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REVIEW ARTICLE

The Beneficial Role of Exercise and Whole-Food Plant-Based Diet in Coronary Artery Disease Prevention and Management

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Abstract

Coronary Artery Disease (CAD) remains a critical global health issue, substantially contributing to morbidity and mortality worldwide. The strategic combination of Regular Physical Exercise (RPE) and a Whole-Food Plant-Based Diet (WFPBD) offers an innovative and powerful solution to mitigate cardiovascular disease risk. Under the visionary leadership of Prof. Dasaad Mulijono, Bethsaida Hospital in Tangerang has successfully pioneered this integrative approach, achieving exceptional clinical results. This comprehensive review examines the multifaceted cardiovascular benefits of RPE and plant-based nutritional therapy, highlighting improvements in lipid profiles, insulin sensitivity, blood pressure regulation, cardiac and vascular remodelling, sleep quality, mitochondrial function, and cellular longevity. Highlighting the ground-breaking clinical outcomes at Bethsaida Cardiac Centre, this integrative model addresses traditional cardiovascular risk factors, enhances overall vitality, and promotes longevity, representing a transformative framework for modern cardiovascular healthcare.

Introduction

CAD is the leading cause of death globally, imposing a heavy burden on healthcare systems worldwide [1-3]. Lifestyle-related factors, particularly sedentary behaviours and unhealthy dietary practices, significantly contribute to the incidence and progression of CAD [3-8]. Growing evidence has demonstrated the decisive role of lifestyle modification, notably RPE combined with nutritional interventions, in preventing and managing CAD [9-22]. Specifically, a WFPBD, characterized by high consumption of fruits, vegetables, legumes, whole grains, nuts, and seeds, has emerged as a promising nutritional strategy. This diet, when combined with consistent physical activity, has demonstrated remarkable efficacy in addressing key cardiovascular risk factors, including hypertension, dyslipidaemia, insulin resistance, and obesity.

RPE, defined as planned, structured, and repetitive physical activity to improve physical fitness, has long been established as crucial for maintaining cardiovascular health. Exercise enhances endothelial function, optimizes lipid profiles, improves insulin sensitivity, lowers blood pressure, induces favourable cardiac remodelling, improves sleep

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quality, and promotes longevity [16-22]. Despite these well-documented benefits, the precise mechanisms underlying these protective effects remain partially understood. Ongoing research aims to optimize exercise regimens for maximal cardiovascular benefit.

This review provides an extensive synthesis of the current evidence regarding the physiological and clinical impacts of integrating regular exercise and a WFPBD approach in the prevention and management of CAD. Additionally, we present significant clinical outcomes from the Bethsaida Cardiac Centre in Indonesia, demonstrating the real-world effectiveness of these combined lifestyle interventions. The aim is to encourage further adoption of these strategies in clinical practice and highlight areas for future research.

The Effect of Exercise on the Cardiovascular System

Exercise prompts numerous beneficial adaptations within the cardiovascular system, including improved lipid profiles, enhanced insulin sensitivity, reduced blood pressure, and favourable cardiac remodelling.

Plasma lipids and atherogenesis

RPE positively influences plasma lipid levels by elevating High-Density Lipoprotein (HDL) and lowering triglycerides [23-27]. Exercise also directly enhances endothelial function and reduces arterial stiffness, which is essential to preventing atherosclerosis. Physical activity increases the availability of Nitric Oxide (NO), a crucial vasodilator that promotes arterial health [28-33].

Insulin sensitivity

Exercise significantly enhances insulin sensitivity, a crucial factor for maintaining cardiovascular health. It reduces triglyceride production, promotes favourable lipoprotein profiles, and enhances NO-mediated vasodilation. Regular physical activity mitigates the harmful vascular effects of insulin resistance, including endothelial dysfunction and arterial stiffness, thereby decreasing CAD risk [34-36].

Blood pressure regulation

RPE results in significant long-term reductions in resting blood pressure. This effect is primarily mediated by decreased systemic vascular resistance, resulting from enhanced endothelial NO production and increased vasodilatory capacity, which significantly lowers the incidence of cardiovascular events [37-41].

Cardiac remodelling and function

RPE induces physiological cardiac hypertrophy, characterized by improved ventricular function and enhanced contractility. Exercise promotes myocardial metabolism, mitochondrial biogenesis, and cardiac ion channel function, enhancing cardiac efficiency and reducing the risk of arrhythmia [42-46].

Vascular adaptations

Exercise stimulates increased micro vascular density, enhanced endothelial function, and improved responsiveness to vasodilatory stimuli. These adaptations enhance tissue perfusion and mitigate ischemic risks, thereby promoting cardiovascular resilience [47-50].

The Effect of Exercise in Improving Sleep Quality

RPE significantly enhances sleep quality, contributing to overall cardiovascular health. Adequate sleep is crucial for cardiovascular recovery, as it helps reduce stress hormones, inflammation, and blood pressure levels. Exercise promotes deeper, more restorative sleep patterns, which indirectly support cardiovascular health and reduce the risk of CAD [51-55].

The Effect of Exercise on Youthful Appearance and Longevity

RPE plays a significant role in maintaining a youthful appearance and promoting longevity. Exercise enhances mitochondrial function, which is vital for energy production and reducing cellular oxidative stress. Improved mitochondrial efficiency prevents premature cellular aging and promotes overall vitality [56-59]. Additionally, exercise has been shown to slow telomere attrition - the progressive shortening of telomeres associated with aging and age-related diseases. Thus, RPE can extend lifespan and enhance quality of life by protecting against cellular aging mechanisms [60-67] (Figure 1).

Bethsaida Cardiac Centre Clinical Outcomes

Under the leadership of Prof. Dasaad Mulijono, Bethsaida Hospital in Tangerang has pioneered integrating WFPBD with RPE (minimum 30 minutes

Figure 1 Lifestyle Intervention for Cardiac Health — A patient undergoing treadmill exercise under professional supervision at Bethsaida Cardiac Center. The healthcare specialist demonstrates a heart-healthy diet consisting of fresh vegetables, fruits, and whole foods, emphasizing the combined role of regular physical activity and balanced nutrition in cardiovascular disease prevention and rehabilitation.

daily of moderate to heavy intensity) as a standard cardiac care practice for nearly seven years, resulting in remarkable outcomes:

Hypertension reversal
Achieving normotensive status without the use of antihypertensive medications.

Diabetes management
Significant reductions in insulin dependency, improved glycaemic control, and increased energy.

LDL reduction
Significant LDL-C reductions without PCSK9 inhibitors.

Sustainable weight loss
Achieved optimal body mass indices (BMI 20-22) without caloric restrictions.

Renal function restoration
Improved kidney function, avoiding dialysis for many.

Improved heart failure outcomes
Enhanced left ventricular function in heart failure patients.

CAD regression
Demonstrated plaque regression and exceptionally low restenosis rates (2%) Post-Drug-Coated Balloon (DCB)- angioplasty.

Inflammation reduction
Stabilized or reversed chronic inflammatory and autoimmune conditions.

COVID-19 outcomes
Remarkable success in managing high-risk elderly COVID-19 patients, achieving zero mortality and no hospitalizations through early WFPBD and RPE interventions.

Discussion

Integrating RPE and a WFPBD offers comprehensive and synergistic cardiovascular benefits. The evidence summarized in this review highlights the capacity of exercise to significantly improve lipid profiles, insulin sensitivity, blood pressure, cardiac function, and vascular health, as well as mitochondrial function and telomere length, which are fundamental to the prevention and management of CAD. Similarly, a WFPBD complements these benefits by reducing dietary intake of harmful substances such as saturated fats, sodium, and animal proteins, and enhancing intake of antioxidants, fibre, and phytochemicals. The clinical outcomes from Bethsaida Cardiac Centre underscore the practical efficacy and sustainability of these combined interventions, demonstrating impressive clinical results, including the reversal of hypertension, improved glycaemic control, LDL reduction, and CAD regression.

However, uncertainties persist regarding optimal exercise intensity, duration, frequency, and specific dietary components of a WFPBD. Further research should investigate precise molecular mechanisms, potential synergies between diet, exercise, and pharmacological treatments, and strategies for maintaining long-term adherence to lifestyle modifications. Clarifying these uncertainties will enable healthcare providers to develop individualized interventions tailored to patient-specific cardiovascular risks and lifestyles, thereby maximizing the preventive and therapeutic potential of lifestyle modifications.

Conclusion

Integrating RPE and a WFPBD represents a robust and comprehensive strategy for significantly reducing CAD risk and enhancing cardiovascular health. The physiological mechanisms underlying these benefits encompass improved lipid profiles, enhanced insulin sensitivity, optimized blood pressure regulation, beneficial cardiac remodelling, significant vascular adaptations, restorative sleep quality, enhanced mitochondrial function, and the prevention of telomere shortening. The impressive clinical outcomes achieved at Bethsaida Cardiac Centre provide compelling evidence in support of the widespread adoption of this combined approach in cardiovascular care. Ongoing research and personalized intervention strategies are crucial for fully harnessing the preventive and therapeutic potential of lifestyle modifications in cardiovascular disease management.

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The authors declare no conflict of interest.

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