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The Rising Burden of Heart Attacks: Causes, Trends, and Prevention Strategies

Satish Kumar Sarankar[1,*], Sushma Somkuwar[2]

Abstract

Heart attacks, or myocardial infarctions, remain a leading cause of morbidity and mortality worldwide, with their incidence rising steadily across diverse populations. This review explores the increasing prevalence of heart attacks, emphasizing traditional risk factors, such as poor diet, physical inactivity, smoking, and medical conditions like hypertension, diabetes, and hyperlipidemia. It also highlights emerging risk factors, such as chronic infections, pollutants, substance abuse, and the lasting cardiovascular effects of COVID-19. Alarming trends show rising heart attack rates among younger adults, driven by lifestyle, genetics, and missed warning signs. Gender-based differences in symptoms and outcomes call for tailored care. The review emphasizes prevention and public health strategies, noting that lifestyle changes – like healthy eating, regular exercise, and quitting smoking – significantly reduce heart attack risk. Public awareness campaigns, leveraging mass media and digital platforms, can enhance symptom recognition and encourage timely medical intervention. Policy measures, like clearer nutrition labels, taxes on unhealthy foods, and stricter anti-tobacco laws, can help reduce cardiovascular risks. Urban planning that supports clean energy, lowers pollution, and encourages physical activity also promotes heart health. Despite progress, challenges remain – socioeconomic gaps, limited healthcare access, and behavioural resistance hinder prevention. Research gaps persist in understanding the impact of emerging risk factors like chronic infections, stimulants, and environmental toxins on atherosclerosis. The future of cardiovascular disease management lies in the development of advanced diagnostic tools, such as AI-assisted imaging and genetic risk profiling, which can facilitate early detection and personalized treatment strategies. Ongoing research into therapies, like PCSK9 inhibitors for hyperlipidaemia and SGLT2 inhibitors for diabetes, offers hope for better long-term cardiovascular outcomes. The rise in heart attack cases highlights the need for a comprehensive approach involving prevention, early intervention, and policy reform. Public health efforts should promote heart-healthy habits, expand access to care, and address social disparities. Combining technology with community strategies can help reduce heart disease's global impact and improve cardiovascular health for all.

Keywords: Cardiovascular disease, risk factors, heart attack prevention, public health interventions, lifestyle modifications, hypertension, diabetes, COVID-19

***Author for Correspondence**
Satish Kumar Sarankar
E-mail: Satish.sarankar@gmail.com

[1]Professor & Principal, Department of Pharmacy, Mansarovar Global University, Sehore, Madhya Pradesh, India.
[2].Associate Professor, Department of Pharmacy, School of Pharmacy, LNCT University, Bhopal, Madhya Pradesh, India.

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INTRODUCTION

Heart attacks, clinically known as myocardial infarctions (MI), are among the most prevalent causes of mortality and morbidity worldwide. Historically, heart attacks were predominantly observed in older adults and were often associated with pre-existing health conditions. However, recent data reveal an alarming rise in their occurrence across all age groups, including younger populations, making this condition a growing global public health challenge. The World Health Organization (WHO) reports that cardiovascular diseases (CVDs), such as heart attacks, lead to

around 17.9 million deaths each year – making up about 32% of all deaths worldwide [1–2]. A large share of these fatalities is caused by ischemic heart disease, which is the main trigger for heart attacks. What's more, the impact isn't the same everywhere – low- and middle-income countries are hit hardest, largely because they often lack access to proper healthcare and effective prevention strategies.

Several factors have contributed to the rising incidence of heart attacks. These include lifestyle changes driven by urbanization, such as reduced physical activity, unhealthy diets rich in processed foods, and increased exposure to stress. In addition, medical conditions, like hypertension, diabetes, and obesity – often referred to as the "modern lifestyle diseases", have become more prevalent, further elevating cardiovascular risk. Recent studies have started to shed more light on how environmental factors – like air pollution and workplace hazards – contribute to heart problems. On top of that, the COVID-19 pandemic has significantly affected heart health [3]. While the virus itself can directly impact the heart, the pandemic also made things worse indirectly by reducing physical activity, delaying medical care, and increasing stress levels. This review aims to give a clear and thorough look at the various factors driving the rise in heart attack cases. By examining traditional and emerging risk factors, gender and age-related variations, and the role of environmental and socio-economic influences, this article aims to highlight critical areas for intervention. Additionally, it will propose evidence-based strategies to reduce the burden of this life-threatening condition.

EPIDEMIOLOGY OF HEART ATTACKS

Heart attacks, or myocardial infarctions, have demonstrated shifting epidemiological patterns over the past few decades. While they were once predominantly associated with high-income countries, the burden has increasingly shifted toward low- and middle-income nations (LMICs), with unique variations in age, gender, and socio-economic impact [4].

Statistical Trends in Developed vs. Developing Countries

In high-income countries, public health campaigns, early detection, and advanced medical care have contributed to a decline in heart attack mortality rates. For instance, in the United States and parts of Europe, heart attack deaths have decreased by approximately 20–30% over the past decade, thanks to improved healthcare access, widespread use of statins, and lifestyle modifications. However, the absolute number of cases remains high due to aging populations. Conversely, in developing nations, the prevalence and mortality rates of heart attacks have been rising significantly. This trend is attributed to urbanization, lifestyle shifts, and limited healthcare infrastructure [5]. According to the Global Burden of Disease study, over 80% of cardiovascular disease-related deaths now occur in LMICs, with South Asia, Sub-Saharan Africa, and parts of Latin America showing particularly sharp increases. In these regions, delayed diagnosis and inadequate treatment often result in higher mortality rates and long-term disabilities.

Age and Gender Distribution

Heart attacks traditionally affected older adults, with most cases occurring in individuals aged 55 and above. However, more and more young people – especially in developing countries – are being diagnosed with heart-related conditions. This shift is largely due to the earlier appearance of risk factors, such as obesity, diabetes, and smoking [6]. Gender differences also play a critical role in the epidemiology of heart attacks. Men are generally at higher risk of developing heart attacks earlier in life, with studies indicating that men under 50 are twice as likely as women to suffer from a myocardial infarction. However, post-menopausal women experience a sharp increase in risk, likely due to hormonal changes and the loss of protective effects from estrogen. Sadly, women often experience less typical symptoms, which can lead to delays in diagnosis and treatment – ultimately resulting in worse outcomes [7].

Emerging Patterns in Younger Populations

One of the most alarming trends in recent years is the increasing incidence of heart attacks among individuals under 40 years of age [8–9]. This shift is particularly evident in urban populations and is often driven by:

- *Lifestyle Factors:* Sedentary behavior, high consumption of processed foods, and smoking or vaping have significantly impacted cardiovascular health in younger individuals.
- *Psychosocial Stress:* Increased work-related stress, financial pressures, and lack of work-life balance are contributing to a surge in cases among young adults.
- *Substance Use:* The growing use of recreational drugs, like cocaine and amphetamines, has been increasingly connected to heart attacks, especially among younger people.
- *Undiagnosed Conditions:* Younger individuals often remain unaware of underlying risk factors, like hypertension, dyslipidemia, or genetic predispositions, which can lead to a first heart attack without warning.

MAJOR CAUSES OF HEART ATTACKS

The rising number of heart attacks is the result of a complex mix of factors – some that people can change, like lifestyle habits, and others that they can't, such as age or genetics. These causes can be broadly categorized into lifestyle, medical, psychological, and environmental determinants, each contributing uniquely to cardiovascular risk.

Lifestyle Factors

- *Poor Diet (High Fat, Sugar, and Salt Intake):* Diets high in saturated fats, trans fats, and added sugars contribute significantly to the development of obesity, hypertension, and dyslipidemia, all of which are major risk factors for heart attacks. Excessive salt intake is another critical factor, as it directly raises blood pressure-a leading cause of cardiovascular disease. The World Health Organization (WHO) advises keeping salt intake under 5 grams a day, but in many parts of the world, people consume much more than that. On top of this, diets often lack enough nutrient-rich foods like fruits, vegetables, whole grains, and omega-3 fatty acids. This combination increases the risk of heart disease, highlighting just how important a balanced and healthy diet is in preventing heart attacks [10].
- *Sedentary Lifestyle and Lack of Physical Activity:* Physical inactivity is a major contributor to obesity and metabolic syndrome, both of which elevate the risk of myocardial infarction. Regular exercise improves cardiac function, lowers blood pressure, and reduces LDL cholesterol levels, yet many individuals fail to meet recommended physical activity guidelines [11].
- *Smoking and Alcohol Consumption:* Smoking accelerates atherosclerosis, damages blood vessels, and increases clot formation, significantly raising the risk of heart attacks. Excessive alcohol consumption contributes to hypertension, arrhythmias, and cardiomyopathy, although moderate alcohol intake may have some protective effects in certain populations [12].

Medical and Genetic Risk Factors

- *Hypertension and Hyperlipidemia:* High blood pressure exerts excessive strain on the heart, leading to hypertrophy and eventual failure. High levels of LDL (bad) cholesterol and low levels of HDL (good) cholesterol can lead to the buildup of plaque in the coronary arteries, which is one of the main causes of heart attacks [13].
- *Diabetes Mellitus:* Diabetic individuals are at a 2–4 times higher risk of developing heart attacks due to chronic hyperglycemia, which damages blood vessels and promotes atherosclerosis. Insulin resistance and associated metabolic abnormalities further worsen cardiovascular outcomes [14].
- *Family History of Cardiovascular Diseases:* A positive family history is a significant risk factor, often linked to genetic predispositions and shared environmental exposures. Genetic mutations affecting lipid metabolism, coagulation pathways, and inflammatory responses have been implicated [15].

Psychological and Social Factors

- *Stress and Depression:* Chronic stress elevates cortisol levels, contributing to hypertension, insulin resistance, and endothelial dysfunction. Depression is independently associated with heart attacks, potentially due to its effects on lifestyle choices, inflammation, and autonomic dysregulation [16].

- *Socioeconomic Disparities and Access to Healthcare:* Lower socioeconomic status is linked to higher cardiovascular risk due to limited access to healthy food, preventive care, and timely medical interventions. Health inequalities disproportionately affect marginalized communities, amplifying their vulnerability to heart attacks [17].

Environmental and Occupational Factors

- *Air Pollution and Exposure to Harmful Chemicals:* Tiny airborne particles, like PM2.5, along with other pollutants, have been closely linked to a higher risk of heart-related illnesses and deaths. Long-term exposure to air pollution induces systemic inflammation, oxidative stress, and vascular dysfunction [18].
- *Work-Related Stress and Irregular Schedules:* High-stress occupations and shift work are known to disrupt circadian rhythms, leading to an increased incidence of hypertension and myocardial infarction. The strain of prolonged work hours and insufficient rest further exacerbates the risk of adverse cardiovascular events by elevating stress levels and impairing recovery. This multifaceted understanding of the causes of heart attacks emphasizes the urgent need for comprehensive prevention strategies that address both individual behaviors, such as stress management and lifestyle adjustments, and systemic factors, including workplace policies and public health interventions [19].

EMERGING CAUSES AND TRENDS

In addition to well-established risk factors, emerging causes and trends have been identified that further contribute to the rising incidence of heart attacks. These include the roles of infections, systemic inflammation, and external factors, such as pandemics and substance use.

Role of Infections and Inflammation

- *Chronic Infections:* Chronic infections, such as periodontal disease, Helicobacter pylori, and hepatitis C, have been linked to systemic inflammation, which accelerates the progression of atherosclerosis. Ongoing inflammation in the body can play a role in the formation of plaque in the arteries, raising the risk of heart attacks. Some infections – like those caused by Chlamydia pneumoniae and Cytomegalovirus – have also been linked to making these plaques more unstable, which could trigger sudden heart problems [20]. Still, their exact impact on heart disease isn't fully understood, pointing to the need for more research into how infections might influence cardiovascular health.
- *Inflammation and Cardiovascular Risk:* Systemic inflammation – often indicated by high levels of C-reactive protein (CRP) – plays a key role in the development and worsening of atherosclerosis. When inflammation persists, it can lead to plaque buildup in the arteries, raising the risk of heart attacks and other heart-related issues. Autoimmune diseases, like rheumatoid arthritis and lupus, also increase cardiovascular risk, mainly due to long-term inflammation and damage to blood vessels [21]. These factors highlight just how important it is to manage inflammation to protect heart health.

Impact of COVID-19 on Cardiovascular Health

The COVID-19 pandemic has shed new light on the interplay between viral infections and cardiovascular health:

- *Direct Cardiac Effects of SARS-CoV-2:* The SARS-CoV-2 virus attaches to ACE2 receptors found in the heart, which can cause direct damage to the heart muscle, lead to inflammation (myocarditis), and trigger irregular heart rhythms. This interference with normal heart function raises the chances of serious cardiovascular issues. Autopsy studies of COVID-19 patients have further revealed the presence of microvascular thrombi and inflammatory infiltrates in cardiac tissue, highlighting the virus's significant impact on the cardiovascular system and its potential role in triggering heart attacks [22].

- *Thrombotic and Inflammatory Complications:* COVID-19 induces a hypercoagulable state, significantly increasing the risk of acute coronary syndromes (ACS) by promoting excessive blood clot formation. Additionally, the severe inflammatory response triggered by the virus, known as a cytokine storm, exacerbates endothelial dysfunction and weakens arterial plaques, making them more prone to rupture. This combination of heightened coagulation and systemic inflammation creates a dangerous environment for cardiovascular health, increasing the likelihood of heart attacks in affected individuals [23].
- *Post-Acute Sequelae (Long COVID):* Individuals recovering from COVID-19 often experience lingering cardiovascular symptoms, such as chest pain, palpitations, and exercise intolerance, indicating potential long-term effects on heart health. Emerging research suggests that even those who had mild initial infections face an increased risk of myocardial infarction in the months or years following recovery. These findings highlight the need for ongoing cardiovascular monitoring and preventive care in post-COVID-19 patients to mitigate long-term heart disease risks [24].

Use of Recreational Drugs and New-Age Stimulants

- *Cocaine and Amphetamines:* Cocaine use significantly increases the risk of acute myocardial infarction (AMI) by inducing coronary vasospasm and enhancing platelet aggregation, which can trigger a heart attack even in individuals without preexisting atherosclerosis. Similarly, amphetamines-whether used recreationally or as part of certain prescription medications-exacerbate hypertension and tachycardia, placing excessive stress on the heart and leading to ischemia [25].
- *Vaping and Synthetic Cannabinoids:* Emerging evidence indicates that e-cigarettes (vaping) contribute to endothelial dysfunction and oxidative stress, both of which increase cardiovascular risk and may accelerate the development of heart disease. Additionally, synthetic cannabinoids, often marketed as *legal highs*, have been associated with severe cardiac complications, including tachyarrhythmias and sudden cardiac events [26].
- *Energy Drinks and Stimulants:* Excessive consumption of energy drinks, especially when combined with alcohol, can trigger acute cardiovascular effects, such as arrhythmias and hypertension, increasing the risk of heart complications. Similarly, the unregulated use of over-the-counter weight-loss pills and supplements containing stimulants poses significant dangers, as these substances can elevate heart rate, blood pressure, and overall cardiac stress. The widespread availability and misuse of these products highlight the need for greater awareness and regulation to prevent adverse cardiovascular outcomes [27].

GENDER AND AGE-RELATED DIFFERENCES

Heart attacks present differently across genders and age groups, with significant variations in symptoms, diagnosis, outcomes, and underlying causes. These differences are crucial for developing targeted prevention, diagnostic, and treatment strategies.

Differences in Symptoms, Diagnosis, and Outcomes Between Men and Women

- *Symptoms:* Men typically experience "classic" heart attack symptoms, including chest pain or discomfort, radiating pain to the arm, jaw, or back, and shortness of breath. In contrast, women are more likely to present with atypical symptoms, such as nausea, fatigue, dizziness, and abdominal discomfort, which can lead to delayed recognition and diagnosis [28]. This difference in symptom presentation underscores the need for greater awareness among both healthcare providers and the public to ensure timely intervention and improved outcomes for women experiencing heart attacks.
- *Diagnosis:* Women are less likely to receive a prompt diagnosis for heart attacks due to their atypical symptom presentation, which often leads to underdiagnosis, or misdiagnosis compared to men with similar risk factors. Studies suggest that standard diagnostic tools, such as electrocardiograms (ECG) and troponin tests, may have different predictive values in women,

further complicating timely identification and treatment [29]. These disparities highlight the need for improved awareness and gender-specific approaches in cardiovascular diagnostics and care.

- *Outcomes:* Women, particularly younger women, tend to experience worse outcomes after heart attacks, with higher mortality and complication rates. These disparities are largely attributed to delayed treatment and the underutilization of evidence-based therapies. In contrast, men generally have higher rates of recurrent heart attacks but tend to respond more consistently to interventions, such as angioplasty and stenting. These differences emphasize the need for more tailored treatment approaches and improved access to timely, effective care for women with cardiovascular disease [30].
- *Biological and Hormonal Factors:* In premenopausal women, estrogen plays a protective role against cardiovascular diseases by improving lipid profiles and enhancing endothelial function, which helps maintain healthy blood vessels. However, after menopause, the loss of estrogen leads to a sharp increase in cardiovascular risk, often closing the gap between men and women. This hormonal shift underscores the importance of proactive heart health management in postmenopausal women, including lifestyle modifications and regular cardiovascular screenings [31].

Increasing Prevalence in Younger Adults: Lifestyle or Genetic Predisposition?

- *Lifestyle-Driven Factors:* The rising incidence of heart attacks among young adults is closely linked to lifestyle factors, such as poor diet, physical inactivity, substance use, and chronic stress. Many young individuals consume diets high in processed foods, sugars, and unhealthy fats, leading to early-onset obesity and metabolic syndrome, both of which significantly increase cardiovascular risk. Additionally, sedentary lifestyles, exacerbated by prolonged screen time and urban living, have contributed to declining cardiovascular fitness. Substance use, including recreational drugs, like cocaine and amphetamines, as well as vaping, has further negatively impacted heart health. Moreover, high levels of stress and burnout, driven by work-related pressures, financial concerns, and poor work-life balance, have emerged as key contributors to the growing number of heart attacks in younger populations [32].
- *Genetic and Familial Predispositions:* A family history of premature cardiovascular diseases significantly increases risk, particularly in younger individuals with genetic predispositions to conditions like familial hypercholesterolemia. Mutations affecting lipid metabolism, coagulation pathways, and inflammatory responses are more common in young adults presenting with heart attacks.
- *Gender-Specific Trends:* Young men and women face distinct risk factors for heart attacks, influenced by biological and lifestyle differences. In young men, smoking, substance abuse, and untreated conditions, such as hypertension and dyslipidemia are the primary contributors to early-onset cardiovascular disease. In contrast, young women may develop heart attacks due to hormonal and pregnancy-related conditions, such as polycystic ovary syndrome (PCOS), preeclampsia, and gestational hypertension [33]. Additionally, spontaneous coronary artery dissection (SCAD), a rare but serious condition, disproportionately affects younger women and can lead to sudden cardiac events. Recognizing these gender-specific risks is essential for early detection, prevention, and tailored treatment strategies.
- *Diagnostic Challenges in Younger Adults:* Younger adults are less likely to undergo routine cardiovascular screenings, resulting in missed opportunities for early detection and preventive interventions. This lack of screening can allow risk factors, such as hypertension, high cholesterol, and diabetes to go unnoticed until a serious cardiac event occurs. Additionally, physicians may not immediately associate heart attack symptoms with younger patients, leading to delays in diagnosis and treatment. These factors contribute to poorer outcomes and highlight the need for increased awareness, early screening programs, and better risk assessment strategies for younger populations [34].

PREVENTIVE MEASURES AND PUBLIC HEALTH INTERVENTIONS

The increasing prevalence of heart attacks necessitates a comprehensive approach to prevention. This involves empowering individuals through lifestyle changes, leveraging medical advances, conducting awareness campaigns, and implementing policy-level interventions to reduce risk factors and improve overall cardiovascular health.

Lifestyle Modifications

- *Promoting Healthy Diets and Physical Activity:* Adopting a heart-healthy diet and an active lifestyle plays a crucial role in preventing cardiovascular diseases. Encouraging the consumption of nutrient-rich foods, such as fruits, vegetables, whole grains, lean proteins, and healthy fats can significantly reduce heart attack risk. Popular dietary approaches, like the Mediterranean and DASH diets, have been proven to lower blood pressure and improve heart health. Simultaneously, reducing the intake of processed foods, added sugars, trans fats, and excessive salt is essential for maintaining optimal cardiovascular function [35]. Regular physical activity is equally important, with health guidelines recommending at least 150 minutes of moderate-intensity exercise or 75 minutes of high-intensity exercise per week. To support an active lifestyle, initiatives, such as community fitness programs, workplace wellness schemes, and the development of urban recreational spaces can help individuals incorporate physical activity into their daily routines. By promoting healthier eating habits and encouraging regular exercise, public health efforts can significantly reduce the prevalence of heart disease across populations.
- *Smoking Cessation Programs:* Quitting smoking is one of the most effective ways to reduce the risk of heart attacks, with significant cardiovascular benefits appearing within just one year of cessation. To support individuals in quitting, access to counseling services, nicotine replacement therapies (NRTs), and pharmacological aids, such as varenicline or bupropion can greatly improve success rates. Additionally, public awareness campaigns that highlight the severe cardiovascular risks associated with smoking and vaping play a crucial role in encouraging behavior change [36]. By combining medical support with educational initiatives, smoking cessation efforts can have a lasting impact on reducing heart disease and improving overall public health.

Medical Management

- *Importance of Early Screening and Regular Check-Ups:* Regular monitoring of key health indicators, such as blood pressure, cholesterol, and glucose levels, is essential for identifying individuals at high risk of heart attacks before symptoms develop. Early detection allows for timely intervention through lifestyle modifications or medical treatment, reducing the likelihood of severe cardiovascular events. Additionally, non-invasive imaging techniques, such as coronary calcium scoring and carotid intima-media thickness measurement, provide valuable insights into subclinical atherosclerosis. These advanced screening methods help detect early arterial plaque buildup, enabling proactive risk management and personalized prevention strategies [37].
- *Advances in Medications and Surgical Interventions:* Medical advancements play a crucial role in preventing and managing heart disease. Medications, such as statins, antihypertensive drugs, and antiplatelet agents, like aspirin, are essential in reducing cardiovascular risk by controlling cholesterol, blood pressure, and clot formation. Additionally, emerging therapies, including PCSK9 inhibitors for hyperlipidemia and SGLT2 inhibitors for diabetes, have shown significant cardiovascular benefits, offering new treatment options for high-risk patients [38]. For individuals with advanced coronary artery disease, surgical interventions have greatly evolved. Innovations in angioplasty, the development of advanced stent technologies, like bioresorbable stents, and minimally invasive bypass surgery, have improved patient outcomes, reduced complications and enhancing recovery.

Awareness Campaigns

- *Educating the Public about Warning Signs and Symptoms:* Raising awareness about the symptoms of a heart attack is crucial for early recognition and timely intervention. Common warning signs

include chest pain or discomfort, shortness of breath, and radiating pain in the arm, jaw, or back. However, women often experience atypical symptoms, such as nausea, fatigue, dizziness, and abdominal discomfort, which can lead to delays in diagnosis and treatment. Educating the public on how to respond to a suspected heart attack is equally important. Individuals should be encouraged to seek immediate medical attention by calling emergency services rather than attempting to wait out the symptoms [39]. Prompt medical intervention can significantly improve survival rates and reduce complications, emphasizing the need for widespread public education on heart attack recognition and response.

- *Role of Media and Technology in Spreading Awareness:* Leveraging mass media, social media platforms, and mobile health applications is an effective strategy for spreading heart health awareness to a wide audience. Digital tools can provide easily accessible information on cardiovascular risk factors, prevention strategies, and emergency response protocols. Interactive resources, such as online risk calculators and gamified fitness apps, can further engage individuals by making heart health education more personalized and motivating [40]. Additionally, collaborating with influencers and community leaders can help reach diverse demographics, ensuring that heart health messages resonate across different age groups, cultural backgrounds, and social communities. By utilizing these modern communication channels, public health initiatives can drive meaningful behavior change and encourage proactive cardiovascular care.

Policy-Level Changes

- *Regulations on Food and Tobacco Industries:* Implementing policy-level changes is essential in reducing the prevalence of heart disease by promoting healthier choices and discouraging harmful behaviors. Enforcing clear labeling of nutritional content, including warnings for high salt, sugar, and fat levels, can help consumers make informed dietary decisions. Additionally, imposing taxes on sugary drinks and unhealthy snacks serves as a deterrent, encouraging individuals to opt for healthier alternatives. Strengthening anti-tobacco legislation, such as banning flavored tobacco products and restricting aggressive marketing campaigns, is another critical step in reducing smoking-related cardiovascular risks [41].
- *Urban Planning for Better Air Quality and Recreational Spaces:* Creating a heart-healthy environment requires policy initiatives that address both air quality and opportunities for physical activity. Prioritizing clean energy solutions and enforcing stricter emissions regulations can help reduce air pollution, which is a recognized risk factor for cardiovascular disease. Additionally, developing public infrastructure that promotes walking, cycling, and other forms of active transportation encourages physical activity as part of daily life [42]. Ensuring equitable access to parks, playgrounds, and sports facilities, particularly in underserved communities, further supports cardiovascular health by providing safe and accessible spaces for exercise.

CHALLENGES AND FUTURE DIRECTIONS

- *Barriers to Implementing Preventive Strategies:* Despite significant advancements in cardiovascular research and public health initiatives, several barriers hinder the effective implementation of preventive strategies. Limited access to healthcare, particularly in low-income and rural communities, prevents early detection and management of cardiovascular risk factors. Socioeconomic disparities also play a critical role, as individuals with lower incomes often face difficulties in maintaining a heart-healthy diet and accessing regular medical check-ups. Additionally, lifestyle modifications, such as smoking cessation and increased physical activity, require sustained behavioral changes that can be difficult to achieve without strong community and policy support. Public resistance to regulatory measures, such as taxes on unhealthy foods or smoking restrictions, further complicates efforts to curb heart disease [43]. Addressing these barriers requires a multi-faceted approach that includes public education, government policies, and healthcare system improvements to ensure equitable access to preventive care.
- *Gaps in Research and Understanding of Novel Causes:* While traditional risk factors, such as hypertension, diabetes, and high cholesterol are well-documented contributors to heart attacks,

emerging causes remain less understood. The role of infections and chronic inflammation in accelerating atherosclerosis is still being studied, with ongoing research exploring the potential impact of viral and bacterial pathogens on cardiovascular health. Additionally, the long-term effects of COVID-19 on heart function remain an area of active investigation, particularly regarding its association with myocarditis and increased clotting risks. Newer lifestyle-related contributors, such as vaping, synthetic drug use, and prolonged exposure to environmental pollutants, also require further research to establish clear causal links to heart disease [44]. Bridging these knowledge gaps is essential for developing more precise preventive strategies and personalized treatments that address both established and emerging cardiovascular risks.

- *Future Technologies in Diagnostics and Treatment:* Advancements in medical technology continue to shape the future of cardiovascular disease prevention, diagnosis, and treatment. Non-invasive imaging techniques, such as AI-assisted coronary calcium scoring and wearable biosensors, are improving early detection and risk assessment. Precision medicine, which tailors treatments based on genetic and metabolic profiling, is paving the way for more targeted interventions. In the realm of therapeutics, breakthroughs in lipid-lowering drugs, such as PCSK9 inhibitors, and cardioprotective medications, such as SGLT2 inhibitors, are revolutionizing disease management [45]. Additionally, the development of bioresorbable stents, gene-editing therapies, and regenerative medicine holds promise for more effective and long-lasting cardiovascular treatments. As technology continues to evolve, integrating these innovations into mainstream healthcare will be crucial in reducing heart attack incidence and improving long-term patient outcomes.

CONCLUSIONS

Heart attacks continue to be a major global health concern, with their prevalence rising in both developed and developing nations. While well-known risk factors, such as poor diet, physical inactivity, and smoking remain significant, emerging contributors including chronic infections, environmental pollution, and the long-term effects of COVID-19 have further complicated the landscape. Alarmingly, younger populations are increasingly affected, often due to lifestyle-related risks or genetic predisposition. Additionally, gender-based differences in symptoms and diagnosis highlight the need for more tailored healthcare approaches. To effectively combat this growing epidemic, a multi-pronged strategy is essential. Public health initiatives promoting healthy lifestyles, early screenings, and smoking cessation can help reduce risk factors, while advancements in medical treatments and surgical interventions improve patient outcomes. Raising awareness through media and technology ensures timely recognition of heart attack symptoms, enabling prompt medical attention. On a broader scale, policy changes regulating the food and tobacco industries, along with improved urban planning to encourage physical activity, can create healthier environments. By integrating prevention, early intervention, and systemic policy reforms, we can significantly reduce the burden of heart attacks and improve cardiovascular health worldwide. A collective effort involving individuals, healthcare providers, and policymakers is crucial in addressing this pressing public health challenge.

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