International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 4, Jul-Aug 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

The Changing Landscape of Heart Attack: In Sight to Diagnosis and Therapeutic Advances

Bhudidha Shivathmika, Narender Boggula, Mandepudi Lakshmi Chandini*

Omega College of Pharmacy, Edulabad, Ghatkesar, Hyderabad, Telangana, India
*Corresponding Author: Mandepudi Lakshmi Chandini

ABSTRACT

Cardiovascular disease is a medical condition which are blocking the blood vessels can cause the heart attack, angina pectoris, heart stroke, myocardial infraction and arrhythmia. Heart Attack is one of the most common and deadly cardiovascular diseases across the world. It is an issue which affects a huge part of society and has now become the 3rd leading cause of the death. A heart attack-also known as a myocardial infarction (MI)-is when the heart muscle does not receive enough blood flow and the heart cells begin to die. This can result from a severely decreased blood flow to the coronary arteries or because there is a complete blockage in the arteries. When the heart muscle begins to die, the person has a heart attack. Symptoms may or may not precede a heart attack. If the heart arteries narrow by more than 70%. Myocardial infarction may be "silent," and go undetected, or it could be a catastrophic event leading to hemodynamic deterioration and sudden death. Most myocardial infarctions are due to underlying coronary artery disease, the leading cause of death in the United States. With coronary artery occlusion, the myocardium is deprived of oxygen. Prolonged deprivation of oxygen supply to the myocardium can lead to myocardial cell death and necrosis. This activity describes the pathophysiology, evaluation, and management of myocardial infarction and highlights the role of the interprofessional team in improving care for affected patients.

KEYWORDS: *Heart attack, myocardial infarction, coronary artery disease, coronary catheterization, magnetic resonance imaging*

How to cite this paper: Bhudidha Shivathmika | Narender Boggula | Mandepudi Lakshmi Chandini "The Changing Landscape of Heart Attack: In Sight to Diagnosis and Therapeutic Advances" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-4, August 2025, pp.103-109, URL: www.ijtsrd.com/papers/ijtsrd97208.pdf

IJTSRD97208

INTRODUCTION

A heart attack occurs when the flow of blood to the heart is severely reduced or blocked. The blockage is usually due to a buildup of fat, cholesterol and other substances in the heart (coronary) arteries. The fatty, cholesterol-containing deposits are called plaques. The process of plaque buildup is called atherosclerosis. Sometimes, a plaque can rupture and form a clot that blocks blood flow. A lack of blood flow can damage or destroy part of the heart muscle.

Many times, people are reckless in nature and taken huge amount of smoking, does not pay attention on its own obesity and there is following factors which enhancing the rate of cardiovascular disease. Heart attack is widely occurred in human populations and they are following category of heart attack such as heart failure, atrial fibrillation etc. They have following stages and following agents are taken to prevent from this disease. Angioplasty is technique it is mainly used in valvular disease by which help to open the blood vessels that supply blood to your muscles of heart. Heart attack patients are suffering from various difficulties such as chest pain, sweating, nausea, vomiting, weakness, dizziness, anxiety and shortness of breath and most of the common symptom are irregular heartbeat. A thin soft tube called catheter are used in this technique.

A heart attack occurs when an artery that sends blood and oxygen to the heart is blocked. Fatty, cholesterol-containing deposits build up over time, forming plaques in the heart's arteries. If a plaque ruptures, a blood clot can form. The clot can block arteries, causing a heart attack. During a heart attack, a lack of blood flow causes the tissue in the heart muscle to die. A heart attack is also called a myocardial infarction. Prompt treatment is needed for a heart attack to prevent death [1-3].

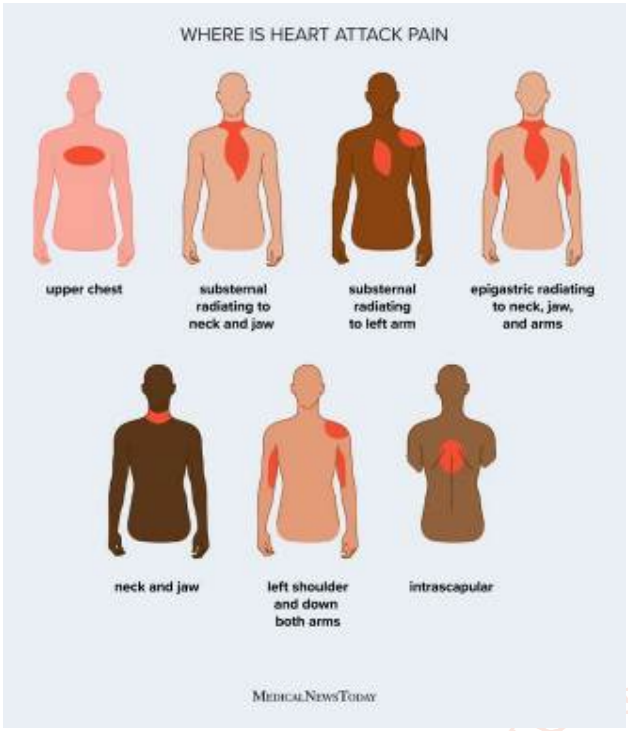

Figure 1: Heart attack pain

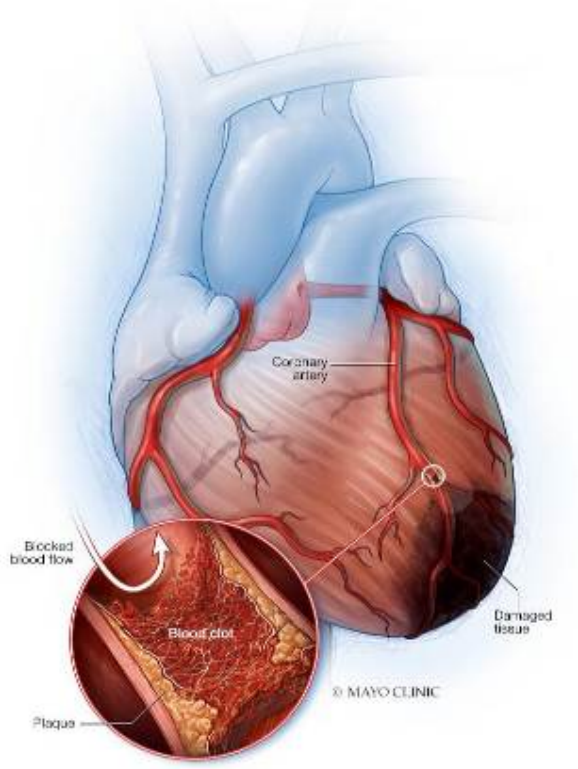

Figure 2: Heart attack

Etiology

As stated above, myocardial infarction is closely associated with coronary artery disease. INTERHEART is an international multi-center case-control study which delineated the following modifiable risk factors for coronary artery disease:

- Smoking
- Abnormal lipid profile/blood apolipoprotein (raised ApoB/ApoA1)
- Hypertension
- Diabetes mellitus
- Abdominal obesity (waist/hip ratio) (greater than 0.90 for males and greater than 0.85 for females)
- Psychosocial factors such as depression, loss of the locus of control, global stress, financial stress, and life events including marital separation, job loss, and family conflicts
- Lack of daily consumption of fruits or vegetables
- Lack of physical activity
- Alcohol consumption (weaker association, protective)

The INTERHEART study showed that all the above risk factors were significantly associated with acute myocardial infarction except for alcohol consumption, which showed a weaker association. Smoking and abnormal apolipoprotein ratio showed the strongest association with acute myocardial infarction. The increased risk associated with diabetes and hypertension were found to be higher in women, and the protective effect of exercise and alcohol was also found to be higher in women.

Other risk factors include a moderately high level of plasma homocysteine, which is an independent risk factor of MI. Elevated plasma homocysteine is potentially modifiable and can be treated with folic acid, vitamin B_6, and vitamin B_{12}. Some non-modifiable risk factors for myocardial infarction include advanced age, male gender (males tend to have myocardial infarction earlier in life), genetics (there is an increased risk of MI if a first-degree relative has a history of cardiovascular events before the age of 50). The role of genetic loci that increase the risk for MI is under active investigation [4-6].

Epidemiology

Heart attacks, also known as myocardial infarctions, are a leading cause of death and disability worldwide. Cardiovascular diseases (CVDs), which include heart attacks, are the leading cause of death globally, accounting for 17.9 million deaths in 2019. About 85% of these CVD deaths are due to heart attacks and strokes, according to the World Health Organization (WHO). Heart attacks are more common in men than women, and the risk increases with age. However, recent studies indicate a decrease in the crude incidence rate of acute myocardial infarction, according to the National Institutes of Health (NIH).

Epidemiological aspects:

- **Global Burden:** CVDs, including heart attacks, are a significant global health problem, particularly in low- and middle-income countries, where over three-quarters of CVD deaths occur.

- **Age and Sex:** The incidence of heart attacks increases with age, and men typically have a higher risk than women, although the sex ratio narrows with age.
- **Risk Factors:** Lifestyle factors like unhealthy diet, physical inactivity, tobacco use, and alcohol abuse contribute significantly to heart attack risk.
- **Modifiable Factors:** Many CVDs, including heart attacks, can be prevented by addressing modifiable risk factors like tobacco use, unhealthy diet, and lack of physical activity.
- **Regional Variations:** There are significant regional variations in heart attack incidence and mortality, with some countries experiencing a rise-and-fall pattern, while others are experiencing a rising epidemic [7-9].

Symptoms

Symptoms of a heart attack vary. Some people have mild symptoms. Others have severe symptoms. Some people have no symptoms. Common heart attack symptoms include:

- Chest pain that may feel like pressure, tightness, pain, squeezing or aching
- Pain or discomfort that spreads to the shoulder, arm, back, neck, jaw, teeth or sometimes the upper belly
- Cold sweat
- Fatigue
- Heartburn or indigestion
- Lightheadedness or sudden dizziness
- Nausea
- Shortness of breath

Women may have atypical symptoms such as brief or sharp pain felt in the neck, arm or back. Sometimes, the first symptom sign of a heart attack is sudden cardiac arrest. Some heart attacks strike suddenly. But many people have warning signs and symptoms hours, days or weeks in advance. Chest pain or pressure (angina) that keeps happening and doesn't go away with rest may be an early warning sign. Angina is caused by a temporary decrease in blood flow to the heart [2,10].

Causes

Coronary artery disease causes most heart attacks. In coronary artery disease, one or more of the hearts (coronary) arteries are blocked. This is usually due to cholesterol-containing deposits called plaques. Plaques can narrow the arteries, reducing blood flow to the heart. If a plaque breaks open, it can cause a blood clot in the heart. A heart attack may be caused by a complete or partial blockage of a heart (coronary) artery. One way to classify heart attacks is whether an electrocardiogram (ECG or EKG) shows some specific changes (ST elevation) that require emergency invasive treatment. Your health care provider may use ECG results to describe these types of heart attacks.

- **An acute complete blockage** of a medium or large heart artery usually means you've had an ST elevation myocardial infarction (STEMI).
- **A partial blockage** often means you've had a non-ST elevation myocardial infarction (NSTEMI). However, some people with NSTEMI have a total blockage. Not all heart attacks are caused by blocked arteries. Other causes include:
- **Coronary artery spasm:** This is a severe squeezing of a blood vessel that's not blocked. The artery generally has cholesterol plaques or there is early hardening of the vessel due to smoking or other risk factors. Other names for coronary artery spasms are Prinz metal's angina, vasospastic angina or variant angina.
- **Certain infections:** COVID-19 and other viral infections may cause damage to the heart muscle.
- **Spontaneous coronary artery dissection (SCAD):** This life-threatening condition is caused by a tear inside a heart artery [3,11,12].

Risk factors

Heart attack risk factors include:

- **Age:** Men age 45 and older and women age 55 and older are more likely to have a heart attack than are younger men and women.
- **Tobacco use:** This includes smoking and long-term exposure to secondhand smoke. If you smoke, quit.
- **High blood pressure:** Over time, high blood pressure can damage arteries that lead to the heart. High blood pressure that occurs with other conditions, such as obesity, high cholesterol or diabetes, increases the risk even more.
- **High cholesterol or triglycerides:** A high level of low-density lipoprotein (LDL) cholesterol (the "bad" cholesterol) is most likely to narrow arteries. A high level of certain blood fats called triglycerides also increases heart attack risk. Your heart attack risk may drop if levels of high-density lipoprotein (HDL) cholesterol - the "good" cholesterol - are in the standard range.
- **Obesity:** Obesity is linked with high blood pressure, diabetes, high levels of triglycerides and bad cholesterol, and low levels of good cholesterol.
- **Diabetes:** Blood sugar rises when the body doesn't make a hormone called insulin or can't use

it correctly. High blood sugar increases the risk of a heart attack.

- **Metabolic syndrome:** This is a combination of at least three of the following things: enlarged waist (central obesity), high blood pressure, low good cholesterol, high triglycerides and high blood sugar. Having metabolic syndrome makes you twice as likely to develop heart disease than if you don't have it.
- **Family history of heart attacks:** If a brother, sister, parent or grandparent had an early heart attack (by age 55 for males and by age 65 for females), you might be at increased risk.
- **Not enough exercise:** A lack of physical activity (sedentary lifestyle) is linked to a higher risk of heart attacks. Regular exercise improves heart health.
- **Unhealthy diet:** A diet high in sugars, animal fats, processed foods, trans fats and salt increases the risk of heart attacks. Eat plenty of fruits, vegetables, fiber and healthy oils.
- **Stress:** Emotional stress, such as extreme anger, may increase the risk of a heart attack.
- **Illegal drug use:** Cocaine and amphetamines are stimulants. They can trigger a coronary artery spasm that can cause a heart attack.
- **A history of preeclampsia:** This condition causes high blood pressure during pregnancy. It increases the lifetime risk of heart disease.
- **An autoimmune condition:** Having a condition such as rheumatoid arthritis or lupus can increase the risk of a heart attack.
- **Lifestyle:** lifestyle is linked to a higher risk of heart attacks. Regular exercise improves heart health.
- **Unhealthy diet:** A diet high in sugars, animal fats, processed foods, trans fats and salt increases the risk of heart attacks. Eat plenty of fruits, vegetables, fiber and healthy oils.
- **Stress:** Emotional stress, such as extreme anger, may increase the risk of a heart attack.
- **Illegal drug use:** Cocaine and amphetamines are stimulants. They can trigger a coronary artery spasm that can cause a heart attack.
- **A history of preeclampsia:** This condition causes high blood pressure during pregnancy. It increases the lifetime risk of heart disease.
- **An autoimmune condition:** Having a condition such as rheumatoid arthritis or lupus can increase the risk of a heart attack [13,14].

Diagnosis

Ideally, a health care provider should screen you during regular checkups for risk factors that can lead to a heart attack. A heart attack is often diagnosed in an emergency setting. If you've had or are having a heart attack, care providers will take immediate steps to treat your condition. If you're able to answer questions, you may be asked about your symptoms and medical history. Diagnosis of a heart attack includes checking blood pressure, pulse and temperature. Tests are done to see how the heart is beating and to check overall heart health.

Tests: Tests to diagnose a heart attack include;

Electrocardiogram (ECG or EKG): This first test done to diagnose a heart attack records electrical signals as they travel through the heart. Sticky patches (electrodes) are attached to the chest and sometimes the arms and legs. Signals are recorded as waves displayed on a monitor or printed on paper. An ECG can show if you are having or have had a heart attack.

Blood tests: Certain heart proteins slowly leak into the blood after heart damage from a heart attack. Blood tests can be done to check for these proteins (cardiac markers).

Chest X-ray: A chest X-ray shows the condition and size of the heart and lungs.

Echocardiogram: Sound waves (ultrasound) create images of the moving heart. This test can show how blood moves through the heart and heart valves. An echocardiogram can help identify whether an area of your heart has been damaged.

Coronary catheterization (angiogram): A long, thin tube (catheter) is inserted into an artery, usually in the leg, and guided to the heart. Dye flows through the catheter to help the arteries show up more clearly on images made during the test.

Cardiac Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI): These tests create images of the heart and chest. Cardiac CT scans use X-rays. Cardiac MRI uses a magnetic field and radio waves to create images of your heart. For both tests, you usually lie on a table that slides inside a long tubelike machine.

Each test can be used to diagnose heart problems. They can help show the severity of heart damage [1,4,15].

Treatment

Each minute after a heart attack, more heart tissue is damaged or dies. Urgent treatment is needed to fix blood flow and restore oxygen levels. Oxygen is given immediately. Specific heart attack treatment

depends on whether there's a partial or complete blockage of blood flow.

Medications: Medications to treat a heart attack might include:

Aspirin: Aspirin reduces blood clotting. It helps keep blood moving through a narrowed artery. If you called 911 or your local emergency number, you may be told to chew aspirin. Emergency medical providers may give you aspirin immediately.

Clot busters (thrombolytics or fibrinolytics): These drugs help break up any blood clots that are blocking blood flow to the heart. The earlier a thrombolytic drug is given after a heart attack, the less the heart is damaged and the greater the chance of survival.

Other blood-thinning medicines: A medicine called heparin may be given by an intravenous (IV) injection. Heparin makes the blood less sticky and less likely to form clots.

Nitroglycerin: This medication widens the blood vessels. It helps improve blood flow to the heart. Nitroglycerin is used to treat sudden chest pain (angina). It's given as a pill under the tongue, as a pill to swallow or as an injection.

Morphine: This medicine is given to relieve chest pain that doesn't go away with nitroglycerin.

Beta blockers: These medications slow the heartbeat and decrease blood pressure. Beta blockers can limit the amount of heart muscle damage and prevent future heart attacks. They are given to most people who are having a heart attack.

Blood pressure medicines called angiotensin-converting enzyme (ACE) inhibitors: These drugs lower blood pressure and reduce stress on the heart.

Statins: These drugs help lower unhealthy cholesterol levels. Too much bad (low-density lipoprotein, or LDL) cholesterol can clog arteries.

Surgical and other procedures: If you've had a heart attack, a surgery or procedure may be done to open a blocked artery. Surgeries and procedures to treat a heart attack include:

Coronary angioplasty and stenting: This procedure is done to open clogged heart arteries. It may also be called percutaneous coronary intervention (PCI). If you've had a heart attack, this procedure is often done during a procedure to find blockages (cardiac catheterization). During angioplasty, a heart doctor (cardiologist) guides a thin, flexible tube (catheter) to the narrowed part of the heart artery. A tiny balloon is inflated to help widen the blocked artery and improve blood flow. A small wire mesh tube (stent) may be placed in the artery during angioplasty. The stent helps keep the artery open. It lowers the risk of the artery narrowing again. Some stents are coated with a medication that helps keep the arteries open.

Coronary artery bypass grafting (CABG): This is open-heart surgery. A surgeon takes a healthy blood vessel from another part of the body to create a new path for blood in the heart. The blood then goes around the blocked or narrowed coronary artery. It may be done as an emergency surgery at the time of a heart attack. Sometimes it's done a few days later, after the heart has recovered a bit.

Cardiac rehabilitation: Cardiac rehabilitation is a personalized exercise and education program that teaches ways to improve heart health after heart surgery. It focuses on exercise, a heart-healthy diet, stress management and a gradual return to usual activities. Most hospitals offer cardiac rehabilitation starting in the hospital. The program typically continues for a few weeks or months after you return home. People who attend cardiac rehab after a heart attack generally live longer and are less likely to have another heart attack or complications from the heart attack [16-18].

Figure 3: Heart attack Rehabilitation

Prevention

In general, there are many things you can do that may prevent a heart attack. However, there are some factors you can't change - especially your family history - that can still lead to a heart attack despite best efforts. Still, reducing your risk can postpone when you have a heart attack and reduce the severity if you do have one. Preventing a heart attack involves adopting a heart-healthy lifestyle and managing risk factors.

Healthy Diet:

- Eat more: Fruits, vegetables, whole grains, legumes, and lean protein (like fish or poultry).
- Limit: Saturated fats, trans fats, cholesterol, salt (sodium), and added sugars.
- Choose: Heart-healthy fats like olive oil, nuts, and seeds.

Regular Physical Activity:

- Aim for at least 150 minutes of moderate aerobic activity (like brisk walking) or 75 minutes of vigorous activity (like running) per week.
- Include muscle-strengthening exercises 2 or more days a week.

Maintain a Healthy Weight:

- Being overweight increases the risk of heart disease. Even a 5–10% reduction in body weight can lower risk.

Control Blood Pressure:

- Monitor your blood pressure regularly.
- Reduce salt intake, exercise, and take prescribed medication if necessary [17-19].

CONCLUSION

Heart is a muscular organ which pumps blood through the blood vessels of the circulatory system. But many time cholesterol deposition led to severe effect in human heart. During heart attack, symptoms are found typically last 30 min and are not relieved by rest or oral medication. Coronary heart disease, heart failure and atrial fibrillation have following agents to treat heart disease but valvular disease of heart can be treated up with stents and balloons.

Heart attack, or myocardial infarction, remains a leading cause of morbidity and mortality worldwide. It results primarily from the blockage of coronary arteries, leading to insufficient blood supply to the heart muscle. Risk factors such as hypertension, high cholesterol, smoking, diabetes, sedentary lifestyle, and poor diet significantly contribute to its occurrence. Early diagnosis, timely medical intervention, and lifestyle modifications are critical for reducing complications and improving patient outcomes. Advances in pharmacological therapies, surgical interventions, and preventive cardiology have greatly enhanced the management of heart attacks. However, public awareness and proactive prevention remain essential to combat this life-threatening condition. A comprehensive approach that includes education, lifestyle changes, and regular health check-ups is vital in reducing the global burden of heart disease.

Conflicts of interest

None declared.

REFERENCES

[1] Frangogiannis NG. Pathophysiology of Myocardial Infarction. Compr Physiol. 2015; 5(4):1841-1875.

[2] Reimer KA, Jennings RB, Tatum AH. Pathobiology of acute myocardial ischemia: metabolic, functional and ultrastructural studies. Am J Cardiol. 1983; 52(2):72A-81A.

[3] Apple FS, Sandoval Y, Jaffe AS, Ordonez-Llanos J. IFCC Task Force on Clinical Applications of Cardiac Bio-Markers. Cardiac Troponin Assays: Guide to Understanding Analytical Characteristics and Their Impact on Clinical Care. Clin Chem. 2017; 63(1):73-81.

[4] Stampfer MJ, Malinow MR, Willett WC, Newcomer LM, Upson B, Ullmann D, Tishler PV, Hennekens CH. A prospective study of plasma homocyst(e)ine and risk of myocardial infarction in US physicians. JAMA. 1992; 268(7):877-881.

[5] Nielsen M, Andersson C, Gerds TA, Andersen PK, Jensen TB, Køber L, Gislason G, Torp-Pedersen C. Familial clustering of myocardial infarction in first-degree relatives: a nationwide study. Eur Heart J. 2013; 34(16):1198-1203.

[6] Mendis S, Thygesen K, Kuulasmaa K, Giampaoli S, Mähönen M, Ngu Blackett K, Lisheng L., Writing group on behalf of the participating experts of the WHO consultation for revision of WHO definition of myocardial infarction. World Health Organization definition of myocardial infarction: 2008-09 revision. Int J Epidemiol. 2011; 40(1):139-146.

[7] Malik MA, Alam Khan S, Safdar S, Taseer IU. Chest Pain as a presenting complaint in patients with acute myocardial infarction (AMI). Pak J Med Sci. 2013; 29(2):565-8.

[8] Weil BR, Suzuki G, Young RF, Iyer V, Canty JM. Troponin Release and Reversible Left Ventricular Dysfunction After Transient Pressure Overload. J Am Coll Cardiol. 2018; 71(25):2906-2916.

[9] Thygesen K, Mair J, Giannitsis E, Mueller C, Lindahl B, Blankenberg S, Huber K, Plebani M, Biasucci LM, Tubaro M, Collinson P, Venge P, Hasin Y, Galvani M, Koenig W, Hamm C, Alpert JS, Katus H, Jaffe AS., Study Group on Biomarkers in Cardiology of ESC Working Group on Acute Cardiac Care. How to use high-sensitivity cardiac troponins in acute cardiac care. Eur Heart J. 2012; 33(18):2252-7.

[10] Samani NJ, Burton P, Mangino M, Ball SG, Balmforth AJ, Barrett J, Bishop T, Hall A., BHF Family Heart Study Research Group. A genome wide linkage study of 1,933 families affected by premature coronary artery disease: The British Heart Foundation (BHF) Family Heart Study. Am J Hum Genet. 2005; 77(6):1011-20.

[11] Bonin M, Mewton N, Roubille F, Morel O, Cayla G, Angoulvant D, Elbaz M, Claeys MJ, Garcia-Dorado D, Giraud C, Rioufol G, Jossan C, Ovize M, Guerin P; CIRCUS Study Investigators. Effect and Safety of Morphine Use in Acute Anterior ST-Segment Elevation Myocardial Infarction. J Am Heart Assoc. 2018; 7(4):e006833.

[12] Minella M, Rognoni G, Fortina A, Brustia A, Rossi P, Aquili C. [Automatic method for the evaluation of the extent of myocardial infarct from the serum of CPK curve]. Minerva Med. 1979; 70:325–331.

[13] Ezaki H, Matsushita S, Ohkawa S, Kuramoto K. Comparison of enzymatic, anatomic and electrocardiographic estimates of myocardial infarct size in man. Jpn Circ J. 1987; 51:374–382.

[14] Patrono C, Morais J, Baigent C, Collet JP, Fitzgerald D, Halvorsen S, Rocca B, Siegbahn A, Storey RF, Vilahur G. Antiplatelet Agents for the Treatment and Prevention of Coronary Atherothrombosis. J Am Coll Cardiol. 2017; 70(14):1760-1776.

[15] Tanaka K, Kersten JR, Riess ML. Opioid-induced cardioprotection. Curr Pharm Des. 2014; 20:5696–5705.

[16] D. Mpanya, T. Celik, E. Klug, H. Ntsinjana. Machine learning and statistical methods for predicting mortality in heart failure. Heart Fail. Rev. 2024; 26(3):545–552.

[17] Rajesh Kumar Yadav, Shweta Singh, Priya Chaurasiya, Kavita, Sadhana and Neda Fatima. A Review Literature on Broad Existence of Heart Attack. International Journal of Current Research. 2018; 11(10):7871-7874.

[18] Abdo Ahmed AA, Mohammed Al-Shami A, Jamshed S, Fata Nahas AR, Mohamed Ibrahim MI. Public Awareness of and Action towards Heart Attack Symptoms: An Exploratory Study. International Journal of Environmental Research and Public Health. 2020; 17(23):8982.

[19] Greenlund KJ, Keenan NL, Giles WH, Zheng ZJ, Neff LJ, Croft JB, Mensah GA. Public recognition of major signs and symptoms of heart attack: Seventeen states and the US Virgin Islands. 2001. Am. Heart J. 2004; 147:1010–1016.