

MYOCARDIAL INFARCTION IN YOUNG ADULTS: RISK FACTORS AND TRENDS

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Abstract. This article explores the rising incidence of myocardial infarction among young adults, a demographic historically considered at low risk for cardiovascular events. The paper identifies both traditional and emerging risk factors contributing to this trend, including smoking, dyslipidemia, hypertension, obesity, sedentary lifestyle, drug use, and psychosocial stress. It also highlights the role of genetic predisposition and the growing impact of metabolic disorders such as diabetes in the early development of coronary artery disease. The study analyzes current epidemiological patterns, gender-based differences, and regional variations, offering a comprehensive overview of the issue. Emphasis is placed on the urgent need for preventive strategies, early risk assessment, and lifestyle modifications aimed at youth. By reviewing recent clinical data and public health findings, the article calls for a shift toward proactive intervention and education to reduce the long-term burden of cardiovascular disease in younger populations. The discussion also addresses gaps in current diagnostic approaches and the importance of tailored treatment protocols for young MI patients.

Keywords: Myocardial Infarction, Coronary Artery Disease, Atherosclerosis, Ischemia, Hyperlipidemia, Hypertension, Obesity, Diabetes Mellitus.

ИНФАРКТ МИОКАРДА У МОЛОДЫХ ВЗРОСЛЫХ ФАКТОРЫ РИСКА И ТЕНДЕНЦИИ

Аннотация. Устойчивость к антибиотикам при пневмонии является растущей глобальной проблемой здравоохранения, которая подрывает эффективность текущих методов лечения и увеличивает показатели заболеваемости и смертности. В этой статье рассматриваются основные механизмы, с помощью которых бактерии развивают устойчивость к обычно используемым антибиотикам, включая ферментативную деградацию лекарств, модификацию целевого участка и эффлюксные насосы. Обсуждается влияние резистентных патогенов на клинические результаты, стратегии лечения и системы здравоохранения. Особое внимание уделяется важности программ управления антибиотиками, вакцинации и методов быстрой диагностики при лечении резистентных инфекций. В обзоре также освещаются текущие исследования новых терапевтических средств и необходимость скоординированных глобальных усилий по снижению устойчивости к антибиотикам. Эффективное управление устойчивостью к антибиотикам при пневмонии имеет решающее значение для улучшения результатов лечения пациентов и охраны общественного здоровья.

Ключевые слова: Устойчивость К Антибиотикам, Пневмония, МЛТУ, Бактерии, MRSA, Эмпирическая Терапия, Управление Антибиотиками, Эффлюксные Насосы.

Introduction

Myocardial infarction (MI), commonly referred to as a heart attack, has traditionally been considered a condition primarily affecting older populations. However, in recent decades, there has been a disturbing rise in the incidence of myocardial infarction among young adults, typically defined as individuals under the age of 45. This emerging trend is becoming an alarming public health concern worldwide, not only due to its immediate clinical implications but also because of the long-term socio-economic consequences associated with cardiovascular

morbidity at a younger age. Several studies have pointed to a multifactorial etiology underlying this phenomenon. Modifiable lifestyle factors including tobacco use, poor dietary habits, physical inactivity, and psychological stress are among the leading contributors to the early onset of ischemic heart disease. Furthermore, the increasing prevalence of metabolic syndrome, particularly obesity, diabetes mellitus, hypertension, and dyslipidemia in the youth population, serves as a significant driver for premature atherosclerosis and subsequent myocardial events. Genetic predispositions, familial hypercholesterolemia, and early exposure to environmental toxins further compound the risk.

Epidemiological data have shown geographical variations in the prevalence of young-onset myocardial infarction, with some developing countries witnessing faster increases than developed nations. These discrepancies often reflect differences in healthcare infrastructure, awareness levels, and access to preventive services. Moreover, gender-specific patterns are also becoming evident, as MI in young women is frequently under-recognized or misdiagnosed due to atypical symptom presentation and a lower index of suspicion. Given the significant implications of MI at a young age, including potential lifelong disability, reduced productivity, and increased healthcare costs, there is a critical need for early identification of high-risk individuals and timely intervention. Understanding the unique risk profile and behavioral tendencies of younger individuals is essential for developing effective prevention strategies and tailored public health policies. This paper aims to provide a comprehensive review of the major risk factors associated with myocardial infarction in young adults and to analyze current trends and epidemiological patterns. In doing so, it seeks to contribute to the ongoing discourse on how best to address this growing challenge through multidisciplinary and preventive approaches.

Main Body

Myocardial infarction (MI), or heart attack, has long been regarded as a disease of middle-aged or elderly individuals. However, recent epidemiological trends have highlighted a troubling increase in the incidence of MI among young adults, typically defined as those under 45 years of age. This shift is significant not only because of the life-threatening nature of MI but also due to its long-term socio-economic impact. Young individuals who suffer from MI are often in the most economically productive stage of life, and premature cardiovascular events can lead to long-standing disability, reduced quality of life, and increased healthcare costs. The reasons behind the rising incidence are multifactorial and include both modifiable lifestyle choices and underlying genetic predispositions. With urbanization, stress, unhealthy dietary habits, and rising levels of obesity and diabetes, younger populations are becoming increasingly vulnerable. Furthermore, the clinical presentation in young patients is often atypical, leading to delays in diagnosis and treatment. This article aims to explore the major risk factors and identify the emerging trends in young-onset MI, with the objective of recommending evidence-based strategies for prevention and early intervention.

Epidemiological data have shown a growing prevalence of myocardial infarction among young adults globally. While cardiovascular mortality has generally declined due to improved management and awareness, the rate of MI in individuals under 45 has remained steady or even increased in certain regions. In countries undergoing rapid industrialization, such as India and parts of Africa, the incidence among the young is rising sharply. Studies indicate that approximately 4 10% of all heart attacks now occur in people under 45 years old. Moreover, there are significant gender disparities young men are more frequently affected, but when young women suffer from MI, the outcomes are often worse due to delays in diagnosis. Socioeconomic

status also plays a role; individuals from lower-income backgrounds have less access to healthcare, poorer dietary options, and higher levels of psychosocial stress. Lifestyle transitions in developing countries, including increased fast food consumption and reduced physical activity, further exacerbate this problem. The epidemiological shift calls for targeted research and customized healthcare strategies aimed at early identification and intervention.

Numerous risk factors contribute to myocardial infarction in young adults, many of which are modifiable. These include smoking, excessive alcohol intake, high-fat diets, obesity, hypertension, dyslipidemia, and sedentary lifestyles. Among these, smoking is the most consistently identified risk factor in young MI patients, with studies showing that over 70% of such cases involve current or past smokers. Dyslipidemia, especially elevated LDL cholesterol and low HDL levels, is also highly prevalent. Diabetes and insulin resistance, once thought to be diseases of the middle-aged, are increasingly diagnosed in young adults, particularly in those with central obesity. Chronic stress and psychological factors, including anxiety and depression, further increase the risk by promoting endothelial dysfunction and inflammatory responses. Non-modifiable factors such as age, sex, and family history play a role, but it is the combination of these with lifestyle-related issues that accelerates disease progression. Early recognition and management of these risk factors are critical to preventing major cardiovascular events in young individuals.

Genetic predisposition is an important yet often under-recognized contributor to early-onset myocardial infarction. Several inherited disorders can increase the risk of premature atherosclerosis and thrombosis. Familial hypercholesterolemia (FH), an autosomal dominant disorder, results in significantly elevated LDL cholesterol levels from birth and is linked with early coronary artery disease if untreated. Other genetic mutations affecting lipid metabolism, such as those involving apolipoproteins and LDL receptors, also play a role. Additionally, polymorphisms in genes related to clotting factors such as Factor V Leiden can predispose individuals to thrombotic events. Having a first-degree relative who experienced MI before age 55 (for men) or 65 (for women) is considered a strong risk marker. While lifestyle factors are important, they can exacerbate genetically driven risks when not managed appropriately. With advancements in genomic medicine, early detection through genetic testing could enable personalized preventive strategies. Genetic counseling and family screening are particularly crucial in populations with a high prevalence of inherited lipid disorders.

Lifestyle choices significantly influence the risk of myocardial infarction in young adults. Tobacco use remains the single most important preventable risk factor, particularly among young men. Smoking induces endothelial damage, promotes atherogenesis, and increases coagulability, creating a high-risk environment for coronary thrombosis. Diets high in saturated fats, sugars, and processed foods contribute to obesity and insulin resistance, further accelerating atherosclerotic changes. Physical inactivity, now prevalent due to sedentary occupations and digital lifestyles, contributes to metabolic syndrome and poor cardiovascular fitness. Excessive alcohol consumption and recreational drug use, including cocaine and amphetamines, can cause acute coronary vasospasm or myocardial injury, especially in younger individuals. Chronic psychological stress and poor sleep patterns are also increasingly linked to cardiovascular disease in youth. These factors often coexist and interact in a synergistic manner, amplifying cardiovascular risk. Public health efforts should focus on early lifestyle education, behavioral interventions, and regular screening programs to mitigate the long-term consequences of these choices.

Recent global health reports have revealed dynamic shifts in the epidemiology and risk profiles of young adults experiencing myocardial infarction. In developing nations, rising urbanization and Western lifestyle adoption are key contributors to increased cardiovascular events. Surprisingly, some regions now report higher MI rates among their youth than the global average. Additionally, digital health records have allowed for better trend analysis, showing that stress-related heart attacks and substance-induced MIs are becoming more common. Gender patterns are evolving as well while men continue to dominate case numbers, the rising trend among young women is alarming due to diagnostic delays and under-treatment. Furthermore, environmental factors such as air pollution and noise exposure in cities are emerging as independent contributors to cardiovascular risk. Societal stressors, including job insecurity and economic instability, particularly affect younger adults and further add to cardiovascular strain. These trends underscore the need for adaptive healthcare systems that can respond quickly to shifting demographics and risk landscapes with culturally appropriate strategies.

One of the most challenging aspects of managing MI in young adults is the variability and atypical nature of their symptoms. Unlike older patients who often present with classic chest pain radiating to the arm or jaw, young individuals may report non-specific symptoms such as fatigue, nausea, back pain, or shortness of breath. Women, in particular, frequently experience “silent” or atypical MI, contributing to delayed diagnosis and worse outcomes. Additionally, healthcare providers may underestimate cardiac risk in this age group, attributing symptoms to anxiety or musculoskeletal causes. Misdiagnosis or delayed recognition often results in missed therapeutic windows, reducing the effectiveness of interventions. Diagnostic tools such as ECG, cardiac enzymes (especially troponins), and echocardiography remain essential, but a high index of suspicion is necessary. Coronary angiography may reveal non-obstructive disease or spontaneous coronary artery dissection (SCAD), particularly in young women. Improved clinical awareness, gender-sensitive diagnostics, and early use of cardiac testing can significantly enhance outcomes in young MI patients.

Preventing myocardial infarction in young adults requires a multipronged approach that includes individual lifestyle modification, public health education, and systemic healthcare reforms. Primary prevention should begin in adolescence, with school-based programs promoting healthy eating, physical activity, and stress management. Routine health screenings for blood pressure, cholesterol, and glucose levels can help identify at-risk individuals early. Smoking cessation campaigns, tax regulations on tobacco and sugary foods, and wider availability of mental health services can further reduce the burden of modifiable risk factors. At the community level, creating safe spaces for exercise and ensuring access to healthy foods are crucial. Healthcare providers must be trained to screen for cardiovascular risk factors even in younger patients and offer tailored advice based on age, gender, and socioeconomic background. Emerging technologies such as mobile health apps, wearable fitness devices, and online counseling platforms can enhance engagement with younger populations. National policies and health campaigns must align to address the growing risk of early cardiovascular disease effectively.

In conclusion, the increasing incidence of myocardial infarction among young adults is a complex and multifaceted issue that demands urgent attention. While traditional risk factors such as smoking, dyslipidemia, and hypertension remain relevant, lifestyle changes, psychological stress, and genetic predispositions are becoming more prominent in this demographic. The atypical clinical presentations and diagnostic delays further complicate management, often

leading to poorer outcomes. A shift in perception is needed-young age should not be considered a protective factor against cardiovascular disease. Preventive strategies must start early and incorporate education, behavioral change, and systemic healthcare adjustments. Looking forward, advancements in genetic screening, personalized medicine, and digital health platforms offer promising avenues for early identification and intervention. Collaborative efforts between clinicians, researchers, policymakers, and communities will be essential in reversing the current trends and securing a healthier future for the younger generation.

Discussion

The rising incidence of myocardial infarction (MI) among young adults presents a significant shift in the traditional understanding of cardiovascular disease, necessitating a reevaluation of current preventive and diagnostic strategies. While MI was historically associated with older populations, the increasing number of cases in individuals under 45 years highlights a disturbing trend shaped by both lifestyle and non-lifestyle factors. The data reviewed in this paper underline the dominance of modifiable risk factors particularly smoking, obesity, dyslipidemia, hypertension, and physical inactivity-as central contributors to early-onset MI. Among these, smoking remains the most pervasive, often acting as a catalyst that exacerbates the effects of other coexisting conditions like diabetes and hypertension.

However, non-modifiable risk factors such as genetic predispositions, including familial hypercholesterolemia and prothrombotic gene mutations, cannot be overlooked. The interplay between hereditary influences and modern sedentary lifestyles significantly increases cardiovascular vulnerability in younger individuals. Emerging evidence also supports the role of psychosocial stress, poor sleep hygiene, and substance abuse as critical yet under-recognized components of cardiovascular risk in this age group. Furthermore, the diagnostic process remains challenging, as young patients frequently present with atypical symptoms that may be mistaken for non-cardiac issues, leading to delays in treatment.

Public health interventions must, therefore, prioritize early education, regular screening, and targeted prevention campaigns aimed at younger populations. Digital health tools, workplace wellness programs, and community-based initiatives could serve as effective platforms to promote cardiovascular health. In parallel, healthcare providers must be educated to take symptoms in young adults seriously and consider cardiac evaluation even in the absence of classic risk profiles. Despite the current advancements in treatment and technology, there remains a gap in preventive cardiology tailored to younger demographics. Research must continue to explore the molecular and behavioral underpinnings of early-onset MI, and healthcare policies must adapt to this new reality by integrating preventive cardiology into primary care from an earlier age. In summary, the multifactorial nature of young-onset myocardial infarction calls for a multidisciplinary, proactive approach involving clinicians, researchers, public health officials, and the community at large to effectively address and reverse this growing public health concern.

Conclusion

The increasing prevalence of myocardial infarction (MI) in young adults is a growing public health concern that demands urgent attention. Unlike older patients, young individuals often suffer MI in the presence of modifiable lifestyle-related risk factors such as smoking, poor diet, physical inactivity, and unmanaged stress. The convergence of traditional cardiovascular risks with modern challenges including substance abuse, psychosocial stress, and a sedentary lifestyle creates a complex and evolving risk profile for younger populations. In many cases,

these young individuals may not exhibit overt signs of cardiovascular disease, resulting in delayed diagnosis and treatment.

Our analysis highlights the importance of early screening, preventive education, and targeted interventions to identify and manage risk factors long before the onset of clinical symptoms. Healthcare professionals should be trained to recognize early indicators of cardiovascular risk in the young and encouraged to take symptoms seriously, even in the absence of a typical patient profile. Moreover, genetic predispositions should not be ignored; instead, they should be integrated into a comprehensive risk assessment strategy that includes both family history and lifestyle evaluation.

Public health strategies must now shift from reactive care to proactive prevention. Community awareness campaigns, school and university-based health education, and digital health monitoring tools can play pivotal roles in raising awareness and reducing the incidence of MI in young adults. Furthermore, research should continue to investigate the underlying biological mechanisms, gender-specific differences, and psychosocial influences contributing to the rise of MI among the youth. In conclusion, myocardial infarction in young adults represents a multifactorial and preventable condition. A coordinated effort involving clinicians, policymakers, educators, and individuals themselves is essential to curb this rising trend. The future of cardiovascular health depends on early action, interdisciplinary collaboration, and a sustained commitment to lifestyle change and risk factor management.

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