

## *Atherosclerosis: Symptoms, Causes, and Prevention*

*Boltaboyev Alisher Murodiljon o'g'li*

Assistant of Central Asian Medical University

Fergana, Uzbekistan.

**Abstract :** Cardiovascular disease is a group of diseases affecting your heart and blood vessels. These diseases can affect one or many parts of your heart and/or blood vessels. A person may be symptomatic (physically experiencing the disease) or asymptomatic (not feeling anything at all). The causes of cardiovascular disease can vary depending on the specific type. For example, atherosclerosis (plaque buildup in your arteries) causes coronary artery disease and peripheral artery disease.

**Keywords:** Atherosclerosis, peripheral artery disease (PAD), arteriosclerosis, cholesterol, LDL, fibrous plaque, Angiogram, Ankle-brachial index, magnetic resonance angiography (MRA), Carotid ultrasound, Endarterectomy, EKG, Bypass surgery.

### INTRODUCTION

Atherosclerosis is when plaque -- a sticky substance made of cholesterol, fat, calcium, and other materials — builds up inside the walls of your arteries. Arteries are the blood vessels that carry blood from your heart throughout your body. Atherosclerosis can put blood flow at risk as your arteries become blocked, and it can cause clots to form. It's the usual cause of heart attacks, strokes, and peripheral artery disease (PAD) -- which together are called cardiovascular disease. The condition doesn't just affect blood vessels in your heart. It can happen in any of your body's arteries. But it most often appears in the major arteries that supply blood to your heart, brain, stomach, lower body, and kidneys. You can both prevent and treat this process.

Arteriosclerosis. The names are similar, but atherosclerosis isn't exactly the same as arteriosclerosis. Arteriosclerosis is a stiffening and thickening of blood vessels that can restrict blood flow to the heart and other organs. It's sometimes called hardening of the arteries. Atherosclerosis is a type of arteriosclerosis.

Causes of Atherosclerosis: doctors don't know exactly how atherosclerosis starts. But it's believed to begin when the endothelium, the thin layer of cells that lines your arteries, somehow gets damaged. It's a progressive disease that can begin in childhood. Common causes of damage to the endothelium include:



High cholesterol  
High blood pressure  
Inflammation, like from arthritis or lupus  
Obesity or diabetes  
Smoking  
Stages of Atherosclerosis

When "bad" ( LDL) cholesterol in your blood crosses a damaged endothelium, it enters the wall of your artery. Your white blood cells stream in to digest the LDL. Over the years, cholesterol and cells become plaque in the artery wall. This plaque creates a bump on your artery wall. As atherosclerosis gets worse, the bump gets bigger. When it gets big enough, it can create a blockage. That slow and gradual process goes on throughout your entire body. Atherosclerosis usually doesn't cause symptoms until you're middle-aged or older. Plaques from atherosclerosis can behave in different ways. They can stay in your artery wall. There, the plaque grows to a certain size and then stops. Since this plaque doesn't block blood flow, it may never cause symptoms. Plaque can grow in a slow, controlled way into the path of blood flow. Over time, it causes significant blockages. Pain in your chest or legs when you exert yourself is the usual symptom. They can suddenly rupture. This allows blood to clot inside an artery. In your brain, this causes a stroke; in your heart, a heart attack. The process of atherosclerosis begins with:

Damage to the endothelium. When the layer of cells that lines your artery walls is damaged, this starts a process that leads to inflammation there.

Fatty streak. A yellow strip lining the walls of major arteries, fatty streak has been found in children as young as 10. In the fatty streak stage, you feel no symptoms.

Fibrous plaque. The second and more dangerous phase of atherosclerosis begins when the cholesterol-containing plaque expands into blood vessels -- the bump.

Complicated lesion. In the last and most serious stage of atherosclerosis, the plaque begins to break up. This exposes the cholesterol and tissue beneath it, causing unseen but serious harm that your immune system tries to fight off. Blood-clotting cells, which block blood flow, are formed in response. The blood clots, combined with the exposed plaque, create what's called a complicated lesion. It can also lead to a stroke or heart attack.

Symptoms of Atherosclerosis

You might not have symptoms until your artery is nearly closed or until you have a heart attack or stroke. Symptoms can also depend on which artery is narrowed or blocked. Symptoms related to your coronary arteries include:

Arrhythmia, an unusual heartbeat

Pain or pressure in your upper body, including your chest, arms, neck, or jaw. This is known as angina.

Shortness of breath

Symptoms related to the arteries that deliver blood to your brain include:

Numbness or weakness in your arms or legs

A hard time speaking or understanding someone who's talking

Drooping facial muscles

Paralysis

Severe headache

Trouble seeing in one or both eyes

Symptoms related to the arteries of your arms, legs, and pelvis include:

Leg pain when walking, called intermittent claudication

Numbness

Cold feet

Aching or burning in your toes and feet when you're at rest

Frequent sores or infections on your feet that won't heal

Symptoms related to your kidneys include:

High blood pressure

Kidney failure



### Risk Factors for Atherosclerosis

Atherosclerosis starts when you're young. Research has found that even teenagers can have signs. If you're 40 and generally healthy, you have about a 50% chance of getting serious atherosclerosis in your lifetime. The risk goes up as you get older. Most adults over 60 have some atherosclerosis, but most don't have noticeable symptoms. The following can increase your risk of atherosclerosis. These risk factors are behind more than 90% of all heart attacks:

Abdominal obesity ("spare tire")

Diabetes and insulin resistance

Family history of heart disease

High alcohol intake (more than one to two drinks a day, depending on your size)

High blood pressure

High LDL cholesterol

High levels of C-reactive protein (CRP) in your blood, which is a signal of inflammation

High triglycerides

Not eating fruits and vegetables, not exercising regularly, sleep apnea, smoking, stress. Rates of death from atherosclerosis have fallen 25% in the past 3 decades. This is because of improved treatments and lifestyles. Six symptoms of atherosclerosis: your symptoms will vary depending on which artery is affected. They may include:

Heart palpitations

Angina (chest pain)

Shortness of breath

Problems with thinking or memory

Leg pain while walking

Erection problems

### Atherosclerosis Diagnosis

Your doctor will start with a physical exam. They'll listen to your arteries and check for weak or absent pulses. You might need tests, including:

Angiogram, in which your doctor puts dye into your arteries so they'll be visible on an X-ray

Ankle-brachial index, which compares blood pressures in your lower leg and arm

Blood tests to look for things that raise your risk of atherosclerosis, like high cholesterol or blood sugar

Carotid ultrasound, an imaging test that shows whether there's hardening of the arteries in your neck

Abdominal ultrasound, which checks for bulges or excess plaque in the aorta, the main artery supplying blood to your lower body

Chest X-ray

CT scan or magnetic resonance angiography (MRA) to look for hardened or narrowed arteries. This is also known as a coronary calcium scan or heart scan.

Doppler ultrasound, which measures blood flow in your arteries

Echocardiogram, which takes images of the chambers and valves in your heart to see how well it pumps

EKG, or electrocardiogram, a record of your heart's electrical activity

Stress test, in which you exercise while health care professionals watch your heart rate, blood pressure, and breathing. You might also need to see doctors who specialize in certain parts of your body, like cardiologists or vascular specialists, depending on your condition. Complications of atherosclerosis include: aneurysms, angina, chronic kidney disease, coronary or carotid heart disease, heart attack, heart failure, peripheral artery disease, stroke, unusual heart rhythms. The plaques of atherosclerosis cause the three main kinds of cardiovascular disease:

Coronary artery disease: Stable plaques in your heart's arteries cause angina (chest pain). Sudden plaque rupture and clotting cause heart muscle to die. This is a heart attack.

Cerebrovascular disease: Ruptured plaques in your brain's arteries cause strokes with the potential for permanent brain damage. Temporary blockages in your artery can also cause



something called transient ischemic attacks (TIAs), which are warning signs of a stroke. They don't cause any brain injury.

**Peripheral artery disease:** When the arteries in your legs narrow, it can lead to poor circulation. This makes it painful for you to walk. Wounds also won't heal as well. If you have a severe form of the disease, you might need to have a limb removed (amputation).

#### Atherosclerosis Treatment

Once you have a blockage, it's generally there to stay. But with medication and lifestyle changes, you can slow or stop plaques. They may even shrink slightly with aggressive treatment.

**Lifestyle changes:** You can slow or stop atherosclerosis by taking care of the risk factors. That means a healthy diet, exercise, and no smoking. These changes won't remove blockages, but they're proven to lower the risk of heart attacks and strokes. **Medication:** Drugs for high cholesterol and high blood pressure will slow and may even halt atherosclerosis. They lower your risk of heart attack and stroke. Diabetes raises the risk for atherosclerosis, so taking medicines to control your diabetes can help lower your risk. Your doctor may prescribe antiplatelet medicines like aspirin, a blood thinner, to help prevent clots. Because long-term aspirin use can cause stomach bleeding, talk with your doctor before you start taking it every day. Doctor can use more invasive techniques to open blockages from atherosclerosis or go around them:

**Angiography and stenting:** Your doctor puts a thin tube into an artery in your leg or arm to get to diseased arteries. Blockages are visible on a live X-ray screen. Angioplasty (using a catheter with a balloon tip) and stenting can often open a blocked artery. Stenting helps ease symptoms, but it does not prevent heart attacks.

**Bypass surgery:** Your doctor takes a healthy blood vessel, often from your leg or chest, and uses it to go around a blocked segment.

**Endarterectomy:** Your doctor goes into the arteries in your neck to remove plaque and restore blood flow. They also may place a stent in higher-risk patients.

**Fibrinolytic therapy:** A drug dissolves a blood clot that's blocking your artery.

#### Atherosclerosis Prevention

You can make changes to your lifestyle to prevent atherosclerosis or slow down its progression. Some things that may help: lower your stress through yoga, mindfulness, or deep breathing. These practices can help lower your blood pressure too. Stop smoking (and vaping), which raises your risk for heart disease. Nicotine narrows blood vessels, forcing your heart to work harder. Quitting smoking is one of the most important lifestyle changes you can make to prevent damage to your heart from atherosclerosis. Follow a healthy diet rich in low-fat proteins, fish, fruits, vegetables, and whole grains. This will help you manage your weight and lower cholesterol, blood pressure, and blood sugar levels.

Lose weight and keep it off. Even a small amount will help lower your risk. Exercise regularly to maintain a healthy blood pressure and improve blood flow. Aim for at least 150 minutes of moderate exercise or 75 minutes of brisk exercise a week. Keep on top of your other health conditions by having regular checkups and following your doctor's treatment plan. Six symptoms of atherosclerosis: your symptoms will vary depending on which artery is affected.

In summary: Stop smoking, exercise, eat less saturated fat and simple carbohydrates, more fiber and possibly omega-3 fatty acids, and cut down on alcohol, moderate consumption has a beneficial effect in prevention and treatment, because risk factors for atherosclerosis include dyslipidemia, diabetes, smoking, family history, psychological factors, sedentary lifestyle, obesity, and hypertension.

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