

BENEFITS OF THE MEDITERRANEAN DIET FOR THE CARDIOVASCULAR SYSTEM: RECENT CONCLUSIONS

Ketly Anne Santos Vieira de Sá

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/9818114007325579>

Lis Campos Ferreira

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/5754047196028912>

Fernanda Santiago Goveia Matos

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/8628926235651755>

Mirna Lopes Peres

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/4400414839240416>

Allana Vitória Oliveira Teixeira

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/1154168323148438>

Rhayana Oliveira Falcão

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/8701096981252253>

Gabrielly Gomes Lima de Sá

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/9384026810404410>

Guilherme Oliveira Rosada

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/6270890735989478>

Lais Oliveira Melo

Universidade Tiradentes, Aracaju

<http://lattes.cnpq.br/7649498468202944>

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Abstract: Introduction: Cardiovascular diseases still remain the most prevalent cause of death in the world's adult population. These risks increase with age along with the prevalence of metabolic syndrome. In this sense, lifestyle changes are enthusiastically recommended in the prevention of cardiovascular diseases. Among them, there is the proposal of the Mediterranean diet. It is about reducing the consumption of meat and carbohydrates in favor of a higher content of plant foods and monounsaturated fats. The richness of some bioactive components proposed in the Mediterranean diet has been promising for the cardiovascular longevity of the population. That said, the current study aims to highlight recent conclusions about the Mediterranean diet (DMed) and its benefits for the Cardiovascular System (CVS). **Methodology:** This is a narrative review with priority for studies published in the last 10 years, seeking to establish the influence of the Mediterranean Diet on the cardiovascular system and its likely benefits, as well as its implication in morbidity and mortality from cardiovascular diseases (CVD). **Results:** A meta-analysis with data from 50 studies and a total of 535,000 individuals concluded that adherence to DMed is associated with a 31% lower risk of metabolic syndrome, with benefit in all its components (hyperglycemia, abdominal obesity, arterial hypertension and atherogenic dyslipidemia). Another meta-analysis of 2,650 subjects reported that DMed is more effective than a low-fat diet in improving different cardiovascular risk factors as well as various inflammatory parameters. Similarly, and confirming previous findings, two recently published meta-analyses - with prospective studies of large cohorts based on clinical events (incidence or mortality) - indicate that a two-point increase on a scale (range 0 to 18 points) Adherence to DMed correlates with a

significant 10% reduction in cardiovascular incidence or mortality. **Conclusions:** The recommendation of a diet consisting of whole grains, vegetables, fruits, vegetables, nuts, olive oil and fish has shown potential for reducing cardiovascular risk according to the body of scientific evidence of the last 10 years.

Keywords: Food. Mediterranean diet. Cardiovascular health. Cardiovascular risk.

INTRODUCTION

Cardiovascular diseases still remain the most prevalent cause of death in the world's adult population. They are insidiously influenced by a set of risk factors, among which, by the American Heart Association, dyslipidemia, obesity, high blood pressure, diabetes and smoking stand out. These risks increase with age along with the prevalence of metabolic syndrome. In this sense, lifestyle changes are enthusiastically recommended in the prevention of cardiovascular diseases. The literature, for example, supports non-exposure to risk factors as a strategy to significantly reduce the number of deaths related to cardiovascular diseases.

The positive effects obtained by behavioral changes on health, in general, are unquestionable. Among the implications for the cardiovascular system can include the reduction of total cholesterol (TC), low-density lipoprotein (LDL-C), triglycerides (TG), blood pressure, improvement in serum cholesterol and high-density lipoprotein (HDL) levels. -C), in addition to the contribution to glycemic control, to the physiological responses related to the increase in metabolic demand, and to the oxygen supply associated with muscle expenditure (CICHOC et al, 2017).

The Brazilian nutritional transition process is multifactorial and is characterized by sequential changes in the diet pattern and

body composition of individuals, resulting from social, economic, demographic, technological and cultural changes that directly affect the lifestyle and health profile of the population. The presence of malnutrition, micronutrient deficiencies, overweight and other chronic non-communicable diseases coexisting in the same communities and, often, in the same household characterizes the nutritional transition scenario. The main changes have occurred in the last two decades with the adoption of a dietary pattern with a high content of saturated fat and sugar, in addition to foods with low fiber content. There is also a reduction in physical activity levels (SANTOS et al, 2013).

Among the changes in life habits recommended by cardiology societies, there is the proposal of the Mediterranean diet to improve cardiovascular health. It is about reducing the consumption of meat and carbohydrates in favor of a higher content of plant foods and monounsaturated fats. Among the recommended ingredients are vegetables, fruits, fish (especially oily fish), white meats, pasta, rice and nuts. Among the many beneficial health properties of this dietary pattern, we can highlight the type of fat that characterizes it (olive oil, fish and nuts), the proportions of the main nutrients (cereals and vegetables as the basis of dishes and meats or similar as “garnish”), the richness of micronutrients, among others (EL DECÁLOGO, 2015). The richness of some bioactive components proposed in the Mediterranean diet (Table 1) has been promising for the cardiovascular longevity of the population.

Bioactive Components	Food sources
Antioxidants	Vegetables, fruits, virgin olive oil, nuts, vegetables, spices and condiments, wine.
Fibers	Vegetables, fruits, whole grains, pulses.
Phytosteroids	Cereals, nuts and dried fruits, pulses and vegetable oils.
monounsaturated fatty acids	Fish and shellfish, nuts.
Polyunsaturated fatty acids	Fish and shellfish, nuts.
Probiotics	Fermented dairy products derived from milk, such as yogurt and cheeses, olives or olives, capers, vinegar and wine.

Table 1. Bioactive components of the Mediterranean diet.

Source: Urquiaga, 2017.

That said, the current study aims to highlight recent conclusions about the Mediterranean diet (DMed) and its benefits for the Cardiovascular System (CVS).

METHODOLOGY

This is a narrative review with priority for works published in the last 10 years, seeking to establish the influence of the Mediterranean Diet on the cardiovascular system and its likely benefits, as well as its implication in morbidity and mortality from cardiovascular diseases (CVD). Scielo, PubMed, Lilacs, UpToDate and Google Scholar databases were used to search for articles. Keywords were defined by the Health Sciences Descriptors (DeCS) in “Mediterranean diet”, “cardiovascular health”, “cardiovascular risk” and “food”. The selection of articles did not use explicit and systematic criteria for the search and critical analysis of the literature. However, articles whose approach did not contribute to the research objectives were excluded, as the year of publication was less than 2012. On the other hand, there was no exclusion of material by criterion of original language.

RESULTS

A meta-analysis with data from 50 studies and a total of 535,000 individuals concluded that adherence to DMed is associated with a 31% lower risk of metabolic syndrome, with benefit in all its components (hyperglycemia, abdominal obesity, arterial hypertension and atherogenic dyslipidemia). Another meta-analysis of 2,650 subjects reported that DMed is more effective than a low-fat diet in improving different cardiovascular risk factors as well as various inflammatory parameters.

The Greek cohort of the EPIC study (*European Prospective Investigation into Cancer and Nutrition Study*) is one of the observations with the greatest impact in terms of the relationship between consumption of a DMed and CVD. In this study, a 2-point increase in the rate of adherence to this diet was associated with a 33% reduction in CVD mortality.

Likewise, and confirming the previous findings, two recently published meta-analyses - with prospective studies of large cohorts based on clinical events (incidence or mortality) - indicate that a two-point increase on a scale (range 0 to 18 points) Adherence to DMed correlates with a significant 10% reduction in cardiovascular incidence or mortality.

Chrysohoou (2008) in a randomized study with 1514 men and 1528 women, aged between 18 and 89 years, during one year in the Attica region of Greece, compared individuals who consumed more than 300g of fish per week with those who did not consume or consumed in smaller amounts. An inverse relationship was observed between fish consumption and concentrations of triacylglycerol, glucose, BMI and systolic blood pressure. The authors concluded that high fish consumption decreased the rate of heart disease by 29% (GODOI and MOTA, 2008).

The recommendation of a Mediterranean diet pattern may be potential for reducing the risk of metabolic syndrome. In a European study, developed with 3,232 individuals, the association between Mediterranean diet scores and the risk of MS was evaluated in a six-year follow-up. Greater adherence to the Mediterranean diet was inversely associated with waist circumference, systolic blood pressure and triglycerides, and directly associated with HDL-cholesterol (SHUSTER et al, 2015).

In fact, it is known that the pattern of food consumption is related to the prevalence of several types of CVD and that the Mediterranean diet can protect against the development and progression of these diseases, based on the hypothesis that the Mediterranean pattern is able to modulate systemic inflammation. intensity and coagulation mechanisms (CHRYSOHOOU et al., 2004).

GLYCEMIC CONTROL

There is pathophysiological evidence of a positive effect of monounsaturated fats on several mechanisms involved in the etiopathogenesis of type 2 diabetes. Mechanistic studies in humans show that short-term interventions, with replacement of saturated fats, or the simple increase in the consumption of monounsaturated fats, can lead to improvements. in insulin resistance, beta cell response in insulin production, increased incretin production response (increased GLP-1) and reduced insulin clearance.

In the Nurses' Health Study, consumption of nuts was associated with a reduced risk of developing diabetes, after adjustments for fiber intake and various lifestyle factors.

COMBATING HYPERTENSION

Epidemiological studies also demonstrate

distinct relationships between the type of fat ingested and changes in blood pressure. Modifications in the proportions of fats, with an increase in the consumption of monounsaturated fat, may contribute to a reduction in blood pressure. However, this beneficial effect can be nullified if the total fat consumed is excessive. Intervention studies show that MUFAs from plant sources, especially when part of the Mediterranean diet, can discreetly lower blood pressure and possibly play an important role in preventing high blood pressure.

Regarding polyunsaturated fats, in a meta-analysis of 36 randomized clinical trials, fish oil supplementation (median dose 3.7 g/day) was shown to reduce systolic blood pressure by 3.5 mmHg and diastolic by 2.4 mmHg. Reduction of adrenergic tone and systemic vascular resistance are proposed mechanisms (SANTOS et al, 2013).

DMed also considers food consumption rich in dietary fiber. Dietary fiber corresponds to the edible fraction of plants that resists digestion and absorption in the human intestine and undergoes partial or complete fermentation in the large intestine. Some fibers are insoluble, like cellulose, and they come mostly from whole grains. Other fibers are soluble, such as inulin, and are obtained from the consumption of vegetables, fruits, legumes, barley and oats. Prospective studies show that dietary fiber intake is inversely associated with the risk of coronary events, estimating a 9% decrease in cardiovascular risk for every 7 g/day of total fiber intake. In addition, intervention studies show beneficial effects of dietary fiber on dyslipidemia, hypertension, blood pressure, and dysglycemia (URQUIAGA, 2017).

EFFECT ON CHOLESTEROL AND REDUCTION OF ABDOMINAL OBESITY

When compared to a low-fat diet or diets low in fat but high in carbohydrates, a diet rich in monounsaturated fatty acids (such as the Mediterranean diet) provides more favorable effects on triglyceride and HDL-c levels, for the same degree of cholesterolemia reduction. A systematic review and meta-analysis of epidemiological studies and randomized controlled trials showed that adherence to this dietary pattern is associated with slight changes in HDL-c (1.17 mg/dL increase) and triglycerides (6.14 mg/dL decrease).

Regarding the consumption content of polyunsaturated fats in the Mediterranean diet, clinical studies show that supplementation with 2 to 4 g of EPA/DHA per day can decrease triglyceride (TG) levels by up to 25% to 30%, increase slightly those of HDL-cholesterol (1% to 3%) and raise those of LDL-cholesterol by up to 5% to 10%. The ability to reduce TG levels depends on the dose, with an approximate reduction of 5% to 10% for every 1 g of EPA/DHA consumed daily, and is greater in individuals with higher basal TG levels (SANTOS et al, 2013).

Chrysohoou et al. (2004) addressed the role of moderate alcohol consumption in the form of wine in reducing cardiovascular risk. Its benefits are attributed to the mild vasodilating effect, the increase in HDL-c levels and the anti-inflammatory characteristics of the flavonoids and other nutrients present in the drink (VISCOGLIOSI et al., 2013).

Probiotics are live microorganisms that, when consumed in adequate amounts, confer health benefits. Fermented dairy foods, such as yogurt and cheese, are part of the Mediterranean diet, and their intake appears to reduce inflammatory markers associated with the development of atherosclerosis. However, the beneficial role of live dairy

microorganisms is not fully proven. Other foods, such as olives, capers, vinegar and wine, typical of this diet, also provide probiotics that can contribute to the gut microbiota (URQUIAGA, 2017).

INDIRECT EFFECTS

It is important to recognize the indirect effects of DMed in also avoiding the consumption of saturated fatty acids and simple carbohydrates, but mainly of trans fatty acids. Espósito et al (2004) showed that insulin resistance and type 2 diabetes mellitus are influenced by excess energy consumption, increasing adipose tissue.

Trans fatty acids are strongly related to cardiovascular risk, especially because they increase the plasma concentration of cholesterol and LDL-c, as well as have an additional adverse effect, because they reduce the plasma concentration of HDL-c, lipoprotein inversely related to cardiovascular events. An important meta-analysis discussed the results of 60 well-controlled studies and reaffirmed the impact of trans fatty acids on both the elevation of cholesterolemia and the reduction of plasma HDL-c concentration.

Several studies have also demonstrated a worsening of sensitivity to insulin action induced by trans fatty acids in animals and humans, particularly among individuals who are predisposed to insulin resistance, thus increasing the risk of developing type 2 diabetes. saturated and polyunsaturated fatty acids, trans impair glucose tolerance, characterized by HOMA - IR (Homeostasis Model Assessment) due to increased hepatic lipogenesis (SANTOS et al, 2013).

Bassett and Cols found that mice that consumed trans fatty acids developed more atherosclerotic lesions when compared to groups that did not consume this fat.

Another recent study reviewed the available scientific evidence, from cohort studies and

clinical trials, on the causal relationship between different components of the diet (nutrients, foods and dietary patterns) and coronary heart disease (MENTE et al, 2009). According to this systematic review, there is solid evidence to state that the risk of coronary heart disease decreases with the intake of monounsaturated fatty acids, vegetables, nuts and a MetD pattern; while increasing with trans fatty acid intake, a Western diet pattern, and high glycemic load diets (Bonito, 2016).

CONCLUSIONS

The recommendation of a diet consisting of whole grains, vegetables, fruits, vegetables, nuts, olive oil and fish has shown potential for reducing cardiovascular risk according to the body of scientific evidence of the last 10 years (Table 2).

bioactive componentes	Benefits pointed out
antioxidants	- Capable of modulating low-intensity systemic inflammation and coagulation mechanisms. - Cardioprotective effect (slight vasodilator effect and increase in HDL-c levels).
Fibers	- Inversely associated with the risk of coronary events, dyslipidemia, hypertension, blood pressure and dysglycemia.
Fitoesteroides	- Inversely related to plasma cholesterol levels.
monounsaturated fatty acids	- Improvements in insulin resistance, beta cell response in insulin production, increased incretin production response (increased GLP-1) and reduced insulin clearance.
Polyunsaturated fatty acids	- Decreased adrenergic tone and systemic vascular resistance. - It can decrease triglyceride (TG) levels by up to 25% to 30%, slightly increase HDL-cholesterol (1% to 3%) and raise LDL-cholesterol by up to 5% to 10%.
Probiotics	- It appears to reduce inflammatory markers associated with the development of atherosclerosis.

Table 2. Benefits of the bioactive components of the Mediterranean diet to cardiovascular health according to recent studies.

Despite this, the global context of the still incipient transition from the western nutritional pattern, rich in simple carbohydrates and trans fats, which reflects obstacles to the good health of the organism, must be recognized.

Therefore, among the behavioral measures to reduce cardiovascular risk recommended by cardiology societies, the following stand

out: control of the BMI at a level considered healthy, avoiding both overweight and underweight; smoking cessation and excessive drinking; practice of a physically active lifestyle, restricting sedentary activities; and adoption of a healthy eating pattern, such as the Mediterranean diet. After all, as demonstrated in this review, recent findings are promising.

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