

Name : Nilfa Khatun (1910272)

Module Code:BMHP5003

Title: Individual Academic Poster

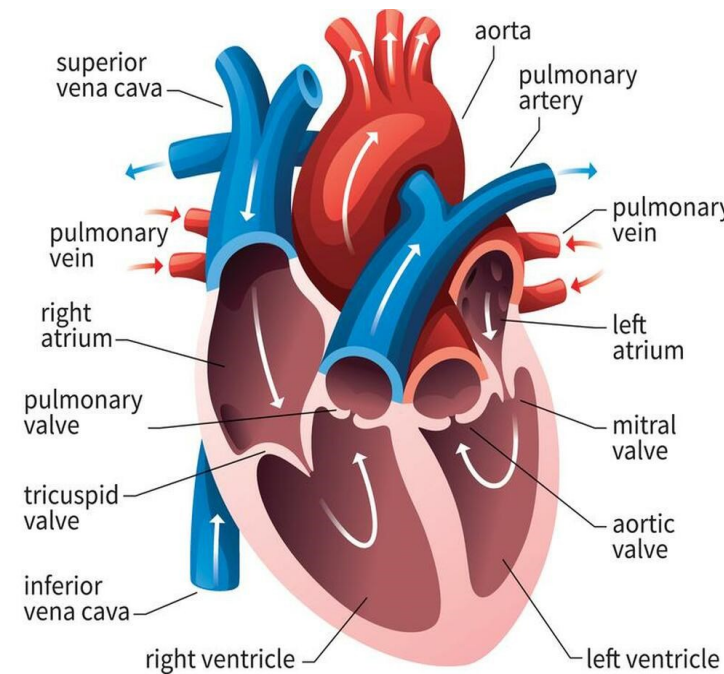
Module Leader: Giridhar Katti

CARDIOVASCULAR SYSTEM

Structure & Function

The Cardiovascular System is a organ system in the human body that pumps blood through arteries and veins all over the body and provides the entire body with oxygen and vital nutrients while also eliminating potentially harmful waste products and carbon dioxide produced by metabolism. The oxygen in the blood is attached to molecules called haemoglobin, which are found on the surface of red blood cells . The Cardiovascular System is made up of three components., the heart, blood vessels, and blood. The heart, arteries, veins, capillaries and blood make up the human circulation system, pushing out blood . Blood runs through the arteries, veins and capillaries, which functions as pipes (tubes) which the blood flows through (Mikhail Rudenko et al. 2012) .

The human heart is located within the chest cavity, between the lungs. It is aligned to the right side of the sternum. Its right side is deflected anteriorly, and its left side is deflected posteriorly.



(Human Heart Circulatory System Medical Educational Science, 2021)

Chambers of the heart

- ⇒ **Left Atrium**
- ⇒ **Right Atrium**
- ⇒ **Left Ventricle**
- ⇒ **Right Ventricle**

The heart is divided into two chambers:

- ⇒ **Auricles** are the upper two chambers.
- ⇒ **Ventricles** are the hearts lower two chambers.

Aorta

- ⇒ A major artery that transports oxygen from the hearts left ventricle to the rest of the body.

Inferior and Superior vena cavae

- ⇒ The two biggest veins in the body, they are located above and below the heart (Mikhail Rudenko et al. 2012).

Every second of the day, the heart beats non– stop. The repetitive contraction and relaxation of the heart muscles that make up the Atria and Ventricles causes the heart to beat. The two Atria (left and right) contract and relax together. Similarly, the two ventricles (left and right) contract and relax in conjunction. The contraction of two Ventricles almost instantly.

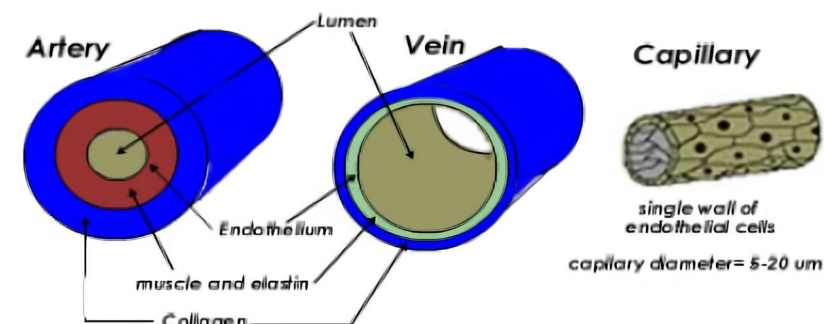
The heart wall is made up of three layers:

- ⇒ The outer layer of the heart wall is called **epicardium**.
- ⇒ The middle layer of the heart wall is called **myocardium**.
- ⇒ The inner layer of the heart wall is **endocardium**

There are four valves in the heart:

- ⇒ The **Aortic** valve stops blood from flowing backward from the left atrium to the left ventricle.
- ⇒ The **Mitral** valve stops blood from flowing backward from the left atrium to the left ventricle.
- ⇒ The **pulmonary** valve stops backflow of blood from the right ventricle.
- ⇒ The **Tricuspid** valve stops backflow of blood from the right atrium to the right ventricles (Ahmed, 2021) .

Valve - In the heart chambers between the veins. Valves are flaps of fibrous tissue. They make certain blood cannot flow backwards because of the flaps. Valves are classified in two groups **Atrioventricular** valve and **Semilunar** Valve.



(2 Body Systems That Work Together To Maintain Homeostasis, 2021)

Three components of the heart:

- ⇒ The Heart
- ⇒ Blood Vessels
- ⇒ Blood

Components of blood:

- ⇒ **Erythrocytes** - Red blood cells deliver oxygen throughout the blood arteries and contain Haemo-globin.
- ⇒ **Leukocytes**- White blood cells, cells of the immunological system. Fights infection.
- ⇒ **Thrombocytes**- A type of blood cell (platelets) cells of coagulation. Prevents clots.
- ⇒ **Plasma**– Liquid Part of blood.

Arteries - Carries blood from heart.

Veins - Carry impure blood from numerous parts of the body to the heart.

Inferior and superior vena cavae- They are the two biggest veins in the body , they are located above and below the heart.

Capillaries- Transports and exchanges gases, fluids, and nutrients throughout the body.

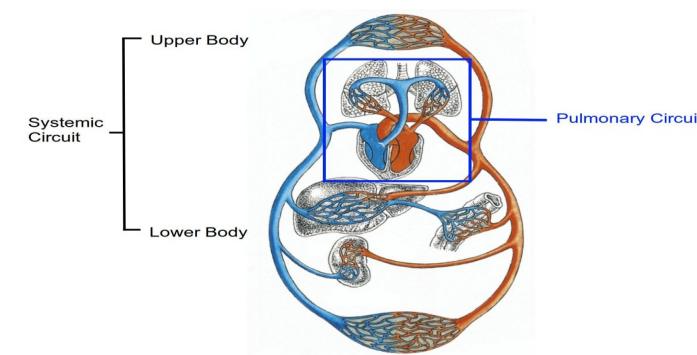
All blood vessels are designed to accomplish a certain role. A capillary for instance, is minutely small to enable gases to pass through. Arteries are robust and flexible and able to handle high blood circulation. Veins include valves to prevent blood from flowing backwards when pressure is reduced. The lumen size of each artery varies. The lumen is referred to as the hollow hole or space within a blood vessel (Entman, 2021).

Specifically, the heart has five functions: transportation of key nutrients, supply of oxygen to working muscles, removal of waste products, and the distribution of key hormones.

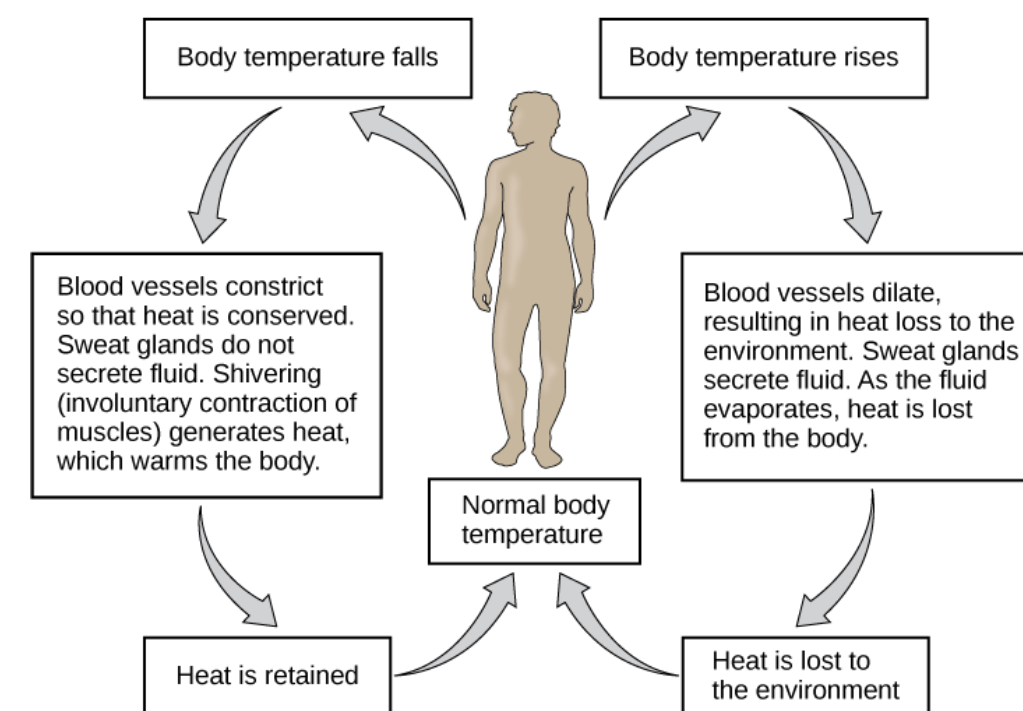
The heart has two sides, left and right. It has four chambers, left and right atriums and left and right ventricles. The ventricles are responsible for pumping the blood, and they are the thickest muscles.

The heart has a double pump system consists of two distinct paths;

- ⇒ **Pulmonary circulation** -Transports deoxygenated blood to the lungs and then proceeds back to the heart.
- ⇒ **Systemic circulation** - Transports oxygenated blood throughout the body and bringing back to the heart (Body, 2021) .



The cardiovascular System is instrumental to the body's ability to maintain **homeostatic** control of the body, the cardiovascular system is crucial at controlling several internal conditions. Blood vessels controls blood flow to the skin, by controlling blood flow to the skin this maintains a constant temperature. When the body's temperature overheats the blood vessels near the surface of the skin opens, and releases heat from the body to allow the body to maintain body temperature constantly. When the body's temperature sets into hypothermia, the blood vessels contract allowing only vital organs to receive vital blood to allow the body to maintain the body's temperature.. The presence of bicarbonate ions in blood, which act as a buffer solution, also helps maintain the bloods PH balance.



(2 Body Systems That Work Together To Maintain Homeostasis, 2021)

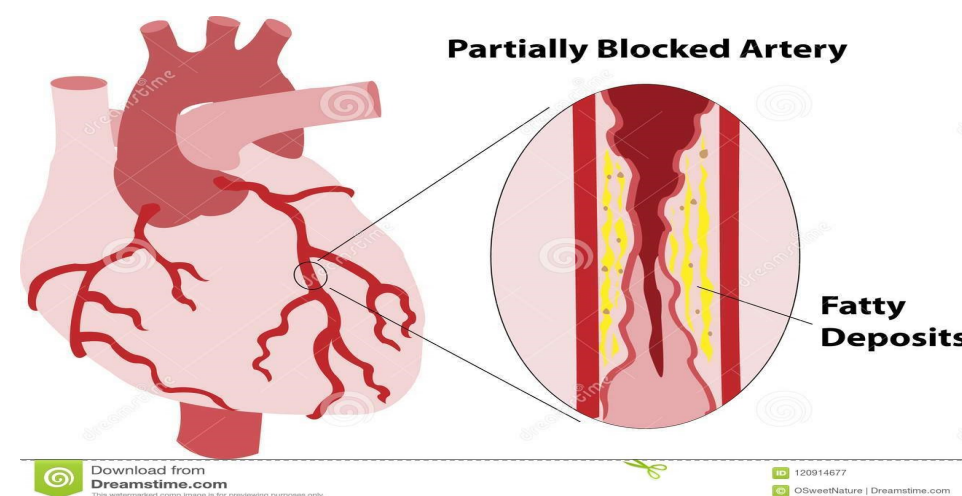
CARDIOVASCULAR SYSTEM

Disorders & Prevention

Cardiovascular disease (CVD) is a condition which is a group of disorders of the heart and blood vessels.

Coronary Heart Disease– Is a disorder in which there's insufficient blood and oxygen supply to the heart. It is caused by blockage of the coronary arteries, when fatty substances or plaque form in the lumen arteries obstructing blood flow.

- ⇒ Heart attacks and strokes are caused by a blockage, A build up of fatty deposits on the inner walls of the blood arteries that supply the heart or brain is the most common cause. Strokes are caused by blood clots or bleeding from a artery in the brain (National Stroke Association.2013).



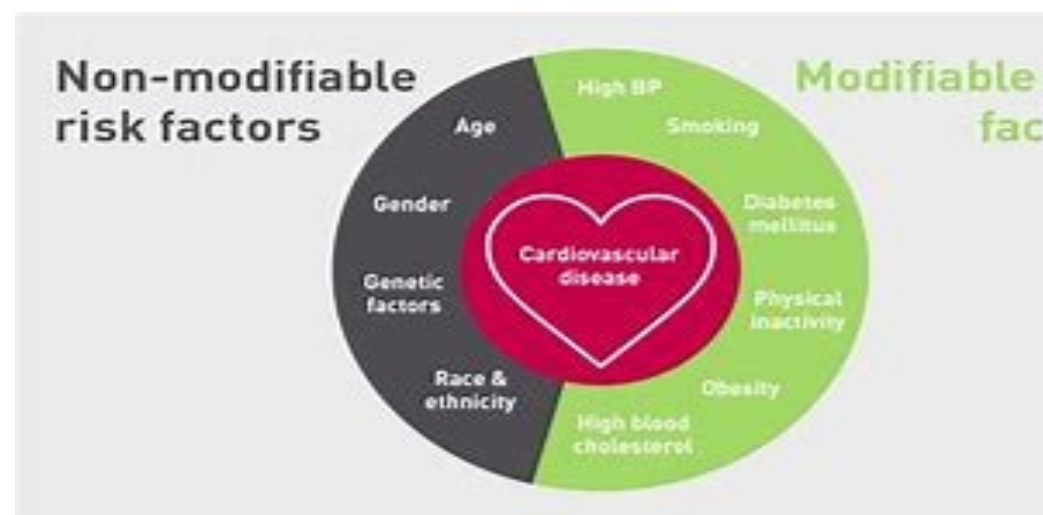
Other cardiovascular diseases:

- ⇒ **Cerebrovascular disease**– Condition that affects the blood arteries that supply the brain.
- ⇒ **Peripheral arterial disease**– Condition that affects the blood arteries that feed the arm and leg.
- ⇒ **Rheumatic heart disease**– Damage to the heart muscle caused by streptococcal germs in rhematic fever.
- ⇒ **Congenital heart disease**– Birth defects that disrupt the normal development and functioning of the heart caused by anomalies of the heart structure from birth are known as congenital heart disease.
- ⇒ **Thrombosis and Pulmonary embolism**– Blood clots in the leg veins, which can dislodge and travel to the heart and lungs (Harvard Health Publications, 2016).

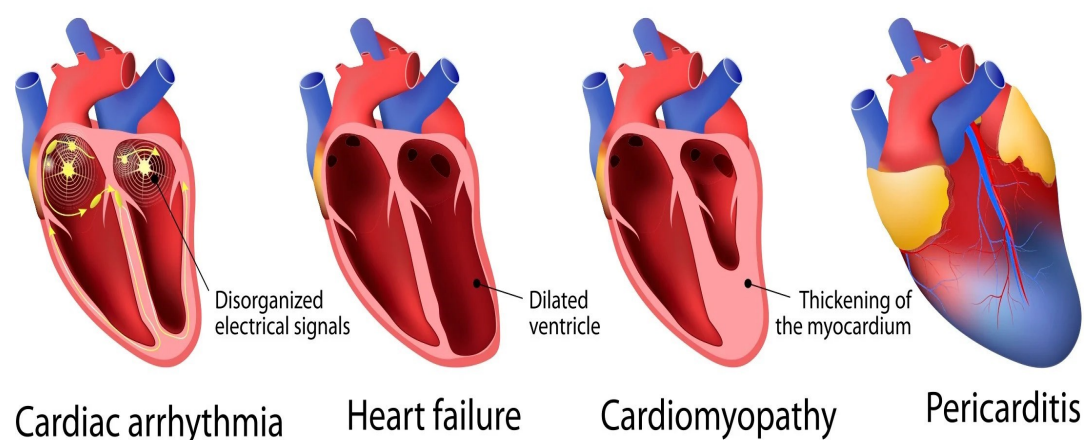
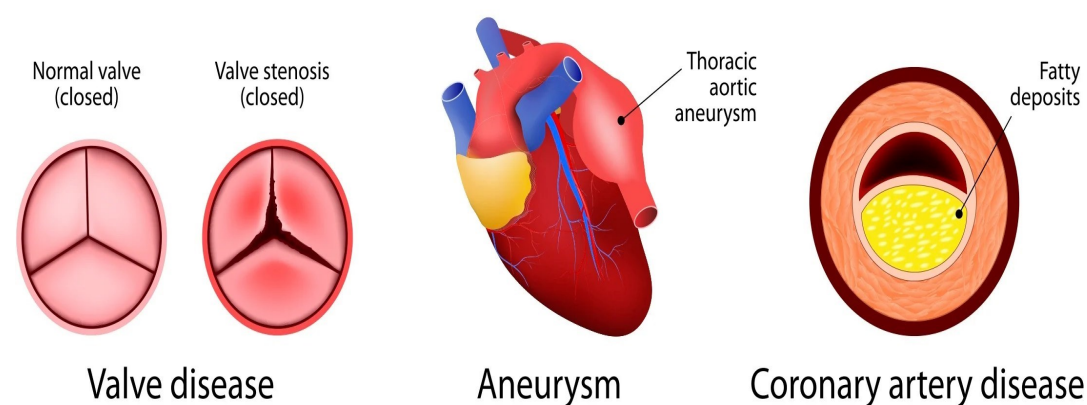
Major behavioural risk factors:

- ⇒ Unhealthy diet.
- ⇒ Physical inactivity.
- ⇒ Tobacco use.
- ⇒ Alcohol consumption.

Individual may experience symptoms such as high blood pressure, high blood glucose, raised blood lipids and overweight or obesity as a result of behavioural risk factors. There is a higher risk of heart attack, stroke, heart failure and other complications.



Types of heart disease



The first step in preventing cardiovascular disease is educating the public on potential risk factors, and how to avoid it. By educating children at a young age regarding eating a nutritious diet and appropriate exercise into their lifestyle.

Early detection at an early age, based on possible risk factors may be able to determine if they are at risk of developing cardiovascular disease. For example, checking blood pressure, regular health checks and lifestyle assessment.

Depending on the severity and degree of risk factor, different therapies may be required. If a person is diagnosed with diabetes, for example, the condition can be managed by diet and exercise rather than prescribed medication. Anticoagulation therapy may also treat strokes and heart attacks, with adequate dosage of Aspirin. Smoking is a leading cause of strokes and heart attacks, seeking additional help to quit smoking may help prevent further damage. In severe cases, surgical intervention and procedures may be required to rectify, restore, and prevent further damage (Everage, N.J.et al. 2014).

Statistics

Cardiovascular disease is the leading cause of death in western countries around the world. It was a rare cause of death in the 20th century., deaths peaked in the mid-1960's and subsequently began to decline, it remains the leading cause of death worldwide.

Heart and circulation disorders account for a quarter of all deaths in the UK, or over 160,000 each year, an average of 460 deaths per day, or one every three minutes. In the United Kingdom, around 7.6 million people suffer from heart or circulatory disease, with 4 million males and 3.6 million women.

Heart attacks account for more than 100,000 hospital admissions in the United Kingdom each year, or one every five minutes.

Heart failure affects around 900,000 people in the United Kingdom. Strokes kill over 34,000 people in the UK every year and are the leading cause of severe disability.

Vascular dementia is substantially more frequent in people who have a family history of coronary heart disease.

Each year, more than 30,000 people in the UK suffer out-of-hospital cardiac arrests, with a survival rate of less than one in ten.

Diabetes affects more than 4.1 million persons in the UK, with thousands more going untreated.

(Cardiovascular diseases, 2021)

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