-10 years earlier and the major effect of this peculiar phenomenon is on the productive workforce of the country aged 35-65 years.[1] Highest burden of ACS in the world is found to be in India, both the prevalence and incidence are high among Indians.[1,2] Changes in the lifestyle, the westernization of the food practices, genetic factors and the increasing prevalence of diabetes mellitus, all these contribute to the rising incidence of ACS in India.According to the CREATE registry (the largest data from Indian patients with ACS) the pattern of ACS among Indian population is much different from that of the Western populations.[3] This registry provided contemporary data on 20,468 from 89 centers from 10 regions and 50 cities in India.The Indian subcontinent has become home to about 20% of the world population and it is one of the region with highest burden of cardiovascular disease (CVD). CVD is considered as a disease of the aged in Western countries, and 23% of CVD deaths occur below the age of 70. In India about 52% CVD deaths occurring among people under 70 years of age.

Due to the urbanization there is an increased prevalence of cardio-

vascular risk factors in India. Urbanization is characterized by decrease in physical activity, increase in the intake of energy dense foods, increased level of psychosocial stress and all of these promote to the development of hyperglycemia, hypertension, and dyslipidemia.India has high prevalence of diabetes mellitus, than any other region in the world, 2-3 times the reported prevalence in the Western countries. In 1995, an estimated 19.3 million people in India alone had diabetes and this expected to 57.2 million in 2025. It was estimated by the Indian council of medical research (ICMR) that, 3.8% had diabetes in rural areas compared with 11.8% in urban areas. Thus urban areas are highest in people with diabetes mellitus. Hypertension is also both prevalent in both urban as well as rural areas in India.Another important cardiovascular risk factor is tobacco consumption. Smoking has become a serious health consequence among Indian youth. There had been an alarming rate of tobacco use of 56% among Indian mean age (12-60 years) reported by the National survey of tobacco use.ICMR surveillance project reported 37.5% among Indian adults aged 15-64 years had dyslipidemia. Even higher prevalence of dyslipidemia is found 62% among male industrial workers.

Kerala Scenario:

The health status Kerala population is much more different from that of other states in India owing to its 100% literacy, better distribution of health care manpower among rural and urban areas and increased healthcare institutions in Kerala. Another important factor is that life expectancy is highest in Kerala where there is lowest infant mortality rate and maternal mortality rates. Study conducted by KJ Raihanathul etal in Kottayam medical college, reported that, of the 1865 case of ACS, 56% had STEMI and 44% had NSTEMI /UA. The mean age of presentation STEMI cases was 59 years and that of NSTEMI/UA was 58.5 years. In patients with STEMI, females, elderly patients and those with diabetes mellitus have significantly high mortality risk compared to males.The ICMR/WHO study estimated that there are 8.72 million hypertensives in Kerala. An estimated figure of 3.48 million had diabetes, 52.1 % of males and 61.4% of females had dyslipidemia in Kerala.

DEVELOPMENT OF ACS:

ACS is an umbrella term and each condition of ACS, unstable angina, NSTEMI and STEMI, share a common pathophysiologic origin, involving instability and fracture in the protective fibrous cap of an atheromatous plaque.[5,6] When these plaque rupture , and core constituents such as lipids, smooth muscle and foam cells are exposed, this will lead to the generation of thrombin and deposition of fibrin. Thus it will lead to the promotion of platelet aggregation, adhesion and the subsequent formation of an intracoronary thrombus. The formation of focal cell necrosis due to the downstream embolization from friable coronary thrombus may occur and leads to the release of troponins.[7] Thus this elevation in troponin levels and cardiac biomarkers provide an evidence for the diagnosis and prognosis of ACS.

Patients presenting with NSTEMI differ from STEMI only through the absence of ST segment elevation on the ECG. When the thrombus is formed on a ruptured atherosclerotic plaque STEMI occurs. Unstable angina can be recognized by the ischemic-type chest pain that is more frequent, severe, prolonged and it will occur at rest or on minimal exertion.

RISK FACTORS FOR ACS:

A series of modifiable risk factors and non modifiable risk factors leads to the development of atherosclerosis and the risk of presenting with ACS. Some of the known risk for ACS include smoking, high blood cholesterol, physical inactivity, diabetes, high blood pressure, being overweight or obese, depression and social isolation. Often the impact of these risks can be successfully reduced by specific preventative methods, such as pharmacotherapy and lifestyle changes. Age, gender and a family history of coronary heart disease are some risk factors which cannot be reduced.

Age and gender:

Age and gender are the most powerful independent predictor for the development of ACS. The number and proportion of older people is increasing and this will contribute coronary artery disease to total burden. Men are having more risk when compared with women. Among men risk increases with age and comparison between men and women demonstrate for premenopausal women, the risk corresponds with that of men approximately 10 years younger. [8] Post menopause, the risk for women is increased, but remains lower than for men of corresponding age.[8] Adjusted for age, women have higher rates of diabetes and hypertension and less frequently smokers.

Family history:

Family history is a non-modifiable risk factor .Genetic traits contribute to the phenotypes of specific risk, including hyperlipidemia and hypertension. It remains a significant independent factor for the development of coronary artery disease.

Diabetes:

Diabetes is a prevailing risk factor for developing coronary heart disease (CHD). People with type 2 diabetes mellitus are much more likely to have disability from cardiovascular disease than those people without diabetes. Therefore there is a need to provide vascular protective measures for patients with diabetes at high risk for CHD events.At younger age itself patients with diabetes becomes high risk for CHD than an individual without diabetes. The prevalence of diabetes is significantly higher in women than in men with ACS. Patient with diabetes also had higher frequencies of silent exertional ischemia and also myocardial infarction.[9]

People with type 2 diabetes mellitus also have a risk of death due to the cardiovascular disease that is two to six fold elevated compared to those without diabetes. A multifactorial approach to risk reduction in patients with diabetes will help to avoid the incidence of CAD. This includes lifestyle modifications, optimizing glycemic, lipid, and blood pressure control. At younger age itself all efforts should be used to optimize vascular risk by lifestyle modifications and glycemic control.

Hypertension:
Elevated blood pressure plays a significant role in accelerating atherosclerosis of the blood vessels and thereby increasing the cardiovascular disease. There is a strong association between CAD and hypertension. About two-thirds of cerebrovascular disease burden and half of ischemic heart disease burden to elevated blood pressure.[10] Thus, for both the secondary as well as in the primary prevention of development of ACS, blood pressure lowering is critically important.

Lipid abnormalities:
Elevated low density lipoprotein (LDL) cholesterol and very low density lipoprotein (VLDL) cholesterol are associated with atherogenesis. Cholesterol is a fat-like substance produced by the body which is found in the blood stream and all other parts of the bodies including organs and nerve fibers. The liver produces cholesterol from a variety of foods, but especially from saturated fats.[11] The main factors that can influence an individual's level of cholesterol include a diet high in saturated fat content, various metabolic conditions such as type2 diabetes etc.

Cholesterol will accelerate atherosclerosis and thus it will influence CHD. Elevated levels of HDL – cholesterol are protective whereas reduced level will increase risk. Cholesterol lowering will reduce number of cardiovascular events.

Body mass index:
Prevalence of overweight and obesity leads to an increasing risk of developing CAD. Excessive body weight gain results in abnormalities in blood lipids. Moreover, the distribution of body fat appears to be an important determinant of the risk of CHD. The dramatic increase in the prevalence of obesity among children and adolescents has been demonstrated across many economically developed and developing countries.[12]

Tobacco intake:
Tobacco consumption through inhalable means such as cigarettes are related to an increased risk of many medical condition. Tobacco consumption will increase the risk of CAD, and thereby increase the risk of mortality.

Alcohol intake:
Long term biological as well as social consequences are linked to alcohol consumption through intoxication, dependence and direct biochemical effects. The direct biochemical effects can influence CHD, alcohol increases the risk of high blood pressure and thereby increases risk of ACS.

Other modifiable and potentially modifiable risk factors:
A series of risk factors such as elevated homocysteine, C - reactive protein, fibrinogen, plasminogen activator inhibitor type 1 and altered platelet reactivity can directly increase coronary and vascular risk. This will up regulate the systemic inflammation and provides a way to atherogenesis and its complications.

A series of additional 'environmental factors' are influenced by life style changes. Some of the factors are high fat, low antioxidant diets, lack of exercise etc. Infectious agents may also contribute to the up regulation of the inflammatory response.The physical inactivity is also a major risk factor of ACS. The greater the degree of physical inactivity greater the risk of coronary events. Depression in patients with ACS is associated with higher incidence of mortality and recurrent cardiovascular events. Depressive episodes after an ACS were associated with a poorer outcome. Reduced levels of omega-3-fatty acids in blood cell membranes, an emerging risk factor for both ACS and depression, could help to explain the relationship between depression and adverse ACS outcomes. Patients with ACS may triggered by acute anger, stress and depression.

CONCLUSION:
The prevalence of CAD and consecutively the prevalence of ACS are continuously increasing as a result of growing life expectancy and increasing rates of cardiovascular risk factors. A further increase is expected not only in highly industrialized countries, but also in the rapidly densely populated regions of the world.

The more the cardiovascular risk factor a patient has the higher the risk of ACS. Different cardiac risk factors are associated with ACS in both men and women. ACS can be prevented to a greater extend by identification of risk factors and regularly assessing patient for their CHD risk and counseling to emphasize therapeutic life style changes. Furthermore health education programs directed towards early identification may contribute most effectively to reducing fatal outcomes.

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