

Overview study related to cardiac diseases and pathology conditions treatment with nutraceuticals & pharmaceuticals

Abstract

Nowadays, a lot of individuals are aware that leading a healthy lifestyle can frequently prevent chronic illnesses like heart disease. Nevertheless, heart-related diseases remain one of the leading causes of death globally. Poor heart and blood vessel health is intimately linked to issues that affect millions of individuals annually, including heart attacks, coronary heart disease (CHD), heart failure, stroke, kidney difficulties, and even disorders like erectile dysfunction. Cardiovascular diseases (CVDs) are chronic illnesses that gradually harm the heart and blood vessels. Inflammation and oxidative stress are two factors that can weaken heart tissues, impair blood flow, and raise the risk of major consequences like heart failure. This is the reason why it's essential to maintain a nutritious diet and healthy eating habits to safeguard the heart and minimize the likelihood of disease. Another significant type of heart disorder is congenital heart disease, which arises before birth due to issues with the heart's structure or blood vessels. In recent years, there has been a growing interest in natural methods to enhance heart health, particularly through the use of nutraceuticals. Nutraceuticals refer to natural substances or dietary supplements derived from food sources that provide additional health benefits beyond standard nutrition. These include vitamins, minerals, herbal products, antioxidants, and omega-3 fatty acids, which may aid in protecting the heart and decreasing the risk of cardiovascular diseases. All things considered, when paired with a balanced diet, consistent exercise, stress reduction, and appropriate medical care, nutraceuticals can be an important component of heart care. People can significantly lower their risk of cardiovascular diseases and improve their quality of life by adopting healthier lifestyle choices and raising awareness of heart health.

Keywords: cardiac diseases, history of cardiac diseases, nutraceuticals for cardiac diseases, pharmaceuticals for cardiac diseases, marketed products for cardiac diseases

Volume 11 Issue 1 - 2026

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Received: May 15, 2026 | **Published:** May 28, 2026

Introduction of cardiac disease

Cardiovascular disease (CVD), another name for heart disease, is a collection of illnesses that impact the heart and blood vessels. It is among the most common causes of disease and mortality worldwide. Heart disease encompasses conditions like blocked arteries, heart failure, irregular heartbeat, heart valve disorders, and congenital heart defects. Exercise, smoking, and excessive alcohol use can all raise the risk of developing heart disease for a variety of reasons.¹ High blood pressure, diabetes, and high cholesterol are among the medical conditions that increase the risk. These elements can harm the heart and blood vessels over time, resulting in major illnesses like heart attacks and other hazardous consequences. Despite significant advancements in the diagnosis and treatment of heart disease, the number of afflicted individuals is still rising, primarily due to aging populations and shifting lifestyles in contemporary society. Preventive care, routine health examinations, and early diagnosis have become more crucial as a result.²⁻⁴ Artificial intelligence (AI), wearable technology, and digital health tools are some of the cutting-edge technologies that medical professionals are using today to better monitor heart health.

These advancements are assisting medical professionals in early problem detection, better treatment, and lower healthcare costs, all while assisting patients in leading longer and healthier lives^{5,6} (Figure 1).

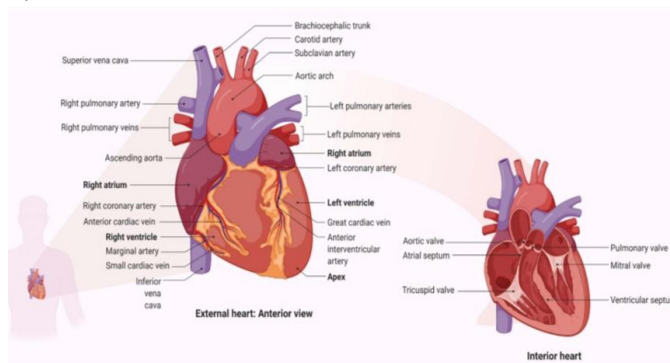


Figure 1 The external and internal structure of heart.

Types of cardiac disease with pathologic conditions⁶⁻⁸

Table 1 Types of cardiac disease⁶⁻⁸

Cardiac Disease	Description	Key Symptoms
Coronary Artery Disease (CAD)	Narrowing/blockage of coronary arteries due to plaque buildup.	Chest pain (angina), shortness of breath, fatigue.
Myocardial Infarction (Heart Attack)	Sudden blockage of blood flow to heart muscle.	Severe chest pain, sweating, nausea, shortness of breath.
Heart Failure	Heart can't pump blood effectively.	Fatigue, swelling in legs, breathlessness, rapid heartbeat.
Arrhythmia	Abnormal heart rhythm (fast, slow, or irregular).	Palpitations, dizziness, fainting, chest discomfort.
Cardiomyopathy	Disease of the heart muscle affecting its ability to pump blood.	Breathlessness, fatigue, swollen ankles, irregular heartbeat.
Congenital Heart Disease	Structural defects in the heart present at birth.	Cyanosis (bluish skin), poor weight gain, rapid breathing in infants.
Valvular Heart Disease	Malfunctioning of one or more heart valves	Heart murmur, fatigue, chest pain, swelling of ankles or feet
Pericarditis	Inflammation of the pericardium (heart lining)	Sharp chest pain (worse when lying down), fever, fatigue
Atrial Fibrillation (AFib)	Irregular and rapid beating of the atria	Irregular pulse, heart palpitations, weakness, dizziness
Endocarditis	Infection of the inner lining of the heart chambers and valves	Fever, chills, fatigue, new or changed heart murmur, night sweats

History of cardiac disease and nutraceuticals or pharmaceuticals⁹⁻¹¹

Ancient to early modern era (2600 BCE – 1900s)

Table 2 Ancient to early modern era (2600 BCE – 1900s)

Year	Milestone / Event	Notes
2600 BCE	Ebers Papyrus mentions heart as centre of the blood system (Egypt).	Ancient Egyptian medicine.
400 BCE	Hippocrates describes sudden cardiac death.	Greek physician.
280 BCE	Herophilus & Erasistratus distinguish arteries vs veins.	Early understanding of circulatory anatomy.
2nd Century (130–200 AD)	Galen proposes two-system blood flow model.	Dominated Western medicine for over a millennium.
1025 AD	Avicenna (Ibn Sina) writes Canon of Medicine.	Pulse diagnosis, chest pain recognition.
1242 AD	Ibn al-Nafis describes pulmonary circulation.	Predated William Harvey by ~300 years.
1628 AD	William Harvey discovers systemic circulation.	Foundation of modern cardiovascular physiology.
1816 AD	René Laennec invents the stethoscope.	Heart sound diagnostics begin.
1896 AD	Riva-Rocci invents sphygmomanometer (blood pressure cuff).	Non-invasive BP measurement.
1903 AD	Willem Einthoven invents ECG.	Diagnoses arrhythmias and heart damage.

20th Century advances (1900–1999)

Table 3 20th Century advances (1900–1999)

Year	Milestone / Event	Notes
1929	Werner Forssmann performs cardiac catheterization on himself.	Opens doors for interventional cardiology.
1950	Framingham Heart Study begins.	Identifies risk factors like smoking, high BP, cholesterol.
1967	Dr. Christiaan Barnard performs first human heart transplant.	South Africa, medical breakthrough.
1977	Andreas Gruentzig performs first balloon angioplasty.	Minimally invasive treatment for blocked arteries.
1980s	Statins introduced	Revolutionized cholesterol management.
1990s	Thrombolytic therapy, ACE inhibitors, beta blockers widely used.	Improves survival in heart failure and MI.

Modern era (2000–2025)

Table 4 Modern era (2000–2025)

Year	Milestone / Event	Notes
2000	Drug-eluting stents introduced.	Reduced restenosis post angioplasty.
2002	Cardiac MRI becomes more common.	Non-invasive imaging for detailed heart structure/function.
2004	Rise in CT Coronary Angiography usage.	Early, less-invasive detection of blockages.
2007	Introduction of high-sensitivity Troponin tests.	Allows earlier detection of myocardial infarction.
2010	Launch of wearable ECG monitors (e.g., Zio Patch).	Long-term arrhythmia detection.

Table 4 Continued...

2015	Rise of TAVR (Transcatheter Aortic Valve Replacement).	Less invasive than open-heart surgery.
2017	Apple Watch adds heart rate alerts.	Consumer health meets cardiac monitoring.
2019	AI algorithms approved for ECG analysis and arrhythmia detection.	FDA clearance for AI tools.
2020	COVID-19 pandemic triggers cardiac complications.	Focus on myocarditis and heart failure in post-COVID care.
2021	Development of mRNA-based heart regeneration studies.	Potential for future cardiac repair.
2022	AI and deep learning in echocardiography become widespread.	Faster, more accurate heart imaging diagnostics.
2023	Wearables used for population-wide AFib screening.	Preventive cardiology through technology.
2024	AI-assisted robotic cardiac surgeries and 3D printed heart valves.	Precision and personalization in treatment.
2025	Integration of genomics and AI in cardiovascular risk prediction.	Personalized cardiology using DNA and AI insights.

Nutraceuticals used in cardiac disease

Natural compounds that offer health benefits beyond basic nourishment are known as nutraceuticals, and they are typically derived from foods or plants. They are thought to aid in the treatment and prevention of heart disease and other illnesses. These drugs function by enhancing vital bodily processes like the metabolism of fat and cholesterol, lowering oxidative stress, enhancing blood

vessel function, and reducing inflammatory factors that are directly related to heart issues like blocked arteries and other cardiovascular diseases. Omega-3 fatty acids, vitamins, minerals, antioxidants, herbal extracts, and dietary supplements are typical examples of nutraceuticals. Nutraceuticals may promote heart health and enhance general wellbeing when paired with a healthy lifestyle and appropriate medical care (Table 5).

Table 5 Nutraceutical used in cardiac disease

Disease	Nutraceutical	Mechanism/Benefits	Adverse effects
Hypertension	Omega-3, CoQ10, Garlic extract	Vasodilation, reduced vascular resistance, improved endothelial function	Fishy aftertaste (Omega-3), GI upset, bleeding risk
Hyperlipidemia	Plant sterols, red yeast rice, Omega-3	Inhibition of cholesterol absorption, HMG-CoA reductase inhibition, TG reduction	Myopathy (Red yeast rice), GI discomfort
Atherosclerosis	Vitamin E, Polyphenols, Curcumin	Antioxidant, anti-inflammatory, anti-platelet aggregation	GI upset, headache (resveratrol), hepatotoxicity (rare)
Heart Failure (CHF)	CoQ10, L-carnitine, Hawthorn extract	Enhances mitochondrial function,	Hypotension, dizziness, nausea
Ischemic Heart Disease	Omega-3, Lycopene, Garlic	Anti-inflammatory, antithrombotic, lipid-lowering	Bleeding risk, garlic odor, GI issues
Arrhythmias	Magnesium, Omega-3, Taurine	Stabilizes cardiac cell membranes, modulates ion channels	Diarrhea (Mg), hypotension
Endothelial Dysfunction	L-Arginine, Vitamin C, Polyphenols	Enhances nitric oxide production, antioxidant effect	GI discomfort, risk in renal
Myocardial Infarction	CoQ10, Omega-3, Curcumin, Vitamin D	Antioxidant, anti-inflammatory, improves cardiac energy metabolism	Nausea, bleeding risk
Peripheral Artery Disease	L-Arginine, Omega-3	Vasodilation, improved blood flow	Hypotension, GI symptoms

Pharmaceutical used in cardiac disease^{12,13}

Heart disease medications are specifically created to help prevent, manage, and treat various issues pertaining to the heart and blood vessels. High blood pressure, blocked arteries, heart failure, irregular heartbeat, and blood clotting disorders are some of these conditions. These medications function in a variety of ways, including lowering blood pressure, increasing blood flow to the heart, lessening cardiac strain, regulating cholesterol, preserving a regular heartbeat, and

averting dangerous blood clots. These medications are primarily intended to maintain healthy heart function, slow the advancement of heart disease, lower the risk of major complications like heart attacks or strokes, and enhance the patient's general quality of life. Heart medications come in a variety of forms, such as those that lower cholesterol, prevent blood clots, control blood pressure, relieve chest pain, and treat irregular heartbeats. These medications are crucial in helping people with heart conditions live longer, healthier lives when taken as prescribed by a doctor (Table 6).

Table 6 Pharmaceutical used in cardiac diseases

Cardiac Disease	Pharmaceutical	Mechanism of Action	Adverse Effects
Hypertension	ACE Inhibitors (e.g., Enalapril).	Inhibits conversion of Angiotensin I to II → vasodilation	Cough, hyperkalemia, hypotension
	Beta-blockers (e.g., Atenolol).	Blocks β1-receptors → decreases heart rate and BP	Fatigue, bradycardia, depression
Heart Failure	Diuretics (e.g., Furosemide)	Inhibits Na ⁺ -K ⁺ -2Cl ⁻ in loop of Henle → reduces fluid overload	Electrolyte imbalance, dehydration
	Digoxin	Inhibits Na ⁺ /K ⁺ ATPase → increases intracellular Ca ²⁺ → ↑ contraction	Arrhythmia, nausea, visual disturbances

Table 6 Continued...

Angina Pectoris	Nitrates (e.g., Nitroglycerin)	Donates NO → vasodilation → ↓ preload & afterload	Headache, hypotension, tolerance
	Calcium Channel Blockers (e.g., Amlodipine)	Blocks L-type calcium channels → vasodilation	Edema, dizziness, reflex tachycardia
Arrhythmia	Amiodarone	Blocks K ⁺ channels → prolongs action potential	Pulmonary fibrosis, thyroid dysfunction
	Lidocaine	Blocks sodium channels in cardiac cells	CNS toxicity, tremors
Myocardial Infarction	Antiplatelets (e.g., Aspirin)	Inhibits COX → ↓ thromboxane A2 → ↓ platelet aggregation	Gastric ulcer, bleeding
	Statins (e.g., Atorvastatin)	Inhibits HMG-CoA reductase → ↓ cholesterol synthesis	Muscle pain, liver enzyme elevation
Atherosclerosis	Ezetimibe	Inhibits intestinal cholesterol absorption	Diarrhoea, fatigue

Adverse effects / side effects: nutraceuticals vs pharmaceuticals¹³⁻¹⁵

Table 7 Adverse effects/side effects: nutraceuticals vs pharmaceutical

Parameter	Nutraceuticals	Pharmaceuticals
General Safety Profile	Generally considered safer with fewer side effects.	Often associated with more frequent and severe side effects.
Common Side Effects	Mild: Nausea, bloating, diarrhea, allergic reactions (in some herbs).	Moderate to severe: Dizziness, drowsiness, nausea, liver/kidney impact.
Long-Term Use Risks	May accumulate in the body if overdosed (e.g., fat-soluble vitamins).	May cause organ damage, resistance, or dependency over time.
Allergic Reactions	Possible with herbal components, pollen, or plant extracts.	Possible with synthetic compounds, excipients, or dyes.
Drug/Nutrient Interactions	May interact with medications (e.g., St. John's Wort with antidepressants).	High potential for interactions requiring clinical monitoring.
Overdose Risk	Usually lower risk, but still possible with mega-doses.	Higher risk of toxicity and adverse reactions with small overdoses.
Dependency/Addiction Potential	Minimal to none.	Some drugs can lead to dependency (e.g., opioids, sedatives).
Toxicity	Rare, mostly seen in poor-quality or adulterated products.	Can cause serious toxicity in case of wrong dose or prolonged use.
Impact on Liver/Kidney	Minimal if taken correctly.	Often burdens liver/kidney, especially in chronic conditions.
Side Effect Monitoring	Usually not required routinely.	Regular monitoring often needed (e.g., liver function tests).

Marketed formulations for cardiac diseases (pharmaceuticals and nutraceuticals)^{6,8,15}

Table 8 Marketed formulations for cardiac diseases (pharmaceuticals)




Medicine Name	Manufacturer	Active ingredient	Sources	Images
Ecosprin	USV Pvt. Ltd.	Aspirin (Acetylsalicylic acid)	Synthetic (originally Willow bark)	
Atorva	Zydus Cadila	Atorvastatin	Synthetic (Chemical synthesis)	
Metolar	Cipla	Metoprolol Tartrate	Synthetic	

Table 8 Continued...



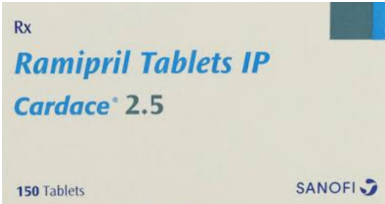

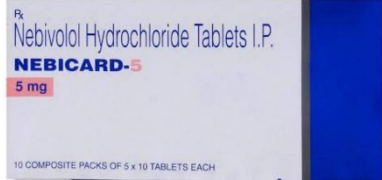


Cardivas	Sun Pharma	Carvedilol	Synthetic	
Nitrostat	Pfizer	Nitroglycerin	Synthetic	
Cardace	Sanofi	Ramipril	Synthetic	
Cilacar	J.B. Chemicals & Pharma	Cilnidipine	Synthetic	
Nebicard	Torrent Pharma	Nebivolol	Synthetic	
Olmesar-H	Macleods	Olmesartan + Hydrochlorothiazides	Synthetic	

Table 8 Continued...

Xarelto	Bayer	Rivaroxaban	Synthetic	
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Marketed formulation for cardiac disease (nutraceuticals)¹⁵⁻¹⁹

Table 9 Marketed formulation for cardiac disease (nutraceutical)





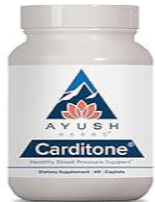
Medicine name	Manufacturer	Active ingredient	Sources	Images
MegaRed	Reckitt Benckiser	Omega-3 Krill oil	Natural (Krill marine source)	
Cardioace	Vitabiotics	Omega-3 fatty acids, coenzyme Q10, L-Carnitine	Natural (Fish oil, plants, Biosynthesis)	
Coronarycare	Himalaya wellness	Arjuna bark extract	Natural (plants source)	
Q-Gel cardio	Tishcon crop (USA)	Ubiquinol (Active CoQ10), Vitamin E.	Synthetic/Natural Mixed	
Carditone	Ayush Herbs	Rauwolfia serpentina, Terminalia arjuna, Tribulus terrestris.	Medicinal herbs	

Table 9 Continued...

Cardio Max	HealthAid	Coenzyme Q10, L-Carnitine, Omega-3 Fatty Acids, Vitamin E.	Fish oil (Omega-3), Plant-based (CoQ10), Meat (L-Carnitine), Nuts (Vit E).
Q-Gold	Sun Pharma	Coenzyme Q10, Vitamin E, Zinc, Omega-3 Fatty Acids.	Fish oil, Nuts, Plant oils.



Conclusion

Until a major incident like a heart attack or stroke occurs, many people are unaware that they have a heart condition. Frequent medical examinations are equally crucial, particularly for those with conditions like diabetes or high blood pressure, which can raise the risk of heart issues if improperly managed. Modern medical technology, improved medications, surgeries, and even AI-based monitoring systems are making it easier than ever for medical professionals to identify and treat heart conditions. In conclusion, both medical assistance and personal care are necessary for the prevention and management of heart disease. We can lessen the effects of heart disease and help people live longer, healthier lives by raising awareness, supporting healthy lifestyles, and encouraging routine medical checkups.

Acknowledgments

None.

Conflicts of interests

The author declare that there are no conflicts of interest.

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