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Mini Review

Physical Activity and Prevention of Cardiovascular Disease

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Abstract

Cardiovascular diseases (CVD) represent one of the leading causes of morbidity and mortality in the world and according to the World Health Organization (WHO), coronary heart disease (CHD) remains the leading cause of death worldwide. Current management strategies for CHD primarily rely on pharmacological therapies. However, several evidence indicates that non-pharmacological interventions, particularly dietary, lifestyle modifications and physical activity (PA) programs, represent essential components for CHD management due to their cost effectiveness and favourable safety profiles. The purpose of this brief review is to analyze the beneficial relationship between physical activity and CVD.

Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide and the treatment of these pathologies (coronary artery disease and stroke) have reduced mortality rates, yet the global burden of CVD remains high [1]. CVD is still largely a preventable disease, prioritizing preventive measures through healthy lifestyle (HL) behaviors is necessary to lessen the burden of CVD. In particular, HL behaviors, such as regular physical exercise (PE), can influence the natural history of these diseases. An overview and the role of the importance of PE represent an essential aspect in prevention of CVD [2].

Even if several pharmacological treatments have resulted in an impressive reduction in CVD mortality rates, the global prevalence of CVD is still high. Key risk factors in the reduction of CVD are represented to healthy lifestyle (HL) behaviors improvement [3].

Many studies have demonstrated that HL behaviors can influence a number of CVD risk factors, including smoking, diabetes, and obesity as well as the less commonly measured risk factor, cardiorespiratory fitness [4]. The approach taken was to consider systematic reviews, large randomized clinical trials, and meta-analyses when evaluating the manuscript.

Physical activity and prevention of cardiovascular disease

1-Regular exercise reduces cardiovascular risk and mortality and plays an important role in primary and secondary prevention.

All individuals who engage in regular PE have a lower incidence of cardiovascular events, and it is well known that PE can effectively counteract the adverse effects of cardiovascular risk factors. Despite this evidence, the general population engages in only modest amounts of physical activity and is all too often sedentary [5]. Therefore, prescribing PE, when indicated, must be an essential part of a specialist's role, and the specialist must provide the patient with precise instructions regarding the type, frequency, intensity, and duration of the exercise to be performed [6].

Regular physical activity is associated with a reduced risk of numerous adverse outcomes in healthy individuals, in those

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with coronary risk factors, and in patients with coronary heart disease. This effect is evident in both men and women, and across all age groups from childhood to old age. Physical activity can effectively counteract all modifiable cardiovascular risk factors, particularly hyperglycemia, hyperlipidemia, hypertension, and stress. Physical inactivity is also considered a cardiovascular risk factor, but it is not included in cardiovascular risk charts because it is difficult to quantify [7,8].

Other known beneficial effects of physical activity include improved endothelial function, microcirculation, and myocardial perfusion; a reduced risk of arrhythmias mediated by modulation of the autonomic nervous system; antithrombotic effects; and the induction of ischemic preconditioning through anatomical (in the coronary arteries) and biochemical changes (increased production of nitric oxide and antioxidant enzymes) [9].

2-The cardio-protective effect of exercise is mediated by cardiorespiratory fitness and improvement in cardiovascular risk factors. In contrast to general recommendations on physical activity, exercise recommendations for patients with CVD are more specific, defining mode, intensity, and duration.

Based on the data of the benefits of PE, international guidelines recommend regular PE as part of a healthy lifestyle to prevent CVD and other chronic conditions. Specific training plans typically begin with moderate aerobic training, followed by resistance training at increasing intensity [10].

Principal pathophysiological mechanisms

PE exerts its preventive effects through various mechanisms. In addition to its impact on traditional risk factors, regular PE has been shown to have a direct effect on cardiovascular health [11].

In fact, exercise improves functional capacity and reduces myocardial oxygen demand at any level of physical activity in apparently healthy individuals and in most people with CVD. Physical activity must be performed regularly for these benefits to be sustained over time [12].

1-Anti-atherogenic effect: The constant exposure of blood vessels and the endothelium to the hemodynamic changes that occur during physical activity leads to the development of anti-atherogenic adaptive mechanisms. Specifically, an increase in wall stress stimulates vasodilation through the release of nitric oxide (NO). In patients with cardiovascular disease, a repetitive increase in wall stress induced by a 4-week moderate-intensity training program has been shown to increase NO levels as well as vasodilation in the coronary circulation. These benefits have been observed most prominently with aerobic exercise, such as endurance running, swimming, or cycling. This is also associated with a reduction in chronic inflammation through the release of myokines, increased collateralization of the coronary circulation, and stabilization of atherosclerotic plaque, in which a higher content of collagen and elastin was observed, along with a reduction in the volume of the necrotic core and an overall reduction in plaque burden [8,13,14].

2-Neuroautonomic Modulation: The autonomic nervous system consists of sympathetic, parasympathetic, and enteric nervous systems. The primary functions of the autonomic nervous system include the regulation of cardiac, respiratory, and vasomotor functions. Regular PE plays an important role in regulating the autonomic nervous system. This is evidenced by improvements in heart rate variability (HRV) in sedentary individuals, as well as in those with chronic heart failure who have started an exercise program [1]. HRV is a measure of vagal influence on the heart. Low HRV is a marker of autonomic dysfunction that may be associated with impaired cardiovascular health as well as a poorer prognosis in patients with chronic heart failure or following a myocardial infarction. Physical activity enhances the parasympathetic system's influence on the sympathetic nervous system (as evidenced by an increase in HRV), restores the normal balance of β-adrenergic receptors by reducing their sensitivity and expression, and all of this results in a lower incidence of malignant arrhythmias and greater protection against ischemia-reperfusion injury [15].

Clinical practice evidences on physical activity and cardiovascular disease

The MET (Metabolic Equivalent of Task) measures the energy expenditure of an activity relative to rest (1 MET = sitting). A volume of 20 MET-hours per week is an excellent physical activity goal, equal to about twice the minimum threshold recommended by international health guidelines [16]. Several clinical studies and guidelines confirm that reaching 20 MET-hours per week provides the greatest reduction in mortality risk and consistent cardiovascular benefits; beyond this threshold, the benefits tend to plateau [17].

Cardiovascular diseases

For adults (including those with stable cardiovascular disease and no contraindications), 150–300 min/week of moderate-intensity aerobic activity or 75–150 min/week of vigorous-intensity aerobic activity (or an equivalent combination) is recommended, spread throughout the week, while reducing sedentary time and adding strength training ≥2 days/week [18].

In cardiovascular disease (CVD) primary prevention, 20 MET-hours per week of leisure-time physical activity reduces both all-cause and cardiovascular mortality [3] as well as the incidence of CVD, CHD, and stroke [17].

In patients with chronic ischemic heart disease (CHD) (secondary prevention), physical activity improves functional capacity and quality of life, and reduces the number of hospitalizations and mortality [18].

Hypertension

Moderate physical activity for ≥150 minutes per week or vigorous physical activity for ≥75 minutes per week (caution is advised in patients with SBP >200 or DBP >110 mmHg [19]) reduces SBP by an average of 4–7 mmHg (and DBP by 3–4 mmHg) [20,21].

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Contraindications

High-risk cardiovascular conditions such as refractory/unstable angina, severe arrhythmias, acute heart failure, severe aortic dilation, active pulmonary thromboembolism, and unstable non cardiac conditions (active infection, uncontrolled diabetes [18]).

Conclusions

A sedentary lifestyle is a risk factor for cardiovascular disease: people who are physically inactive are twice as likely to experience a cardiac event and three times more likely to die from a heart attack than people who engage in regular physical activity. Regular physical activity is one of the most important ways to reduce cardiovascular risk, and it is one of the factors that can be modified without medication - simply through a little effort and commitment.

It is important to engage in regular physical activity, as it reduces the risk of cardiovascular disease and stroke by lowering blood pressure and minimizing complications. In addition, moderate and regular exercise helps maintain or achieve a healthy weight, which is a key factor in reducing the incidence of cardiovascular events. The amount of physical activity is just as important as the food we eat, because maintaining a healthy weight means balancing the energy the body takes in through food with the energy expended through physical activity. Overweight individuals are more prone to high blood pressure and high cholesterol levels and therefore have a higher risk of experiencing cardiovascular events (acute myocardial infarction and stroke). An important aspect of physical activity is the management of diabetes through improved glycemic control, lower hemoglobin A1c levels, and reduced insulin levels. Finally, physical activity increases HDL cholesterol levels and lowers LDL cholesterol levels. This is extremely important, as reducing the risk of CVD (21).

Key message!

"You don't need to engage in intense physical activity; moderate but regular exercise is just as effective.

You don't have to be an athlete - just take advantage of opportunities in your daily life to be physically active, reduce your risk of cardiovascular disease, and stay healthy".

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