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PREVENTION OF CORONARY HEART DISEASES

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Abstract

The atherogenic effect of cholesterol is detailed showing the pathophysiology of thrombosis, which leads to ischemia by the increased level of cholesterol.

Risk factors like hypercholesterolemia, LDL, HDL, Lpa, hypertension, cigarette smoking, obesity and lack of exercise are discussed with preventive precautions mainly by dietary restrictions (controlled use of green vegetable). The positive factors in the use of coconut oil is also discussed.

The atherogenic effect of cholesterol and the risk of coronary artery disease in people with hypercholesterolemia are proved beyond doubt. In normal persons, the blood cholesterol level varies from 150 to 220 mg/100 ml. The blood cholesterol should be preferably below 200 mg/100 ml. Females during the reproductive age have a slightly lower level. In the new-born, the serum cholesterol is around 100 mg/100 ml which slowly rises to about 160 mg/100 ml by the age of 1. Cholesterol levels would tend to slowly rise after the 4th decade of life in men as well as women.

Increased level of cholesterol for prolonged periods will cause deposits of cholesterol on the intimal side of artery, causing the development of atherosclerosis and later hardening of arterial walls (arteriosclerosis). Aorta, coronary arteries and cerebral vessels are predominantly affected. The formation of an atherosclerotic plaque leads to narrowing of the vessel wall where blood flow becomes turbulent. Finally, a clot is formed which occludes the vessel. Thrombosis in coronary, cerebral or in peripheral vessel leads to ischemia of the tissue supplied by that artery. As the oxygen supply is lost, infarction or tissue death occurs.

The risk factors associated with coronary heart diseases are shown below:

1. Hypercholesterolemia and consequent atherosclerosis will increase the probability for myocardial infarction. Cholesterol levels are pathologically increased in diabetes mellitus, obstructive jaundice, hyperthyroidism, congenital hyperliproteinemias and in nephrotic syndrome. All these conditions predispose the occurrence

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of atherosclerosis and heart diseases.

2. Low Density Lipoproteins (LDL): About 75% of plasma cholesterol is associated with LDL. Normal levels of serum LDL-cholesterol for 20 - 29 years is 60 - 150 mg/100 ml., for 30 - 39 years, 80 - 175 mg/100 ml and for 40 - 60 years, 90 - 200 mg/100 ml The cholesterol synthesised in liver is transported to peripheral tissues by means of the LDL. Thus the more the LDL– chole-sterol fraction, the tendency for atherosclerosis is increased.

3. On the contrary, High Density Lipoproteins (HDL) have a protective effect on the development of atherosclerosis. Normal serum level for HDL-cholesterol for adult males is 30 - 60 mg/100 ml. and for females is 35 - 75 mg/100 ml. HDL is the form by which cholesterol is transported from tissues towards the liver and then excreted through the bile. Therefore, HDL has a scavenging role on the body cholesterol content. A high HDL cholesterol level is known to reduce the risk of developing coronary artery diseases.

4. Lipoprotein - a (Lpa): Atherosclerotic heart diseases are generally seen after the age of 50. But in some persons, myocardial infarction is seen in their 30s and 40s. This young - adult form of the disease has a strong familial prediliction. In their blood, a special form of lipoprotein, now called Lpa, is seen. It is similar to LDL, but the protein has an extra arm, which will prevent plasminogen activation leading to thrombosis, thus accelerating the atherosclerotic process.

5. Hypertension: Hardening of the blood vessel by atherosclerosis will lead to hypertension. This in turn causes turbulent blood flow in narrow vessels and leads to thrombus formation. Statistically, an increase in 10 mm of blood pressure will reduce life expectancy by 10 years. Every 6th Indian has high blood pressure and 50% of them are prone to get myocardial infarction.

6. Cigarette smoking: Cigarette smoke contains many deleterious substances such as nicotine, carbon monoxide, nitrogen dioxide, carbon soot and benzopyrenes. Nicotine is a natural poison. Tobacco broth is used as a pesticide. Nicotine increases heart rate and blood pressure. It produces transient contraction of coronary artery which may trigger the thrombo - embolic attack in the coronary vessels. Cigarette smoke contains 5% carbon monoxide, which depletes oxygen in the red blood cells and restricts oxygen availability to vital areas including the heart. Nitrogen dioxide content in cigarette smoke is 250 ppm (parts per million), as compared to the safe industrial level of 5 ppm. It corrodes cells of membranes of alveolar sac as well as blood vessels. Benzopyrenes are powerful carcinogens, and the incidence of lung cancer is related to the use of cigarettes. Considering all these facts, it is statistically estimated that one cigarette reduces 10 minutes from the life span of the individual. Hence the motto "Cigarette smoking is injurious to health" is put forward by the World Health Organisation. However, the injury of cigarette smoke is not restricted to the person who smokes. The surrounding air is also polluted, and when it is inhaled by another person, the second man is also involved in the deleterious effects of cigarette smoke. This "passive smoking" is also equally dangerous. Hence the International Union Against Cancer has modified the original slogan as "Your smoking is injurious to our health".

7. Obesity and lack of exercise are also contributory factors to coronary diseases.

Since atherosclerosis affects important arteries, prevention of this pathological process is of utmost importance. Elevation in cholesterol level can be prevented or reversed by dietary restrictions. The following regimen will help in this process:

A) reduce total fat intake; B) maintain adequate quantities of poly unsaturated fatty acids in food; C) avoid diet rich in cholesterol; D) increase vegetables and dietary fibres; E) avoid cigarettes and F) take moderate exercise.

Dietary substances rich in cholesterol are the following: whole egg (500 mg/100 g); egg yolk (1300 mg/100 g); liver (500 mg/100 g); meat (150 mg/100 g). It is better to avoid these food stuffs. After taking one omelette, a rise in 20 mg of blood cholesterol level will be observed.

Green leafy vegetables contain plant sterols (sitosterols), which prevent the absorption of cholesterol from intestine. Moreover, the fibre content of vegetables will increase the intestinal motility, which again reduces cholesterol absorption. These actions will favour the elimination of cholesterol from the body.

Poly unsaturated fatty acids (PUFA) are linoleic acid, linolenic acid and arachidonic acid. These are available in large quantities in vegetable oils. For example, ground nut oil contains 20%, sunflower oil 50% and safflower or kardi oil contains 75% PUFA. Fish oils also contain large amount of PUFA in the form of timnedonic acid and nervonic acid. PUFA are required for esterification of cholesterol and their subsequent incorporation into HDL-cholesterol and final excretion through the bile. Thus PUFA will facilitate excretion of cholesterol and thereby lower the cholesterol level. Animal fat contains only 5% PUFA while it carries about 50% saturated fatty acids; these will tend to increase the cholesterol level and hence are to be avoided.

Although intake of PUFA is beneficial, eating more PUFA may not give extra benefit. The PUFA are more liable to be degraded by oxygen radicals and may cause actual damage, if taken in large doses. Therefore, the recommended daily allowance is that total fat may be 20 - 30% of total calories, out of which 20 - 30% should be of poly unsaturated fatty acids. For an average Indian, this will be about 30 - 50 g of vegetable oil, out of which 10 - 15 g should be of PUFA.

The role of coconut oil in the atherogenesis is a controversial issue. About 30 years ago, it was observed that PUFA in food will decrease blood cholesterol level, while long chain fatty acids or saturated fatty acids, such as palmitic acid and stearic acid, will increase the cholesterol level. It is also known that coconut oil does not contain PUFA, but contains some saturated fatty acids. As saturated fatty acids are bad for health, people thought that coconut oil is bad. Even now, many educated people are under this wrong idea. Later research works have shown that coconut oil contains no deleterious long chain saturated fatty acids. Instead it has medium chain fatty acids (MCFA) such as lauric acid and myristic acid. That gives some special properties for coconut oil. The metabolism of long chain fatty acid is different from that of medium chain fatty acid. MCFA is easily digested and absorbed from intestines. In fact, coconut oil is the oil of choice in treating malabsorption syndrome where other types of fats and oils will worsen the condition. Moreover, when it reaches inside the tissues, MCFA is preferentially metabolised and is not deposited as fat in adipose tissues. The present day concept is that coconut oil will neither increase nor decrease the cholesterol level in blood. Therefore, coconut oil can safely be used in atherosclerosis but it may not reverse the already deposited cholesterol in vessel walls. There is no need for changing the habit of using coconut oil. However, supplementation of PUFA by means of other vegetable oils in small but adequate quantities is recommended.