Be cholesterol smart means knowing what risk factors can affect blood cholesterol levels; having blood cholesterol tests; maintaining a healthy lifestyle to keep blood cholesterol level in check; and taking cholesterol-lowering medications if necessary.

Cholesterol is a type of lipid of a soft waxy consistency found in the bloodstream and in the body’s cells. In order to function properly, our body needs cholesterol to make and repair cell membranes. Our body also uses cholesterol to produce important hormones (such as sex hormones), vitamin D and bile acids which help to digest foods. However, too much cholesterol in the blood is harmful to health. Excess cholesterol will deposit as plaque on the inner walls of blood vessels. Over time, this build-up causes hardening, narrowing or blockage of the vessels that in turn can lead to coronary heart disease (CHD), stroke and other vascular diseases. Studies across different populations reveal that those with higher blood cholesterol levels have more atherosclerosis (i.e. hardening of arteries) and CHD than those having lower levels.

A large proportion of cholesterol in the human body is manufactured by the liver, while some is directly derived from the diet. Dietary cholesterol is found in foods of animal origin such as meat, seafood, egg yolk or dairy products; while foods of plant origin are cholesterol-free. Although it is well-known that too much dietary cholesterol can cause raised blood cholesterol, the role of dietary saturated fat in this is actually more important.

Being insoluble in water, cholesterol binds to proteins to become lipoproteins so that it can be transported in blood. These lipoproteins can broadly be divided into ‘good’ high-density lipoprotein cholesterol (HDL-C) and ‘bad’ low-density lipoprotein cholesterol (LDL-C), according to their effects on health. Along with triglycerides (another type of lipid), they are the major blood lipids usually used in calculating total blood cholesterol level (Box 1). According to the US National Cholesterol Education Program (NCEP), a desirable level of total blood cholesterol level (after a 9- to 12-hour fast without food and liquids) for adults in general should stay below 5.2 mmol/L. While levels between 5.2 mmol/L and less than 6.2 mmol/L are considered borderline high, levels at or above 6.2 mmol/L are regarded as high.

Global Perspective

High blood cholesterol is a major risk factor for mortality and burden of disease globally. According to the World Health Organization (WHO)’s estimation, high blood cholesterol causes 2.6 million deaths worldwide each year (0.9 million in low-income countries, 1.3 million in middle-income countries.
and 0.5 million in high-income countries). Besides, about one third of CHD is attributed to high blood cholesterol globally.2,3

A systematic analysis of health examination surveys and epidemiological studies with 321 country-years and 3 million participants estimated that the global age-standardised mean total cholesterol was 4.64 mmol/L for men and 4.76 mmol/L for women in 2008, with little change since 1980 (falling by less than 0.1 mmol/L per decade in men and women). Total cholesterol concentrations showed a noticeable age association, peaking at around 50-60 years.2,4 In 2008, the global prevalence of raised total cholesterol (>5.0 mmol/L) among adults aged 25 and over was 39% (37% for males and 40% for females). Nevertheless, the prevalence of raised total cholesterol increased noticeably according to the income level of the country. While around a quarter of adults in low-income countries had raised total cholesterol, the prevalence increased to around one third of adults in lower-middle-income countries. In high-income countries, over 50% of adults had raised total cholesterol.2 Using the conventional threshold for high total cholesterol at 6.2 mmol/L or more, another study with nationally representative data on total cholesterol distributions of about 380 000 adults from the Asia-Pacific region reported that the prevalence of elevated total cholesterol ranged from 4% (in the Philippines) to 27% (in Australia). High total cholesterol tended to be more prevalent in women than in men.5

Box 1: Major types of blood lipids used in total blood cholesterol level calculation1

<table>
<thead>
<tr>
<th>‘Good’ HDL-C</th>
<th>‘Bad’ LDL-C</th>
<th>Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ It helps to keep arteries clear by transporting excess cholesterol from arterial walls back to the liver for degradation and removal, thereby minimising the amount of blockage and reducing the risk of cardiovascular diseases.</td>
<td>◆ It clogs up arteries by carrying cholesterol to the arterial wall for deposit, thereby increasing the risk of cardiovascular diseases.</td>
<td>◆ High levels of triglycerides may clog arteries and prevent HDL from functioning properly, increasing the risk of cardiovascular diseases.</td>
</tr>
<tr>
<td>◆ HDL-C levels greater than 1 mmol/L are considered desirable. The higher the HDL-C level, the better. A level above 3.3 mmol/L is considered to be protective against cardiovascular diseases.</td>
<td>◆ LDL-C levels below 2.6 mmol/L are considered optimal. Any level above optimal appears to be atherogenic, whereas atherogenesis would proceed at a significant rate when levels are 3.4 mmol/L or above. The lower the LDL-C level, the better.</td>
<td>◆ The optimal triglyceride levels are below 1.7 mmol/L. The lower the triglyceride level, the better.</td>
</tr>
</tbody>
</table>

Note: To convert blood cholesterol (total, HDL and LDL) concentrations from mmol/L to mg/dL, multiply the value by 38.67. For triglycerides, multiply by 88.57.
Since high blood cholesterol itself shows no sign or symptom, many people are unaware that they have the problem. Although effective cholesterol-lowering medications are widely available, many people having high blood cholesterol still do not realise that they need treatment or are not getting the treatment they need. An analysis of national health examination survey data of over 79,000 adults aged 40-79 from eight countries (England, Germany, Scotland, Jordan, Mexico, Japan, Thailand and the United States) between 1998 and 2007 reported the proportion of people with undiagnosed high blood cholesterol varied from 16% in the United States to 78% in Thailand. The proportion of people who were diagnosed but untreated ranged from 9% in Thailand to 53% in Japan.\

Local Situation

In 2004/2005, the Department of Health (DH) conducted a survey pertaining to heart health that involved analysis of blood cholesterol concentrations of 1,238 land-based non-institutionalised persons aged 15-84. Results showed that the mean cholesterol concentrations were 4.86 mmol/L for males and 4.79 mmol/L for females. The mean cholesterol concentrations increased with age, from 4.10 mmol/L in persons aged 15-24 to 5.23 mmol/L in persons aged 65-84 (Figure 1a). Overall, 36.3% of males and 30.8% of females had cholesterol concentrations at a level regarded as borderline high (5.2 to < 6.2 mmol/L) or high (≥ 6.2 mmol/L). The prevalence of blood cholesterol at a borderline high or high level (≥ 5.2 mmol/L) also increased with age, from 8.6% in persons aged 15-24 to 49.8% in persons aged 65-84 (Figure 1b). In addition, the study revealed that nearly two-thirds (65.3%) of persons who had high blood cholesterol were unaware of their condition. The proportion was particularly high among persons aged 44 and below (83.6%), but reduced slightly to 58.9% among persons aged 45-64 and 48.1% among persons aged 65-84.\

Figure 1a: Mean cholesterol concentrations among land-based non-institutionalised persons aged 15-84 by sex and age group

![Figure 1a](image1a.png)


Figure 1b: Proportion of land-based non-institutionalised persons aged 15-84 having cholesterol concentrations at a borderline high or high level (≥5.2 mmol/L) by sex and age group

![Figure 1b](image1b.png)
Be Cholesterol Smart

Be cholesterol smart means knowing what risk factors can affect blood cholesterol levels, having blood cholesterol tests, maintaining a healthy lifestyle to keep blood cholesterol level in check, and taking cholesterol-lowering medications if necessary.

Factors affecting blood cholesterol levels

A variety of factors can affect blood cholesterol level. Excessive intake of foods high in saturated fat (such as lard, butter, palm and coconut oils, processed meat including bacon and sausage, whole dairy products and cream), trans fat (such as margarine, chips, cookies and pastries) and dietary cholesterol (Table 1) is an important cause of high cholesterol in the blood. Lack of exercise, excess weight and smoking can lower the amounts of ‘good’ cholesterol in the blood, as well as raise the levels of ‘bad’ cholesterol and triglycerides. Certain medications (such as steroid and oral contraceptives) and medical conditions (such as diabetes mellitus, Cushing’s syndrome and hypothyroidism) may also lead to high blood cholesterol.

Furthermore, age and gender can affect blood cholesterol levels. As we get older, blood cholesterol levels rise. Women before menopause tend to have lower total cholesterol levels than men of the same age. After menopause, however, women’s LDL-C levels would rise. High blood cholesterol can run in families as well. For example, familial hypercholesterolaemia is a genetic disorder caused by a defect on chromosome 19 that makes the body unable to remove LDL-C from the blood, increasing the person’s risk of having atherosclerosis and CHD at an early age.

Having blood cholesterol checks

While high blood cholesterol has no sign or symptom, people having high blood cholesterol can have the condition detected with a blood test. In the United States, the NCEP guidelines for detection of high blood cholesterol recommends everyone aged 20 or older should get their blood cholesterol levels checked at least once every five years. While currently there is insufficient local medical evidence to recommend for (or against) mass screening for blood cholesterol, people at risk of having high blood cholesterol or cardiovascular diseases should be tested. This allows early detection of this ‘silent’ problem and timely treatment if indicated. For example, diabetic patients should have at least annual screening of blood lipids. More frequent intervals may be required according to individuals’ overall cardiovascular risk profile, clinical situations and doctor’s advice. For those who do not know their blood cholesterol level, it would be good for them to talk with their family doctor if a baseline cholesterol test is necessary.
Maintaining an optimal blood cholesterol level

Having an optimal blood cholesterol level is desirable for everyone regardless of their age, sex or whether they have had cardiovascular diseases. As for those who are suffering from high blood cholesterol, even a small reduction can yield substantial health benefits. Clinical trials found that 1% reduction in total cholesterol level reduced CHD risk by about 2%, whereas 1% reduction in LDL-C could reduce the risk by about 1%.¹

Here are some tips that can help keeping ‘bad’ cholesterol levels and triglycerides low and boosting up the ‘good’ cholesterol levels in the blood:

- **Eat a balanced diet** that includes at least 5 servings of fruit and vegetables a day and an appropriate amount of whole-grains and cereals. Avoid foods that are high in saturated fat, trans fat and cholesterol. Choose lean meats, poultry without skin and fish. Use vegetable oils in small quantities for cooking. Opt for skimmed dairy products. As a general rule, limit dietary cholesterol intake to less than 300 milligrams (mg) per day and get no more than 10% of daily calories from saturated fat.

- **Be physically active.** Studies show that regular physical activity or exercise raises HDL-C, and in some persons, lowers LDL-C levels.¹ ⁹ Adults should aim for at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity, or equivalent amounts of both throughout the week.

- **Maintain an optimal weight and waistline.** Carrying some extra weights contributes to high blood cholesterol. For Asian adults, aim for a body mass index between 18.5 and 22.9, with a waist circumference not greater than 90 cm for men and 80 cm for women.

- **Do not smoke.** The toxic chemicals in cigarettes (such as acrolein or nicotine) can affect the way the body metabolises cholesterol. For smokers, quitting smoking can significantly improve LDL-C and HDL-C levels in a matter of weeks. Ask a family doctor or call the Integrated Smoking Cessation Hotline of DH at 1833 183 for support to quit smoking.

- **Refrain from drinking.** Excessive alcohol intake elevates triglycerides (and blood pressure), contributes towards obesity and increases both cardiac and total mortality risks. Although moderate use of alcohol has been linked with higher levels of HDL-C, it should never be a reason for non-drinkers to start drinking as such potential effect can easily be outweighed by detrimental consequences of alcohol on various chronic diseases and injuries. If drinking at all, limit consumption to no more than two standard drinks a day for men and no more than one standard drink a day for women.

Use of cholesterol-lowering medications

While a healthy lifestyle is a very important line of defense against high blood cholesterol, sometimes eating a healthy diet and getting more active are not enough. Cholesterol-lowering medications may also be required to keep cholesterol in check.

As with other medications, cholesterol-lowering medications may have side effects. So before starting medications, discuss with a family doctor about the pros and cons, and let the doctor know if you have any discomfort (e.g. muscle pain) during the course of treatment.
Of note, it is never too late to have blood cholesterol properly controlled and managed, but the earlier the better. Cohort studies showed that a decrease in LDL-C (and total cholesterol) concentrations of 0.6 mmol/L in men is associated with a decrease in the risk of CHD of about 50% at the age of 40, 40% at 50, 30% at 60, and 20% at 70 and above in the next five years. For more information about healthy living, please visit the Central Health Education Unit website of DH at http://www.cheu.gov.hk, or call the 24-hour Health Education Hotline at 2833 0111.

References


News Bites

Olive oil consumption was associated with a lower incidence of stroke among older people, a study suggested.

The prospective population-based study in 3 French cities included over 7,600 community-dwelling adults aged 65 and above who had no history of stroke at baseline. They reported their diets and other lifestyle factors and were followed-up for about 5 years. After adjustment for socio-demographic variables (such as age, sex and education attainment), lifestyle factors (such as dietary habits, alcohol consumption, level of physical activity and smoking) and major risk factors for stroke (including high blood pressure, high blood cholesterol, diabetes and history of cardiovascular disease), results showed that people who used olive oil (for both cooking and dressing) were 41% less likely to have a stroke than those who never used olive oil.

The research finding implicated that the well-known benefits of olive oil in preventing heart disease might extend to stroke as well. For optimal health, people are urged to choose olive oil (or other oils high in unsaturated fats) over oils high in harmful saturated fats and trans fats, and use oils in moderation. Besides, a healthy diet should also include plenty of fruit and vegetables and moderate amounts of whole-grains and lean meat.


Data Brief

Coronary heart disease (CHD) is the leading cause of premature death in many developed and some developing countries. In Hong Kong, the age-standardised death rates for CHD have declined by about one-fifth over the last 20 years. However, there were still over 4,600 registered deaths due to CHD in 2010. Analysed by sex and age group, most of the cases were among males (57.2%) and people aged 65 and above (84.4%).

As unhealthy behaviours (such as smoking, poor diet, not enough physical activity and excessive drinking) are the main culprit for nearly 80% of CHD cases, members of the public are urged to lead a healthy lifestyle so as to reduce the risk of developing CHD.

Number (Rate*) of registered deaths due to CHD by sex and age group, 2010†

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 and below</td>
<td>78 (4.2)</td>
<td>16 (0.7)</td>
<td>94 (2.4)</td>
</tr>
<tr>
<td>45-64</td>
<td>535 (50.8)</td>
<td>92 (8.3)</td>
<td>627 (29.0)</td>
</tr>
<tr>
<td>65 and above</td>
<td>2,041 (482.8)</td>
<td>1,874 (382.9)</td>
<td>3,915 (429.2)</td>
</tr>
<tr>
<td>Total†</td>
<td>2,655 (80.2)</td>
<td>1,983 (52.8)</td>
<td>4,638 (65.6)</td>
</tr>
</tbody>
</table>

Notes: * Rate per 100,000 population in the respective group.
† The figures are provisional.
† Total includes cases of unknown age.
Sources: Department of Health and Census and Statistics Department.

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Non-Communicable Diseases (NCD) WATCH is dedicated to promote public’s awareness of and disseminate health information about non-communicable diseases and related issues, and the importance of their prevention and control. It is also an indication of our commitments in responsive risk communication and to address the growing non-communicable disease threats to the health of our community.

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