Introduction
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"Health is a harmonious interplay,
between Body - Mind - Soul.
While disease, in essence
is the result of conflict between them."

Health is the topmost priority in every individual’s life. It is a basic need of every of very human being. The importance of health is evident from the old saying like, “Health is wealth” and “Healthy body has a healthy mind”. Health is man’s greatest possession, which can be achieved through preventive, promotive and curative measures with herbal care, and it leads to happy and harmonious life. Traditional herbs have been the source of medicine since time immemorial and the entire world population is turning towards the plant-based treatment.

Interest of people towards natural drugs is because of the widespread belief that ‘green medicines’ are healthier and safer than the synthetic ones. Hence a ‘herbal renaissance’ is now blooming across the world.

Utilizing the healing properties of plants is an ancient practice. People in all continents have long used hundreds, if not thousands, of indigenous plants for the treatment of various ailments dating back to prehistory. Herbs are the major component in all traditional medicines and a common element in Siddha, Ayurvedha, homeopathy, naturopathy, traditional Chinese medicine, and Native American Indian medicine.

The knowledge of plants usage in Indian Medicinal System (IMS) is inherited traditionally. It is greatly restricted to Vaidhyas or chief of the tribes or to some interested persons. In lesser way it is practiced in every household as a preliminary medicine or as first aid in the form of Grandma’s medicinal pouch. With development of Allopathy this knowledge slowly perished and after seeing the adverse effect or side effects of the allopathic medicines, mankind is turning towards this herbal
medicines. Hence spreading and preserving medicinal plants and their uses has become important for human exercise.

Medicinal plants have curative properties due to the presence of various complex chemical substances of different composition, which are found as secondary plant metabolites (alkaloids, glycosides, corticosteroids, essential oils, etc.) in one or more parts of these plants.

Anthocyanidins and other flavonoids including quercetin, resveritrol, and catechins of *Vaccinium myrtillus* L. may strengthen blood vessels, possess antioxidant properties, improve circulation and prevent the oxidation of LDL cholesterol. Studies suggest that fresh garlic and garlic supplements may prevent blood clots and destroy plaque. Garlic may also prevent heart diseases due to high blood pressure, cholesterol and diabetes. Ginseng, especially Asian ginseng, may reduce endothelial cell dysfunction, thereby rendering a heart attack less likely.

Green tea may prevent atherosclerosis particularly in the coronary heart diseases. Hawthorn has antioxidant properties that protect the formation of plaques and may help to control cholesterol and blood pressure. Turmeric is a proven anti-atherosclerotic agent that inhibits the oxidation of LDL cholesterol.

**1.0 Myocardial Infarction**

Myocardial infarction is a common presentation of ischemic heart disease. Ischemic heart disease is the leading cause of death in developed countries, but third to AIDS and lower respiratory infections in developing countries. About two-thirds of the global estimated 14.3 million annual ischemic heart disease deaths occur in the developing world. By the year 2015, ischemic heart disease could be the most important cause of mortality in India. Links between these diseases and smoking, excessive cholesterol associated with high-fat diets, high blood pressure, and insufficient exercise are all well established key. To prevent heart disease is simply maintaining a healthy life style.
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Acute myocardial infarction (AMI or MI), commonly known as heart attack, is the death or necrosis of myocardial cells. It occurs when myocardial ischemia exceeds a critical threshold and overwhelms myocardial cellular repair mechanisms that are designed to maintain normal operating function and homeostasis. Ischemia at this critical threshold level for an extended time period results in irreversible myocardial cell damage or death\(^{14-16}\). It is a medical emergency, and the leading cause of death for both men and women all over the world\(^{12}\). The term myocardial infarction is derived from *myocardium* (the heart muscle) and *infarction* (tissue death due to oxygen starvation).

Critical myocardial ischemia may occur as a result of increased myocardial metabolic demand and/or decreased delivery of oxygen and nutrients to the myocardium via the coronary circulation. An interruption in the supply of myocardial oxygen and nutrients occurs when a thrombus is superimposed on an ulcerated or unstable atherosclerotic plaque and results in coronary occlusion\(^{17}\).

![Figure 1: Plaque Buildup and Heart Attack](image.png)
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1.1 Types

From an anatomic or morphologic standpoint, the two types of MI are transmural and non-transmural.

A transmural MI is characterized by ischemic necrosis of the affected muscle segment(s), extending from the endocardium through the myocardium to epicardium.

A non-transmural or sub endocardial MI is defined as an area of ischemic necrosis that does not extend through the full thickness of myocardial wall segments. It is limited to either the endocardium or the endocardium and myocardium.

1.2 Risk Factors

Risk factors for atherosclerosis are generally risk factors for myocardial infarction:

- Old age
- Male gender
- Cigarette smoking
- Hypercholesterolemia, more accurately hyper lipoproteinemia, especially high low-density lipoprotein and low high-density lipoprotein.
- Diabetes (with or without insulin resistance)
- High blood pressure
- Obesity (defined by a body mass index of more than 30kg/m², or alternatively by waist circumference or waist-hip ratio)

Many of these risk factors are modifiable; maintaining a healthier lifestyle can prevent so many heart attacks. Physical activity, for example, is associated with a lower risk profile. Socio economic factors such as a shorter education and lower income (particularly in women), and living with a partner may also contribute to the risk of MI.
Women who use combined oral contraceptive pills have a modestly increased risk of myocardial infarction, especially in the presence of other risk factors, such as smoking. Inflammation is known to be an important step in the process of atherosclerotic plaque formation. C-reactive protein (CRP) is a sensitive but non-specific marker for inflammation. Elevated CRP blood levels, especially measured with high sensitivity assays, can predict the risk of MI, as well as stroke and development of diabetes.

1.3 Signs and Symptoms

Acute MI has unique presentation in individual patients. The onset of symptoms in myocardial infarction is usually gradual, over several minutes, and rarely instantaneous. The degree of symptoms ranges from none at all to sudden cardiac death. An asymptomatic MI is not necessarily less severe than a symptomatic event; but patients who experience asymptomatic MI’s are more likely to be diabetic. Despite the diversity of presenting symptoms of MI, there are some characteristic symptoms. (Table 1):

<table>
<thead>
<tr>
<th>Signs and Symptoms of Myocardial Infarction</th>
</tr>
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<tbody>
<tr>
<td>• Chest pain described as a pressure sensation, fullness, or squeezing in the mid portion of the thorax.</td>
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<tr>
<td>• Radiation of chest pain into the jaw/teeth, shoulder, arm, and/or back.</td>
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<tr>
<td>• Associated dyspnea of shortness of breath.</td>
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<tr>
<td>• Associated epigastric discomfort with or without nausea and vomiting.</td>
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<tr>
<td>• Associated diaphoresis or sweating.</td>
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<tr>
<td>• Syncope or near-syncope without other cause.</td>
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<tr>
<td>Impairment of cognitive function without other cause.</td>
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</table>

Cardioprotective Effect of Muntingia calabura L.- A Traditional Drug Source
Any group of symptoms compatible with a sudden interruption of the blood flow to the heart is called an acute coronary syndrome. A MI may occur at any time of the day, but most appear to be clustered around the early hours of the morning and/or associated with demanding physical activity.

Approximately half of all MI patients have experienced warning symptoms such as chest pain prior to the infarction. Approximately one third of all myocardial infarctions are silent, without chest pain or other symptoms. A silent course is more common in the elderly, in patients with diabetes mellitus and after heart transplantation, probably because the donor's heart is not connected to nerves of the host.

1.4 Diagnosis

The diagnosis of myocardial infarction made by integrating the history of the presenting illness and physical examination with electrocardiogram findings and cardiac markers (blood tests for heart muscle cell damage). A coronary angiogram allows visualizing narrowing or obstructions on the heart vessels and therapeutic measures can follow immediately. Now regional wall motion abnormalities on an echocardiogram are also suggestive of a myocardial infarction and are sometimes performed in equivocal cases. Technetium and thallium can be used in nuclear medicine to visualize areas of reduced blood flow and tissue visibility respectively.

WHO criteria have classically been used to diagnose MI; a patient is diagnosed with myocardial infarction if two (probable) or three (definite) of the following are satisfied:

1. Clinical history of ischemic type chest pain lasting for more than 20 minutes.
2. Changes in serial ECG tracings.
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3. Rise and fall of serum cardiac enzymes (biomarkers) such as creatine kinase, tropinin I, and lactate dehydrogenase isoenzymes specific for the heart.

WHO criteria were refined in 2000 to give more prominence to cardiac biomarkers.

1.4.1 Physical Examination

The general appearance of patients may vary according to the experienced symptoms; the patient may be comfortable, or restless and in severe distress with an increased respiratory rate. Blood pressure may be elevated or decreased, and the pulse can become irregular.

If heart failure ensues, elevated jugular venous pressure and hepatojugular reflux, or swelling of the legs due to peripheral edema may be found on inception. Various abnormalities can be found on auscultation, such as a third and fourth heart sound, systolic murmurs, paradoxical splitting of the second heart sound, a pericardial friction rub and rales over the lung.

1.4.2 Electrocardiogram

The primary purpose of the electrocardiogram is to detect ischemia or acute coronary injury in broad, symptomatic emergency department populations. Routine or 12 - lead electrocardiography is the most commonly performed test in cardiology. The ECG shows a series of waves (P waves, QRS complex, T waves) that represent the electrical events of heart chambers and conduction pathways. The current guidelines for the ECG diagnosis of acute myocardial infarction require at least 1mm (0.1 mV) of ST segment elevation in 2 or more anatomically contiguous leads.
The GUSTO (Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries) investigators developed a set of criteria for identifying acute myocardial infarction in the presence of left bundle branch block and paced rhythm. They include concordant ST segment elevation > 5 mm (0.5 mV) and concordant ST segment depression in the left pericardial leads. The presence of reciprocal changes on the 12 lead ECG may help to distinguish trace acute myocardial infarction from the mimics of acute myocardial infarction. The contour of the ST segment may also be helpful, with a straight or upwardly convex (non-concave) ST segment favoring the diagnosis of acute myocardial infarction.

### 1.4.3 Myocardial Markers

Cardiac markers or cardiac enzymes are proteins from cardiac tissues found in the blood. These proteins are released into the blood stream when damage to the heart occurs, as in the case of a myocardial infarction. The enzymes SGOT, LDH, CK are very specific for myocardial injury. Current guidelines are generally in favor of troponin sub-units I or T, specific for the heart muscle and are thought to rise before permanent injury develops. Elevated troponins in the setting of chest pain may accurately predict a high likelihood of a myocardial infarction in the near future.
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The diagnosis of myocardial infarction requires two out of three components (history, ECG, and enzymes). When damage to the heart occurs, levels of cardiac markers rise over time that is why blood tests for them are taken over a 24-hour period. The amount of enzymes released from the damaged myocardium is a measure of index of the infarct size.

1.4.4 Angiography

In difficult cases or in situations where intervention to restore blood flow is appropriate, coronary angiography can be performed. A catheter is inserted into an artery (usually the femoral artery) and pushed to the vessels supplying the heart.

1.4.5 Histopathology

Histopathological examination of the heart may reveal infarction. One of the earliest changes under a normal microscope is so-called wavy fibers. Subsequently, the myocyte cytoplasm becomes more eosinophilic (pink) and the cells lose their transversal striation, with typical changes and eventually loss of the cell nucleus.

1.5 Treatment

A heart attack is a medical emergency, which demands both immediate attention and activation of the emergency medical services. The ultimate goal of the management in the acute phase of the disease is to salvage as much myocardium as possible and prevent further complications. As time passes the risk of damage to the heart muscle increases; hence the phrase in myocardial infarction, ‘time is muscle’ and time wasted is muscle lost. Treatment can be done by three main methods such as drug therapy, angioplasty (using one of several methods to clear the blocked blood vessel, such as inflating a balloon inside it or holding it open with a device called a stent), and surgery.

Once treated for an acute heart attack, changing lifestyle factors (including making important nutritional changes) and taking medications as prescribed as well
as, possibly, supplements such as herbal remedies and relaxation techniques may also be considered very important for avoiding recurrent heart attacks and even death.

1.5.1 Life Style

Attending cardiac rehabilitation following a heart attack can significantly improve many risk factors for heart disease, including high cholesterol, high blood pressure, extra weight, high homocysteine, and elevated C-reactive protein. This improvement, in turn, lowers chances for repeated heart attacks. Cardiac rehabilitation programs generally involve comprehensive education on diet, physical activity, and relaxation with participation in a supervised exercise and stress reduction program.

1.5.2 Medications

Aspirin and nitroglycerin are essential for improving blood flow. Nitroglycerin does by widening the blocked artery, while aspirin does so by thinning the blood and preventing the formation of blood clots. Some other drugs with similar functions are:

- Streptokinase (SK)
- Tissue plasminogen activator
- Anisoylated plasminogen streptokinase activator complex
- Heparin

Additional medications needed during acute treatment of a heart attack include:

- Beta-blockers - reduce cardiac rupture, new heart attacks, irregular heartbeat; various side effects.
- Angiotensin - converting enzyme (ACE) inhibitors - reduces high blood pressure.
- Pain control - morphine sulphate, intravenous
- Oxygen - by a tube inserted into the nose, as needed
1.5.3 Supplements and Vitamins

Bromelain, which has anti-inflammatory and anti-thrombotic properties may prove to play a useful role in treating angina and preventing heart attacks. The beneficial effect of coenzyme Q 10 in the prevention and treatment of heart disease is due to its ability to improve energy production in cells, inhibit clot formation, and act as an antioxidant. The chances of experiencing subsequent heart attacks and administering daily Co Q 10 supplements to people who suffered heart attack minimizes chest pain.

Multivitamin with adequate vitamin B complex, particularly folic acid (at least 400μg) are helpful in treating heart disease. Studies suggest that people who take L-Carnitine supplements soon after suffering a heart attack may be less likely to have a subsequent heart attack, chest pain and abnormal heart rhythms, or develop congestive heart failure.

Omega-3 fatty acids from fatty, cold-water fish can help in treating atherosclerosis by inhibiting the development of plaque and blood clots and also prevent atherosclerosis. In addition to this omega-3 fatty acid supplements everyday after a heart attack may reduce the risk of a subsequent heart attack or a stroke and improve chances for survival.

Low levels of selenium in body may worsen atherosclerosis or even increase chances for a heart attack. Selenium supplementation can prevent either a heart attack or development and progression of atherosclerosis. Vitamin C helps in preventing the oxidation of LDL cholesterol (a process that contributes to plaque buildup in the arteries) as well as other negative outcomes related to oxidative stress and improve endothelial dysfunction. Vitamin E prevent arteries from clogging by blocking the conversion of cholesterol into the waxy fat deposits called plaque that stick to blood vessel walls.
1.5.4 Herbs

Herbs has local heritage with global acceptance. The use and search of drugs and dietary supplements from plants have accelerated in recent years. Pharmacologists, microbiologists, botanists, and natural-product chemists are combing the Earth for Phytochemical and leads that could be developed for treatment of various diseases. Medicinal plants can be used as general heart tonics and for treating the conditions associated with MI, like atherosclerosis, congestive heart failure, high blood cholesterol levels, high blood pressure, and obesity. 

‘Arjuna Vegicaps’ is an Ayurvedic cardioprotective drug whose ingredient is Terminalia arjuna improves pumping activity of heart, improves cardiac muscle strength, decrease in LDL cholesterol levels. The cardioprotective potential of T. arjuna is proved scientifically.

Rashona Rasayana - a natural herbal dietary supplement for heart health contains extracts of Ashwagandha, Jatamamsi, Valerian root, Shankapushpi and herbal powders of Garlic, Hawthorn, Nutmeg, Ginger root and Cardamom. This is used to reduce abnormal blood pressure and heart problems.

High - Rite is a capsule, which improves the heart’s ability to pump blood effectively, while also treating and preventing plaque build up in the arteries. It contains Crataegus ocycantha, Passiflora incarnata, Viburnum opulus and Ginkgo biloba. Aqua - Rite is a concentrated tincture a companion remedy for High - Rite helps to balance blood pressure and improve circulation. It contains Agathosma betulina, Taraxacum officinale and Olea europea.

1.6 Prognosis and Complications

The prognosis for patients with myocardial infarction varies greatly, depending on the patient, the conditions and the nature of treatment given. Some of the more reproduced risk factors are age, heart failure, ST - segment elevation,
relationships with diabetes, serum creatine concentration, peripheral vascular diseases and elevation of cardiac markers.  

Heart attack accounts for 1 out of every 5 deaths. If the person is alive 2 hours after an attack, the probable outcome for survival is good, but may include complications such as:

- Irregular hearth rhythm, called an arrhythmia: this may increase chances for sudden death and may require electrical cardioversion or placement of a device to protect from sudden death or a pacemaker to direct the electrical system of heart.
- Congestive heart failure
- Shock
- Pericarditis (infection around the lining of the heart)
- Pulmonary embolism (blood clot in the lungs)

1.7 Preventive Care

The risk of heart attack may be reduced by

- Avoiding known risk factors like cigarette smoking or exposure to second hand smoke.
- Getting aerobic exercise (such as walking, biking or swimming) for at least 3 hours per week (for example, 30 minutes 6 days per week)
- Reducing stress and learning stress - reduction techniques such as deep breathing and meditation. Yoga and tai chi, two forms of exercise that emphasize stretching, breathing, and meditating, can also help to reduce stress level.
- Eating a low - fat diet rich in antioxidants (like carotenoids, flavonoids, vitamins C and E) as well as fiber and stay at the proper weight for height and age.