



Mediterranean diet in the treatment of metabolic syndrome: nutritional therapy and life perspective

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Abstract

Metabolic syndrome is the association of chronic diseases related to diet and physical activity. Also recognized as a complex entity that associates well-established cardiovascular risk factors, such as high blood pressure, hypercholesterolemia, and diabetes, among others, such as central fat deposition and insulin resistance. Currently, Metabolic Syndrome has gained worrisome dimensions within clinical practice, becoming one of the greatest challenges at the beginning of this century. In contrast, the Mediterranean diet recognized for its combination of tasty taste and nutritional benefits, in addition to its culture of the link between health and longevity, is a strategy in the treatment of the metabolic syndrome. Although there is no consensus on the most adequate nutritional strategy to treat Metabolic Syndrome (MS), in such a way that there is a reduction in cardiovascular risk, recent studies show the effectiveness of adopting healthy lifestyles capable of reversing this trend. To address the role of diet in MS treatment, with the main focus on the interaction of benefits of different nutritional interventions in MS remission, contributing to the integration of current evidence in the pre-existing context. In view of the studies carried out in this research, it was found that the Mediterranean diet has shown benefits in the secondary prevention of this syndrome, although the underlying mechanisms are not completely clear. In this sense, it is important to revitalize and apply this diet in the future in terms of preventive and therapeutic

guidelines.

Keywords: Mediterranean diet. Metabolic syndrome. Nutritional therapy. Prevention. Control.

Introduction

Diets are always in fashion and are reinvented according to the nutritional needs or needs of each individual in relation to health and aesthetics in general [1]. In this sense, the search for weight loss is one of the constants that affect the population in order to solve a problem that is obesity [2-4]. Excessive weight gain generates comorbidities that many of them are characterized as metabolic syndrome, in which the individual, to be diagnosed, must have three or more metabolic or anthropometric changes such as increased waist circumference, systemic arterial hypertension, hyperglycemia, hypertriglyceridemia, and reduction in serum HDL levels [5-7].

It is important to highlight the association of MS (metabolic syndrome) with cardiovascular disease, increasing overall mortality by about 1.5 times and cardiovascular by about 2.5 times [8]. A primary measure to face the changes that trigger MS is the practice of physical activities, the reduction of caloric intake, and the reduction of body weight. These factors directly influence the stability of blood pressure as well as the reduction of cholesterol and blood glucose levels and reduction in waist circumference. According to Mathai correctly planning food in order to pre-

pare balanced meals is an important factor in regulating these rates. The combination of protein, fat, and carbohydrates during different meals or snacks allows for better control of blood glucose levels and a slower release of insulin than when consuming only meals or snacks consisting mainly of carbohydrates [9].

However, there is no consensus on the most adequate nutritional strategy to treat MS. Although the current proposals are related to behavioral changes such as modification of eating habits and physical activity, nutritional recommendations can be established by healthy patients or patients with isolated changes and have different results, as the genetic and cultural background must be considered. of each individual. The diet to be beneficial to most patients with MS must include fruits, vegetables, dried pulses, cereals, unsaturated fat (mono and polyunsaturated), and low-fat dairy products in adequate amounts [2,3].

In this sense, the Mediterranean diet presents itself as the main therapeutic proposal in the treatment of MS, since it corresponds to caloric limitations without changing the nutritional status suitable for the patient. According to Salas et al. [10], the traditional Mediterranean diet is characterized by a high intake of cereals, vegetables, fruits, and olive oil; moderate intake of fish and alcohol, especially wine; and low intake of dairy products, meats, and sweets. The Mediterranean diet has a high content of unsaturated fat since olive oil is used abundantly in cooking. Dried fruits, too, with a high content of unsaturated fat are commonly consumed foods in the Mediterranean diet. Evidence from epidemiological and clinical studies indicates that regular intake of nuts may have a positive effect on adiposity, insulin resistance, and other metabolic disorders related to MS [10,11].

Thus, the objective of this study was to approach the Mediterranean diet as a therapeutic proposal in the treatment and prevention of MS and to evaluate its effectiveness as a nutritional benefit for quality of life. Thus, as a justification for this study, it proposed to gather up-to-date information on MS, giving more relevance to the importance of nutrition and physical activity both in its prevention and in its treatment.

Methods

An integrative review was carried out in the PubMed, Scielo, and books database including articles between 2000 and 2021 to analyze the Mediterranean diet as an effective solution in the prevention and treatment of metabolic syndrome in order to seek alternatives that allow for a greater perspective of healthy life and longevity. Keywords were used as search terms individua-

lly or in association: Mediterranean diet, metabolic syndrome, nutritional therapy, prevention, and control.

Results and Discussion

Metabolic syndrome and its components

The MS is constituted by a set of metabolic abnormalities which stands out, as the Insulin Resistance (IR) is more relevant [12]. Next, the most relevant individual components of the metabolic syndrome and the possible interventions for them will be described, highlighting the preventive measures related to nutrition.

Obesity

Obesity, now known as an "epidemic" disease, is considered by the National Cholesterol Education Program's Adult Treatment Panel III (NCEP ATP III) as the main responsible for the increase in the prevalence of MS; in fact, it contributes to high blood pressure, decreased HDL, increased cholesterol and hyperglycemia; factors that are associated with an increased cardiovascular risk [12,13]. As a primary intervention measure, dietary approaches that may vary in the prescription of total energy and macronutrients are adopted. However, the decrease in daily energy consumption is the most important determinant for effective weight loss. It should be remembered that the association of diet with physical activity increases weight loss and decreases abdominal fat [13].

Blood pressure

Blood pressure as a component of metabolic syndrome is a factor that increases the likelihood of cardiovascular disease as well as cardiovascular and renal morbidity and mortality. Among the environmental factors that are related to blood pressure levels, diet seems to play an important role in both the prevention and treatment of systemic arterial hypertension [11].

Hypertriglyceridemia (low HDL)

Hypertriglyceridemia results from the elevation of lipoproteins responsible for the transport of triglycerides and are mildly associated with obesity. Reducing triglyceride levels can be achieved by reducing the consumption of fast-absorbing carbohydrates, as well as the consumption of omega-3 fatty acids derived from saltwater fish [14].

Hyperglycemia

Hyperglycemia is defined as impaired fasting glucose, impaired glucose tolerance, or type 2 diabetes me-

llitus (DM) [15]. Diets that take into account the glycemic index (GI) of foods are among the current proposals for the management of hyperglycemia, especially for patients with DM. Among these proposals, the high consumption of fibers stands out, particularly soluble fibers, which have beneficial effects on glucose and lipid metabolism [16]. The prevalence of MS in the world reaches worrying percentages. In the United States, it is estimated at 24%, and above 60 years of age, this figure rises to 43.5%. In general, the prevalence of MS is increasing and these findings are associated with the epidemic of obesity and diabetes mellitus [15].

Although the data send a warning to society, there are still few studies reporting the statistics of the syndrome in some countries and therefore further studies on the prevalence of MS that prioritize awareness and its risks are necessary. However, studies in different populations, such as Mexican, North American, and Asian, reveal high prevalences of MS, depending on the criteria used and the characteristics of the population studied, with rates ranging from 12.4% to 28.5% in men and from 10.7% to 40.5% in women [15,16].

Studies performed by DiBello et al. [17] found that a more modern dietary pattern associated with a high intake of processed and refined foods, including rice, potato chips, and pancakes, was positively associated with the presence of MS. Accordingly, Noel et al. [18] found that a traditional dietary pattern rich in rice, beans, and fat, and sweets rich in sugar, sugary drinks, and dairy desserts was associated with a higher probability of having MS and low concentrations of HDL-cholesterol. In this context, the Mediterranean diet has been presented as the main element in the treatment of MS [2-7].

History and concept of the Mediterranean diet – Health perspective

The Mediterranean region is made up of parts of three continents. The countries of Europe - Italy, Spain, Greece, Yugoslavia, France, and Albania; from Africa - Egypt, Libya, Tunisia, Algeria, and Morocco; and Asia - Turkey, Israel, Syria, and Lebanon represent the region bathed by the Mediterranean Sea. Despite the great cultural, social, and economic differences between these countries, certain geographic elements in common, such as relief, climate, soil, and hydrography, influenced agriculture and, consequently, eating habits, making them co-founders of Mediterranean cuisine [19].

From the mid-twentieth century, researchers identified the epidemic of cardiovascular diseases in industrialized countries. However, in research, the incidence

of these was much lower on the island of Crete, located in the Mediterranean [20]. This incidence is probably due to the use of monounsaturated fatty acids, such as olive oil, by the population. Several studies seek to confirm singularities and establish the benefits of Mediterranean food [21].

Recognized gastronomically and nutritionally for its excellent combination of tasty taste and healthy effects on the body, the Mediterranean diet is propagated as a model for the ideal diet. Formed by the region's climate and agricultural tradition, it is composed of high consumption of vegetables, fruits, cereals, legumes, oilseeds, fish, olive oil, wine, and a low intake of animal products, simple sugars, and saturated fats [22].

In this context, the traditional Mediterranean diet is known for the health and longevity benefits it provides. It is characterized by a high intake of unsaturated fat since olive oil is used abundantly in cooking. Dried fruits, too, with a high content of unsaturated fat are commonly consumed foods in the Mediterranean diet. Evidence from epidemiological and clinical studies indicates that regular intake of nuts may have a positive effect on adiposity, insulin resistance, and other metabolic disorders related to MS [12,20].

Results of a review carried out by Babio et al. [23], indicated that a healthy eating pattern characterized mainly by high consumption of vegetables, fruits, nuts, olive oil, pulses, and fish; Moderate in alcohol, and low in red meat, processed meat, refined carbohydrates, and high-fat dairy products is beneficial for individuals at increased risk for MS or individuals with MS. In turn, Gouveri et al. [24], in multivariate analysis, revealed that the Mediterranean diet is associated with a 20% reduction in MS (odds ratio: 0.80; 95%CI: 0.65-0.98), after adjustment for age, sex, smoking, mild physical activity, LDL-cholesterol and γ -glutamyl transferase concentrations, diabetes, cardiovascular disease, family history of hypertension, and/or hyperlipidemia.

In 1993, the World Health Organization (WHO) and the Oldways Preservation & Exchange Trust, together with researchers from the Center for Nutritional Epidemiology at Harvard, promoted the development of food guides in the form of pyramids. This conference organized the Mediterranean Diet food pyramid, which is based on existing dietary patterns in the 1960s typical of the island of Crete [25].

The base of the Mediterranean food pyramid is made up of whole grains and olive oil, which can be consumed daily. Next, the food groups are represented by vegetables and fruits. Above, legumes, oilseeds, and cooked vegetables. Near the apex of the pyramid are eggs, fish and seafood, poultry, milk, and dairy products, which must be consumed a few times a week. At the top of the pyramid

are red meats, simple sugars, and saturated fats, which should not be eaten more than once a month. This population has the habit of regular physical activity, drinking plenty of water and wine moderately [20]. Thus, the Mediterranean diet is propagated as a health perspective, when adopted correctly followed by physical activity habits and disassociated from excessive tobacco and alcohol, and has satisfactory results in a quality of life as well as in the prevention of diseases that constitute the syndrome metabolic.

Diet and benefits

The word diet is of Greek origin and means lifestyle. Despite socially representing deprivation and renunciation, the term expresses the link between man and the region in which he lives. The diet present in Mediterranean countries seems to give the population a link to health and longevity [22].

By following the dietary principles that the diet suggests, it is possible to benefit as well as prevent many factors that trigger metabolic syndrome. The Mediterranean diet has shown several benefits, both in the development of MS [26] and in terms of its components. In a meta-analysis of 50 randomized and controlled studies, involving a total of 534 906 participants, Kastorini [27] found a significant decrease in the risk of MS in individuals who adhere to the diet, with a reduction in waist circumference, blood glucose, triglycerides, blood pressure systolic and diastolic blood pressure, and increased levels of c-HDL, when compared to other diets.

As for the dietary pattern factors that are rich in fruits and vegetables; moderate in low-fat dairy products; and low animal protein content, but with a substantial amount of vegetable protein, from legumes and nuts, are active in reducing both systolic and diastolic pressure between hypertensive and normotensive individuals. Furthermore, diet is associated with a lower risk of cardiovascular disease and MS [23].

The association of a good eating plan and the regulation of physical activity practices are entirely related to the benefits against MS [28]. It has been proven that this association causes a significant reduction in abdominal circumference and visceral fat, significantly improves insulin sensitivity, decreases plasma glucose levels [29], and can prevent and delay the onset of type 2 diabetes. two interventions, a significant reduction in blood pressure and triglyceride levels, with an increase in HDL-cholesterol [24].

Strategies for the treatment and prevention of

metabolic syndrome

The treatment of MS aims to improve resistance to insulin action. In this sense, weight loss represents the basis for treatment, as it promotes improved insulin sensitivity, reducing the risk of cardiovascular complications [30]. According to Salas [10], the main focus for patients with MS is the control of individual cardiovascular risk factors, which can be achieved through lifestyle modifications, including dietary intervention. A balanced caloric intake is recommended, which, associated with physical activity, allows you to reach and/or maintain the ideal weight.

In this sense, it can be stated that the implementation of a diet plan to reduce weight, associated with physical exercise is considered first-choice therapy for the treatment of patients with metabolic syndrome [30]. As for prevention, the ideal is to adhere to healthy eating practices, since obesity and IR play a central role in the pathogenesis of MS, all strategies used to improve them seem to be effective in their prevention and treatment. Maintaining a moderate to a high level of physical activity and/or limiting sedentary activities, especially in children, is one of the points of interest in the prevention or treatment of MS3. However, it is important to correctly promote physical activity, as there is a positive association between its practice and the reduction of body fat and IR [18].

Given the exposure to MS, the urgency to act immediately and effectively to prevent the growing trend that this problem tends to maintain becomes evident, as the proportion of children and young people who have it is, in reality, worrying. Thus, lifestyle changes are undoubtedly necessary to minimize this problem and they necessarily go through an increase in the practice of physical exercise and the consequent reduction in sedentary activities (watching television, playing computer, playing with cell phones, etc.). Changes in diet, especially in this age group, are essential, since energy-dense foods are often used, which end up providing a lot of calories; other measures must be taken, such as the use of drugs or other more specific treatments, when the goals are not achieved at all with the lifestyle changes mentioned above [4-7].

It has been proven that even minor reductions in body weight greatly improve the components of MS and, as almost all individuals who suffer from it are overweight or even obese, perhaps start a diet suited to their health and lifestyle problems, is a good starting point [6,7].

Conclusion

The present review addressed the beneficial effects

of the Mediterranean diet in reducing the prevalence of MS, therefore, the dietary pattern described in the Mediterranean diet added to physical activities can be used as useful clinical tools in the treatment of MS. In addition, the suggested menu, with foods rich in fiber is associated with a reduction in cardiovascular risk and, therefore, the Mediterranean diet is recognized as an agent for promoting health and preventing obesity. In this sense, it is verified that dietary factors can play a fundamental role both in the individual components and in the prevention and control of MS. Recent data associate the presence of MS with lower consumption of whole grains, fruits and vegetables. Therefore, there is a close relationship between these foods and dietary fiber, and, likely, soluble fiber is more directly related to these effects. This study is extremely relevant to public health, since the dietary patterns presented can be easily adopted by all population groups and different cultures, and as presented in this manuscript, it can also cost-effectively contribute to the primary and secondary prevention of MS and its components. The clarification and confirmation of several MS-related dietary aspects discussed in this manuscript indicate the need for further studies to assess the influence of different dietary factors on the presence and development of MS, another important observation that should be taken into account is the fact to associate diet with physical activity, thus obtaining a better quality of life and health perspective.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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