

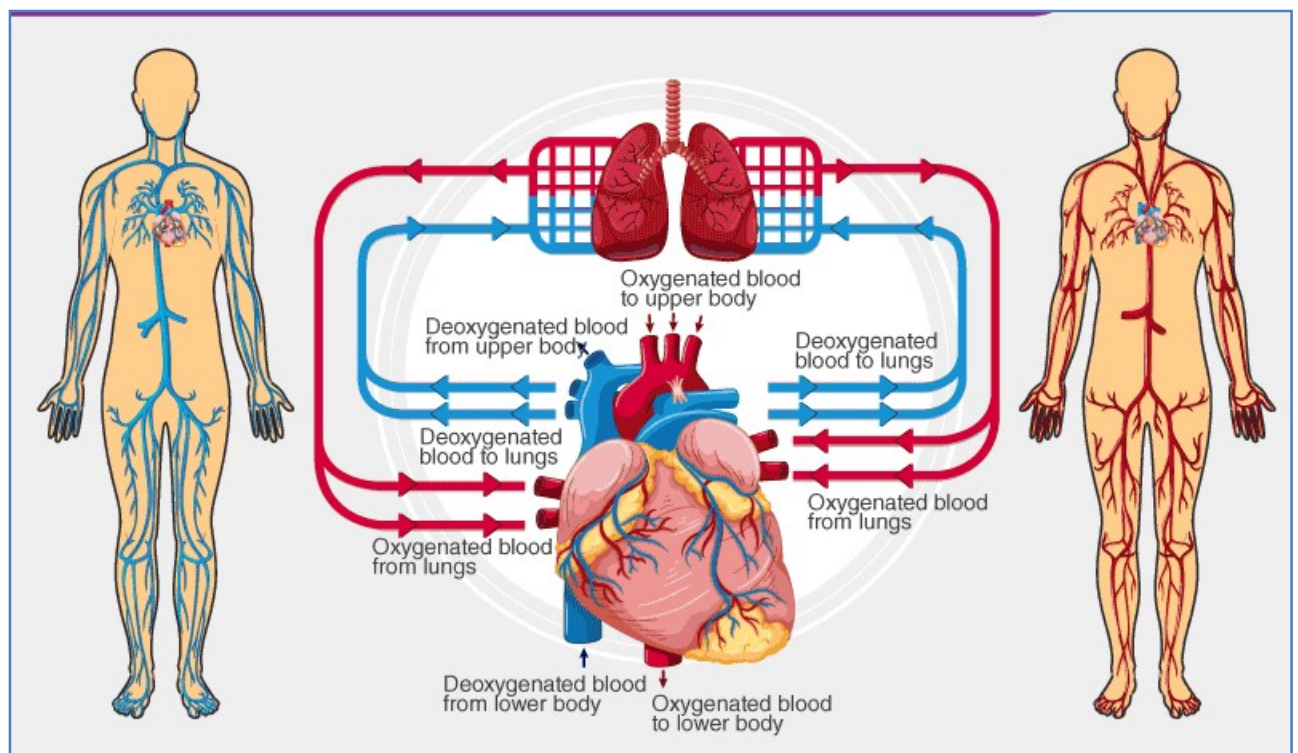
Human Circulatory System

The human body is a complex machine, requiring many processes to function efficiently. To keep these crucial processes running without any hitches, vital elements and components need to be delivered to the various parts of the body.

This role of transportation is undertaken by the human circulatory system, moving essential nutrients and minerals throughout the body and metabolic waste products away from the body. Below is the neat labelled Circulatory system diagram.

Read on to explore intricate about the human circulatory system and its components in greater detail.

Human Circulatory System Diagram

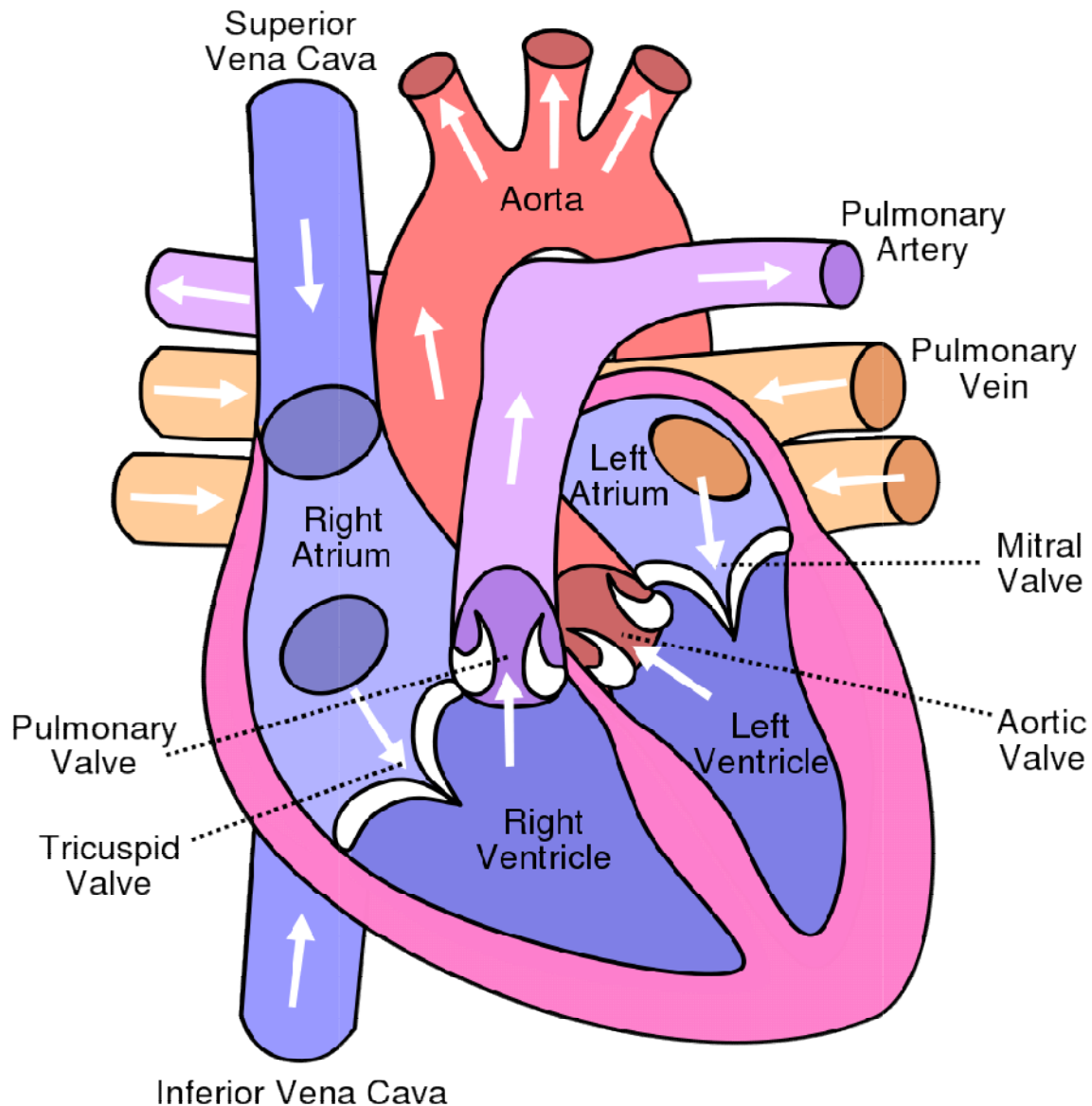


Circulatory system diagram highlighting the various pathways of blood (**Blue**=De-oxygenated blood & **Red**=Oxygenated blood)

Human Circulatory System

The human circulatory system consists of a network of arteries, veins, and capillaries, with the heart pumping blood through it. Its primary role is to provide essential nutrients, minerals, and hormones to various parts of the body. Alternatively, the circulatory system is also

responsible for collecting metabolic waste and toxins from the cells and tissues to be purified or expelled from the body.



Features of Circulatory System

The crucial features of human circulatory are as follows:

- The human circulatory system consists of blood, heart, blood vessels, and lymph.
- The human circulatory system circulates blood through two loops (double circulation) – One for oxygenated blood, another for deoxygenated blood.
- The human heart consists of four chambers – two ventricles and two auricles.
- The human circulatory system possesses a body-wide network of blood vessels. These comprise of arteries, veins, and capillaries.
- The primary function of blood vessels is to transport oxygenated blood and nutrients to all parts of the body. It is also tasked with collecting metabolic wastes to be expelled from the body.

- Most circulatory system diagrams do not visually represent its sheer length. Theoretically, if the veins, arteries, and capillaries of a human were laid out, end to end, it would span a total distance of 1,00,000 kilometres (or roughly eight times the diameter of the Earth).

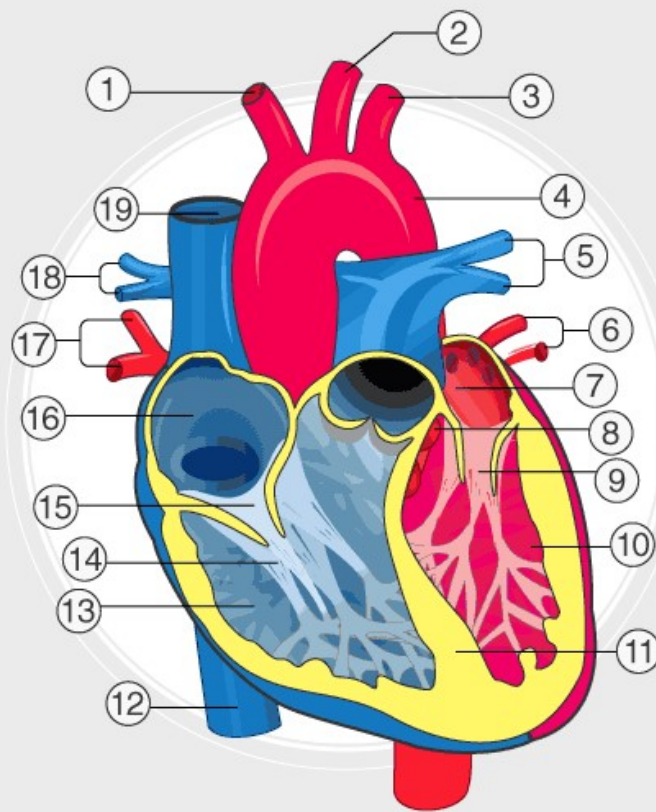
Organs of Circulatory System

The human circulatory system comprises of 4 main organs that have specific roles and functions. The vital circulatory system organs include:

- Heart
- Blood (technically, blood is considered a tissue and not an organ)
- Blood Vessels
- Lymphatic system

Heart

The heart is a muscular organ located in the chest cavity, right between the lungs. It is positioned slightly towards the left in the thoracic region and is enveloped by the pericardium. The human heart is separated into four chambers; namely, two upper chambers called atria (*singular: atrium*), and two lower chambers called ventricles.



1 Brachiocephalic Artery	2 Left Common Carotid Artery	3 Left Subclavian Artery	4 Aorta
5 Left Pulmonary Arteries	6 Left Pulmonary Veins	7 Left Atrium	8 Semilunar Valves
9 Atrioventricular Valve	10 Left Ventricle	11 Septum	12 Inferior Vena Cava
13 Right Ventricle	14 Chordae Tendineae	15 Atrioventricular	16 Right Atrium
17 Right Pulmonary Veins	18 Right Pulmonary Arteries	19 Superior Vena Cava	

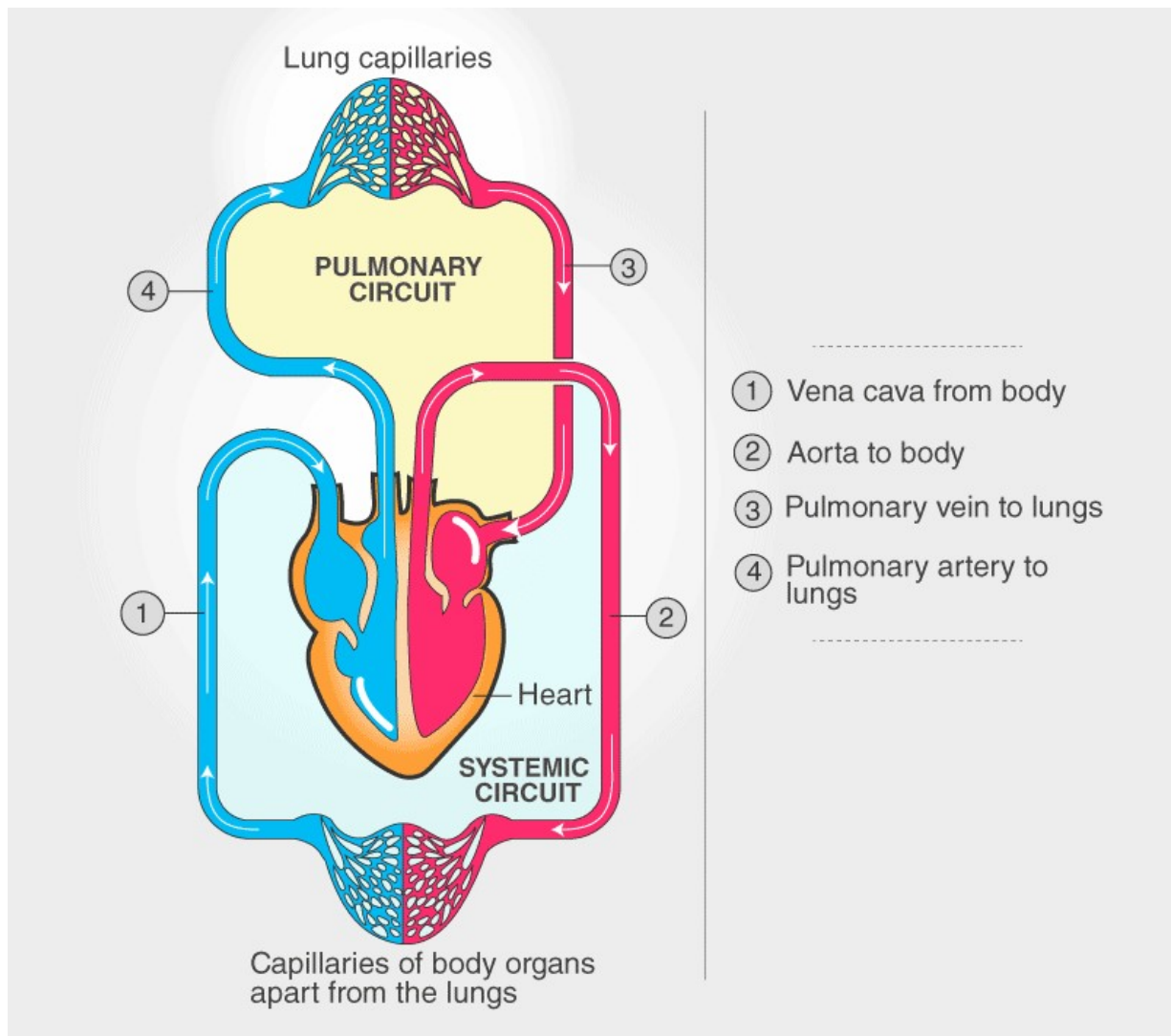
Heart, a major part of the human circulatory system

Though other animals possess a heart, the way their circulatory system functions is quite different from humans. Moreover, in some cases, the human circulatory system is much more evolved when compared to insects or molluscs.

Double Circulation

The way blood flows in the human body is unique, and it is quite efficient too. The blood circulates through the heart twice; hence, it is called double circulation. Other animals like fish have single circulation, where blood completes a circuit through the entire animal only once.

The main advantage of double circulation is that every tissue in the body has a steady supply of oxygenated blood, and it does not get mixed with the deoxygenated blood.



Circulation of blood in humans – Double circulation

Blood

Blood is the body's fluid connective tissue, and it forms a vital part of the human circulatory system. Its main function is to circulate nutrients, hormones, minerals and other essential components to different parts of the body. Blood flows through a specified set of pathways called blood vessels. The organ which is involved in pumping blood to different body parts is the heart. Blood cells, blood plasma, proteins, and other mineral components (such as sodium, potassium and calcium) constitute human blood.

Blood is composed of:

- Plasma – the fluid part of the blood and is composed of 90% of water.
- Red blood cells, white blood cells and platelets constitute the solid part of blood.

Types of Blood Cells

The human body consists of three types of blood cells, namely:

- **Red blood cells (RBC) / Erythrocytes**

Red blood cells are mainly involved in transporting oxygen, nutrients, and other substances to various parts of the body. These blood cells also remove waste from the body.

- **White blood cells (WBC) / Leukocytes**

White blood cells are specialized cells which function as a body's defence system. They provide immunity by fending off pathogens and harmful microorganisms.

- **Platelets / Thrombocytes**

Platelets are cells that help to form clots and stop bleeding. They act on the site of an injury or a wound.

Blood Vessels

Blood vessels are a network of pathways through which blood travels throughout the body. Arteries and veins are the two primary types of blood vessels in the circulatory system of the body.

Arteries

Arteries are blood vessels that transport oxygenated blood from the heart to various parts of the body. They are thick, elastic and are divided into a small network of blood vessels called capillaries. The only exception to this is the pulmonary arteries, which carries deoxygenated blood to the lungs.

Veins

Veins are blood vessels that carry deoxygenated blood towards the heart from various parts of the body. They are thin, elastic and are present closer to the surface of the skin. However, pulmonary and umbilical veins are the only veins that carry oxygenated blood in the entire body.

Lymphatic System

The human circulatory system consists of another body fluid called lymph. It is also known as tissue fluid. It is produced by the lymphatic system which comprises a network of interconnected organs, nodes and ducts.

Lymph is a colourless fluid consisting of salts, proteins, water, which transport and circulates digested food and absorbed fat to intercellular spaces in the tissues. Unlike the circulatory system, lymph is not pumped; instead, it passively flows through a network of vessels.

Functions of Circulatory System

The most important function of the circulatory system is transporting oxygen throughout the body. The other vital functions of the human circulatory system are as follows:

1. It helps in sustaining all the organ systems.
2. It transports blood, nutrients, oxygen, carbon dioxide and hormones throughout the body.
3. It protects cells from pathogens.
4. It acts as an interface for cell-to-cell interaction.

5. The substances present in the blood helps repair the damaged tissue.

Frequently Asked Questions

1. How does the human circulatory system work?

The human circulatory system is a network of arteries, veins, capillaries designed to provide essential minerals, nutrients, and other essential components to various parts of the body. It also collects metabolic waste to be filtered or expelled from the body.

2. What are the three types of circulation?

- Pulmonary Circulation
- Systemic Circulation
- Coronary Circulation

3. Is the human circulatory system open or closed?

The human circulatory system is a closed system that pumps blood through a network of arteries and veins. This type of circulation is seen in all vertebrates and some invertebrates.

4. What is the advantage of a closed circulatory system?

In a closed circulatory system, more pressure is available in the system, and the blood can reach the body extremities much quicker. This translates to a much faster metabolism rate and quicker movements in organisms with closed circulatory systems.

5. What is double circulation?

Double circulation is a system of circulation where the blood flows through the heart twice. This type of circulation is very effective as the body has a constant supply of oxygenated blood.

6. What are the dangers of high blood pressure?

High blood pressure can cause the inner walls of the arteries to get damaged. It can also cause arteries to become less elastic. Worst-case scenario, it can cause an aneurysm (a bulge in the artery that can potentially rupture).

7. What is a stroke?

A stroke is caused when brain cells do not get enough oxygen and blood supply. This causes the cells to die, resulting in symptoms such as numbness in the face, arms or a part of the body.

8. What is hypertension?

Hypertension is another term for high blood pressure. It occurs when the blood travels through the blood vessels with more force than normal. This can result in damage to the body. An average healthy human has a blood pressure of 120/80 Hg. Values higher than this is considered hypertension.

9. What is hypo-tension?

Also known as low blood pressure, hypotension is a condition where the blood flows through the blood vessels with unusually low pressure. On average, healthy blood pressure is considered to be between 120/80 Hg. Anything lower than this is considered as hypo-tension.

10. What was the earliest circulatory system like?

The circulatory system evolved as an efficient method to pump important nutrients and collect waste materials throughout the body. The earliest circulatory system resembled today's open circulatory system where blood flowed in a hollow enclosed space. Closed circulation evolved much later in ancestors of vertebrates

Disorders of the Circulatory System

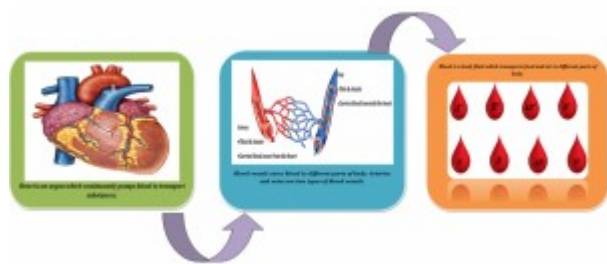
A disorder is defined as a state of irregular functioning of the body. The disorders of the circulatory system could be defined as any ailment which affects the heart, blood vessels, and the blood cells. This disorder leads to the insufficient or reduced transportation of blood, oxygen, hormones, and nutrients to the tissue and cells.

Example: High Blood Pressure. Let us take an overview of disorders of the circulatory system.

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Circulatory System



The circulatory system may be defined as the system which is involved in the circulation of lymph and blood throughout the body. The circulatory system consists of many parts like heart, blood vessels, blood cells, lymph, lymphatic vessels, and glands. This disorder may be affected by the following factors:

1. An emotional response to distressing events like an accident.
2. Blockage of a blood vessel.

3. Formation of tumours in blood vessels.
4. Reduction in the artery diameter.

Types of Disorders in the Circulatory System

- **High Blood Pressure**



The pressure which is created by the blood flow on the wall of blood vessels. In humans, the normal range of blood pressure is 120/80. In this range, 120 is the systolic blood pressure and 80 is the diastolic blood pressure.

Systolic blood pressure – It is defined as the pressure that is created in the arteries when blood flows through arteries to the rest of the body when the heartbeats.

Diastolic blood pressure– It is defined as the pressure created in the arteries when the heart relaxes between the beats.

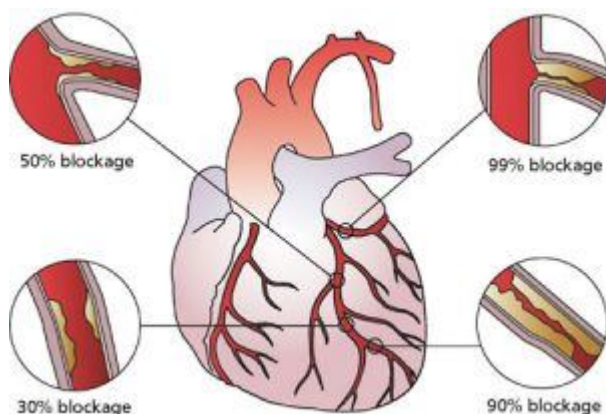
If the normal blood pressure is higher than 140 over 90 or higher, it leads to hypertension. It has no signs and symptoms.

Hypertension may lead to heart diseases and improper functioning of some organs like brain and kidney. High blood pressure may be caused by the following factors:

High blood pressure could be caused by the following factors:

1. Intake of salty foods.
2. Intake of too much alcohol.
3. Intake of large amounts of fat-rich foods.

- **Coronary Artery Disease (CAD)**



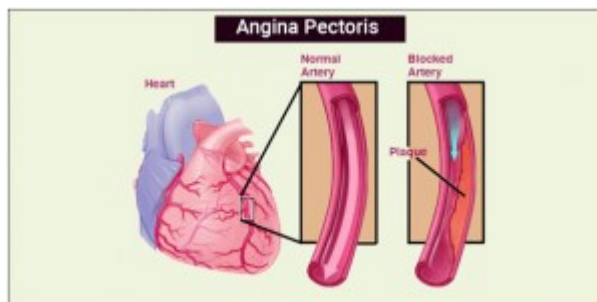
Coronary artery disease is also termed as atherosclerosis. Coronary Artery Disease is the disease which is caused by the deposition of waxy substances in the blood vessels which

supplies the blood to the heart muscle and this deposition leads to the blockage of the blood flow. The examples of waxy substances are fat, cholesterol and fibrous tissues. As a result, it may also cause a heart attack.

Coronary Artery Disease (CAD) could be caused by the following factors:

1. Smoking.
2. High blood pressure.
3. High cholesterol.
4. Diabetes or insulin resistance.

- **Angina**



Angina is the condition in which chest pain occurs if the heart receives insufficient oxygen and nutrients through the [blood vessels](#). Angina could be caused by the different risk factors. These factors are as follows:

1. Smoking.
2. Age factor (More than 40 age).
3. Hypertension.
4. Obesity.
5. Physical inactivity.

- **Heart Failure**

Heart failure may be defined as a chronic condition when the heart doesn't pump sufficient blood to the tissue cells in the body. It is sometimes known as congestive heart failure because the main symptom of heart failure is lung congestion.

Heart failure may be caused by the following risk factors:

1. Smoking.
2. Obesity.
3. Intake of fat-rich food.