

DEADLY DIABETES

Dr Low Lip Ping, Emeritus Chairman of the Singapore Heart Foundation, discusses Diabetes Mellitus and Cardiovascular Disease in the *Healthy Times* Diabetes and the Heart campaign.

Diabetes mellitus is a chronic disease which has been described as a state of raised blood glucose associated with premature mortality. It arises when the pancreas fails to produce enough insulin (type 1 diabetes), or when the body cannot effectively make use of the insulin produced (type 2 diabetes).

Diabetes is fast becoming a world pandemic. The pandemic of type 2 diabetes mellitus has emerged as a global health problem. There will soon be more than 200 million persons with a history of diabetes mellitus worldwide with the majority in Asia.

These numbers are projected to double in the next decade with a disproportionate risk of developing type 2 diabetes among the elderly.

Unfortunately, cardiovascular complications remain the leading cause of death among patients with type 2 diabetes accounting for 70% of all case-fatalities. If action is not taken to stem the tide of type 2 diabetes, the prospects for world health are bleak.

The most prevalent form of diabetes mellitus is type 2

diabetes. This disorder typically makes its appearance later in life. Type 2 diabetes is caused by the combination of insulin-resistance and defective secretion of insulin by pancreatic b-cells.

Insulin resistance develops from obesity and physical inactivity, interacting with a genetic susceptibility.

Insulin secretion declines with advancing age, and this decline may be accelerated by genetic factors. Insulin resistance typically precedes the onset of type 2 diabetes and is commonly accompanied by other cardiovascular risk factors such as dyslipidemia, hypertension, and prothrombotic factors. The common clustering of these risk factors in a single individual has been called the metabolic syndrome.

Many patients with the metabolic syndrome manifest impaired fasting glucose (IFG) even when they do not have overt diabetes mellitus. The metabolic syndrome commonly precedes the development of type 2 diabetes by many years; of great importance, the risk factors that constitute this syndrome contribute independently to Cardiovascular Disease risk.

Cardiovascular Disease

Cardiovascular diseases are diseases affecting the heart and circulatory system, which, for example, can result in heart attack, stroke and amputation of the lower limbs.

Cardiovascular disease is a major worldwide public health problem. It is the number one cause of death in industrialized countries and in Singapore. It is also set to overtake infectious diseases as the most common cause of death in many parts of the less developed world, with levels becoming comparable to those in Western societies – a situation which seemed inconceivable a few decades ago.

In developing countries the most common cause of cardiovascular disease used to be infection of the heart valves. However, in recent years there has been a shift away from infectious causes in many developing nations.

Today the most widespread form of cardiovascular disease around the world is that which starts with damage to the blood vessels.

The two main processes by which the blood vessels become damaged are atherosclerosis and hypertension. Atherosclerosis leads to the formation of plaques of atheroma which narrow the diameter of the large and medium-sized arteries.

This narrowing of the arteries impairs blood flow. Plaques are also prone to rupture or to ulcerate and then act as a site for blood clot formation. The resulting blood clots, which can block the affected vessel completely, are usually responsible for the more severe clinical manifestations of cardiovascular disease such as heart-attack and stroke.

Hypertension damages the smaller vessels in the circulatory system. Over time they become scarred, hardened, narrowed and less elastic. Hypertension can also both predispose to and accelerate the development of atherosclerosis.



The Cardiovascular Disease Triad

The major clinical manifestations of cardiovascular disease can be divided into three groups:

- those affecting the heart and coronary circulation (coronary heart disease);
- those affecting the brain and cerebral circulation (cerebrovascular disease); and
- those affecting the lower limbs (peripheral vascular disease).

Coronary Heart Disease

The heart receives a blood supply of its own from the blood vessels known as the coronary arteries.

Angina is a term used to describe pain in the chest due to a reduced blood supply to the heart (ischaemia). It results from atherosclerosis in the coronary circulation. Typically angina causes central chest pain, which often radiates to the left arm, shoulder or jaw.

The pain is related to exertion and is relieved by rest. Shortness of breath and sweating are commonly associated with angina. If the responsible plaque of atheroma is causing a severe narrowing of the vessel, then angina symptoms may rapidly worsen and occur at rest, and may warn of an impending heart attack.

Atherosclerosis can lead to a heart attack if the coronary arteries become blocked. The onset of a heart attack is usually heralded by severe central chest pain, which may also radiate to the left arm, shoulder or jaw. Severe shortness of breath, sweating and feeling faint are common additional symptoms.

Sudden death can occur as a consequence of an abrupt loss of the heart's ability to pump blood. It may result from a massive heart attack or a severe abnormality of the rhythm of the heartbeat.

Heart failure occurs when damage to the heart muscle is severe enough to prevent it functioning adequately as a pump. It manifests itself either acutely with severe shortness of breath or, more chronically, with shortness of breath, reduced exercise tolerance and swelling of the ankles.

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Cerebrovascular Disease

The brain receives its blood supply from four main arteries: the two carotid arteries and the two vertebral arteries. The clinical consequences of vascular disease in the cerebral circulation will depend upon which vessels or combinations of vessels are involved.



Stroke occurs when the blood supply to a part of the brain is blocked resulting in the death of an area within the brain. If a large vessel is blocked the outcome may be rapidly fatal or may lead to very severe disability. If smaller blood vessels are blocked the outcome is less critical and recovery may be good. The most common types of disability are the loss of use of one side of the body and speech problems.

There are three principal types of stroke:

- **Thrombotic:** Stroke due to the blockage of an artery leading to or in the brain by a blood clot.
- **Haemorrhagic:** Stroke due to bleeding from a ruptured blood vessel, usually a consequence of hypertension.
- **Embolic:** Stroke due to the formation of a blood clot in a vessel away from the brain. The clot is carried in the bloodstream until it lodges in an artery leading to or in the brain.

The thrombotic and haemorrhagic forms are the most common, although they occur with varying frequency in different parts of the globe.

Transient ischaemic attacks arise when the blood supply to a part of the brain is temporarily interrupted without producing permanent damage. By definition, recovery occurs within 24 hours. These attacks, particularly if frequent, can be a warning sign of an impending stroke.

They usually result from small blood clots or clumps from plaques of atheroma which get carried into the blood circulation producing transient blockages. Occasionally these clots may get carried from the heart or arteries leading to the brain, rather than from within the cerebral circulation itself.

Dementia may result from repeated episodes of small strokes which produce progressive damage to the brain over a period of time. The main clinical feature of dementia is a gradual loss of memory and intellectual capacity. Loss of motor function in the limbs and incontinence can also occur.

Peripheral Vascular Disease

The lower limbs each receive their blood supply via an artery known as the femoral artery. Peripheral vascular disease is said to be present when the blood vessels in this part of the body are affected by atherosclerosis. In the absence of diabetes the single most important risk factor is heavy cigarette smoking.



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