Mediterranean Diet and Health

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Submitted: February 14th, 2022 Reviewed: March 4th, 2022 Published: May 20th, 2022

DOI: 10.5772/intechopen.104257

Abstract

In recent years, much emphasis has been placed on the relationship between the diet form known as the "Mediterranean diet" and various diseases. The Mediterranean diet is considered as one of the most effective diet forms in relation to a healthy diet and reducing the risk of cardiovascular diseases. Research has demonstrated that adherence to this diet form has contributed positively to protecting dental health and reducing mortality rates stemming from neurodegenerative diseases (e.g. Parkinson's and Alzheimer's), Type 2 diabetes, obesity, hypertension, cancer (particularly colon and breast cancers), mental function diseases, lower incidence of atherosclerosis, and chronic degenerative diseases. It has further been determined that this diet form, positively affects the improvement of general health status, with its positive effects on living a healthy life and quality aging. Tackling the basic characteristics of the Mediterranean diet, this chapter renders the things to do for disease prevention and the findings of studies examining the relationship between this diet form and different diseases.

Keywords: Mediterranean diet, mediterranean diet and health, cardiovascular diseases, obesity, dental health

1. Introduction

The Mediterranean diet was first described scientifically by Ancel Keys in the 1960s as a result of "The Seven Countries Study", in which the dietary habits of individuals in the Mediterranean basin were studied [1, 2]. With its nutritional dimension, the Mediterranean diet reflects the common dietary characteristics of Mediterranean countries. It is mainly characterized by high consumption of olive oil, olives, fruit, vegetables, cereals (mostly whole grains), legumes, and oilseeds; a moderate-to-high consumption of fish, moderate consumption of eggs, poultry, and dairy products; and low consumption of meat and meat products [3, 4, 5]. In this diet, moderate wine consumption is acceptable unless it is contrary to religious and social norms [5, 6].

The Mediterranean diet gained popularity at the beginning of the 1990s with the creation of the Mediterranean pyramid, which is a nutrition guide and categorizes nutrients graphically into daily, weekly, or less frequent consumption [7]. The scientific world has continued to work on the Mediterranean diet to update this pyramid, considering the changing lifestyles of the societies in the Mediterranean region over time, the dietary and health status of new generations, and environmental and cultural factors [4]. At the international conference titled "The Mediterranean Diet as a Sustainable Diet Model" held in Italy in 2009, the Mediterranean diet was defined as a sustainable diet model because of its nutritional, environmental, economic, and socio-cultural dimensions [8]. At the international scientific symposium held in 2010 on "Biodiversity and Sustainable Diets", it was emphasized that sustainable diets are diets offering healthy living for the present and future generations. The thousands-year-old heritage of the

Mediterranean countries, the Mediterranean diet was accepted as the “Intangible Cultural Heritage of Humanity” by UNESCO in 2010. As a result of the international scientific consensus, a new Mediterranean diet pyramid developed in accordance with today’s lifestyles was published in the same year, and it was proposed that individuals should organize their daily nutrition plans according to this pyramid. The latest Mediterranean pyramid is shown in Figure 1 [4, 7]. The beneficial health effects of nourishment suited to the Mediterranean diet pyramid are mostly correlated with reduced risks of cardiovascular diseases, Type 2 diabetes, obesity, some neurodegenerative diseases, and cancer [9, 10, 11]. Rich fiber content, a high proportion of unsaturated fatty acids and antioxidant components, and low energy content might account for these positive effects of this diet on health [5]. The findings of the studies that examined the effects of the Mediterranean diet on health are presented in the following headings.

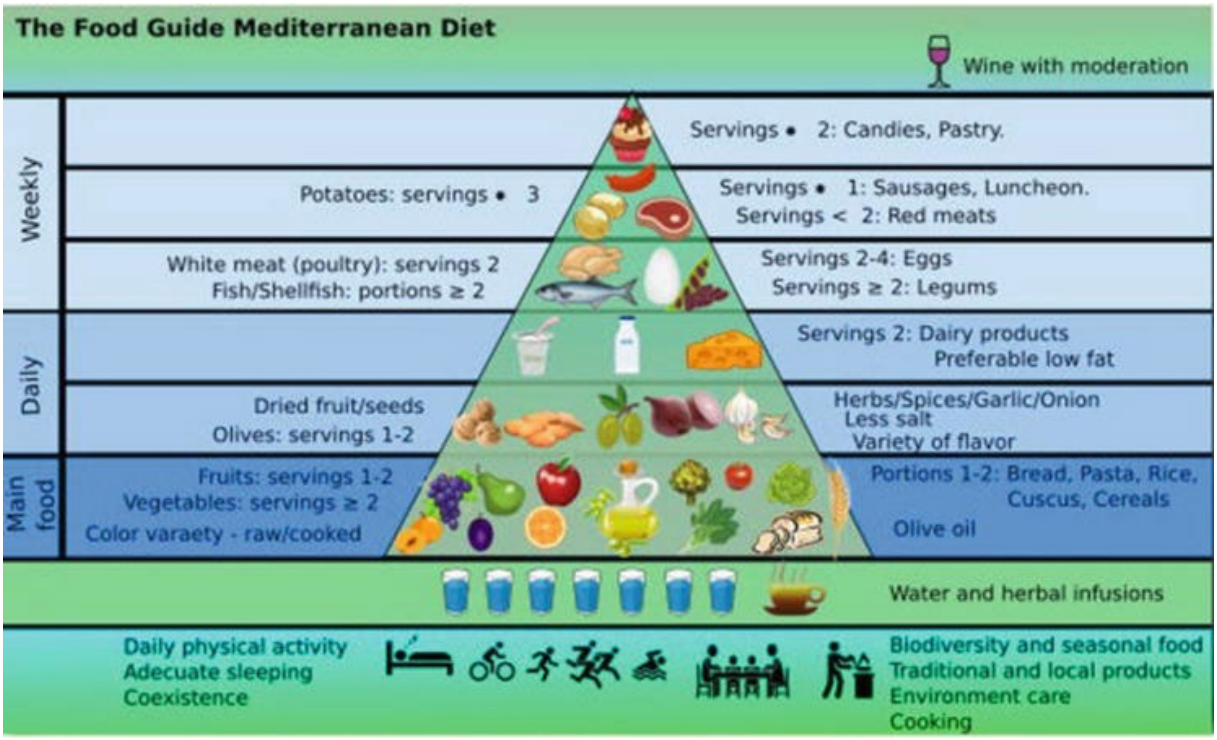

Figure 1.

The Mediterranean diet pyramid.

2. The effects of the Mediterranean diet on cardiovascular diseases

Today, cardiovascular diseases are the most important health problem in industrialized societies. Mortality and morbidity rates from cardiovascular diseases are of particular importance [12]. It is acknowledged that the Mediterranean diet has a protective role in reducing these rates and supporting the cardiovascular system [13]. For instance, a study found that coronary heart patients on a Mediterranean diet had a 70% reduced risk of a second heart attack [14]. Another study revealed that adherence to the Mediterranean diet also protected against the development of coronary heart disease in patients with metabolic syndrome, hypercholesterolemia, and hypertension [15].

A population-based study examining the relationship between the survival status of 1302 Greek men and women diagnosed with coronary heart disease and eating a traditional Mediterranean diet suggested a significant decline in mortality rates from coronary heart diseases. This situation has been affiliated with adherence to the traditional Mediterranean diet [16]. Great adherence to the Mediterranean diet has also been associated with a significant decrease in mortality from cardiovascular diseases in the Mediterranean and non-Mediterranean populations [17].

Studies have also shown the beneficial effects of the Mediterranean diet with low rates of saturated fatty acids on primary and secondary prevention of cardiovascular diseases [18, 19]. In one study, in addition to adapting the daily dietary plan to the Mediterranean diet, tomato products were also included in the diet. Lycopene in tomatoes was observed to improve endothelial function in patients with dysfunctional cardiovascular disease. This has explained the beneficial effects of lycopene, a component of the Mediterranean diet, on the vascular system. It has also strengthened the evidence that a healthy diet is needed to increase endothelial function in populations at risk despite medical treatments. However, the researchers have also noted that further interventional studies are needed to determine whether lycopene supplementation might alter outcomes in preventing cardiovascular diseases in populations at risk [20].

The Mediterranean diet contributes to the intake of antioxidant compounds, such as polyphenols, vitamins, and carotenoids. It has been stated that supplementing these compounds in the diet together with compliance with the Mediterranean diet might be beneficial in the prevention of cardiovascular diseases. It has been confirmed that carotenoids have antioxidant biological properties due to their chemical structure and interactions with biological membranes. It has been stated that Mediterranean diet components might have positive effects on cardiovascular risk factors, including antioxidant and anti-inflammatory activities, inflammation markers, hyperlipidemia, hypertension, insulin resistance, and obesity. It has further been determined that the diet might contribute indirectly to the subsequent improvements in blood pressure baseline levels, reduction of inflammation, correction of dyslipidemias, and improvement of cardiovascular health [21].

3. The effect of the Mediterranean diet on diabetes

Diabetes is a disease that develops when the pancreas does not produce enough insulin hormone, or the insulin hormone it produces cannot be used effectively [22]. Diabetes is constantly increasing in parallel with obesity and is estimated to affect 340 million people worldwide. Proper diet, physical activity, and education have a significant contribution, especially in reducing the course of Type 2 diabetes. The Mediterranean diet is recommended as an effective way to reduce obesity, considered a major public health problem. In addition, the traditional Mediterranean diet is shown as the best diet form to maintain a healthy weight [3, 23]. Weight loss is the first step in the treatment of overweight diabetic patients. It was determined that certain foods had a protective effect on Type 2 diabetes or reduced its course [24]. Based on the consumption of whole-grain products, fruit and vegetables, fish, and olive oil, the Mediterranean cuisine, rich in traditional fiber, has the feature of meeting the nutrients required for diabetic patients. The Mediterranean diet might also improve blood,

glucose, and lipid profiles [25]. Most foods in the Mediterranean diet have a low glycemic index [23].

A study among participants with Type 2 diabetes revealed that adherence to a Mediterranean diet with high olive oil content might delay the use of glucose-lowering drugs at the onset of the disease. It has been determined that this diet form also significantly reduces the need for insulin [26]. At the University of Spain, 13,380 non-diabetic people were followed up for 4.4 years. The study findings revealed that the participants who followed the Mediterranean diet exactly had an 83% lower risk of diabetes compared to the patients with the lowest adherence score to this diet [27]. Another study conducted on 944 Italian patients with type 2 diabetes evaluated the relationship between peripheral artery disease risk and adherence to a Mediterranean diet. The results emphasized that the course of the disease decreased, and the Mediterranean diet was effective in this positive change [28]. Adherence to the Mediterranean diet is now known to provide sustained protection against Type 2 diabetes and other insulin resistance conditions. It was asserted that the interactions between exercise and nutrition and their synergistic effects might fully optimize metabolic health in people prone to diabetes and other metabolic diseases. It was further stated that changing the diet forms of individuals would improve their quality of life [29].

4. The effect of the Mediterranean diet on obesity

The growth of obesity in developed countries has revealed the importance of diet models that diminish the incidence of obesity. The Mediterranean diet is considered an effective dietary model recommended to people searching for a healthy model rather than diets high in saturated fatty acids [30]. The Mediterranean diet has proven to be the most effective nutritional model among diets for preventing obesity-related diseases [3]. Research findings demonstrated that the diet was effective in the treatment of various metabolic disorders and related obesity [31]. High adherence to the Mediterranean diet was found to have a 33% effect on the prevention of obesity [32]. Adherence to the Mediterranean diet provided many advantages in preventing and treating obesity in several observational studies describing the highly satiating effect of meals prepared with olive oil [30, 31]. The Mediterranean diet was also claimed to be an effective way to prevent childhood obesity, considered an important public health problem with short- and long-term effects [17].

It has also been established that especially young people in Mediterranean countries avoid the Mediterranean dietary plan despite its association with numerous health benefits and preventive effects against many pathologies including obesity. Guiding people’s adherence to the principles of the Mediterranean diet should therefore be among the goals of governments in their health policies [33]. This approach could help combat the obesity epidemic, especially in childhood. Well-designed, carefully executed, and supported public health communication programs might contribute to shaping the dietary behaviors of individuals by increasing their awareness and knowledge because the institutions responsible for the development of health policies have the capacity to elicit the change in the lifestyles of their citizens through the activities they might carry out [34].

5. The Mediterranean diet and hypertension

Although hypertension is acknowledged as an adult disease, its incidence is gradually increasing in childhood and adolescence. Specifically, adherence to the Mediterranean diet, the quality of diet, and nutrient adequacy were shown to be protective against hypertension [35].

Although the Mediterranean diet model has been proven and published to have both hypertension-preventing and health-promoting qualities, researchers are discussing whether it is a diet that will sustain in the future. There is a tendency for the younger generations to abandon their traditional dietary habits throughout the Mediterranean basin. Studies have suggested that adherence to the Mediterranean diet begins to decline dramatically among young people, while it remains a pronounced choice for the elderly. Recent reports have shown that young people's diets lack key features of the traditional Mediterranean diet. It has been noted that the rates of hypertension, obesity and high cholesterol among young people are increasing in Greece, Spain, and Italy, similar to the United States [36, 37, 38].

The change in the lifestyles of individuals, leading a life away from families, and divergence from the habit of preparing food at home have indicated the need to present the Mediterranean diet commercially to individuals. For that reason, the dissemination of commercial businesses that carry the characteristics of the Mediterranean diet and their consideration as a gastronomic element is important for reaching people who want to live a healthy life.

6. The effect of the Mediterranean diet on cancer

Cancer is one of the most common diseases of our age. It is a type of tumor defined as a physiological disorder as a result of the uncontrolled proliferation of some cells in the organism. During this time, some cells disappear, or their normal biochemical functions change. They are divided into two benign and malignant [39]. Alcohol and tobacco use, environmental pollution, occupational types, geophysical factors, various infections, drugs, genetic predisposition, and dietary habits are among the causes of cancer.

It is stated that there is an important relationship between cancer and diet, and the formation of cancer can greatly be prevented with the Mediterranean diet. The Mediterranean diet is claimed to prevent the risk of prostate, pancreatic, uterine cancer by up to 10%, the risk of breast cancer by 15%, and the risk of colon cancer by 25% in individuals on a Mediterranean diet. The Mediterranean diet is therefore acknowledged as an important cultural model for delaying and preventing the onset of cancer [40]. One study presented evidence for the beneficial role of the Mediterranean diet on the risk of endometrial cancer, suggesting that the combination of foods rich in antioxidants, fibers, phytochemicals, and unsaturated fatty acids had a positive effect in protecting against cancer [41].

Lung cancer is one of the most common types of cancer, and smoking is known to be an important risk factor. However, there are findings suggesting that a diet rich in fruit and vegetables, such as the Mediterranean diet, might be protective against lung

cancer. Antioxidant vitamins and phytochemicals have been shown as the main factor in this relationship [42]. In studies that examined the compliance of the daily diet of lung and bladder cancer patients on a Mediterranean diet, it was determined that these people were deficient in beta carotene. It was stated that malnutrition from beta carotene might also account for the formation of these cancers. Vitamin C found in fruit and vegetables is known to be protective against esophageal and stomach cancers. Foods such as nuts and olive oil containing Vitamin E were also proven to have beneficial effects on protecting against digestive tract cancers [42]. It was reported that oleic acid, one of the important components of olive oil, blocks the growth of breast cancer cells. It was noted that the rich polyphenol compounds in olive oil also reduced DNA damage with their antioxidant power [43].

It was determined that adherence to the Mediterranean diet had a lowering effect on the risk of prostate cancer, especially in men [40]. Although its mechanism was not fully explained, it was revealed that consumption of whole meal and fiber foods could also prevent intestinal cancer cases at a high rate [42]. 25,623 people (10,582 men, 15,041 women), participated in the Greek EPIC cohort study. The study examined the relationship between the traditional Mediterranean diet and the incidence of cancer. The results indicated a correlation between high adherence to the Mediterranean diet and a decrease in the incidences of cancer [44].

It was asserted that the global proliferation of particularly olive oil consumption might contribute to reducing the onset of cancer in the world population. The consumption of olive oil was also shown as a protective factor to slow down the development of various types of cancer by preventing DNA damage. However, it was emphasized that prospective studies should be increased by considering various external variables, including geographical areas, lifestyles, hereditary factors, and the origin of foods [40].

7. The effect of the Mediterranean diet on Alzheimer's

Alzheimer's is a disease characterized by a decrease in daily living activities and deterioration in cognitive abilities, accompanied by neuropsychiatric symptoms and behavioral changes. Alzheimer's is the most common type of dementia in developed countries due to the increase in the elderly population. It gradually increases in parallel with the aging of the population [45, 46]. The most common neurodegenerative disorder, Alzheimer's manifests itself with memory loss that develops after cell loss in neural structures. Many risk factors including medical, social, psychological, environmental, lifestyles, dietary habits, and genetic factors are involved in the onset and progression of the disease [45]. In addition to genetic factors, other causes are also emphasized. Both human and animal experiments have shown that high intake of saturated fatty acids, low intake of polyunsaturated fatty acids, high level of low-density lipoprotein cholesterol (LDL), and the use of refined sugar are effective factors in the formation of Alzheimer's. The results of epidemiological studies have indicated a relationship between Alzheimer's disease and the use of oils containing saturated fatty acids and sugar consumption. Various studies have also shown that people who take less unsaturated fatty acids, and especially omega-3 fatty acids, have a higher risk of Alzheimer's.

The possible relationship between the Mediterranean diet and Alzheimer's disease was first demonstrated in 2006 as a result of a four-year follow-up study of 2258 people

without dementia. The risk of Alzheimer's disease was observed to be high in those with a low score for adherence to the Mediterranean diet. 262 of the participants in the study were diagnosed with Alzheimer's disease at the end of the fourth year. The risk of developing Alzheimer's disease was reported to be 40% less in the group with the highest adherence to the diet. These results were confirmed by other studies conducted with the same group. Another study determined that the highest adherence to the Mediterranean diet reduced the risk of Alzheimer's by 68% [47]. A different study demonstrated that the positive relationship between adherence to the Mediterranean diet and memory performance might mediate the maintenance of brain volume in the medial temporal lobes. The Mediterranean diet was also shown to be inversely associated with pathological biomarkers, such as amyloidosis and tauopathy. A healthier diet is thought to reduce brain atrophy, and the Mediterranean diet is considered to contribute to preserving brain structure [48].

Positive relationships between the Mediterranean diet and brain morphology and the Mediterranean diet and memory performance define the relationship between the Mediterranean diet and Alzheimer's. The Mediterranean diet is thought to be a protective lifestyle against the neurodegeneration and memory impairment associated with Alzheimer's disease. Alzheimer's disease might be delayed with dietary interventions [48, 49]. It was shown that changes in dietary habits might prevent Alzheimer's disease and slow the progression of the disease. It is noted that olive oil is contained in the diet, vitamins contained in vegetables and fruit (beta-carotene, Vitamin C and E, as well as folate), and flavonoids exert this effect. Due to its omega-3 fatty acid content, fish consumption might also affect the onset and progression of Alzheimer's disease [47, 50]. In addition, the Mediterranean diet can protect against dementia, thanks to its positive effects on cardiovascular risk factors such as obesity, insulin resistance, hypercholesterolemia, and hypertension [51, 52]. To further explain the extent to which the Mediterranean diet is responsible for preventing dementia risk, it is emphasized that the data on long-term adherence to the Mediterranean diet should also be evaluated before dementia is diagnosed [49].

8. The effects of the Mediterranean diet on oral and dental health

Dental caries is a multifactorial infectious disease that represents a significant health problem worldwide. Besides cariogenic bacteria and poor oral hygiene, the cariogenic diet is the main risk factor for dental caries. It has been stated that the Mediterranean diet can be a good example of adequate and balanced nutrition, that this diet can provide a healthier diet worldwide, and in connection with this, a healthier dental structure can be achieved. There was an inverse correlation between dental caries in children aged 3–9 years with low adherence to the Mediterranean diet, and diet quality was directly related to dental caries [53]. In a study, a lower Body Mass Index (BMI) was determined in adults with high adherence to the Mediterranean diet, which was associated with higher chewing performance. Also, dental treatment and the rehabilitation of missing teeth were claimed to be beneficial in improving diet quality. In addition, impaired oral and dental health might cause deficiencies in dietary intake [54, 55]. A study conducted with elderly individuals with low adherence to the Mediterranean diet (73.9 ± 8.5) found higher BMI, more drug use, and lower chewing performance [54]. Another study evaluating the relationship between the

Mediterranean diet and Sjögren's syndrome characterized by dry mouth (xerostomia) associated higher adherence to the Mediterranean diet with a lower probability of Sjögren's syndrome [56].

Wine is an important element of the Mediterranean diet, and it is recommended to consume one glass of wine every day. Studies have emphasized that wine might also affect the oral cavity positively due to its acidity and alcohol content [57]. However, the amount of consumption is also important in wine consumption. It was stated that frequent consumption of white wine might lead to serious dental erosion. In addition, it was shown that white wine had a higher abrasive potential on tooth enamel than red wine, and the amount of consumption was an important factor [58].

The role of the Mediterranean diet on the risk of the oral cavity and pharyngeal cancer was also investigated, and it was reported that adherence to a high Mediterranean diet was protective against pharyngeal cancer [59]. The main source of monounsaturated fatty acids in Mediterranean countries, olive oil is consumed at high rates. It was determined that olive oil had a positive effect on various neoplasms, including oral and pharyngeal cancers, due to its antioxidant properties rich in both oleic acid and Vitamin E [60]. It was further asserted that the favorable effect of the Mediterranean diet on oral and dental health was apparently stronger in young, highly educated ex-smokers or nonsmokers [59].

9. The effect of the Mediterranean diet on the digestive system

Adequate and balanced nutrition is to maintain a healthy life. Just as a healthy digestive system is needed to ensure this, a healthy diet within a healthy digestive system is of great importance. The digestive system is one of our important systems in which solid and liquid foods are broken down into small building blocks that can be absorbed and passed into the blood circulation, along with water, vitamins, and minerals, as well as proteins, carbohydrates, and fats during their progression through the digestive tract. Digestive system diseases caused by infectious agents and stress factors added to an unbalanced diet are frequently encountered today [61]. The Mediterranean diet positively affects the digestive system due to its rich olive oil content. It is suggested that olive oil can also prevent the formation of gallstones due to the fact that it increases bile production and provides monounsaturated and polyunsaturated fatty acids in a balanced way. It was found that the formation of gallstones is lower in areas with high consumption of olive oil [25].

As can be seen from the studies conducted, compliance with the Mediterranean diet is an important dietary model both for the protection of general health and the prevention of many diseases. For that reason, it is important for individuals to acquire the right dietary habits from a young age. Individuals should be made conscious of the protection of public health, sustainability, and the transformation of the Mediterranean diet into a lifestyle.

10. Conclusion and future perspective

Dietary patterns and culinary culture exhibit regional differences. Despite the similarity of the diet in the regions with a coast to the Mediterranean to the Mediterranean diet, marked variations might be observed in other regions. The results of the studies discussed in this chapter have suggested that the Mediterranean diet is a diet that should be applied as a lifestyle. It might be observed that this dietary form, however, has not been adopted adequately or attached significance throughout the world. Emerged as a result of globalization and technological developments, fast-food diet causes societies to move away from their traditional dietary habits. Although the climatic conditions and geographical structure of countries are considered as an obstacle for individuals to adopt the Mediterranean diet, the development of trade networks and transportation conditions today might enable us to eliminate this obstacle. The important point is that individuals demand other nutrients, especially olive oil, recommended to be consumed in this diet. The fact that individuals have this awareness might create an important solution to the Mediterranean diet in reducing the risk of obesity and other chronic diseases viewed as the main public health problem in many countries. The nutrition of the family, the smallest unit of society, is the prerequisite for a healthy society. Adequate, balanced, and healthy nutrition of individuals is the basic requirement for maintaining health and preventing diseases for individuals of all age groups. It is crucial to acquire the right nutritional knowledge and habits from childhood to increase life quality and experience a quality aging process. Current information reveals that the Mediterranean diet has the potency to do this. The current situation might be revealed by conducting interdisciplinary scientific studies based on long-term observations with broad participation, considering the dietary styles of societies. Individuals might be made aware of the Mediterranean diet, both through social media and through written and visual communication tools. This can thus contribute to the increase in the quality of life of individuals and lead a healthy life.