

CURRENT STRATEGIES FOR CARDIOVASCULAR DISEASE PREVENTION: AN OVERVIEW

Author: Dr. M.R.N Shaikh^{1*}

Co-Author: Sahil Pawar²

Co-Author: Prasad Pawar³

¹ Principal at MET BKC's, Met Institute of D Pharmacy, Adgaon, Nashik, Maharashtra, India.

² Student of Bachelor of Pharmacy, MET BKC's, Met Institute of D Pharmacy, Adgaon, Nashik, Maharashtra, India.

³ Student of Bachelor of Pharmacy, MET BKC's, Met Institute of D Pharmacy, Adgaon, Nashik, Maharashtra, India.

Corresponding Author:
Sahil Pawar

Abstract

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality worldwide and the economic and social burden created by this problem is enormous. Nevertheless, the highest percentage of CVD incidences can be prevented by specific interventions. This review of the current evidence-based approaches to CVD prevention shifts away from a traditional risk-factor-based paradigm, and towards a more holistic paradigm that inherently incorporates population-level public-health initiatives, individualized-patient risk assessment, and interventions on spectrums between primordial, primary, and secondary preventions. We outline the main importance of lifestyle change (diet, physical exercise, smoking control), as the cornerstone of prevention. Besides, we examine pharmacological aspects in the management of such important risk factors as hypertension, dyslipidemia, or diabetes mellitus. New ideas, such as employing risk enhancers as means of personalized decision-making, the promise of new pharmacological treatments (e.g., GLP-1 RAs, SGLT2 inhibitors), and the incorporation of digital health technology, are discussed as well. The conclusion is that multi-faceted, collaborative efforts that comprise policymakers, healthcare systems, and individuals are the most important in reducing the world effects of CVD.

Keywords: Cardiovascular Disease, Prevention, Atherosclerosis, Risk Factors, Lifestyle Modification, Statins, Hypertension, Public Health.

1. Introduction

Cardiovascular diseases such as: coronary artery disease, heart failure, stroke, and peripheral artery disease cause an estimated 17.9 million deaths/annually or 32% of the total deaths globally. CVD prevalence has been on the rise despite much progress in treatment, contributing to the increasing global weight of cardiometabolic risk factors caused by increasing numbers of older adults and the weight of risk factors in the population. The economic cost is huge with healthcare services, pharmaceutical expenses, and missed productivity estimated to cost more than 1 trillion U.S. alone by 2035.

This theoretical background that atherosclerosis is a process that is modifiable, which in many cases may take decades to develop, offers a time bomb when it comes to acting. Studies such as the Framingham Heart Study that are landmark researches laid out the idea of risk factors to the way of preventive cardiology. The current methods of preventing it are organized into three levels:

- Primordial Prevention: The prevention of risk factors themselves (ex: the prevention of obesity in children).
- Primary Prevention: Doing it to prevent the initial cardiovascular event in the patients with the risk factors.
- Secondary Prevention: Prevention of recurrence in individuals with CVD.

In this paper, the existing evidence-based ideas along this continuum are reviewed, with emphasis on the synthesis of the population-wide and high-risk individual interventions.

2. Individualized Prevention:

Proper risk assessment is essential in the treatment of those who will receive the most intensive measure.

- The Pooled Cohort Equations (PCEs): In the U.S., the PCEs have been the instrument of estimating a 10-year risk of atherosclerotic CVD (ASCVD) in primary preventive patients age 40-79. Although there is a worry of over- and under-estimation in some of the cohorts, they provide a screened point of departure.
- Risk Enhancers: The recent guideline emphasizes on the significance of risk enhancers to inform decision-making in intermediate-risk patients. They are a family history, certain ethnic groups, metabolic syndrome, chronic kidney disease, inflammatory diseases (e.g., rheumatoid arthritis), and biomarkers such as lipoprotein(a) [Lp(a)], and high-sensitivity C-reactive protein.
- Coronary Artery Calcium (CAC) Scoring: a CAC score of zero shows a very low probability of events within 10 years which may in many cases warrant the delaying of statin administration in intermediately-risk patients. On the other hand, the high CAC score proves the presence of atherosclerosis and provides a very serious reason to start preventive pharmacotherapy.

3. Some Lifestyle Changes: The Foundation of Prevention.

The initial intervention of all-risk levels is lifestyle intervention.

Dietary Patterns

The emphasis has been solely on particular nutrients and diets in general. Mediterranean Diet: Lots of fruits, vegetables, whole grains, legumes, nuts and olive oil; moderate amounts of fish and poultry; limited red meat and sweets. Its superior use over low-fat diets has been proven consistent by RCTs in the prevention of major CV events.

- DASH (Dietary Approaches to Stop Hypertension): The focal of this diet is put on the consumption of fruits, vegetables, low-fat dairy, and low saturated and total fat. It has great efficacy in reducing blood pressure.
- Plant-Based Diets: Diets with plant foods that are minimally processed are linked to a low incidence of CVDs. In independent studies, CV health is positively related to reduction of ultra-processed foods.

Physical Activity

Current recommendations are 150 minutes of moderate intensity or 75 minutes of vigorous intensity aerobic physical fitness and muscle strengthening physical fitness 2 times a week. Vitality enhances blood pressure, lipid level, insulin sensitivity, and body mass.

Smoking Cessation

The best modifiable risk factor is perhaps the use of tobacco. The decisive action on smoking cessation helps to decrease the CVD risk within a short period of time, and the risk amount is close to that of a never-smoker in 10-15 years. Behavioral support and pharmacotherapy (varenicline, bupropion, nicotine replacement) are the interventions.

Weight Management

The cause of hypertension, dyslipidemia, as well as insulin resistance are fueled by obesity especially visceral adiposity. A small amount of 5-10 percentage weight loss is capable of creating significant metabolic benefits.

4. Pharmacological Controlling of Risk Factors.**Lipid Management**

- Statins: These are first-line therapy of lowering LDL-C, as well as reducing ASCVD disease events in primary and secondary prevention. Therapy is put at the level of the absolute risk of the patient.
- Ezetimibe: suppresses absorption of cholesterol in the intestine. It is administered as an augmentative therapy to statins with additional LDL-C and CV risk reduction.
- PCSK9 Inhibitors (Evolocumab, Alirocumab): Monoclonal antibodies that reduce LDL-C (>50) x significantly and decrease CV events, on maximally tolerated statin therapy, in high-risk patients.

Blood Pressure Control

The majority of adults are now advised to achieve a target of <130/80 mmHg. Thiazide diuretics, ACE inhibitors, angiotensin receptor blockers (ARB), and calcium channel blockers are the first-line agents, and frequently have to be combined.

Management of Diabetes Mellitus.

In addition to glucose control, the agent used is important. Agents that inhibit urine SGLT2 (e.g., empagliflozin) and those that stimulate the GLP-1 receptor (e.g., liraglutide, semaglutide) have assertive effects on major adverse CV events, heart failure hospitalization, and mortality, irrespective of glycemic control. They have become the standard of care of most T2DM patients and those who have ASCVD or high risk that have been established.

Antiplatelet Therapy

- **Primary Prevention:** Aspirin is no longer routinely advised as the marginal benefit of it in most current population is lower than the risk of bleeding. It can be selectively used among individuals who are very high-risk and low bleeding risk.
- **Secondary Prevention:** Displacement Primary Dual antiplatelet therapy (i.e., aspirin + a P2Y12 inhibitor) is usual following acute coronary syndrome or percutaneous coronary intervention and is succeeded by long-term mono antiplatelet therapy.

5. Special Considerations and New Concepts.

- **Social Determinants of Health (SDOH):** CVD risk factors are based primarily on socioeconomic status, education, neighborhood, and food security. SDOH measures should be addressed with a view of meeting health equity.
- **Digital Health:** Mobile health (mHealth) applications, activity and arrhythmia (e.g., AFib) monitoring wearables, and telemedicine are becoming effective instruments to enhance adherence and patient monitoring at a distance.
- **Novel Therapies:** Inflammatory therapies (ex: colchicine in the post-MI patient; and high Lp(a)) are under intensive study.

6. Conclusion

Prevention of cardiovascular disease needs a multi-level, synergistic approach. Nationwide interventions (i.e., sodium intake minimization in the food industry, prohibition of trans-fats, tobacco regulation legislation) are needed in order to change the risk profile of the whole population. At the same time, individual approaches of high risk and using specific risk evaluation, aggressive lifestyle counseling and reasonable implementation of evidence-based pharmacotherapy are essential. Innovation in CVD prevention means even greater personalization of care utilization and capitalizing on genetics, biomarkers, and digital technology, but without ever forgetting the primacy of a heart-healthy lifestyle. The only feasible solution to reversing the global CVD epidemic is collaboration among the governments, health care providers and patients.

7. References

1. American Heart Association. (2017). Cardiovascular Disease: A Costly Burden for America.
2. Appel, L. J., et al. (1997). *New England Journal of Medicine*, 336(16), 1117-1124.

3. Arnett, D. K., et al. (2019). *Journal of the American College of Cardiology*, 74(10), e177-e232. (2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease)
4. Cannon, C. P., et al. (2015). *New England Journal of Medicine*, 372(25), 2387-2397. (IMPROVE-IT)
5. Cholesterol Treatment Trialists' (CTT) Collaboration. (2010). *The Lancet*, 376(9753), 1670-1681.
6. Estruch, R., et al. (2018). *New England Journal of Medicine*, 378(25), e34. (PREDIMED)
7. Gaziano, J. M., et al. (2018). *The Lancet*, 392(10152), 1036-1046. (ARRIVE)
8. Goff, D. C., et al. (2014). *Journal of the American College of Cardiology*, 63(25 Part B), 2935-2959.
9. Havranek, E. P., et al. (2015). *Circulation*, 132(9), 873-898.
10. Hecht, H., et al. (2022). *JACC: Cardiovascular Imaging*, 15(5), 927-937.
11. Jensen, M. D., et al. (2014). *Obesity*, 22(S2), S1-S410. (AHA/ACC/TOS Guideline)
12. Kannel, W. B., et al. (1961). *Annals of Internal Medicine*, 55(1), 33-50.
13. Marso, S. P., et al. (2016). *New England Journal of Medicine*, 375(19), 1834-1844. (LEADER)
14. Nidorf, S. M., et al. (2020). *New England Journal of Medicine*, 383(19), 1838-1847. (COLCOT)
15. Piercy, K. L., et al. (2018). *Journal of the American Medical Association*, 320(19), 2020-2028. (Physical Activity Guidelines)
16. Sabatine, M. S., et al. (2017). *New England Journal of Medicine*, 376(18), 1713-1722. (FOURIER)
17. Satija, A., et al. (2017). *Journal of the American College of Cardiology*, 70(4), 411-422.
18. Steinhubl, S. R., et al. (2018). *The Lancet*, 392(10152), 1047-1057.
19. U.S. Surgeon General. (2014). *The Health Consequences of Smoking—50 Years of Progress*.
20. Valgimigli, M., et al. (2018). *European Heart Journal*, 39(3), 213-260. (ESC DAPT Guideline)

21. Whelton, P. K., et al. (2018). *Hypertension*, 71(6), e13-e115. (ACC/AHA Hypertension Guideline)
22. World Health Organization. (2021). *Cardiovascular diseases (CVDs) Fact Sheet*.
23. Zinman, B., et al. (2015). *New England Journal of Medicine*, 373(22), 2117-2128. (EMPA-REG OUTCOME)
24. Visseren, F.L.J., et al. (2021). *European Heart Journal*, 42(34), 3227-3337. (2021 ESC Guidelines on cardiovascular disease prevention in clinical practice)
25. Lloyd-Jones, D. M., et al. (2022). *Circulation*, 145(18), e895-e1032. (Life's Essential 8: Updating and Enhancing the American Heart Association's Construct of Cardiovascular Health)
26. McNamara, R. L., et al. (2019). *JAMA Cardiology*, 4(10), 1021-1026. (Review on Digital Health in Cardiology)
27. Ridker, P. M., et al. (2017). *New England Journal of Medicine*, 377(12), 1119-1131. (CANTOS: Canakinumab for Inflammation)