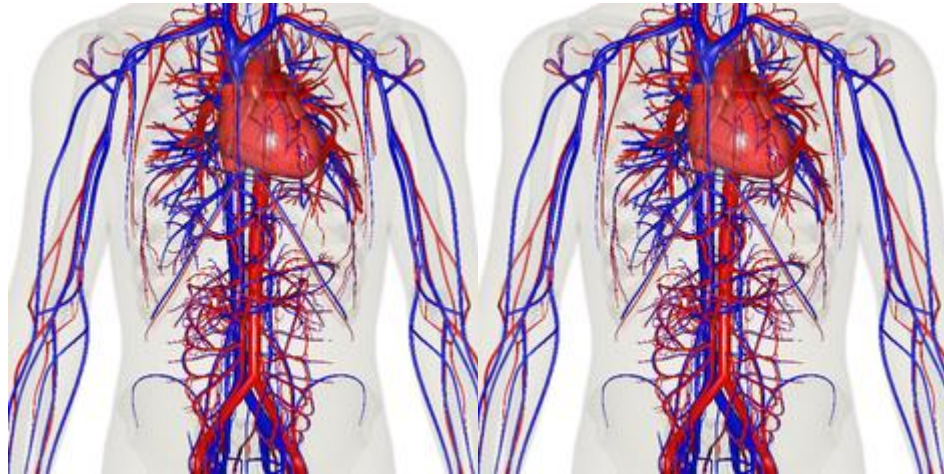


Cardiovascular disease

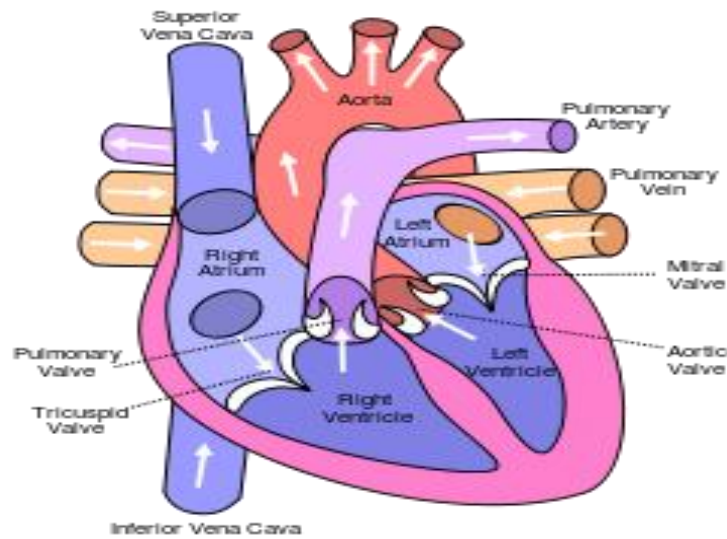


The essential components of the human cardiovascular system are the heart, blood, and blood vessels. It includes: the pulmonary circulation, a "loop" through the lungs where blood is oxygenated; and the systemic circulation, a "loop" through the rest of the body to provide oxygenated blood. An average adult contains five to six quarts (roughly 4.7 to 5.7 liters) of blood, accounting for approximately 7% of their total body weight. Blood consists of plasma, red blood cells, white blood cells, and platelets. Also, the digestive system works with the circulatory system to provide the nutrients the system needs to keep the heart pumping.

Closed cardiovascular system

The cardiovascular systems of humans are closed, meaning that the blood never leaves the network of blood vessels. In contrast, oxygen and nutrients diffuse across the blood vessel layers and enter interstitial fluid, which carries oxygen and nutrients to the target cells, and carbon dioxide and wastes in the opposite direction. The other component of the circulatory system, the lymphatic system, is not closed.

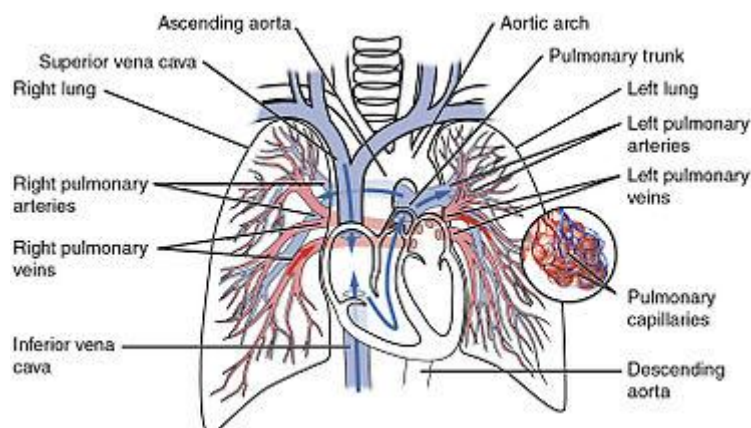
Heart View from the front, which means the right side of the heart is on the left of the diagram (and vice-versa)



Coronary circulation

Coronary circulatory system provides a blood supply to the myocardium (the heart muscle). It arises from the aorta by two coronary arteries, the left and the right, and after nourishing the myocardium blood returns through the coronary veins into the coronary sinus and from this one into the right atrium. Back flow of blood through its opening during atrial systole is prevented by the Thebesian valve. The smallest cardiac veins drain directly into the heart chambers.

Pulmonary circulation



The pulmonary circulation as it passes from the heart. Showing both pulmonary trunk and bronchial arteries.

Pulmonary circulation

The pulmonary circulatory system is the portion of the cardiovascular system in which oxygen-depleted blood is pumped away from the heart, via the pulmonary artery, to the lungs and returned, oxygenated, to the heart via the pulmonary vein.

Oxygen deprived blood from the superior and inferior vena cava, enters the right atrium of the heart and flows through the tricuspid valve (right atrioventricular valve) into the right ventricle, from which it is then pumped through the pulmonary semilunar valve into the pulmonary artery to the lungs. Gas exchange occurs in the lungs, whereby CO₂ is released from the blood, and oxygen is absorbed. The pulmonary vein returns the now oxygen-rich blood to the left atrium.

Risk factors

Evidence suggests a number of risk factors for heart diseases: age, gender, high blood pressure, hyperlipidemia, diabetes mellitus, tobacco smoking, processed meat consumption, excessive alcohol consumption, sugar consumption, family history, obesity, lack of physical activity, psychosocial factors, and air pollution. While the individual contribution of each risk factor varies between different communities or ethnic groups the consistency of the overall contribution of these risk factors to epidemiological studies is remarkably strong. Some of these risk factors, such as age, gender or family history, are immutable; however, many important cardiovascular risk factors are modifiable by lifestyle change, social change, drug treatment and hypertension, hyperlipidemia, and diabetes.

Cardiovascular disease

Cardiovascular disease (also called **heart disease**) is a class of diseases that involve the heart, the blood vessels (arteries, capillaries, and veins) or both.

Cardiovascular disease refers to any disease that affects the cardiovascular system, principally cardiac disease, vascular diseases of the brain and kidney, and peripheral arterial disease. The causes of cardiovascular disease are diverse but atherosclerosis(a disease of the arteries characterized by the deposition of plaques of fatty material on

their inner walls). and hypertension are the most common. In addition, with aging come a number of physiological and morphological changes that alters cardiovascular function and lead to increased risk of cardiovascular disease, even in healthy asymptomatic individuals.

Types

- Coronary artery disease (also known as coronary heart disease and ischemic heart disease)
- Cardiomyopathy - diseases of cardiac muscle
- Hypertensive heart disease - diseases of the heart secondary to high blood pressure
- Heart failure
- Pulmonary heart disease - a failure at the right side of the heart with respiratory system involvement
- Cardiac dysrhythmias - abnormalities of heart rhythm
- Inflammatory heart disease
 - Endocarditis – inflammation of the inner layer of the heart, the endocardium. The structures most commonly involved are the heart valves.
 - Inflammatory cardiomegaly
 - Myocarditis – inflammation of the myocardium, the muscular part of the heart.
- Valvular heart disease
- Cerebrovascular disease - disease of blood vessels that supply blood to the brain such as stroke
- Peripheral arterial disease - disease of blood vessels that supply blood to the arms and legs
- Congenital heart disease - heart structure malformations existing at birth

Rheumatic heart disease - heart muscles and valves damage due to rheumatic fever caused by *Streptococcus pyogenes* a group A streptococcal infection

Heart and blood vessel disease — also called heart disease — includes numerous problems, many of which are related to a process called atherosclerosis. Atherosclerosis is a condition that develops when a substance called plaque builds up in the walls of the arteries. This buildup narrows the arteries, making it harder for blood to flow through. If a blood clot forms, it can stop the blood flow. This can cause a heart attack or stroke.

Types of Heart Disease

Cardiovascular disease is the leading cause of death.

There are many different types of heart disease – some are congenital (people are born with heart problems) while a majority of heart diseases develop over the course of time and affect people later in life.

Heart and blood vessel diseases are often referred to as “silent killers” because they usually develop over time and can go unnoticed. Many heart problems develop when the arteries, which supply blood to the heart, slowly clog with cells, fat and cholesterol (plaque). When the inner walls of arteries become narrow from a buildup of plaque, blood clots form and less blood can get through. This condition is known as **atherosclerosis**, or hardening of the arteries. Lack of blood flow to the heart can cause a heart attack, while lack of blood flow to the brain can result in a stroke.

Coronary Artery Disease

Blockage in the coronary arteries is called coronary artery disease—a condition in which the heart muscles don't get enough blood and oxygen. The most serious effect of coronary artery disease is sudden death without warning—something that usually happens in individuals who have had heart attacks or other heart damage. Coronary artery disease can take the form of:

Silent Ischemia

A form of coronary artery disease in which the blood flow to the heart muscle is reduced but produces very little pain or symptoms. When discomfort is experienced, it is usually during physical exertion.

Angina pectoris: pain or pressure in the chest, back, arm or jaw, which indicates that the heart muscle isn't receiving enough oxygen. Angina may be caused by a narrowing of the arteries or muscle spasms in the coronary arteries. These spasms may be induced by cigarette smoke, cold temperatures, strong emotions, and other sources. It is important to note that angina isn't a heart attack and doesn't usually cause permanent heart damage, even though it causes pain. The pain of angina can be relieved either by increasing the oxygen supply to the heart or by decreasing the heart's demand for oxygen.

Angina

Angina is discomfort or pain that means your heart is not getting enough oxygen and nutrients. The causes of angina are generally atherosclerosis or coronary artery spasm. Angina is not the same for everyone. While it usually occurs when the heart is working harder than normal, such as after a meal or during physical or emotional stress, it can also occur when resting. Traditionally, angina occurs primarily in the chest and radiates down the left arm. However, it can be any discomfort that radiates in the chest, across the shoulders, in the upper back, arms (both left and right), neck, throat, or jaw.

Symptoms of Angina

Aching	Numbness or Tingling
Burning	Pain
Cramping	Pressure
Discomfort	Shortness of Breath
Fullness	Sweating or Dizziness
Heaviness	Squeezing
Indigestion	Tightness

If symptoms occur;

- Stop your activity, sit or lie down, and relax.
- Take a nitroglycerin (NTG) tablet.
- Be sure to notify your physician if these symptoms increase in frequency or severity but are not so severe that you feel the need to go to an emergency room.

If angina lasts longer than 15 minutes or worsens, **get to a hospital emergency room immediately.**

Heart Attack (Myocardial Infarction)

When blood flow to part of the heart is blocked and part of the heart muscle is damaged or dies as a result. If the blockage is brief, and the heart eventually receives enough blood, oxygen, and nutrients, the damage is often reversible. This is why it is especially important for the heart attack victim to get medical help fast.

Warning signs of a heart attack include:

- Heavy feeling, pressure, or intense pain or squeezing in the chest that lasts for more than a few minutes.
- Pain that radiates to the shoulders, neck or arms.
- Lightheadedness or fainting
- Severe weakness
- Rapid heartbeat
- Shortness of breath
- Profuse Sweating
- Nausea or vomiting

If you experience any symptoms for more than 15 minutes and believe they are heart related, get you to the nearest emergency room as soon as possible.

Heart Failure

Heart failure happens when the heart isn't pumping enough blood to meet your body's needs. It does not mean that you are about to die, or even that your heart has stopped. It simply indicates that the heart is not squeezing as well as it should. Heart failure usually does not occur suddenly but gradually worsens over the time. Heart failure can be caused by:

- **Coronary Artery Disease**
- **Heart Defects present at Birth**
- **Past Heart Attacks**
- **High Blood Pressure**
- **Diabetes**
- **Diseases of the Heart Valves**
- **Cardiomyopathies (diseases that damage the heart muscles)**
- **Lung Disease such as Emphysema**

If you have the following symptoms of heart failure, you should see a doctor:

- **Swelling in the feet, ankles or legs, known as edema**
- **Fluid which builds up in the lungs, known as pulmonary congestion**
- **Other symptoms may include wheezing, sleep apnea, cough, and fatigue**

Arrhythmia

Sometimes the heart's electrical system does not function normally. It may race, become slow, irregular, skip beats or sometimes the heart's electrical signal does not move in the proper sequence. This causes the heart to beat faster or slower than normal, or erratically. These abnormal rhythms are called arrhythmias. They can cause a variety of symptoms: dizziness, fainting, fatigue, shortness of breath and chest pain or rapid palpitations that may feel like flutters or pounding of the heart. If left untreated, arrhythmia's can be life threatening. There are four major types of arrhythmias:

Bradycardia: Occurs when the heart's electrical signal is delayed too long or blocked, resulting in a slower than normal heartbeat. If it happens only once in awhile, bradycardia is not a problem. However, if it continues over a long period of time, the body will not receive an adequate blood supply, which can be very serious. Heart disease and some drugs can cause bradycardia, and a physician should evaluate it to determine if treatment is required. Treatment can include discontinuing a medication and/or a pacemaker to make sure the heart beats at a normal rate.

Irregular or extra heartbeats: Even completely healthy people have irregular or extra heartbeats every once in awhile. In some cases, irregular or extra beats can lead to rapid heartbeats.

Ventricular Tachycardia (VT): Occurs when the heart's electrical signal begins in the ventricles (lower chambers of the heart) and the heart beats too rapidly. When the ventricles pump too fast, they cannot deliver enough blood to the body. In some cases, VT can create a very rapid, erratic heartbeat (ventricular fibrillation), or cardiac arrest. If VT lasts for only a second or two, it may not be noticed and probably will not cause any serious problems. However, if it lasts longer, it can be very serious and should be evaluated by a physician.

Supraventricular Tachycardia (SVT): Occurs when the heart's electrical signal begins above the ventricles (the lower chambers of the heart) causing the heart to beat very rapidly or erratically. As a result, the heart is strained, and the body receives an inadequate blood supply. There are three types of SVT; Atrial flutter, Atrial fibrillation, Paroxysmal SVT. A number of underlying conditions can lead to SVT. Medication and/or

electrical shock treatment (cardioversion) can restore normal heartbeat. To prevent recurrences, additional treatment and medication may be necessary.

Poor blood supply to the heart, diseases of the heart valves or chemical imbalances in the body can cause VT. It often occurs during or after a heart attack. No matter how long it lasts, a physician must evaluate it. Normal heartbeat can be restored with electrical shock treatment (the paddles). Long-term control of VT may require an implanted defibrillator and/or medication.

Heart Defects

Obstruction defects – Heart Valve Problems: an obstruction is a narrowing that partly or completely blocks the flow of blood. Obstructions called stenoses can occur in the heart valves, arteries or veins.

- **Pulmonary stenosis**
- **Aortic stenosis**
- **Bicuspid aortic valve**
- **Subaortic stenosis**
- **Mitral valve prolapse**

Peripheral Arterial Disease

Like the heart, all tissues of the body need oxygen and other nutrients to survive and work. Fatty plaques or atherosclerosis can also affect arteries that supply oxygen-rich blood to other areas of the body. For example, peripheral arterial disease (PAD) occurs when the flow of oxygen-rich blood to the legs and feet is blocked or decreased. This blockage in the vessels deprives the feet and legs of oxygen and nutrients, and produces symptoms usually in the thigh, calf muscle and feet.

Symptoms of PAD

- **Brown spots on the skin**
- **Changes in color of the skin on the leg: foot goes from pink to blue**
- **Coldness**
- **Loss of hair on the lower leg**
- **Numbness and tingling**
- **Pain or cramping after walking short distances**
- **Slow healing of wounds**
- **Swelling**
- **Ulcers**

Medications, catheter/surgical procedures, quitting smoking, following a diet low in cholesterol and fats, and loss of excess body weight are ways to reduce PAD.

Heart valve problems: When heart valves don't open enough to allow the blood to flow through as it should, it's called stenosis. When the heart valves don't close properly and allow blood to leak through, it's called regurgitation. When the valve leaflets bulge or prolapse back into the upper chamber, it's a condition called mitral valve prolapse. When this happens, they may not close properly. This allows blood to flow backward through them. Learn more about heart valve disease.

Cardiovascular Disease	Treatment
Heart Valve Problems	<u>Medications</u> <u>Heart Valve Surgery</u>
Arrhythmia	<u>Medications</u> <u>Pacemaker</u> <u>Cardiac Defibrillation</u>
Heart Attack	<u>Medications</u> — clotbusters (should be administered as soon as possible for certain types of heart attacks) <u>Coronary Angioplasty</u> <u>Coronary Artery Bypass Graft Surgery</u>
Stroke	<u>Medications</u> — clotbusters (must be administered within 3 hours from onset of stroke symptoms for certain types of strokes) <u>Carotid Endarterectomy</u>

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