

## REVIEW ARTICLE

### Recent Evidence for the Prevention of Coronary Artery Disease

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#### Abstract

Numerous novel techniques have surfaced in the fight against coronary artery disease. This review aims to explore primary prevention by assessing methods to control modifiable risk factors and examining strategies for secondary prevention. Mitigating the burden of cardiovascular disease through careful risk reduction highlights the importance of prioritizing primary prevention in health policy. The global consensus endorses smoking cessation, weight management, and exercise as crucial measures. However, recommendations diverge on approaches to hypertension and optimal lipid profiles, posing contentious issues. This paper synthesizes international evidence on preventive strategies to offer a comprehensive overview of coronary artery disease research and identify areas needing further investigation.

**Keywords:** Coronary Artery Disease, Diabetes, Hypertension, Obesity, Prevention

#### Introduction

Coronary heart diseases, particularly coronary artery disease (CAD), are prevalent in India. According to the Registrar General's data for India, CAD accounted for 17% of total deaths and 26% of deaths among adults from 2001 to 2003, increasing to 23% of all deaths and 32% of deaths among adults between 2010 and 2013. Both the WHO and the Global Burden of Disease study have reported an increase in years lost due to CAD and disability-adjusted life years in India. Over the past six decades, CAD prevalence in India has risen from 1% to 9% - 10% in urban areas and from less than 1% to 4%-6% in rural areas. Case-control studies have identified several risk factors for CAD in India, including high cholesterol levels, smoking, diabetes, hypertension, obesity, mental stress, an unhealthy diet, and

a lack of physical activity. Implementing effective prevention measures is crucial to addressing this growing health crisis.<sup>1</sup>

While the rates of heart disease and related mortality are decreasing in developed countries, they are increasing in less developed countries. Specifically, India and other nations in South Asia have witnessed a significant rise in the prevalence of heart disease and deaths attributed to cardiovascular conditions over the past two decades.<sup>2</sup>

India's speedy urbanization and improvement have brought extensive way of life modifications. Many Indians smoke or chunk tobacco as a social popularity image, forget bodily pastime, eat extra junk and fatty foods, eat extra salt, and revel in elevated psychosocial

strain. Those lifestyle changes have caused an epidemic of related illnesses. Consistent with conservative estimates, India has 155 million overweight people, a hundred and forty million hypertensive sufferers, 31.8 million coronary heart disease patients, sixty-four million diabetic or pre-diabetic sufferers, and 1-2 million stroke patients.<sup>3</sup>

The management of CAD has evolved to incorporate modern diagnostic technologies, cutting-edge pharmaceuticals, invasive procedures, advances in prevention, emerging therapies, collaborative models, long-term follow-ups, and a greater emphasis on lifestyle modifications and cardiac rehabilitation. This holistic approach seeks to enhance outcomes and the overall quality of life for patients with CAD.<sup>4</sup>

### **Epidemiology in India**

The increase in CAD prevalence in India over the last three decades underscores the necessity of identifying contributing factors. Asian Indians face a significantly higher CAD risk, which is 3-4 times higher than that of the general population, six times higher than that of Chinese individuals, and 20 times higher than that of Japanese individuals.<sup>5</sup>

India is currently facing a CAD epidemic, with urban Indians experiencing CAD rates similar to those of non-resident Indians and four times higher than those of Americans. While CAD rates in the West have halved over the past 30 years, they have doubled in India and show no signs of slowing down. The average age of first myocardial infarction (MI) has decreased by 20 years in India, with approximately half of all MIs in Asian-Indian men occurring before age 50 and 25% occurring before age 40.<sup>6</sup>

CAD is the leading cause of death worldwide, accounting for 21.9% of all deaths and projected to rise to 26.3% by 2030. By 2020, India is expected to bear 60% of the global burden of cardiovascular disease. In India, the number of deaths related to cardiovascular disease increased from 2.3 million in 1990 to 2.8 million in 2002, with projections indicating a rise to five million by 2020. Among adults over 20 years old, the estimated prevalence of coronary heart disease (CHD) is approximately 3-4% in rural areas and 8-10% in urban areas.<sup>7</sup>

### **Global Evidences of Prevention of Coronary Heart Disease**

The population attributable risk (PAR) percentages for CAD due to different risk factors are as follows:

smoking (35.7%), history of hypertension (HTN) (17.9%), diabetes (9.9%), abdominal obesity (20.1%), low intake of fruits and vegetables (13.7%), and lack of regular physical activity regardless of age, sex, and ethnicity (12.2%). Together, these factors contribute to 90% of PAR in males and 94% in females.<sup>8</sup>

With on-going advancements in the prevention and treatment of CAD, a continued decrease in its prevalence and lethality is anticipated in high-income countries. Preventive measures will include lipid-lowering, anti-thrombotic, and anti-inflammatory therapies, as well as lifestyle modifications.<sup>9</sup>

### **Evidences for Prevention of Coronary Artery Disease (CAD)**

#### ***Primary Prevention***

Primary prevention measures such as quitting smoking, maintaining a healthy weight, adopting a balanced diet, and engaging in regular exercise not only lowers the risk of heart attack and heart failure, but also decreases the necessity for coronary artery bypass surgeries. These actions contribute to increased life expectancy and overall well-being.

#### ***Secondary Prevention***

The key to secondary prevention is early detection of the disease process and the implementation of therapies aimed at stopping its progression, which will prevent the condition from worsening.

#### ***Smoking***

The evidence indicates that smoking significantly raises morbidity and mortality from CAD, and the benefits of quitting smoking become evident within a few months of successful cessation. Former smokers, particularly those under the age of 65 years, may require several years to achieve health outcomes comparable to non-smokers.

Given this, healthcare professionals should consistently advise smoking cessation to their patients. Various treatment approaches are crucial to achieve smoking cessation, including behavioural interventions, nicotine replacement therapy, and pharmacotherapy with medications such as bupropion and varenicline.<sup>10</sup>

#### ***Diet***

Proper nutrition plays a crucial role as a modifiable risk factor in preventing and reducing coronary artery disease. Specific dietary components have proven more effective in preventing coronary artery disease than

simply adhering to a low-fat, low-cholesterol diet.<sup>11</sup> Studies indicate that up to one-third of the population's risk for CAD can be attributed to consuming unhealthy foods such as meats, eggs, and salty snacks. Consumption of high-fat foods and other dietary practices prevalent in the Western diet are significantly associated with CAD risk. Risk factors such as high stress levels, poor dietary habits, sedentary lifestyle, and smoking can be modified to prevent CAD.<sup>12</sup>

### **Physical Activity**

Exercise training has been shown to enhance various aspects of health in obese patients, including blood pressure, lipid profile, glucose control, and weight management. It has also been found to improve clinical outcomes by reducing the risk of mortality and morbidity associated with coronary artery disease. Various forms of exercise training, such as aerobic, interval, and resistance training, have been extensively studied and all have proven to be feasible, well-tolerated, and beneficial for patients with CAD.<sup>13</sup>

Recent evidence establishes a clear inverse dose-response relationship between physical activity and the risk of cardiovascular disease and mortality. Physical activity also plays a crucial role in the secondary prevention of cardiovascular diseases by mitigating their impact, slowing their progression, and preventing recurrence. This review underscores the significance of physical activity in both primary and secondary prevention strategies for cardiovascular diseases. Furthermore, it delves into the mechanisms through which regular physical activity and exercise enhance cardiovascular health and reduce disease burden.<sup>14</sup>

### **Obesity**

Obesity plays a giant role in the development of atherosclerosis and coronary artery sickness. Superior cardiac imaging techniques facilitate early identity of cardiac structural and useful abnormalities in obese people. Making use of verified improvements in cardiac diagnostic tactics allows early detection and treatment of subclinical clinical situations, thereby fostering prevention of cardiovascular activities.<sup>15</sup>

Obesity contributes significantly to the development of cardiovascular disease and increases cardiovascular mortality, independent of other risk factors. Recent data emphasize abdominal obesity, as measured by waist circumference, as a distinct marker of

cardiovascular disease risk separate from body mass index.<sup>16</sup>

### **Diabetes**

There is a strong correlation between diabetes mellitus (DM) and cardiovascular disease, which remains the leading cause of morbidity and mortality among diabetic individuals. Common cardiovascular risk factors such as obesity, hypertension, and dyslipidemia are prevalent among those with DM, significantly increasing their vulnerability to cardiac events. Therefore, addressing cardiovascular risk factors in diabetic patients is crucial to mitigate the long-term cardiovascular complications associated with the condition.<sup>17</sup>

Numerous studies have identified biological mechanisms linked to DM that independently elevate CVD risk in these individuals. This review explores the diabetes-CVD relationship, investigates potential disease progression mechanisms, reviews current treatment guidelines, and suggests future research avenues.<sup>18</sup>

### **Hypertension**

High blood pressure is a significant risk factor for heart disease. According to the American Heart Association, it is recommended to maintain blood pressure below 140/90 mm Hg for patients under 80 years age and below 150/90 mm Hg for those 80 years and older, if tolerated. Approximately 69% of patients who experience their first heart attack also have hypertension. Additionally, high blood pressure increases the risk of sudden cardiac death and angina.<sup>18</sup>

Multiple randomized studies have demonstrated that the target threshold for systolic blood pressure (SBP) is 140 mmHg and for diastolic blood pressure (DBP) is 90 mmHg. Lowering blood pressure to these levels has been shown to effectively reduce the risk of cardiovascular events.<sup>19</sup>

### **Conclusion**

Preventive healthcare is built on three main pillars. Firstly, primary prevention focuses on lifestyle modifications. For instance, in the context of coronary artery disease, this includes maintaining an optimal weight, consuming balanced diets, and avoiding detrimental behaviors like smoking and excessive alcohol intake. However, CAD results from a combination of modifiable and non-modifiable factors. Tertiary prevention steps in when symptoms

manifest and significant damage has occurred, aiming to enhance patient lifespan and well-being through intensive interventions.

## Recommendations

### *Lifestyle Interventions*

- **Behavioural Research:** Research on behavioural interventions, such as motivational interviewing and cognitive-behavioural therapy, can enhance the effectiveness of lifestyle changes like smoking cessation, dietary modifications, and exercise.
- **Technology-Based Interventions:** Studies on the use of digital health tools, such as mobile apps, wearable devices, and telemedicine, show promise in supporting lifestyle changes and monitoring heart health.

### *Dietary Research*

- **Nutritional Studies:** On-going research into specific diets, such as the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH) diet, and plant-based diets, continues to provide evidence on the most effective dietary patterns for preventing CAD.

### *Biomarkers and Early Detection*

- **Biomarker Identification:** Research into biomarkers can help detect early signs of CAD before symptoms appear. Biomarkers such as specific proteins, lipids, or genetic markers can provide early warning signs.
- **Advanced Imaging Techniques:** Studies are exploring advanced imaging technologies like Computerized Tomography (CT) angiography, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET) scans to detect CAD at an early stage, allowing for timely intervention.

### *Clinical Trials and Guidelines*

- **Participation in Clinical Trials:** Encouraging participation in clinical trials helps advance research and provides access to cutting-edge treatments and preventive measures.
- **Evidence-Based Guidelines:** Research findings continually update clinical guidelines for the prevention and management of CAD, ensuring that recommendations are based on the latest scientific evidence.

## Conflict of Interest

We declare that there is no conflict of interest

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Self

## References

1. Rajeev G, Indu M, Jagat N. Trends in coronary heart disease epidemiology in India. *Ann Glob Health* 2016;82(2):307-15.
2. Krishnan N. Coronary heart disease and risk factors in India - On the brink of an epidemic? *Indian Heart J* 2012;64(4):364-367.
3. Dwivedi S. Life style interventions in the prevention of coronary artery disease. *Ann Natl Acad Med Sci (India)* 2014;50(1&2):45-56.
4. Bansal A, Hiwale K. Updates in the management of coronary artery disease: a review article. *Cureus* 2023;15(12):e50644.
5. Dalal J, Hiremath MS, Das MK, *et al.* Vascular disease in young Indians (20-40 years): role of ischemic heart disease. *J Clin of Diagn Res* 2016;10(9):OE08-OE12.
6. Enas EA, Senthilkumar A. Coronary artery disease in Asian Indians: An update and review. *Internet J Cardiol* 2001;1(2).
7. Khapre M, Saxena V. Review of current global evidences for prevention of coronary heart disease. *J Datta Meghe Inst Med Sci Univ* 2019;14(1):1-5.
8. Steg PG, Ducrocq G. Future of the prevention and treatment of coronary artery disease. *J Am Coll Cardiol* 2016;80(5):1067-1072.
9. Vally M, Irhuma MOE. Primary prevention of coronary artery disease. *S Afr Fam Pract* 2018; 60(2):32-37.
10. Hasegawa K, Komiyama M, Takahashi Y. Obesity and cardiovascular risk after quitting smoking: the latest evidence. *Eur Cardiol Rev* 2019;14(1):60-61.
11. Yildiz O, Seyrek M, Ulusoy KG. Prevention of coronary artery disease through diet. In: Kirali, K., editor. *Coronary artery disease - assessment, surgery, prevention* [Internet]. London: IntechOpen; 2015 [cited 2022 Aug 22]. Available from: <https://www.intechopen.com/chapters/49188doi:10.5772/61339>
12. Kromhout D, Menotti A, Kesteloot H, *et al.* Prevention of coronary heart disease by diet and lifestyle: Evidence from prospective cross-cultural,

- cohort, and intervention studies. *Eur J Clin Nutr* 2002;105(7):893-898.
13. Robert H, Norman M, Sandra E, *et al.* Physical exercise training and coronary artery disease. *Rev Health Care* 2013;4(3):175-91.
  14. Alves AJ, Viana JL, Cavalcante SL, *et al.* Physical activity in primary and secondary prevention of cardiovascular disease: Overview updated. *World J Cardiol* 2016;8(10):575-583.
  15. Csige I, Ujvárosy D, Szabo Z, *et al.* The impact of obesity on the cardiovascular system. *J Diabetes Res* 2018;2018:3407306.
  16. Powell-Wiley TM, Poirier P, Burke LE, *et al.* Obesity and cardiovascular disease: A scientific statement from the American Heart Association. *Circulation* 2021;143(21):e984-e1010.
  17. Leon BM, Maddox TM. Diabetes and cardiovascular disease: epidemiology, biological mechanisms, treatment recommendations and future research. *World J Diabetes* 2015;6(13):1246-58.
  18. Clive R, Daniel TL, Mathew, *et al.* Treatment of Hypertension in Patients With Coronary Artery Disease: A Scientific Statement From the American Heart Association, American College of Cardiology, and American Society of Hypertension. *Circulation* 2015;131(19): 435-70.
  19. Kim HL. Recent evidence on target blood pressure in patients with hypertension. *Cardiovasc Prev Pharmacother* 2024;6(1):17-25.