

## **CARDIOVASCULAR DISEASES**

Shahla Karuthedath

Assistant Professor (Adhoc),

PG Department of Home Science, Korambayil Ahamed Haji Memorial Unity Women's College,  
Manjeri, Malappuram, 676122, Kerala, India

### **INTRODUCTION**

Cardiovascular disease is a class of diseases that involve the cardiovascular system. They include diseases of the coronary arteries that supply the heart muscle with oxygen and nutrients; diseases of arteries such as the carotid artery that provide blood flow to the brain; and diseases of the peripheral arteries that carry blood throughout the body. Worldwide, cardiovascular disease is the leading cause of death, causing about a third of all deaths each year. Cardiovascular diseases (CVDs) are a group of disorders affecting the heart and blood vessels, and they are the leading cause of death globally, taking an estimated 17.9 million lives each year. This means that more people die from CVDs than from any other cause, including cancer and respiratory diseases. Coronary heart disease (CHD) is the most common type of CVD, and it is caused by the buildup of plaque in the arteries that supply blood to the heart. This plaque buildup can narrow the arteries, reducing blood flow to the heart and eventually leading to a heart attack.

### **RISK FACTORS**

The factors that play a role in causing or increasing the risk of getting cardiovascular disease are called risk factors. Figure 1 illustrates these risk factors. As you may have noticed in the figure, these factors are classified as modifiable and non-modifiable risk factors. Modifiable risk factors are those which we have control over. For example, obesity, smoking, high blood pressure, high cholesterol, physical inactivity etc. By themselves, they are major risk factors, which increase our risk of developing CHD. Positive healthy living, smokefree air, good nutrition, regular physical activity, and supportive living and working environments can go a long way in preventing CHD. Non-modifiable risk factors are those that we have no control over such as hereditary, age, gender etc.

1. Family history: People who already have the disease in their family are more prone to getting heart disease. Genetic factors greatly influence the risk of developing premature cardiovascular diseases.
2. Obesity: As you know obesity or excessive weight is the primary cause of cardiovascular disease. It is an independent risk factor for heart disease. Obesity is generally associated with elevated triglyceride, elevated low-density lipids, increased blood pressure and impaired glucose tolerance. Weight reduction improves these abnormalities. Keeping the body mass index within the normal range (18.5-24.9) can be helpful in retarding the onset of CAD. Remember we read about BMI in unit 9. Further, android form of obesity makes us more prone to heart diseases as compared to the gynoid form of obesity. Thus, abdominal fat is considered more harmful than fat on the hips as you may recall studying in Unit 9. This can be measured by waist/hip ratio (WHR). Normal WHR is 0.85 for females and 1.0 for males.
3. Hypertension or high blood pressure: It is also one of the risk factors of cardiovascular disease and is frequently accompanied by hyperlipidemia (excess lipids in the blood). Increased coronary artery wall tension is believed to accelerate the atherosclerotic process by stimulating arterial smooth muscle cell hyperplasia and hypertrophy with resultant fibromuscular thickening.
4. Diabetes: Sustained hyperglycemia is associated with tissue damage and cardiomyopathies. Control of blood glucose levels is important to prevent heart disease.
5. Age: Earlier men less than 55 years were more prone but now heart disease has caught up with a younger age-group of 30 years also. In fact, autopsy studies have indicated that the process of atherosclerosis can begin as early as at two years of age and that the sites of blockage may get predetermined in the womb of hyper-cholesterolemic women.
6. Smoking and tobacco: Cigarette smoking and tobacco is a major independent risk factor for myocardial infarction and cardiac failure. Coronary artery disease has been seen in 80% of smokers. Inhaling nicotine, carbon monoxide and various other pollutants narrow the coronary arteries thus reducing the blood flow to the heart muscle. It deserves special attention in the prevention of cardiovascular disease.

7. Alcohol: Excessive amount of alcohol is also a risk factor. Alcohol shows a positive relationship between the amount of alcohol consumed and blood pressure levels, hence it is best to avoid it or take it in moderation.

8. Lack of physical activity: Sedentary and un-exercised people are more prone to CVD.

9. Syndrome X is a cluster of conditions such as central abdominal obesity, diabetes, dyslipidemia or hypertension with elevated triglycerides, decreased HDL and blood sugar abnormalities—all harmful for cardiovascular disease.

10. Plasma fibrinogen and Lipoprotein(a): Plasma fibrinogen is closely associated with blockage in the arteries due to blood clot formation. Serum lipoprotein (a) which is a genetically inherited mutant of plasminogen, is a discriminant marker of early, asymptomatic atherosclerotic plaques in the carotid arteries and aorta of hypercholesterolemic individuals.

11. Psychological, social, cultural and religious factors indirectly influence the risk of cardiovascular diseases by their effects on kind of food and quantity of food consumed, cigarette and alcohol consumed. Highly competitive job stress and physical exercise, people who are impatient, workaholic, can cause greater harmful effects on the heart and its vessels.

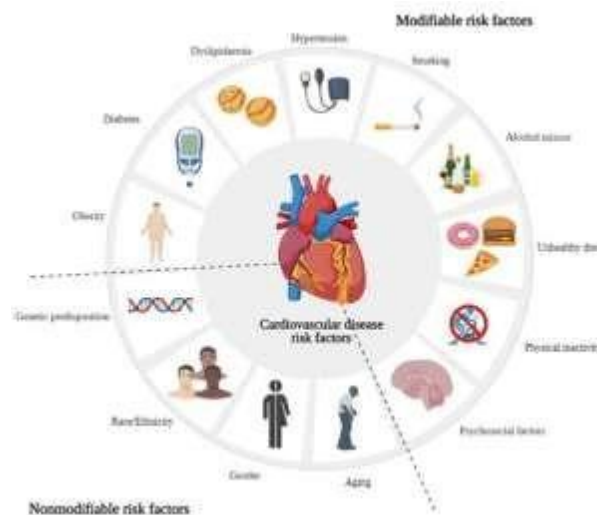


Figure 1: Risk factors of cardiovascular diseases

(Source: [https://www.researchgate.net/figure/Cardiovascular-disease-risk-factors-Created-with-BioRendercom\\_fig1\\_352260450](https://www.researchgate.net/figure/Cardiovascular-disease-risk-factors-Created-with-BioRendercom_fig1_352260450))

## Precursors of Cardiovascular Disease

There are two very common conditions that are precursors to virtually all cases of cardiovascular disease: hypertension (hypertension) and atherosclerosis (hardening of blood wall). Both conditions affect the arteries and their ability to maintain normal blood flow.

### **HYPERTENSION**

Hypertension is a chronic medical condition in which the blood pressure in the arteries is persistently elevated, as defined in Table 1. Hypertension usually does not cause symptoms, so more than half of the people with high blood pressure are unaware of their condition. Hypertension is typically diagnosed when blood pressure is routinely measured during a medical visit for some other health problem.

Table 1: Classification of Blood Pressure (in adults)

Category	Systolic (mm Hg)	Diastolic (mm Hg)
Normal blood pressure	90-119	60-79
Prehypertension	120-139	80-89
Hypertension	140 or higher	90 or higher

High blood pressure is classified as either primary or secondary high blood pressure. At least 90% of cases are primary high blood pressure, which is caused by some combination of genetic and lifestyle factors. Numerous genes have been identified as having small effects on blood pressure. Lifestyle factors that increase the risk of high blood pressure include excess dietary salt and alcohol consumption in addition to the risk factors for cardiovascular disease stated above. Secondary high blood pressure, which makes up the remaining 10% of cases of hypertension, is attributable to chronic kidney disease or an endocrine disorder such as Cushing's disease.

Treating hypertension is important for reducing the risk of all types of cardiovascular disease, especially stroke. These and other complications of persistent high blood pressure are shown in Figure 2.

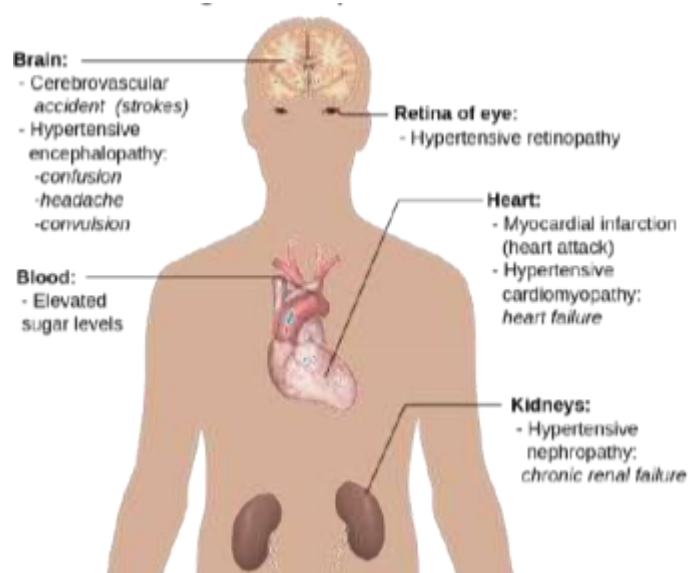


Figure 2 : If high blood pressure is not brought under control, it can eventually cause hypertensive retinopathy, myocardial infarction, heart failure, nephropathy, strokes, confusion, headache, convulsion, and elevated sugar levels. Lifestyle changes, such as reducing salt intake and adopting a healthier diet may be all that is needed to lower blood pressure to the normal range. In many cases, however, medications are also required.

(Source:[https://bio.libretexts.org/Bookshelves/Human\\_Biology/Human\\_Biology\\_\(Wakim\\_and\\_Grewal\)/17%3A\\_Cardiovascular\\_System/17.7%3A\\_Cardiovascular\\_Disease](https://bio.libretexts.org/Bookshelves/Human_Biology/Human_Biology_(Wakim_and_Grewal)/17%3A_Cardiovascular_System/17.7%3A_Cardiovascular_Disease))

## DIETARY MANAGEMENT

**Energy:** Calorie requirement should be based on the concept of maintaining an ideal body weight. Excess calories through fats and carbohydrates have to be reduced so that weight is maintained. **Proteins:** A normal protein intake is recommended. Protein should contribute 15-20% of the total energy needs. Excess non-vegetarian foods especially red meat and egg yolks could be avoided as it has greater proportion of saturated fatty acids. **Fats:** The fats incorporated in the diet should be rich in unsaturated fatty acids and should not provide more than 20% of the total energy (refer dietary management of dyslipidemia for details). **Carbohydrates:** About 60-65% energy should be provided from carbohydrates which are polysaccharides (complex carbohydrates) rather than simple sugars (monosaccharides and disaccharides). Let us now learn about the most important aspect of dietary management, i.e. the intake of minerals and electrolytes, which are closely associated with the maintenance of blood volume. Hypervolemia as we know would cause greater pressure on the arteries. **Minerals and Electrolytes:** Minerals and electrolytes of clinical significance include calcium, sodium and potassium.

**Calcium (Ca):** Adequate calcium intake is an essential part of the treatment, and this could be ensured through intakes of milk and milk products and green vegetables as well as adequate cereals and pulse intakes.

**Sodium:** Studies have shown that sodium restriction along with weight reduction is effective in controlling mild to moderate hypertension along with diuretics recommended. Sodium is restricted to 1-2 g/day which equates to 2.5-5 g of salt for a day. The conversion factor for this is: grams of sodium  $\times$  2.5 = grams of salt. 1 teaspoon of salt contains about 2300 mg of sodium. However, it is wise to keep salt at a lower level (2.5 g) as the rest of the sodium can be accounted in a day's diet.

**Mild Sodium restriction:** 2-3 g sodium (2000-3000 mg). Salt may be used lightly in cooking, but no salt at the table is allowed. There is no restriction on naturally occurring fresh foods, but processed foods should be avoided.

– **Moderate Sodium restriction:** 1 g sodium (1000 mg). In addition to the above restrictions, some control in naturally occurring fresh foods and no salt in cooking is added. Canned

vegetables and baked products are avoided. Meat and milk products are used in moderate amounts.

- Strict Sodium restriction: 0.5 g sodium (500 mg). Apart from the restrictions stated above, meat, milk and eggs are allowed in small portions.

- Severe Sodium restriction: 0.25 g sodium (250 mg). This level is too restrictive and nutritionally inadequate and unrealistic to be used practically. In this, restricted quantities of meat and eggs are used only occasionally. Table 11.6 presents details on low sodium foods.

Potassium: Increasing the potassium content in the diet lowers the blood pressure and improves hypertension. This could be done by increasing fruits and vegetables in the diet, which are rich in both potassium and fibre content. Fluids: Fluid restriction is necessary only if oedema is present. Dehydration may be observed in some patients on diuretics. Thus, normal amount of fluids especially in the form of plain drinking water can be taken. Thus, remember the following points while chalking out a patient care plan for hypertensives.

- Lifestyle changes: Avoiding smoking, use of tobacco, and excess alcohol intake. Physical activity like walking, 4 times a week for 40 minutes, is beneficial.

- Medications: Diuretics, calcium channel blockers and others should be consumed regularly.

- Nutritious balanced diet: The diet of a hypertensive should be nutritious.

It should be low in calories (if required) and fat with a normal protein content. It should be low in sodium but rich in potassium, calcium, magnesium and fibre. Currently the DASH diets are recommended. These are rich in fruits and vegetables, non-fat dairy products and low in total as well as saturated fats.

### Atherosclerosis

Atherosclerosis is a condition in which artery walls thicken and stiffen because of the buildup of plaques inside the arteries. Plaques consist of white blood cells, cholesterol, and other fats. Typically, there is also a proliferation of smooth muscle cells that make the plaque fibrous as well as fatty. Over time, the plaques may harden with the addition of calcium crystals. This

reduces the elasticity of the artery walls. As plaques increase in size, the artery walls dilate to compensate so blood flow is not affected. Eventually, however, the lumen of the arteries is likely to become so narrowed by plaque buildup that blood flow is reduced or even blocked entirely. Figure 3 illustrates the formation of a plaque in a coronary artery.

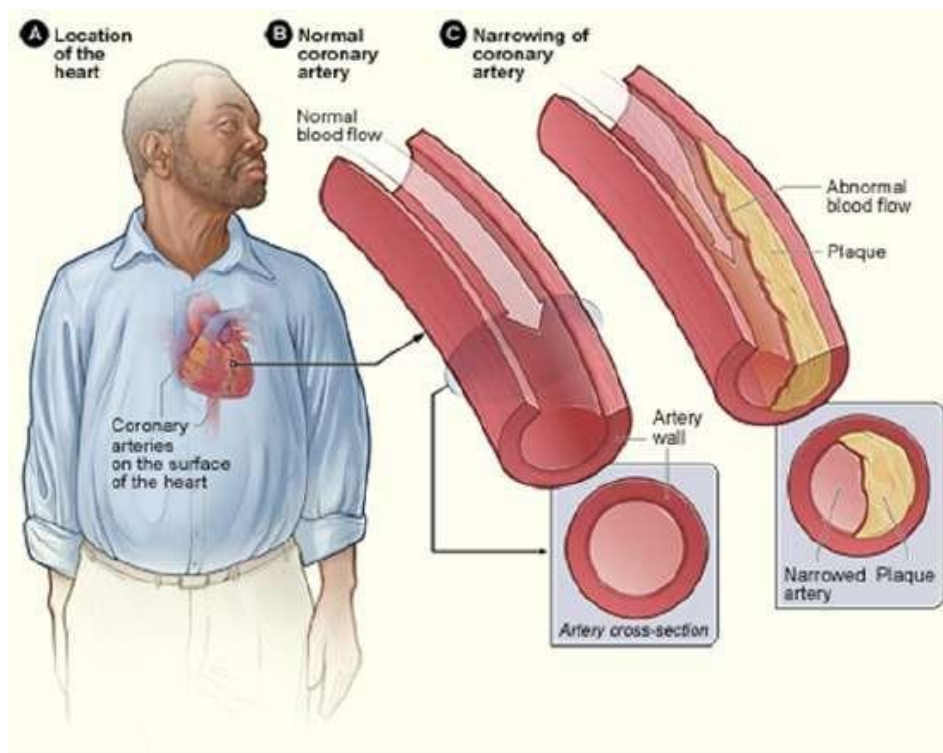


Figure 3: Plaque accumulation in a coronary artery may reduce blood flow to cardiac muscle cells.

(Source:[https://bio.libretexts.org/Bookshelves/Human Biology/Human Biology](https://bio.libretexts.org/Bookshelves/Human%20Biology/Human%20Biology)).

In most people, plaques start to form in arteries during childhood and progress throughout life. Individuals may develop just a few plaques or dozens of them. Plaques typically remain asymptomatic for decades. Signs and symptoms appear only after there is severe narrowing (stenosis) or complete blockage of arteries. As plaques increase in size and interfere with blood flow, they commonly lead to the formation of blood clots. These may plug arteries at the site of



the plaque or travel elsewhere in the circulation. Sometimes plaques rupture or become detached from an arterial wall and become lodged in a smaller, downstream artery. Blockage of arteries by plaques or clots may cause a heart attack, stroke, or other potentially life-threatening cardiovascular events. If blood flow to the kidneys is affected, it may lead to chronic kidney disease.

The process in which plaques form is not yet fully understood, but it is thought that it begins when low-density lipoproteins (LDLs) accumulate inside endothelial cells in artery walls, causing inflammation. The inflammation attracts white blood cells that start to form a plaque. Continued inflammation and a cascade of other immune responses cause the plaque to keep growing. Risk factors for the development of atherosclerosis include hypertension, high cholesterol (especially LDL cholesterol), diabetes, and smoking. The chance of developing atherosclerosis also increases with age, male sex, and a family history of cardiovascular disease.

Treatment of atherosclerosis often includes both lifestyle changes and medications to lower cholesterol, control blood pressure, and reduce the risk of blood clot formation. In extreme cases or when other treatments are inadequate, surgery may be recommended. Surgery may involve the placement of stents in arteries to keep them open and improve blood flow or the use of grafts to divert blood flow around blocked arteries.

**Role of Carbohydrates:** It is important to know about these carbohydrates, as they all differ in their digestive properties. The rate of absorption is variable. Monosaccharides get absorbed the fastest and polysaccharides get absorbed the slowest. This is because polysaccharides contain more fibre. The latter are good for many disorders like intestinal diseases, diabetes, and even cardiac problems. Fibre is beneficial for cardiovascular disease and is found as water-insoluble and water-soluble type.

Soluble fibers like pectins, gums and mucilage's have shown reduction in cholesterol levels. Intake of about 20-40 g of soluble fibre has proven to be beneficial. As you can see, legumes, oats, whole grains, fruits (apples, pears, and citrus fruits), and vegetables along with psyllium (isabgol) are a rich source of soluble fibre. Soybeans are a good source of fibre and soya proteins have estrogenic effect, which causes lipid lowering. A recent analysis of 38 completed trials showed the beneficial effects of soya protein to be in the amount of 47g/day.

**Proteins:** While the quantity of protein does not impose any significant impact on the serum lipoproteins, it is the quality of protein, which may be of significance. Patients should be advised to consume plant origin proteins over those of animal origin. This is because plant origin foods, which are good sources of protein, are generally rich sources of dietary fibre, have low amounts of saturated fat and are devoid of cholesterol. Egg white and lean meats (meat without fat) should be the preferred options in case of animal foods.

**Vitamins:** Antioxidants and flavonoids, natural vitamin E, vitamins C and A are nutrients (vitamins) that scavenge cell-damaging free radicals and act as antioxidants as you may recall studying earlier in Unit 7. It is important to know this because damage through free radicals is quite pronounced among patients with Syndrome X – a risk factor for cardiovascular disease. Vitamin A is present in good amounts in green and yellow fruits and vegetables and lycopene in tomatoes and anthocyanin in grapes and berries. Vitamin E rich foods include corn (0.09 mg), almonds (25.86 mg), sunflower seeds (23.1 mg), spinach (1.29 mg) and soyabean (1.29 mg). Hence, vitamins (E, C and A) containing foods, bright yellow fruits and vegetables like papaya, orange, mango, strawberry, tomato, carrots and green leafy vegetables like methi and spinach, cabbage, red wines, tea and soyabean are excellent foods because of their antioxidant properties.

**Minerals:** The three most important minerals are chromium, zinc and magnesium. These minerals play a critical role in maintaining proper insulin function. Deficiency of these minerals increases the risk of Syndrome X – a risk factor for cardiovascular disease. Excess sodium intake and lack of potassium have been seen to play an important role in hypertension. Low intakes of calcium can also be a risk for cardiac disorder. Sodium added to food or sodium-rich foods need to be restricted in cardiovascular diseases.

**Antioxidants and Flavanoids:** You must have already read about different antioxidants present in our foods. The body makes use of a great variety of antioxidants and free radical scavengers for different purposes and to protect tissues with different needs. Vitamins A, C and E have important antioxidant functions as you have already studied above. The B vitamins, although not technically antioxidants, often act as a co-factor with antioxidants. Flavonoids naturally occur in fruits, vegetables, tea and wine.

## **CORONARY ARTERY DISEASES**

Coronary artery diseases are a group of diseases that result from atherosclerosis of coronary arteries. Treatment of the diseases mainly involves treating underlying atherosclerosis. Some of the common coronary artery diseases are given below.

### **Rheumatic Heart Disease (RHD)**

It is a very common cause of cardiovascular disorder in children and adolescents in India. This disease involves damage to the entire heart and its membranes. It is a complication of rheumatic fever (resulting from an untreated Streptococcus throat infection) and usually occurs after attacks of rheumatic fever. Rheumatic fever can damage the heart valves. If the heart valves are damaged, they will fail to open and close properly. When this damage is permanent, the condition is called Rheumatic Heart Disease.

#### **Symptoms**

Symptoms generally appear after 1 to 6 weeks of the fever and sometimes the infection may have been too mild to have been recognized. The symptoms are fever, fatigue, shortness of breath, fainting, palpitation and chest pain. Swollen, tender, red, painful nodules or small protuberances may appear. There could be red, raised, lattice-like rash and uncontrolled movements of arms, legs and facial muscles.

#### **Complications**

Inflammation of lining of heart (pericarditis), anaemia, heart enlargement, valve deformities (mitral and tricuspid valves), embolism, arrhythmia, abdominal pain, fever, arthritis etc.

#### **Dietary management**

The diet should be nutritious and without restrictions except in the patient with congestive heart failure, whose fluid and sodium intake should be restricted. Potassium supplementation may be necessary because of the mineralocorticoid effect of corticosteroid and the diuretics (if used).

### Valvular Heart Disease

If any of the valves of the heart (aortic, mitral, pulmonary and tricuspid valves) are damaged, it results in valvular heart disease. The basic reason for this disease is the damage to heart valves due to age.

The functions of these valves are to ensure that blood is flowing at the right speed in the right direction. In valvular heart disease conditions, the valves of the heart become very thin and hard that changes the rate and speed of blood flow in the system. Sometimes they may be completely closed.

#### Symptoms

Symptoms of this disease are very sudden. This disease advances slowly and heart adjusts to it, and it becomes very difficult to find the symptoms. General symptoms are almost similar to rheumatic heart disease. Symptoms are Giddiness, Excess fatigue, Palpitations, Chest pain.

#### Treatment

Long term antibiotic therapy, Medications which prevent clotting, Balloon dilatation etc.

### **Inflammatory Heart Disease**

Inflammatory heart disease is caused due to inflammation of the pericardium. Causes of this disease include bacterial or fungal infection, Heart attack and myocarditis. Due to radiation therapy to the chest use of medications that suppress the immune system, due to diseases such as cancer, leukaemia, tuberculosis, kidney failure etc.

#### Symptoms

Severe chest pain, Difficulty in breathing when lying down, Dry cough, Anxiety, Excess fatigue

#### Treatment

The main goal of the treatment is to suppress acute inflammatory process, Eradication of streptococcal infection, prevent the further occurrence of disease, and protect heart against damaging effects of carditis.

## Ischemic Heart Disease

Ischemic heart disease is a wide range of heart diseases caused by the decreased supply of oxygen to the myocardium i.e. the muscle of the heart. It is also known as coronary artery disease.

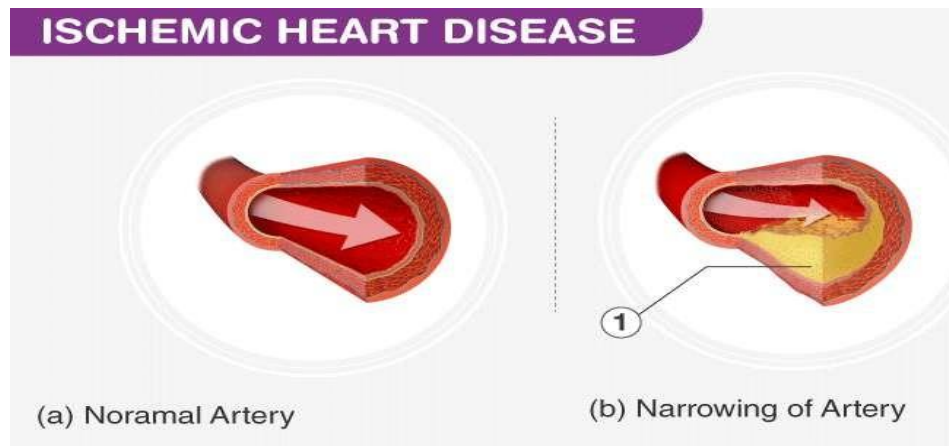


Figure 4. Lipid deposit of plaque

Source : <https://www.natural-health-news.com/myocardial-ischemia-causes-symptoms-diagnoses-and-treatment>

### Symptoms

Chest pain, especially after physical exertion, Dizziness or fainting, Heart palpitations, which may feel like your heart fluttering or skipping beats, Shortness of breath, Swelling in your feet or ankles.

### Causes of Ischemic Heart Disease

Risk factors include smoking, diabetes mellitus, and cholesterol levels, Genetic and hereditary factors may also cause this disease, Hypertension, Stress is also a risk factor.

### Causes myocardial ischemia

Causes of myocardial ischemia include:

**Coronary artery disease.** This is a buildup of plaque and cholesterol inside your coronary arteries, which supply blood to your heart muscle. The buildup narrows your artery so much that the oxygen-rich blood your heart needs can't get through, and your heart muscle becomes starved for oxygen. This causes ischemia and angina. Atherosclerotic plaque causes 70% of fatal heart attacks.

**Blood clot.** When plaque that forms in your narrow coronary artery breaks apart, it can attract a blood clot. When a blood clot settles in a coronary artery that's already narrow, it can cause a blockage (thrombosis).

**Coronary artery spasm.** This happens when the coronary arteries spasm, which temporarily reduces or cuts off blood supply to your heart.

Cocaine use.

**Coronary artery dissection.** This rare condition can keep blood from getting to your heart.

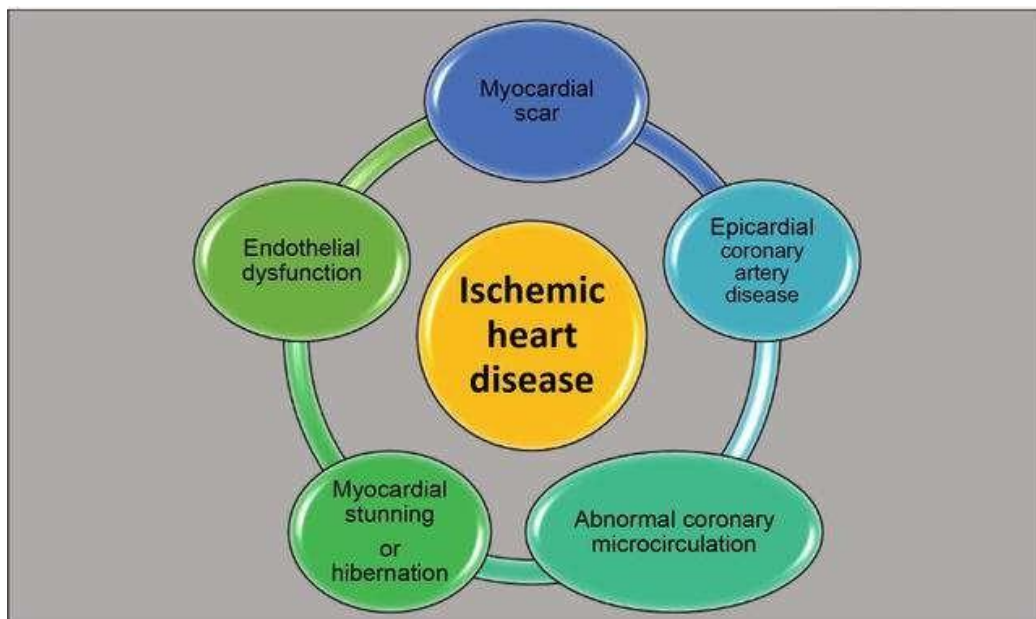


Figure 5. Ischemic heart disease features in the etiology of heart failure.

(Source : <https://www.intechopen.com/chapters/77100>)

## **Treatment**

Treatment of Ischemic heart disease includes medications like organic nitrates help to relax the non-specific smooth muscles. Beta-blockers help to reduce cardiac work and increase oxygen consumption. Medication like aspirin reduces the risk of angina. Calcium channel blockers reduce the total coronary flow by blocking beta receptors.

## **Dietary management of valvular heart disease and ischemic heart disease**

**Limit salt intake:** Eating salty foods increases blood pressure, increases pressure on blood vessels, thereby increasing the burden on the heart leading to heart failure. Patients with valvular heart disease need to reduce the burden on the heart, maintain a stable blood pressure. The recommended amount of salt in patients with valvular heart disease is 2-4g per day, so the dishes should be processed lighter, should not be eaten. Foods containing a lot of salt such as fish sauce and seafood.

**Avoid stimulants** such as tea, coffee, alcohol, tobacco. Using these stimulants increases the risk of heart attack and stroke.

**Smoking:** Smoking increases the risk of atherosclerosis leading to coronary heart disease, stroke, and high blood pressure. People with heart valve disease need to quit smoking to reduce the risk of atherosclerosis and reduce the burden on the heart.

**Tea and coffee:** Tea and coffee contain caffeine, theobromine, theophylline, L-theanine, which stimulates the sympathetic nervous system, which destabilizes physiological activities such as palpitations, palpitations, and tachycardia. Patients with valvular regurgitation regularly use coffee and tea for a long time, which can lead to heart failure and anxiety disorders. In addition, tea and coffee can lead to increased blood pressure, slow blood transport, and make heart valve disease worse.

**Drinking a lot of alcohol and beer:** Alcohol causes many harmful effects on organs such as the liver, pancreas, kidneys, brain and heart. People with valvular heart disease should avoid consuming alcoholic beverages as they can cause arrhythmias and worsen symptoms. Limit soluble fats such as animal fats, cheese milk, coconut oil, palm oil, canned foods, fried foods, processed meats like sausages, bacon. Substances This soluble fat causes hypercholesterolemia,

increases the risk of atherosclerosis, burdens the blood vessels and heart, and increases the risk of myocardial infarction and stroke. When the blood vessels are atherosclerotic, the heart has to work harder to meet the blood supply for the whole body. Therefore, the disease condition in people with heart valve regurgitation will become serious. Do not use foods containing refined carbohydrates

Refined carbohydrates including white bread, sugar and sweeteners, people with heart valve regurgitation should not use these foods because the processing process has been done. remove healthy ingredients such as fiber, minerals, fatty acids, and other natural ingredients. In addition, in the processing process, bad ingredients such as trans-fat and sugar are added to the process, which adversely affect the cardiovascular system. Do not drink soft drinks, carbonated drinks: Soft drinks and carbonated drinks contain very high sugar content, making it easy to gain weight quickly, increasing the burden on the heart.

### **Angina Pectoris**

Angina pectoris, or just angina, is temporary chest pain or discomfort caused by decreased blood flow to the heart muscle. Because of the decreased flow of blood, there is not enough oxygen to the heart muscle resulting in chest pain. Coronary artery disease, which can result in narrowing of the coronary arteries that carry blood and oxygen to the heart muscle, is one of the most common causes of angina. While angina is not a heart attack, it does signal an increased risk for a heart attack. Seek immediate medical attention if you experience any chest pain or discomfort.

There are two main types of angina—stable and unstable. Stable angina, the most common type, develops during physical activity and usually lasts a short time (approximately five minutes or less) if the physical activity has ended. Unstable angina is less common and usually occurs during periods of rest.



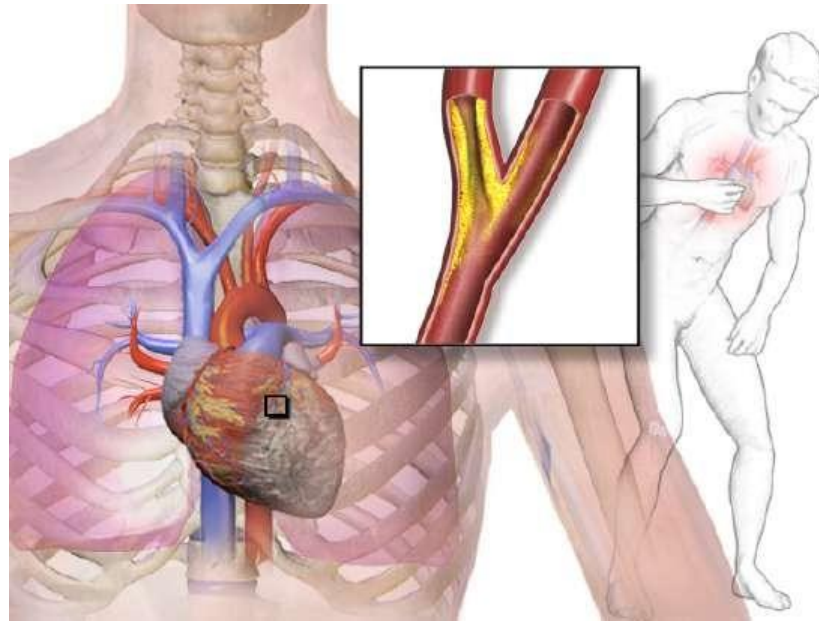


Figure 5: Angina is a pain in the chest due to reduced blood flow in coronary arteries so the heart muscle does not receive adequate oxygen.

(Source: <https://byjus.com/biology/angina-pectoris>)

### Symptoms

Chest pain or discomfort, such as tightening of the chest, Discomfort in the jaw, neck, arms, upper abdomen, shoulder or back, Fatigue, Sweating, Nausea. Dizziness

There are many risk factors associated with angina including, but not limited to, high blood pressure, diabetes, obesity, family history, tobacco use, stress and age.

### Diagnosis

Electrocardiogram (ECG): This test records the electrical activity of the heart, which is used to diagnose heart abnormalities such as arrhythmias or to show ischemia (lack of oxygen and blood) to the heart.

Stress test without imaging: This heart-monitoring test is used to help evaluate how well the heart performs with activity. During a stress test, you will usually be asked to perform physical exercise, like walking on a treadmill. An ECG is recorded during the period of exercise. The ECG is assessed by your doctor to see if your heart reached an appropriate heart rate and if there

were any changes to suggest decreased blood flow to your heart. If you are unable to perform exercise, medications that mimic the heart's response to exercise may be used.

**Blood tests:** The tests can identify certain enzymes such as troponin that leak into the blood after your heart has suffered severe angina or a heart attack. Blood tests can also identify elevated cholesterol, LDL and triglycerides that place you at higher risk for coronary artery disease and therefore angina.

#### Treatment

**Chest x-ray:** This noninvasive imaging test helps your doctor rule out other sources of chest pain such as pneumonia. Imaging with x-rays involves exposing the chest to a small dose of radiation to produce pictures of the chest and heart.

**CT of the chest:** Chest CT is a more sensitive test than chest x-ray that can identify other causes of chest pain such as aortic disease or **blood clots** in the blood vessels of the lungs. This imaging test combines special x-ray equipment with sophisticated computers to produce multiple images of the chest and heart.

**Coronary computed tomography (CT) angiography:** This exam evaluates the coronary arteries (blood vessels that supply blood and oxygen to the heart) to determine the extent of narrowing of the arteries due to plaque without the need for an invasive catheter feed through the arteries into the heart.

**Magnetic resonance (MR) imaging:** The primary purpose of this exam is to determine whether there is good blood flow to the heart muscle. If there are areas with decreased blood flow, this could indicate plaque with blood vessel narrowing. This blood flow evaluation may be done twice during the exam with the use of a contrast material. The first time may be performed after the administration of a pharmaceutical, which stresses the heart like exercise. The second time will be at rest. Performing the evaluation both with stress and rest helps determine if the decreased blood flow only occurs with exercise. This exam can also assess function of the heart and determine if there is any scar in the heart muscle. MRI machines use a powerful magnetic field, radio waves and a computer to produce detailed images.

*Catheter angiography:* In this invasive imaging test, a thin, long plastic tube, called a catheter, is inserted into an artery in your groin or hand using a needle. The catheter is guided with a wire into the coronary arteries and is used to inject contrast material directly into the coronary arteries to determine whether there is any narrowing of the blood vessels. Images of the contrast material in the blood vessels are captured using x-rays. Narrowed portions of the vessels can be reopened using either a balloon or stents.

*Echocardiogram:* During this test, a transducer that produces high-frequency sound waves is used to create moving images of the heart. The motion of the walls of the heart is evaluated. If there is decreased motion within a portion of the wall of the heart, this could indicate decreased blood flow from narrowing of the coronary artery. Imaging can also be performed with a pharmaceutical agent stressing the heart to detect decreased motion in a portion of the heart muscle with stress.

*Single Photon Emission Computed Tomography (SPECT):* This stress test with imaging is performed with a nuclear medicine tracer. During an imaging stress test, the patient is usually asked to perform some kind of physical exercise like walking on a treadmill. If the patient is unable to perform exercise for any reason, drugs that mimic the heart's response to exercise may be used. A radioactive tracer will be injected into the blood during the peak of exercise and images of the heart will be taken. The radioactive tracer flows with the blood and will show whether there is an area of the heart with decreased blood flow.

Diet for preventing angina pectoris.

Obviously, a healthy diet goes a long way in preventing angina pectoris. The following basic guidelines need to be followed with meticulous care:- Avoid fatty foods to the maximum possible extent. This includes fried food, milk products such as butter and cheese, full cream milk, oils, etc. Fermented milk products are good for people with angina. This includes curds. Use only vegetable oils for cooking. This includes sunflower, olive, groundnut and rapeseed oils. Avoid salt in the diet. Do not consume foods that are too salty. In meats, red meats such as mutton, beef and pork must be avoided. White meats such as poultry and fish are beneficial. Fishes with high body oil content must be preferred. This includes sardines, tunas, mackerels, salmons, herrings, etc. Canned fish must be strictly avoided. There should at least two to

three fish consumptions per week. Carbohydrates should form the major part of the food. This includes cereals, wheat, rice, bread, potatoes and pasta. It is found that a little bit of alcohol is actually beneficial for angina, but excess is harmful. The safe limit of alcohol is as follows:- For men: 21 units per week, and not more than 4 units on any one day .For women: 14 units per week, and not more than 3 units on any one day.

#### Prevention of angina pectoris

Many of the risk factors for angina can be tackled by lifestyle changes.

- Eat a varied and healthy diet with plenty of leafy vegetables. Avoid sugary foods and saturated fats found in meat and full-fat dairy products.
- Stop smoking. -To provide advice about stop-smoking.
- Lose weight if you are overweight.
- Exercise more: aim for a half-hour walk each day.
- If you have diabetes or high blood pressure, maintain treatment for these conditions.

#### Ayurvedic herbs

Ayurveda is a treasure-house of remedies for angina pectoris. There is a long list of herbs that have been used since ancient times for the treatment of the condition. The following is a list of these herbs with their actions on the human body:- Guggul is an age-old remedy used by Ayurvedic exponents for treating angina pectoris and its complications. Guggul is in fact a mixture of several substances that have been extracted from the Commiphora mukul plant. This medicine is effective in treating atherosclerosis, which is a leading cause of angina. This is because of guggulsterone, which is a compound found in the guggul plant.

#### Myocardial Infarction

A myocardial infarction (MI), commonly known as a heart attack, occurs when blood flow stops to a part of the heart causing damage to the heart muscle and the death of myocardial cells. MI usually occurs because of complete blockage of a coronary artery, often due to a blood clot or the

rupture of a plaque (Figure 6). An MI typically causes chest pain and pressure, among other possible symptoms, but at least one-quarter of MIs do not cause any symptoms.

In the worst case, an MI may cause sudden death. Even if the patient survives, MI often causes permanent damage to the heart. This puts the heart at risk of heart arrhythmias, heart failure, and cardiac arrest.

Heart arrhythmias are abnormal heart rhythms, which are potentially life-threatening. Heart arrhythmias often can be interrupted with a cardiac defibrillator, which delivers an electrical shock to the heart, in effect —rebooting it.

Heart failure occurs when the pumping action of the heart is impaired, so tissues do not get adequate oxygen. This is a chronic condition that tends to get worse over time, although it can be managed with medications.

Cardiac arrest occurs when the heart no longer pumps blood or pumps blood so poorly that vital organs can no longer function. This is a medical emergency requiring immediate intervention.

#### Dietary management

Proper and careful treatment of the underlying cause (usually dyslipidemia, advanced atherosclerosis or severe chronic hypertension) is imperative to prevent the occurrence of any acute ischemic event namely myocardial infarction/stroke. Dietary management is the key component in preventing the progression of underlying disease condition. The most vital objectives of dietary and lifestyle management include:

To maintain ideal weight for age

To lower blood pressure through drugs and diet control

To avoid exertion and unnecessary stress

To follow a prudent diet /DASH diet The nutrient requirement here are the same as discussed earlier, however, to sum up it can be said that we need to restrict calories from total fats (particularly saturated fats) and from simple carbohydrates; avoid glandular meats (brain, liver, kidneys etc.); use less salt in cooking and avoid salt sprinklers.

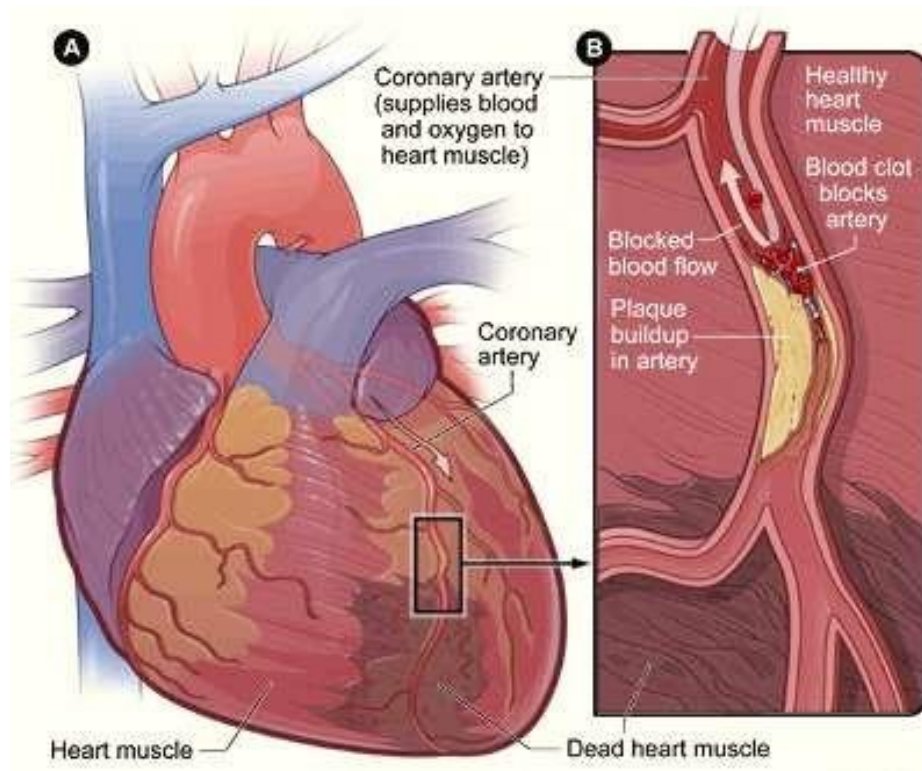


Figure 6 : A myocardial infarction occurs when cardiac muscle cells die due to blockage of a coronary artery.

(Source:<https://medicine.umich.edu/dept/cardiac-surgery/patient-information/adult-cardiac-surgery/adult-conditions-treatments/coronary-artery-disease-cad>)

### Dietary Management

Patients who suffer from an attack of myocardial infarction are hospitalized and are usually kept under strict medical supervision. During the initial 24 to 48 hours most patients are on intravenous support and if needed on an artificial ventilator to meet their oxygen requirements. Initially oral food intake is restricted and not recommended as the ailing heart cannot support the oxygen and absorption of food. Oral food intake is resumed based on several cardiac function tests which help in assessing the residual functional capacity of the heart after injury. Low fat soft diet is generally recommended and during the initial stages foods may be introduced in very small quantities every hour or after every two hours. Observation of the patient during consumption of food and at least till  $\frac{1}{2}$  to 1 hour after eating is essential to rule out the elicitation of angina pectoris or another attack of myocardial infarction.

**Energy:** As mentioned above, patients who have recently suffered from an attack of myocardial infarction are hospitalized in the intensive cardiac care unit wherein their movement is strictly restricted, and they generally are advised not to socialize a lot. Thus, the energy expenditure on physical activity is very low or negligible. The diet should therefore provide enough calories to meet the basal requirements, hence a low-calorie diet is recommended. Other benefits of providing a low calorie diet include: reduction in the adipose tissue mass particularly among obese patients and hence reduced oxygen requirements of the body (tissues); reduction in the requirement of oxygen associated with ingestion, digestion and assimilation of food. The energy intake may initially begin with 800 Kcal which can be slowly progressed to a 1200 Kcal diet till the patient is discharged. Thereafter, the patient's energy intake should be governed on the maintenance of body weight which is preferably 1 to 2 kg below IBW.

**Protein, Carbohydrates and Fat :** The protein intake generally remains the same as per the RDI i.e. 1.0 gm protein per kg body weight per day. Adequate amount of proteins are necessary to promote regeneration of the necrotic tissues in the myocardium. As we had mentioned earlier emphasis should be laid on plant proteins and low-fat animal products (skimmed milk, low-fat paneer, chicken, fish and other marine foods). The majority of MI patients are also hyperlipidemic and have elevated serum triglyceride levels. In such cases, the calorie contribution from fat should not be above 20% and the dietary cholesterol intake should remain below 200 mg per day.

**Carbohydrates** should provide 60% of the total energy. However, emphasis should be laid on the inclusion of easy-to-digest simple carbohydrates, which are low in fibre. Low fibre cereals, roots and tubers should be served in a soft well-cooked/ blended form (purees etc.). **Vitamins and Minerals:** The requirement of vitamins and minerals is largely governed by the existing nutritional status and the clinical parameters of the patient. Mild to moderate sodium restriction is generally recommended if the patient is hypertensive or is at risk of developing oedema due to congestive cardiac failure. Inclusion of low fibre, low sodium fruits and vegetables can help in providing good amounts of iron and B-group vitamins particularly folic acid and vitamin B12.

other Considerations

They are initially kept on intravenous fluids to maintain a desirable blood volume and also to supply some amount of calories. As the condition improves, the patients may either be put on enteral tube feeding (intubated with ventilator to supply oxygen) or introduced small sips of full-fluids after every 1 to 2 hours. The diet gradually progressed to a semi-soft and then a soft one. The patients are closely observed when on a soft to normal diet, a few days before discharge. Thus, great care must be taken regarding the consistency and quantity of food being served to the patient. The patient should be advised to eat slowly and adhere to a small frequent meal pattern even after discharge. Rest after meals should be advocated and the patient should avoid all forms of activity after meals. If the patient is overweight/ obese and needs to be operated on, a low calorie diet to aid in weight reduction is a must. As a dietician you must be vigilant if the patient is also a diabetic as his insulin requirements may fluctuate drastically during the post MI period. Proper dietary counseling must be provided, particularly if congestive cardiac failure is present. In our next section, we shall learn about the causes, symptoms, treatment and management of congestive cardiac failure—a decompensated heart disease that frequently develops among patients of MI after several years of rehabilitation.

### Stroke

A stroke, also known as a cerebrovascular accident or brain attack, occurs when blocked or broken arteries in the brain result in the death of brain cells. There are two main types of strokes: ischemic stroke and hemorrhagic stroke. Ischemic stroke is illustrated in Figure 7

An ischemic stroke occurs when an embolus (blood clot) breaks off from a plaque or forms in the heart because of arrhythmia and travels to the brain where it becomes lodged in an artery. This blocks blood flow to the part of the brain that is served by arteries downstream from the blockage. Lack of oxygen causes the death of brain cells. Treatment with a clot-busting drug within a few hours of the stroke may prevent permanent damage. Almost 90 percent of strokes are ischemic strokes.

A hemorrhagic stroke occurs when an artery in the brain ruptures and causes bleeding in the brain. This deprives downstream tissues of adequate blood flow and also puts pressure on brain tissue. Both factors can lead to the death of brain cells. Surgery to temporarily open the cranium



may be required to relieve the pressure. Only about 10 percent of strokes are hemorrhagic strokes, but they are more likely to be fatal than ischemic strokes.

In both types of strokes, the part of the brain that is damaged loses its ability to function normally. Signs and symptoms of stroke may include an inability to move, feel, or see on one side of the body; problems understanding speech or difficulty speaking; memory problems; confusion; and dizziness. Hemorrhagic strokes may also cause a severe headache. The symptoms of a stroke usually occur within seconds or minutes of the brain injury. Depending on the severity of the stroke and how quickly treatment is provided, the symptoms may be temporary or permanent. If the symptoms of a stroke go away on their own in less than an hour or two, the stroke is called a transient ischemic attack. Stroke is the leading cause of disability in the United States, but rehabilitation with physical, occupational, speech, or other types of therapy may significantly improve functioning.

The main risk factor for stroke is high blood pressure. Therefore, keeping blood pressure within the normal range, whether with lifestyle changes or medications, is the best way to reduce the risk of stroke. Another possible cause of stroke is the use of illicit drugs such as amphetamines or cocaine. Having had a stroke in the past greatly increases one's risk of future strokes. Men are also more likely than women to have strokes.

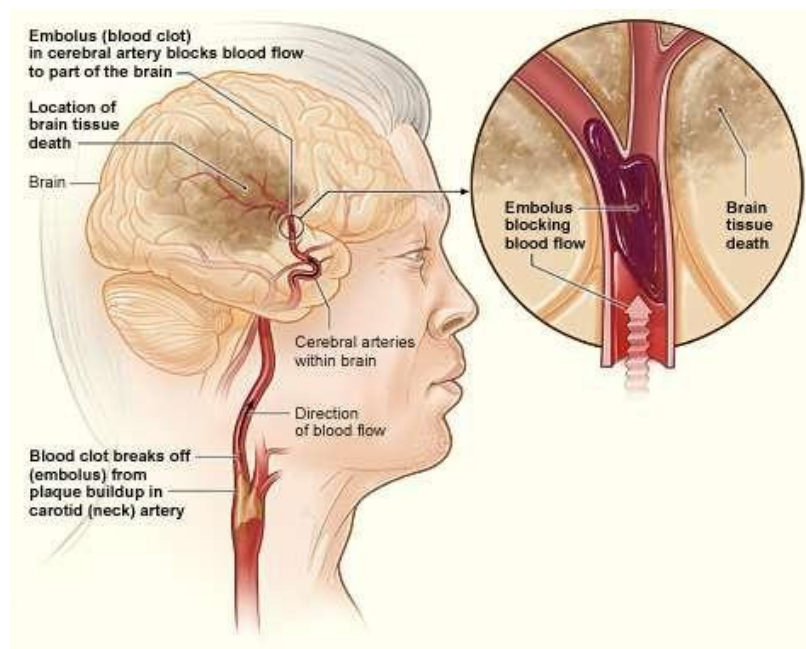


Figure 7 : In an ischemic stroke, brain cells die due to a blocked artery in the brain. The blockage happens when a blood clot breaks from a buildup in the carotid artery and blocks blood flow to part of the brain. As a result, the brain tissue dies. The traveling clot is called embolus.

(Source: <https://www.lecturio.com/concepts/ischemic-stroke>)

### Peripheral Artery Disease

Peripheral artery disease (PAD) is the narrowing of the arteries other than those that supply the heart or brain due to atherosclerosis. Figure 8 shows how the PAD occurs. PAD most commonly affects the legs, but other arteries may also be involved. The classic symptom is leg pain when walking, which usually resolves with rest. This symptom is known as intermittent claudication. Other symptoms may include skin ulcers, bluish skin, cold skin, or poor nail and hair growth in the affected leg(s). However, up to half of all cases of PAD do not have any symptoms.

The main risk factor for PAD is smoking. Other risk factors include diabetes, high blood pressure, and high blood cholesterol. The underlying mechanism is usually atherosclerosis. PAD is typically diagnosed when blood pressure readings taken at the ankle are lower than blood pressure readings taken at the upper arm. It is important to diagnose PAD and treat underlying atherosclerosis because people with this disorder have a four to five times higher risk of myocardial infarction or stroke. Surgery to expand the affected arteries or to graft vessels in order to bypass blockages may be recommended in some cases.

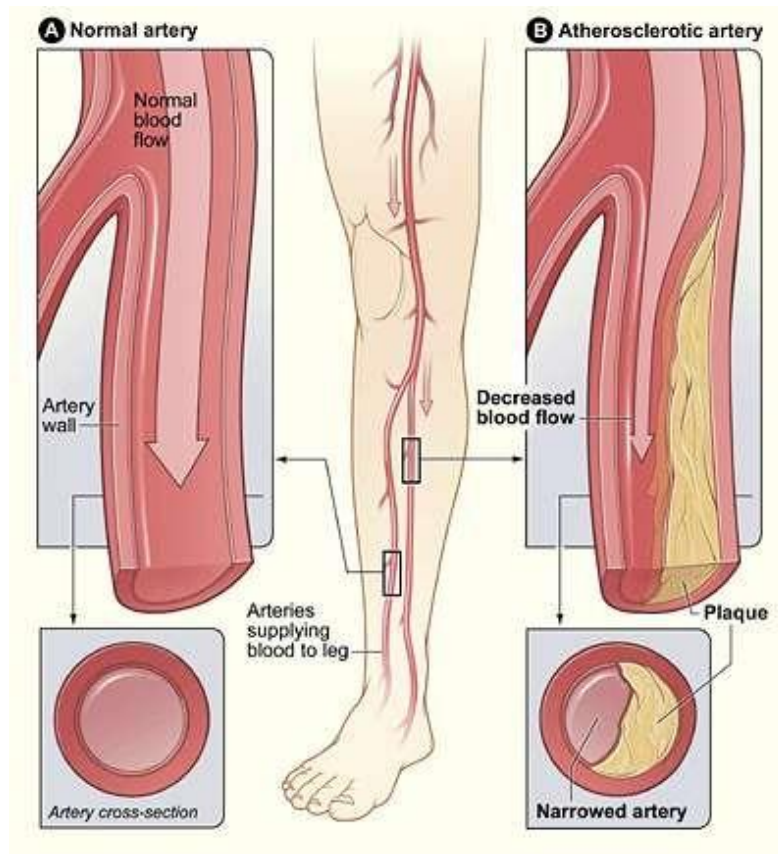


Figure 8 : Peripheral artery disease (PAD) develops when plaque accumulates in the wall of the leg artery. PAD typically causes pain and other symptoms because of decreased blood flow in the leg or other areas of the body served by peripheral arteries.

(Source: <https://columbiasurgery.org/news/2016/04/01/peripheral-arterial-disease-pad-may-be-one-most-common-health-problems-you-ve-never>)

#### Dietary management

Mediterranean diet Mediterranean Diet has been associated with lower rates of PAD and improvement of claudication symptoms. Mediterranean diet is characterized by generous amounts of olive oil as the main culinary fat and is characterized by high consumption of plant-derived foods (fruit, vegetables, legumes, nuts and seeds, and whole grain cereals); frequent, but moderate intake of - mainly red - wine with meals; moderate consumption of seafood and dairy products (especially yogurt and cheese, but not whole milk, butter or cream), poultry and eggs; and low consumption of sweet desserts, red and processed meats . The studies showed a

significant relative risk reduction in type2 diabetes mellitus (40%), PAD (64%) incidence and other cardiovascular complications (30%) in patients following a Mediterranean diet. Olive oil consumption seems to be superior to nut oil in terms of cardiovascular outcomes. Dietary advice can be helpful for the prevention of PAD in diabetics, even in populations traditionally accustomed to Mediterranean dietary habits. High adherence to this dietary pattern was not only associated with low prevalence of obesity and hypertension, but also decreased the odds of concentric left ventricle hypertrophy. The Mediterranean diet was proved to increase ventricular filling, which in turn increased end-diastolic filling, left ventricular volumes, stroke volume, and ejection fraction. Data from the studies shows that high adherence to the prudent dietary pattern was associated with lower odds of abdominal obesity, abnormal glucose concentration, and metabolic syndrome. This finding is of clinical impact in primary prevention for cardiovascular events.

### Conclusion

This chapter discussed etiological factors, metabolic alterations, clinical manifestations, and dietary management of the disease of heart. Cardiovascular diseases, hypertension, atherosclerosis, myocardial infarction, congestive cardiac failure and RHD are a group of cardiac diseases that are discussed briefly in this chapter. Finally, it focused on the various dietary recommendations proposed by WHO for the prevention of heart diseases, as well as dietary guidelines of the American Heart Association (AHP).

### REFERENCES

- Widmer, R. Jay, et al. "The Mediterranean diet, its components, and cardiovascular disease." *The American journal of medicine* 128.3 (2015): 229-238.
- Reynolds, Andrew N., et al. "Dietary fibre in hypertension and cardiovascular disease management: systematic review and meta-analyses." *BMC medicine* 20.1 (2022): 139.
- Bays, Harold E., et al. "Ten things to know about ten cardiovascular disease risk factors." *American journal of preventive cardiology* 5 (2021): 100149.
- Roth, Gregory A., et al. "Global burden of cardiovascular diseases and risk factors, 1990–2019: update from the GBD 2019 study." *Journal of the American college of cardiology* 76.25 (2020): 2982-3021.