

Date: 19th May-2026

ANATOMICAL STRUCTURE AND PHYSIOLOGICAL CHARACTERISTICS OF
THE HUMAN HEART.

Ahmadaliyeva Xushnoza Erkinjon qizi

Teacher of public health technical college named after
Pop Abu Ali Ibn Sino

Annotation: This scientific article examines the anatomical structure, physiological functions, and clinical significance of the human heart. The heart is considered one of the most vital organs in the human body because it maintains blood circulation and ensures the continuous transportation of oxygen, nutrients, hormones, and metabolic substances throughout the organism. The article discusses the external and internal anatomy of the heart, including its chambers, layers, valves, blood supply, conducting system, and functional mechanisms. Furthermore, the importance of the cardiovascular system in maintaining homeostasis and overall human health is analyzed. Special attention is also devoted to cardiovascular diseases, preventive healthcare, and the role of anatomy in modern medicine.

Keywords: anatomy, heart, cardiovascular system, myocardium, endocardium, physiology, blood circulation, arteries, veins, cardiac valves.

Anatomy is one of the fundamental branches of biological and medical sciences that studies the structure of living organisms. Human anatomy specifically investigates the organization, relationships, and functions of organs and body systems. Understanding anatomical structures is essential for medicine because accurate diagnosis, treatment, and prevention of diseases are impossible without detailed anatomical knowledge.

Among all organs of the human body, the heart occupies a central and irreplaceable position. The heart is a hollow muscular organ responsible for pumping blood throughout the circulatory system. Through this process, oxygen and nutrients are delivered to tissues while waste products and carbon dioxide are removed. The continuous activity of the heart ensures the survival of every cell in the body.

The cardiovascular system consists of the heart, arteries, veins, and capillaries. Together, these structures maintain circulation and provide stability within the internal environment of the organism. The failure of cardiac function leads to severe physiological disturbances and may ultimately result in death. Therefore, the study of cardiac anatomy and physiology is critically important in medicine, biology, surgery, sports science, and public health.

In modern society, cardiovascular diseases remain one of the leading causes of mortality worldwide. Sedentary lifestyles, unhealthy nutrition, smoking, obesity, stress, and environmental factors negatively affect heart function. Consequently, comprehensive knowledge about the structure and mechanisms of the heart is necessary not only for healthcare professionals but also for the general population.



Date: 19th May-2026

This article aims to provide a detailed scientific overview of the anatomical structure and physiological characteristics of the human heart.

The heart is a cone-shaped muscular organ located within the thoracic cavity. More specifically, it lies in the mediastinum, between the two lungs, slightly shifted toward the left side of the chest. The base of the heart is directed upward and posteriorly, while the apex points downward and toward the left.

In an average adult, the heart weighs approximately 300–350 grams in males and 250–300 grams in females. Its average length is about 12–15 centimeters, and its width measures approximately 8–10 centimeters.

The heart has several anatomical surfaces and borders:

- anterior surface;
- inferior surface;
- right border;
- left border;
- base;
- apex.

The apex of the heart is mainly formed by the left ventricle, whereas the base is primarily composed of the atria and the roots of the great blood vessels.

The heart is enclosed within a protective membranous sac known as the pericardium. This structure stabilizes the heart and reduces friction during cardiac movements.

The myocardium requires a constant supply of oxygen and nutrients. This supply is provided through the coronary arteries.

There are two primary coronary arteries:

- right coronary artery;
- left coronary artery.

Obstruction of coronary vessels may lead to ischemia and myocardial infarction. Coronary artery disease is among the most common cardiovascular disorders globally.

Conducting System of the Heart

The heart possesses an intrinsic conducting system responsible for generating and transmitting electrical impulses.

The conducting system includes:

- sinoatrial node;
- atrioventricular node;
- bundle of His;
- Purkinje fibers.

The sinoatrial node acts as the natural pacemaker of the heart. Electrical impulses generated here initiate rhythmic contractions.

Physiology of Cardiac Function

Cardiac activity consists of alternating phases of contraction and relaxation known as the cardiac cycle.



Date: 19th May-2026

The cardiac cycle includes:

- atrial systole;
- ventricular systole;
- diastole.

During systole, the heart contracts and pumps blood. During diastole, the chambers relax and refill with blood.

A healthy adult heart beats approximately 60–80 times per minute under resting conditions. Physical exercise, emotional stress, and hormonal changes may influence heart rate.

Blood Circulation

The circulatory system consists of two major circuits:

- systemic circulation;
- pulmonary circulation.
- Systemic Circulation

Systemic circulation begins in the left ventricle. Oxygenated blood enters the aorta and is distributed throughout the body. After delivering oxygen and nutrients, deoxygenated blood returns to the right atrium.

Pulmonary Circulation

Pulmonary circulation starts in the right ventricle. Venous blood travels to the lungs, where gas exchange occurs. Oxygenated blood then returns to the left atrium.

Regulation of Cardiac Activity

Cardiac function is regulated by nervous and hormonal mechanisms.

Nervous Regulation

The autonomic nervous system controls heart rate:

- sympathetic stimulation increases heart activity;
- parasympathetic stimulation decreases heart activity.

Hormonal Regulation

Hormones such as adrenaline and noradrenaline affect cardiac output and heart rate.

During stress or physical exertion, hormonal stimulation accelerates cardiac contractions.

Cardiovascular Diseases

Cardiovascular diseases represent a major public health concern worldwide.

Common disorders include:

- hypertension;
- atherosclerosis;
- myocardial infarction;
- heart failure;
- arrhythmia.

Major risk factors include:

- smoking;
- obesity;
- unhealthy diet;



Date: 19th May-2026

- lack of exercise;
- chronic stress;
- diabetes mellitus.

Early diagnosis and preventive measures are essential for reducing cardiovascular mortality.

Importance of Heart Health

Maintaining cardiovascular health is crucial for overall well-being. Preventive strategies include:

- balanced nutrition;
- regular physical activity;
- stress management;
- avoidance of tobacco and alcohol;
- routine medical examinations.

Physical exercise strengthens the myocardium and improves circulation efficiency.

Importance of Anatomy in Medicine

Anatomy forms the scientific basis of medicine. Physicians, surgeons, nurses, and healthcare professionals rely heavily on anatomical knowledge.

Cardiac anatomy is especially important in:

- surgery;
- cardiology;
- radiology;
- emergency medicine;
- transplantation;
- pharmacology.

Modern medical technologies such as echocardiography, magnetic resonance imaging, and computed tomography are based on detailed anatomical understanding.

The human heart is one of the most complex and essential organs in the body. Through continuous rhythmic contractions, it maintains blood circulation and supports all physiological processes necessary for life. The anatomical organization of the heart, including its chambers, valves, muscular layers, and conducting system, demonstrates remarkable structural and functional specialization. A detailed understanding of cardiac anatomy and physiology is fundamental for modern medicine and healthcare. Cardiovascular diseases continue to pose significant challenges worldwide, making preventive education and healthy lifestyles increasingly important. Regular exercise, balanced nutrition, and avoidance of harmful habits contribute significantly to maintaining optimal cardiac function. The study of anatomy not only enhances scientific knowledge but also improves diagnostic accuracy, therapeutic interventions, and the overall quality of medical care.



Date: 19th May-2026

REFERENCES:

1. Collins, F. S., & Varmus, H. (2015). A new initiative on precision medicine. *New England Journal of Medicine*, 372(9), 793–795. <https://doi.org/10.1056/NEJMp1500523>
2. Ashley, E. A. (2016). The precision medicine initiative: A new national effort. *JAMA*, 315(8), 793–794. <https://doi.org/10.1001/jama.2016.0297>
3. Hamburg, M. A., & Collins, F. S. (2010). The path to personalized medicine. *New England Journal of Medicine*, 363(4), 301–304. <https://doi.org/10.1056/NEJMp1006304>
4. Manolio, T. A., Chisholm, R. L., Ozenberger, B., Roden, D. M., Williams, M. S., Wilson, R., ... Ginsburg, G. S. (2013). Implementing genomic medicine in the clinic: The future is here. *Genetics in Medicine*, 15(4), 258–267. <https://doi.org/10.1038/gim.2012.157>
5. Schork, N. J. (2015). Personalized medicine: Time for one-person trials. *Nature*, 520(7549), 609–611. <https://doi.org/10.1038/520609a>

