

## What is High Cholesterol?

High cholesterol, a condition known as hypercholesterolemia, is characterized by elevated levels of cholesterol in the blood. Cholesterol is a white, waxy substance required for various functions in the body, including providing structure to cell membranes and serving as the base material in the production of vitamin D, steroid hormones, and bile acids. It is transported in the blood by molecules called lipoproteins.

Types of lipid- and cholesterol-transporting molecules include:

- **High-density lipoprotein (HDL) cholesterol** (commonly called “good” cholesterol), responsible for transporting cholesterol from tissues to the liver to be metabolized
- **Low-density lipoprotein (LDL) cholesterol** (commonly called “bad” cholesterol), responsible for transporting cholesterol from the liver to cells throughout the body to perform its various functions
- **Triglycerides (TGs)**, enable the transfer and storage of fat in adipocytes (fat cells)
- **Very low-density lipoprotein (VLDL) cholesterol**, which functions as a carrier molecule of triglycerides

In individuals with high cholesterol, the liver is unable to excrete excess LDL cholesterol, resulting in the development of atherosclerosis (the buildup of plaque deposits in blood vessels). Chronic high cholesterol increases the risk of cardiovascular diseases.

### Signs, symptoms, and complications

High cholesterol doesn't present with any clinical symptoms. It is commonly diagnosed using a lipid panel to detect elevated levels of cholesterol in the blood. Uncontrolled or chronic high cholesterol may be associated with complications, including:

- Carotid artery disease
- Coronary artery disease (e.g., angina, heart attack)
- Peripheral artery disease
- Stroke

### Causes and risk factors

The causes and risk factors for high cholesterol include:

- Certain health conditions (e.g., biliary obstruction, chronic kidney disease, hypertension, hypothyroidism, type 2 diabetes)
- Certain medications (e.g., cyclosporine, diuretics, glucocorticoids)
- Genetics, familial hypercholesterolemia (FH)
- High dietary intake of saturated or trans fat
- Overweight and obesity
- Physical inactivity
- Smoking

## Diet and High Cholesterol

Dietary approaches that have been shown to reduce cholesterol levels include the [DASH diet](#), the Mediterranean diet, and the Ornish diet. Foods to enjoy and limit on these diet plans are summarized in the table below.

| Diet                      | Enjoy   | Limit  |
|---------------------------|---|--|
| <b>DASH diet</b>          | Fruits and vegetables<br>Good quality fat (e.g., avocado, flaxseeds)<br>Whole grains<br>Low-fat dairy<br>Animal protein<br>Plant-based protein (e.g., beans, legumes, nuts, seeds)            | Processed and cured meats<br>Poor quality fat (e.g., margarine, shortening)<br>Saturated fat (e.g., animal fat, whole milk dairy products)<br>Sodium<br>Added sugars<br>Alcohol                              |
| <b>Mediterranean diet</b> | Fruits and vegetables<br>Extra-virgin olive oil (EVOO)<br>Whole grains<br>Legumes<br>Nuts and seeds<br>Moderate intake of lean meats, fish, dairy, and red wine                               | Red meat (e.g., beef, pork)<br>Refined and processed foods (e.g., breakfast cereals, prepared meals, fried foods, baked goods)<br>Sugar (e.g., sweets, soft drinks, desserts, table sugar)                   |
| <b>Ornish diet</b>        | Fruits and vegetables<br>Whole grains<br>Legumes, soy products<br>Nonfat milk, yogurt, and cheese<br>Egg whites<br>10% of daily calories from fat (e.g., fish oil, flaxseed oil, nuts, seeds) | Refined carbohydrates (e.g., white flour, white rice, sugar)<br>Other fats and oils (e.g., avocado, olive, coconut, animal fats)<br>Other animal products (e.g., meat, poultry, seafood)<br>Caffeine<br>Salt |

**Dietary supplements** that have been shown to regulate cholesterol levels include:

- Artichoke leaf
- Coenzyme Q10 (CoQ10)
- Garlic
- Niacin
- Omega-3 fatty acids
- Plant sterols and stanols
- Red yeast rice
- Soluble fiber

## Lifestyle and High Cholesterol

Several modifiable lifestyle factors may be considered to prevent or address high cholesterol. In overweight and obese individuals, a modest weight loss of five to 10% of body weight has been associated with improvements in cardiovascular disease risk factors including HDL cholesterol and triglyceride levels. Regular physical activity may help lower cholesterol levels and manage weight. See the handout on [Physical Activity Guidelines](#) for further information. Additionally, smoking cessation is an essential step in reducing the risk of high cholesterol and cardiovascular disease in individuals who smoke.