

## Preventive Cardiology in Coronary Artery Disease: Shifting the Paradigm from Treatment to Prediction

Mohamed Ahmed Mostafa 

Department of Cardiology, Military Medical Academy, Cairo, Egypt

**Corresponding author:** Dr. Mohamed Ahmed Mostafa, Department of Cardiology, Military Medical Academy, Cairo, Egypt.

E-mail: [drmam1978@yahoo.com](mailto:drmam1978@yahoo.com).

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### Abstract

Coronary artery disease (CAD) remains the leading cause of global mortality despite advances in acute care. Preventive cardiology emphasizes early risk detection, lifestyle modification, and targeted therapy before disease onset. Recent developments in genomics, imaging, and digital health have transformed prevention from a theoretical concept into a practical, data-driven strategy. This editorial critically examines innovations in risk stratification, technology-enabled interventions, and pharmacologic prevention - including statins and emerging agents such as SGLT2 inhibitors and GLP-1 receptor agonists - while addressing systemic barriers and future challenges. Prioritizing prevention as the cornerstone of cardiovascular care is essential for reducing the global burden of CAD.

**Keywords:** Preventive cardiology; Cardiovascular disease; Risk prediction; Digital health; Life-style modification; Genomics

### Introduction

Coronary artery disease (CAD) remains the leading cause of global mortality despite advances in acute care. Preventive cardiology emphasizes early risk detection, lifestyle modification, and targeted therapy before disease onset. Recent developments in genomics, imaging, and digital health have transformed prevention from a theoretical concept into a practical, data-driven strategy. This editorial critically examines innovations in risk stratification, technology-enabled interventions, and pharmacologic prevention - including statins and emerging agents such as SGLT2 inhibitors and GLP-1 receptor agonists - while addressing systemic barriers and future challenges. Prioritizing prevention as the cornerstone of cardiovascular care is essential for reducing the global burden of CAD.

### Risk Stratification and Genomics

Traditional tools like the Framingham Risk Score often fail to capture individual variability. Emerging data show that genomic risk scores, particularly polygenic risk scores (PRS), are increasingly integrated into cardiovascular risk prediction tools. For instance, in type 2 diabetic patients, a meta-PRS had a hazard ratio of 1.28 per SD for predicting CVD events (UK Biobank) [1]. Coronary Artery Calcium (CAC) scoring represents an imaging-based leap forward. A 2023 NHLBI-sponsored study involving 3,000 adults found CAC scoring significantly improved 10-year risk prediction compared to clinical scores alone [2].

## Digital Health and Wearables

Smartphone apps and wearables can bridge the gap between awareness and action. A 2025 systematic review highlighted their efficacy in promoting healthy behaviours, enabling early ASCVD detection, and improving medication adherence and weight control [3,4]. The American Heart Association noted that while wearables and mobile health are promising, equitable access remains essential to avoid exacerbating health disparities [5].

## Lifestyle Modification

Regular exercise, healthy diet, smoking cessation, and stress control remain foundational. Lifestyle-based prevention can reduce cardiovascular risk by as much as 80%. Mobile apps and telehealth interventions have shown significant gains in treatment adherence and behavioral change [3,4].

## Pharmacologic Prevention

Statins and antihypertensives remain crucial. PREVENT risk equations (AHA 2024) now guide therapy thresholds [6]; however, evolving guidelines underscore the importance of individualized approaches. Statins in primary prevention continue to reduce CVD events and mortality, especially when tailored based on risk scores and CAC results [7]. Beyond statins, SGLT2 inhibitors (e.g., empagliflozin, dapagliflozin) have demonstrated cardiovascular and renal benefits in patients with type 2 diabetes and chronic kidney disease [10]. GLP-1 receptor agonists also show promise in reducing major adverse cardiovascular events among high-risk diabetic populations [11]. These agents represent a paradigm shift toward comprehensive pharmacologic prevention strategies. Artificial intelligence in preventive cardiology raises concerns related to governance, transparency, and ethical implementation [12], while systemic barriers such as cost, adherence challenges, and inequitable digital access continue to limit widespread preventive care adoption [13].

## Health Disparities and Social Determinants

The burden of CVD disproportionately affects individuals in poverty and marginalized communities. A U.S. study in 2023 showed a significant increase in CVD prevalence among those with hypertension living in poverty - particularly among Black and Hispanic populations [8]. Additionally, area- and individual-level social determinants (e.g., low education, income) modestly improved risk stratification models, especially among Black individuals [9].

## Conclusion

Preventive cardiology is more than an adjuvant to treatment; it is the cornerstone of long-term cardiovascular health. A transition from reactive to proactive care can be achieved through the integration of risk prediction, lifestyle modification, and individualized therapy. However, systemic barriers - including healthcare system inertia, cost constraints, challenges in patient adherence, and inequitable access to digital health technologies - continue to limit widespread adoption. Additional challenges include concerns related to data privacy in artificial intelligence-driven tools, integration of genomics into routine clinical practice, and ensuring equitable access to emerging therapies such as SGLT2 inhibitors and GLP-1 receptor agonists. Overcoming these challenges will require coordinated efforts among clinicians, governments, and communities, along with sustained investment in education and technology. Ultimately, the future of cardiology will be defined not by interventions alone, but by our ability to prevent disease before it occurs.

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