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# HEART DISEASES AND THEIR CAUSES

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**Annotation.** This article focuses on the types of heart diseases, their causes, risk factors, and preventive measures. The cardiovascular system is one of the most vital systems of the human body, and any disruption related to its function poses a serious health risk. The article provides detailed information about common heart diseases such as ischemic heart disease, heart failure, arrhythmias, and hypertension. It also highlights that improper nutrition, physical inactivity, stress, smoking, alcohol abuse, genetic predisposition, and environmental factors play a key role in the development of heart diseases. This article includes recommendations for preserving heart health, promoting a healthy lifestyle, and implementing preventive measures. It is beneficial for medical professionals, students, and the general public.

**Key words:** heart diseases, ischemic heart disease, heart failure, arrhythmia, hypertension, risk factors, healthy lifestyle, genetic predisposition, heart health, prevention, physical activity, nutrition.

The human heart has 4 chambers: consisting of 2 atria and 2 ventricles, it is conical in shape, with the base facing backward, upward and to the right, and the apex (tip) facing downward, forward and to the left. The heart is located in the lower anterior thoracic cavity and is bordered on either side by the lungs and pleurae, which touch the sternum and rib cage. The heart is anchored at the top and back by blood vessels and at the bottom by the diaphragm. The position of the heart is not the same for all people and also depends on their age, sex, body condition, and structure. For instance, in newborn babies, the heart is round in shape, with the dome of the diaphragm being higher and more transverse and upward, while the thymus gland pushes it considerably backward from the sternum.

Later, at 1-3 years of age, the heart changes its position to a horizontal one, similar to that of adults, and is positioned obliquely. The average weight of the heart is 300 g in men and slightly less (220-250 g) in women. The length of the heart in middle-aged individuals is 13-15 cm, its widest part (transversely) is 9-11 cm, and the length from the anterior surface to the posterior surface is 6-7 cm. The sharp (right) and blunt (left) edges of the external surface of the heart separate it into posterior and anterior surfaces. The size of each person's heart approximately matches the size of their right fist. The heart of a middle-aged person can contract on average 70-75 times per minute and 100,000 times a day. This force is equivalent to lifting a load of 20 tons to a height of 1 meter. [1]

The upper boundary of the heart corresponds to a horizontal line drawn from the point where the third rib is attached to the sternum.

The right border of the heart will be located about 2-3 cm away from the right edge of the sternum (around the right 3rd and 5th ribs). In children under one year of age, the right border of the heart

[1] Murodova Hilola Zafarjon qizi „Yurak-Qon Tomirlar Sistemasi Patofiziologiyasi" Tafakkur manzili. 15.05.2022-yil

may extend 1.0-1.5 cm beyond the right edge of the sternum. The lower left border of the heart corresponds to the apex, located 1.5 cm inward from the mid-clavicular line of the 5th rib.

The position of the heart borders also depends on the shape of a person's chest; in people with a wide chest, the heart is positioned lower. Therefore, in individuals with such a body structure, the heart is in a horizontal position. In a chest with average length, the heart is tilted. The heart of women is somewhat smaller and is positioned horizontally. In people who engage in physical labor and sports, the size of the heart tends to be somewhat larger.

The heart atria are spaces that receive blood from the veins. The right atrium receives venous blood from the superior and inferior vena cava, while four pulmonary veins drain into the left atrium. Both atria connect to the ventricles through atrioventricular openings. When the ventricles contract, the openings are closed by valve flaps (cusps). There are muscular structures on the inner surfaces of the ventricles, consisting of intertwining muscle fibers and papillary muscles that extend into the ventricular space. The fibers that emerge from these muscles attach to the edges of the atrioventricular valve flaps. They prevent the valve flaps from being pushed up into the atria.

Semilunar valves are located at the base of the aorta and pulmonary artery. These valves consist of three flaps that open in the direction of these vessels. When the heart contracts, blood is ejected from the right ventricle into the pulmonary artery and from the left ventricle into the aorta.

The small circulatory system starts from the right ventricle and the large circulatory system starts from the left ventricle. The heart is wrapped in its sac — the pericardium, which has three layers: the inner endocardium, the middle myocardium, and the outer epicardium. The fluid in the narrow space between the epicardium and pericardium reduces the friction of the heart walls as it works. The muscular layer of the heart — the myocardium, consists of 2 layers in the atria and 3 layers in the ventricles and is composed of specialized transverse striated muscle fibers that contract involuntarily, distinguishing it from skeletal muscles. The muscle fibers of the heart's atria and ventricles originate from a fibrous tissue ring that encircles the opening between the right atrium and ventricle and the left atrium and ventricle. However, the atrial muscles are not connected to the ventricular muscles and contract separately. The atrial muscles are longitudinal from the inside, and transverse from the outside, while in the ventricles, they are longitudinal from the inside and outside, and transverse in the middle. The internal and external longitudinal muscles connect at the apex of the heart, while the middle transverse muscles do not connect. The interventricular septum is mainly composed of muscle tissue and the endocardial layer that covers it.

The heart's activity is based on the rhythmic contractions of the myocardium. The contraction of the heart is called systole, and its relaxation is called diastole. The heart contracts automatically. The impulses that ensure the contraction of the myocardium are generated in the heart's conduction system. These impulses, which normally occur 60-80 times per minute at the sinus node, first spread to the atrial myocardium and then move to the ventricular myocardium through the atrioventricular node, the bundle of His, and Purkinje fibers, causing them to contract. The speed of the impulses decreases when they transition to the ventricles. For this reason, contraction of the atria finishes sooner compared to that of the ventricles. The contraction and relaxation phases of the heart constitute the cardiac cycle. This cycle consists of the atrial systole (0.1 seconds), ventricular systole (0.33-0.35 seconds), diastole (the phase of relaxation of both atria and ventricles), and a pause (0.4 seconds).

When the ventricles contract, the blood pressure in them (in the right ventricle between 1-2 mm to 6-9 mm of mercury column, in the left ventricle up to 8-9 mm) rises. As a result, blood passes through the valves into the ventricles.

During ventricular contraction, only 30% of the blood exits into the ventricles, while 70% flows freely during the overall pause time. The contraction phase of the ventricles is also divided into stages. When the pressure in the ventricles increases, the atrioventricular valves close, but the semi-lunar valves do not open. During this (isometric contraction phase), all muscle fibers of the ventricles contract, and the tension increases. As a result, when the pressure in the ventricles exceeds the pressure in the aorta and pulmonary trunk, the semi-lunar valves open; blood is ejected from the ventricles into the arteries; the phase of blood ejection thus begins.[2]

In a person, blood is pumped into the circulatory system. The pressure in the left ventricle is recorded at 65-75 mm of mercury, while in the right ventricle it reaches 5-12 mm. Within 0.10-0.12 seconds, the pressure in the ventricles sharply increases (110-130 mm of mercury in the left ventricle and 25-35 mm in the right ventricle during the rapid ejection phase). The contraction of the ventricles (0.10-0.15 seconds) ends with a slow ejection phase. Then, the ventricles begin to relax, their pressure rapidly decreases, the pressure in the main arteries increases, and the semilunar valves close. When the pressure in the ventricles drops to zero, the atrioventricular valves open, and blood starts to flow from the atria into the ventricles. This phase is divided into a rapid (0.08 seconds) and a slow (0.07 seconds) filling phase. The diastole of the ventricles ends with the phase of blood filling. The duration of the phases of the cardiac cycle is variable and depends on the heart rhythm frequency. Therefore, checking the phases of the cardiac cycle is an important method for determining the functional state of the heart muscles. The amount of blood ejected from the heart in one minute is called the minute volume (MV) of the heart. The amount of blood ejected from both ventricles is equal. In a resting state, the average minute volume of the heart is about 4.5-5 liters, and the amount of blood ejected in one contraction of the heart—systolic volume—averages around 65-70 ml.

The contraction strength and frequency of the heart vary according to the oxygen and nutrient needs of the body's tissues and organs. Although the impulses that ensure heart contraction are generated within the heart itself, its activity is regulated by the nervous system. Errant nerves weaken the contraction strength of the heart and slow down its rhythm, while sympathetic nerves, on the contrary, strengthen it. The heart muscles also possess the ability to self-regulate: for example, the more blood that comes to the heart, the stronger it contracts. The strength of the heart muscle contractions is related to its stretch, that is, the initial (pre-contraction) length of the muscle fibers. The faster the muscle fibers stretch, the stronger the contraction. This is known as the law of the heart.

Cardiovascular diseases are currently one of the main causes of mortality not only in developed countries but also among the populations of developing nations. According to the World Health Organization (WHO), millions of people die each year from cardiovascular diseases worldwide. This situation highlights the need to enhance attention to heart health and accelerate preventive measures in this regard.

Cardiovascular diseases refer to a collection of pathological conditions related to the functioning of the heart and blood vessels, which include ischemic heart disease, heart failure, arrhythmias,

[2] Narziyeva SH.S, Abdullaeva M, „Ichki Kasalliklar Propedevtikasi" o'quv qo'llanmasi - Buxoro „Durdona" nashriyoti, 2018.

hypertension, heart valve defects, myocarditis, and other diseases. They manifest as disturbances in the heart's pumping function, damage to the heart muscle, or changes in heart rhythm.

Heart diseases

• Ischemic heart disease

• Aortic stenosis

• Heart failure

• Myocardial infarction

• Pericarditis

Coronary heart disease (ischemia comes from the Greek meaning "blood not coming") also conveys this meaning. It arises due to disturbances in blood circulation in the myocardium, which is attributable to the impaired blood flow in the coronary blood vessels and the myocardium's demand for blood. These changes occur due to sclerotic changes and inflammation (coronaryitis) and narrowing (spasm) of coronary vessels, resulting in a deficiency of oxygen in the muscles. Coronary heart diseases are primarily caused by factors such as smoking, alcoholism, hypodynamia, and diabetes. Symptoms of the disease include pain in the left arm, shoulder, neck, and scapular areas. If patients take medications that dilate the coronary blood vessels and rest a bit, the pain alleviates. Patients sometimes feel constricting, burning heaviness, cutting, or sharp pains, along with symptoms of shortness of breath and heart palpitations. Upon examination, patients may show pallor of the skin, cyanosis of the lips during an attack, and excessive sweating.

Atherosclerosis (from Greek: athera - gruel and sclerosis - hardening) is a chronic disease that arises from the disruption of lipid metabolism, leading to the accumulation of these substances in the inner layer of arteries and the excessive growth of connective tissue. Atherosclerosis occurs along with general and local disturbances of blood circulation. Changes in the cells of the arterial wall tissues and disruptions in the biochemical processes that take place in them play a significant role in the onset and development of atherosclerosis. The development of fibrous tissue in certain areas of the arterial wall leads to the accumulation of cholesterol and other substances in those areas. This is directly related to the increase in arterial blood pressure or arterial hypertension. One of the diseases that can lead to the exacerbation and progression of atherosclerosis is diabetes mellitus.

Hypertension manifests as an increase in arterial blood pressure, with systolic blood pressure exceeding 140 mmHg and diastolic pressure exceeding 90 mmHg. Hypertension is primarily caused by diabetes, mental agitation, emotional stress, and frequent nervousness. Patients suffering from hypertension commonly complain of headaches, dizziness, darkening of vision, nausea, vomiting, tinnitus, decreased visual acuity, and palpitations. Patients may exhibit a flushed face and cheeks, warm skin, and increased heart rate and pulse.

Myocardial infarction occurs unexpectedly. A strong burning pain appears behind the chest. This pain radiates to the left arm, left shoulder, left back, and the left side of the lower jaw. Often, the patient is overcome with a panic of death, weakness, pallor of the skin, cyanosis of the lips, and cold sweat. Sometimes, astheno-neurotic symptoms are observed in myocardial infarction, such as weakness, dizziness, headache, fainting, nausea, vomiting, and constipation.

Heart defects - A structural anomaly in the anatomical structure of the heart, deficiencies, and changes disrupt normal blood flow. Heart defects can mainly be of two types: congenital and acquired.

Congenital heart defects may develop as a result of improper formation during the embryonic development of the fetal heart and major vessels. Toxic effects on the mother's body in early pregnancy, suffering from certain diseases, and genetic disorders can also lead to congenital heart defects. Common types of congenital heart defects include abnormal pathways of varying combinations between the pulmonary and systemic circulation and narrowing of major heart vessels.

Acquired heart defects can also occur due to heart diseases during life, such as rheumatic heart disease and atherosclerosis. Acquired heart defects are characterized by the inadequate closure of the heart valves, as well as narrowing of the opening between the atria and ventricles or the main arteries.[3]

This disease occurs as a result of insufficient blood supply to the heart muscles. The narrowing or blockage of the coronary arteries due to atherosclerosis leads to this condition. One of the most dangerous forms of ISH can manifest as a myocardial infarction.

As a result of heart muscle damage, the heart can no longer pump blood according to the body's needs. This condition manifests in the patient as shortness of breath, fatigue, swelling, and other symptoms.

It is a disorder of the heart rhythm, characterized by a fast or slow heartbeat, or an irregular rhythm. Arrhythmias negatively affect the heart's ability to pump blood.

Constantly high blood pressure puts extra strain on the heart muscle. This leads to thickening of the heart and eventually results in heart failure.

Many factors play a role in the development of heart diseases. These include:

Excessive consumption of fatty, salty, and sugary products accelerates cholesterol accumulation in the blood vessels. This leads to atherosclerosis, which narrows the cardiovascular system.

Living a sedentary lifestyle leads to the weakening of the heart muscles, obesity, and the development of hypertension.

Tobacco products lead to the narrowing of blood vessels, disrupt heart rhythm, and cause oxygen deficiency. Alcoholic beverages destabilize heart rhythm and damage heart muscle.

Constant stress can lead to excessive workload on the heart, increasing blood pressure and potentially triggering heart attacks.

If there are heart diseases in parents or close relatives, the risk of this disease developing in the offspring is high.

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[3] Gadayev . A, M.SH.Karimov. X.S.Axmedov, „Ichki Kasalliklar Propedevtikasi" o'quv qo'llanmasi-„Muharrir" nashriyoti. Toshkent, 2012.

Men over 40 years old and women after menopause are more prone to heart diseases.

Diabetes, obesity, kidney diseases, and thyroid gland diseases also negatively affect heart function.

Heart diseases can manifest through the following signs:

• Pain or pressure in the chest area;

• Shortness of breath;

• Rapid or irregular heartbeat;

• Weakness, fatigue;

• Swelling in the hands, feet, face;

• Dizziness, fainting episodes.[4]

To prevent heart diseases, the following measures are necessary:

A diet based on fruits, vegetables, cereals, lean meats, and fish is beneficial for the heart. Salt, sugar, and animal fats should be limited.

It is recommended to engage in at least 30 minutes of light physical exercise, walking, running, or cycling daily.

Completely quitting tobacco products significantly improves heart function.

Stress can be managed through meditation, breathing exercises, sports, or music.

It is advisable to check heart EKG (electrocardiogram), blood pressure, cholesterol, and blood sugar levels annually.

The following are used in the treatment of heart diseases:

Medications: Antihypertensives, anticoagulants, beta-blockers, and others.

Lifestyle changes: Transitioning to a healthy lifestyle.

Surgical methods: Stenting, aortic bypass surgeries, and others.In summary, heart diseases pose a significant risk to human health.

In conclusion, heart diseases pose a great risk to human health. Their prevention is possible through establishing a healthy lifestyle, controlling risk factors, regular medical check-ups, and following physician recommendations. Every individual should approach heart health with responsibility. A healthy heart is the guarantee of a long and happy life.

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