

## CHOLESTEROL & WOMEN

### Summary

**Cardiovascular disease** is the leading killer of American women, causing almost 500,000 deaths every year, according to the **American Heart Association (AHA)**. As with men, elevated **cholesterol** levels signal danger for a woman's health, putting her at risk for both **heart disease** and **stroke**. According to *AHA Heart Disease and Stroke Statistics 2004 Update*, over 50 million American women have borderline to high cholesterol levels.

Women are particularly at risk after **menopause**, when their **HDL** ("good") cholesterol levels drop and their **LDL** ("bad") cholesterol levels increase. In fact, the **National Heart, Lung and Blood Institute (NHLBI)** finds that over half of postmenopausal women need to reduce their total cholesterol levels. Women also need to carefully monitor their levels of **triglycerides**, another type of fat in the blood.

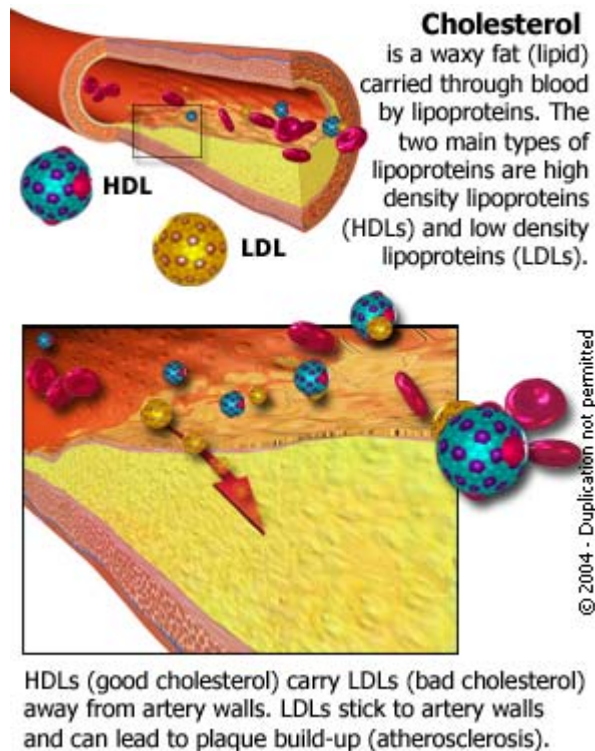
The **American College of Cardiology (ACC)** encourages women to maintain an HDL cholesterol level of at least 45 milligrams per deciliter (mg/dL), which is 5 mg/dL higher than the level recommended for a man. The current ACC recommendations also call for triglyceride levels to be at or below 150 mg/dL.

This Patient Guide discusses the different ways in which cholesterol is measured in men and women and how they relate to heart disease.

All cholesterol measurements in this article are given in milligrams per deciliter (mg/dL). Labs outside of the United States may use different units of measure for cholesterol levels. To convert a cholesterol level from milligrams per deciliter (mg/dL) to international units (IU), multiply the mg/dL cholesterol level by 0.0259 millimoles per liter (mmol/L). For example, a cholesterol level of 200 mg/dL is equal to a cholesterol level of 5.18 IU.

### About cholesterol screening and women

Currently, women's **cholesterol** levels are measured by the same set of **blood tests** used to measure those of men: a *lipid profile* (or **cholesterol blood test**). A lipid profile is a group of simple blood tests that reveal the types, amount and distribution of the various fats (**lipids**) found in the blood. These fats include **triglycerides** and cholesterol, which travel through the bloodstream wrapped in **high-density lipoproteins** (HDL or "good" cholesterol) or **low-density lipoproteins** (LDL or "bad" cholesterol) and other forms of protein (**chylomicrons**).



The criteria for healthy cholesterol levels are different among men and women, partly because of the hormonal changes that occur throughout a woman's life. Thus, physicians will often approach cholesterol screening differently for women. Some of the key differences include:

- Low levels of HDL cholesterol appear to be a stronger predictor of **heart disease** in women over 65 than in men over 65. This is primarily because of changes that occur due to **menopause**, when HDL levels drop.
- High blood levels of triglycerides appear to be a more important **risk factor** among women than men.

Besides cholesterol and triglycerides, a physician may also screen for a specific component of cholesterol called *apolipoprotein B* (apoB). Studies have shown that determining apoB levels may be a better indicator of heart disease than calculating the level of LDL cholesterol alone. For more information about components of a lipid profile, see **Cholesterol Test**.

The **National Institutes of Health** recommend that women have their first cholesterol screening by the age of 20. Some experts also recommend first cholesterol screenings at a younger age for women who begin taking **birth control pills** before age 20.

If initial tests reveal a high cholesterol level, then annual testing is recommended until levels fall within normal ranges. These ranges are somewhat dependent on the patient's risk factor of having a heart attack in the next 10 years. Patients at very high risk for a heart attack may be advised to maintain lower levels of LDL cholesterol than patients at a lower risk. This optimum level may be less than 70 mg/dL.

Patients at high risk may be advised to maintain an LDL cholesterol level of less than 100 mg/dL. These risk levels are based on a variety of factors, including the patient's age, presence of heart disease, and lifestyle factors such as diet and smoking. In addition, **cholesterol-lowering drugs**, such as **statins**, may be prescribed.

When cholesterol levels are normal, women are generally advised to have cholesterol screenings every five years. Some experts recommend more frequent testing after menopause.

### Gender differences in cholesterol levels

Women and men tend to have different average **cholesterol** levels at various times in their lives, primarily because of the effect of **estrogen**. After puberty, when a woman's ovaries begin producing estrogen, the level of **HDL** "good" cholesterol tends to rise while the level of **LDL** "bad" cholesterol tends to fall. This seems to have a cardio-protective effect, especially through a woman's childbearing years.

As **menopause** approaches, however, and estrogen levels begin to decline, the opposite effect takes place. HDL levels tend to drop, while LDL and **triglyceride** (another **blood fat**) levels rise. This rise in LDL cholesterol often takes place in conjunction with other changes that put a woman at risk, including increasing **blood pressure**, fat accumulation in the abdomen (a risk factor for **heart disease**) and weight gain.

Studies have shown that by about age 45, a greater proportion of women have borderline high (200 milligrams per deciliter [mg/dL]) total cholesterol than men.

To combat this constellation of age-related risk factors, women are encouraged to maintain higher HDL cholesterol levels than men. Whereas men are advised to keep their HDL levels at or above 40 mg/dL, the **American College of Cardiology** recommends that women maintain an HDL level of at least 45 mg/dL.

Another strategy for determining whether women's cholesterol levels are healthy is to divide the total cholesterol level by the HDL cholesterol level. This is known as the **cholesterol ratio** and is usually expressed as a numeric ratio, as in 5:1. If the resulting ratio is less than or equal to 5:1, then the cholesterol level is within normal limits. The optimal ratio is 3.5:1. A cholesterol ratio greater than 5:1 indicates a higher risk for developing **coronary artery disease** for both women and men.

For example, a woman with an HDL level of 40 (less than the level recommended by the ACC) is still within the normal range as long as her total cholesterol level is at or below 200. If her total cholesterol is over 200, her challenge is to increase her level of HDL cholesterol without raising her LDL cholesterol levels.

In addition to this gender difference in the importance of HDL cholesterol, there are some developmental stages of life when there are significant differences between the cholesterol levels of men and women. These periods are summarized below:

- Before puberty, there are no significant differences between the cholesterol levels of boys and girls.
- After puberty, young women's bodies (specifically their ovaries) produce more estrogen, which decreases their level of LDL ("bad") cholesterol and increases their level of HDL ("good") cholesterol. Young men's cholesterol levels tend to stay about the same.
- During pregnancy, a woman's total cholesterol level increases significantly in order for the fetus to develop normally.
- Before menopause, women with high total cholesterol levels are at greater risk of developing disease of the heart or blood vessels – as are men. High cholesterol

increases the risk of developing coronary artery disease (a **risk factor** for **heart attack**) and **carotid artery disease** (a risk factor for **stroke**). A woman's high total cholesterol level remains a key risk factor for stroke throughout her life

- After menopause, women experience the reverse of what happened during puberty. The ovaries wind down their production of estrogen, which decreases HDL cholesterol and increases LDL cholesterol. Men show no mid-life changes in cholesterol, just as they showed no dramatic cholesterol changes during puberty.
- After menopause, a woman's key risk factors for developing coronary artery disease (CAD) change. Whereas her main risk factor had been a high total cholesterol level, her risk factors after menopause become low HDL cholesterol and high **triglycerides** (another type of fat in the blood). Therefore, a postmenopausal woman could have a high total cholesterol level but still not have an elevated risk for heart disease, as long as her HDL cholesterol level was high and her triglycerides were low. Whereas LDL cholesterol levels are less important for postmenopausal women's development of CAD, they are strongly associated with men's risk of developing CAD.

### **Impact of HRT on cholesterol**

At one time, studies suggested that taking **hormone replacement therapy** (HRT) provided an added benefit in postmenopausal women by protecting them against **heart disease**. Later research found differently and HRT is no longer recommended for the purpose or reducing a woman's cardiovascular risk.

HRT involves the replacement of **estrogen** that is lost during **menopause** – the time in a woman's life when her ovaries wind down to the point where menstrual periods stop. The primary purpose of HRT is to reduce the symptoms often associated with *perimenopause* (the period of time before menopause). During perimenopause (which may begin 10 years or more before menopause), women may experience mild to severe sensations such as hot flashes, irritability, anxiety, depression, night sweats and heavy or irregular monthly periods.

For women who still have their uterus, HRT typically combines estrogen with progesterone for protection from uterine cancer (women who have had a hysterectomy can take estrogen without progesterone). HRT can relieve some symptoms of menopause and can improve bone density and reduce the incidence of hip fractures in women with **osteoporosis**.

Since it is believed that estrogen has a cardio-protective effect for women prior to menopause, it seemed plausible that HRT might help extend that protection for postmenopausal women. A study known as The Women's Health Initiative was started in 1997 and monitored over 16,000 postmenopausal women 50 to 79 years of age who still had their uterus. However, the study was terminated three years early (May 31, 2002) when it was shown that the risks of HRT outweighed its benefits.

Researchers found that HRT consisting of estrogen and progesterone increased the risks of **heart attack**, **stroke**, breast cancer, **blood clots** and overall **cardiovascular disease**. The estrogen-only part of the Women's Health Initiative continues (for those having had a prior hysterectomy), and no conclusions have yet been drawn about its long-term health outcomes.