

## Mediterranean diet and the elderly: a review

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**Abstract.** The culinary pattern is close related to health. The elderly represent a special category if we take in consideration their nutrient need. The Mediterranean diet represents a lifestyle followed by centuries by the population around the Mediterranean Basin. The main characteristic is the high intake of fruits, vegetables, whole grains, fish, olive oil and the low intake of fat cheese and red meat. This diet meets the required culinary needs of elderly for a healthy aging. Numerous studies have shown the beneficial role of the Mediterranean diet for longevity and prevention of cardiovascular diseases.

**Key Words:** Mediterranean diet, elderly, primary and secondary prophylaxis, cardiovascular diseases.

**Rezumat.** Obiceiurile alimentare sunt legate strâns de sănătate. Vârstnicii sunt o categorie specială din punct de vedere al necesităților alimentare. Dieta mediteraneană reprezintă un stil de viață urmat de secole de populația din zona bazinului mediteranean. Caracteristica dietei mediteraneene o constituie consumul sporit de fructe, legume, cereale integrale, carne de pește, ulei de măsline și, mai puțin, de brânzeturi grase și carne roșie. Aceasta dietă îndeplinește nevoile alimentare ale vârstnicilor pentru o îmbătrânire sănătoasă. Numeroase studii au demonstrat beneficiul dietei mediteraneene pentru longevitate și prevenția bolilor cardiovasculare.

**Cuvinte cheie:** Dieta mediteraneană, vârstnici, profilaxie primară și secundară, boli cardiovasculare.

**Introduction.** The elderly (people aged over 60) take a special place in human society. They are not older versions of adults, as children are not younger versions of adults. The number and the proportion of older people are growing every year around the globe. In 2002 there were 605 million elderly in the world. Greece and Italy had the highest proportion of older people (24 % in 2000). By 2025, the number of older people will reach 1.2 billion (WHO 2009a).

Nutrition is one of the most important parts of every man's life. It is essential for the development and the subsequent survival of the humans. Nutrition is the base of a healthy old age. The elderly are particularly vulnerable to malnutrition. That is because, aside from aging itself, older people face other complex problems. Aging is associated with many cardiovascular diseases, mental illnesses and a poor financial status due to a decrease of earnings.

There are several studies that correlate certain dietary pattern with lower risk of diseases. One beneficial diet is particularly attractive because of the overwhelming supportive data: the Mediterranean diet.

**Background.** The human body contains chemical compounds, such as water, complex carbohydrates, amino acids, fatty acids and nucleic acids. The underlying structure of the substances is made from several compounds like carbon, hydrogen, oxygen, nitrogen, phosphorous, calcium, iron, zinc, magnesium etc. These elements occur in various forms and combinations (hormones, vitamins etc.), both in the human body and in the plant and animal organisms that people consume.

The Mediterranean diet is the name given to the culinary habits of the people who live around the Mediterranean Sea. There are 18 countries within the Mediterranean basin with a similar dietary style. There are some differences between the cooking habits of each country, but a recognizable pattern has been described (Brill 2009).

The first study (Seven Country Study) that evaluated the effect of the Mediterranean diet was published in the 80's. The results showed that blood cholesterol level and, subsequently, the cardiovascular risk was linked to the type and quantity of food that the subject consumed (Keys 1980). After that, a great number of studies showed the beneficial effects of the Mediterranean diet.

The traditional Mediterranean diet (Figure 1) is characterized by a low intake of meat, poultry, eggs (zero to two times a week) and sugar (or sugar-derived products), a low-moderate intake of dairy (especially low-fat cheese and yogurt), a moderately-high intake of fish (salmon, tuna, trout, sardines, pangasius, cod) and seafood, a high intake of olive oil (the most important fat source), a high intake of vegetables (lettuce, garlic, onion, tomatoes, broccoli, peppers, capers, spinach, eggplant, mushrooms, white beans, lentils, chick peas, carrots), fruits (apples, mangoes, strawberries, watermelons, kiwi, oranges), nuts (walnuts), and cereals (whole grains - bread, pasta, potatoes, polenta, rice, couscous). Total fat is high (about 40 % of total intake), but the monounsaturated: saturated fat ratio is 2:1 or more. Moderate quantities of alcohol (one or two glasses of wine) should be consumed every day during lunch or dinner (Willet et al 1995, Trichopoulou et al 1995).

**Mediterranean Diet – Advantages for the Elderly.** Several changes take place as humans grow old. Taste sensation decreases with age. Older people have an impaired ability to identify food by taste. Because 85 % of older people have one or more chronic ailments the usage of medication is inherent (Saltzham & Mason 1997). There are a number of drugs and diseases that can affect the taste. Even if the tooth loss in the elderly has declined in last decades, 60 % are edentulous. Poor dentition is a major contributor to impaired chewing and reduces the caloric intake. The saliva production is practically unaffected by aging. The elderly have a modest slowing of gastric emptying, which may predispose to anorexia and weight loss by prolonging gastric distention and increasing meal-induced fullness and satiety. Small intestine bacterial overgrowth is common in the elderly. It determines malabsorption of several micronutrients like folate, iron, calcium and vitamins (Beers 2005). Also, aging is associated with a high incidence of atherosclerosis. Therefore, a balanced diet is needed in an attempt to maintain a healthy status in the elderly.

World Health Organization (WHO) recommends that a dietary guideline for healthy ageing to the several nutritional factors as: food variety, nutrient density (culture-specific food/dishes as Mediterranean or Asian meals), phytochemical density. According to WHO, a healthy nutrition may be influenced in a favorably way by the addition of herbs and spices. Also specific foods should be present in a dietary pattern for the elderly: fish, lean meat, legumes, whole cereals, nuts, and low-fat dairy products. Unsaturated fat should be obtained from nuts, seeds and fatty fish. Olive or canola oil is to be preferred for cooking. WHO recommendations can be all found in the Mediterranean dietary pattern (WHO 2009).



Figure 1. The Mediterranean diet pyramid

Mediterranean diet is better suited for the elderly because it contains a high number of vegetables and cereals which are rich in fibers,  $\beta$ -carotene, vitamins (B<sub>6</sub>, B<sub>12</sub>, C and E), antioxidants, minerals and polyphenols. Antioxidants counter the excessive production of free oxygen radicals, reducing the DNA (deoxyribonucleic acid) damage (Bogani & Visioli 2007). This action explains the significant drop of the incidence of chronic diseases, associated with Mediterranean diet. The antioxidative action of vitamins and other compounds in the Mediterranean diet improves the transient endothelial dysfunction seen in healthy people after consumption of high fat meals. Fibers influence the cytokines milieu by reducing the circulating IL-18 (interleukin) levels, thus having an anti-inflammatory role (Esposito et al 2004). Olive oil down-regulates endothelial VCAM-1 (vascular cell adhesion molecule), ICAM-1 (intercellular adhesion molecule), and E-selectin expression and decreases plasma concentrations of sICAM-1, sVCAM-1, sE-selectin, interleukin-6, and CRP in patients with cardiovascular high risk (Dell'Agli et al 2006, Cortés et al 2006, Fitó et al 2008). AIRGENE trial was designed to evaluate the benefits of a Mediterranean diet on systemic inflammation of the myocardial infarction survivors. Data from this study revealed that moderate red wine intake (1-12 glasses per month) reduced the levels of inflammatory markers like C-reactive protein or IL-6 (Panagiotakos et al 2009). This effect is due to the polyphenols that are found in grapes and their derivatives (grape juice or wine). Polyphenols reduce cholesterol absorption and triglycerides levels (Zern & Fernandez 2005). Table 1 describes the major sources for

phytochemicals (non-essential nutrients, but who are scientifically confirmed as beneficial to human health).

Table 1

Food sources of phytochemicals and their possible roles in health

<i>Phytochemicals</i>	<i>Important food sources</i>	<i>Possible roles in health</i>
Carotenoids	Orange pigmented, and green leafy vegetables, carrots, tomatoes, spinach	Anticarcinogen Antioxidant Antimutagen Immuno-enhancing
Flavonoids, isoflavonoids, saponins	Green and yellow leafy vegetables, parsley, celery, soybean and soy products	Anticarcinogen Antioxidant Antimutagen
Polyphenolics	Cranberry, raspberries, blackberries, rosemary, oregano, thyme	Antioxidant Antibacterial Reduce urinary tract infection
Isothiocyanates and indoles	Cruciferous vegetables, broccoli, cabbage	Antimutagen
Allyl sulphides	Garlic, onions, leeks	Anticarcinogen Antibacterial Cholesterol-lowering
Phytosterols	Pumpkin seeds	Reduce symptoms of prostate enlargement
Salicylates	Grapes, dates, cherries, pineapple, oranges, apricots, gherkins, mushrooms, capsicums, zucchini	Protective against macrovascular disease Modulation of gene expression
L-dopa	Broad bean	Treatment of Parkinson disease
Non-digestible carbohydrates	Artichoke, chicory root, murrnong, maize, garlic, oats, fruit, and vegetables	Stimulate growth of microbial flora Cholesterol-lowering

Source: [www.who.int/nutrition/publications/en/nut\\_older\\_persons\\_2.pdf](http://www.who.int/nutrition/publications/en/nut_older_persons_2.pdf)

The high intake of fish in Mediterranean diet provides a good amount of omega-3 polyunsaturated fatty acids. In a previous article we discussed the cardioprotective value of omega-3 acids in the general population (Vesa et al 2008). Data from CHS (Cardiovascular Health Study) showed that the consumption of tuna or other broiled or baked fish is associated with lower incidence of stroke in the elderly. Frequent intake of tuna (over 5 meals per week) was not associated with a lower stroke risk compared with modest intake (1-4 servings per week – as in the Mediterranean diet). Meals that consisted in fried fish determined a higher incidence of ischemic stroke (Mozaffarian et al 2005). Frying alters in a profound manner the nutrient composition of the fish, increasing the omega-6: omega-3 ratio (Candela et al 1998). The analysis of NHS (Nurses' Health Study) linked the adherence to the Mediterranean diet with lower risk of incident heart diseases and stroke in women. The association was even stronger for fatal events. Fung et al hypothesized that this fact is due to the high intake of fish. Also, the study revealed that Mediterranean dietary pattern is beneficial not only for primary prevention of heart disease, but it improves the survival rate of patients already diagnosed with cardiac conditions (Fung et al 2009).

The PREDIMED (Prevención con Dieta Mediterránea) was a large clinical trial that aimed to assess the effects of the traditional Mediterranean diet on the primary prevention of cardiovascular diseases. It included people aged over 60 years which had a

high risk of developing cardiovascular disease. The participants followed a Mediterranean diet rich in unsaturated fat supplemented with mixed nuts (once per day) for 1 year. The results showed that the overall prevalence of the metabolic syndrome (abdominal obesity, hypertriglyceridemia, elevated blood pressure and hyperglycemia) was reduced in this people, compared with the control group, which followed a low-fat diet (Salas-Salvado et al 2008). The analysis of the SUN (Seguimiento Universidad de Navarra) cohort demonstrates the same low association between elderly who adhere to a Mediterranean eating pattern and the incidence of the metabolic syndrome (Tortosa et al 2007). The mechanism by which the Mediterranean diet influences the metabolic syndrome is revealed by one study that showed a reduction of C-reactive protein levels and endothelial stress in people who eat after the Mediterranean food pattern (Esposito et al 2004).

The analysis of a subgroup of the PREDIMED study showed reduced immune cell activation (crucial in genesis of the atherosclerotic plaque) and decreased concentrations of inflammatory markers related to atherogenesis in older people who adhere to a Mediterranean diet. These changes were independently of the treatment with anti-inflammatory drugs (Mena et al 2009).

The EPIC (European Prospective Investigation into Cancer and Nutrition) study recruited over 30000 people of all ages from all regions of Greece. Its purpose was to investigate "the role of biological, dietary lifestyle, and environmental factors in the etiology of cancer and other chronic diseases". The result of the EPIC study showed a reduction in mortality, related to both coronary heart diseases and cancer, in people with a high degree of adherence to the Mediterranean diet. The decrease was not linked to each component of the diet, but to the whole sum. This means that, even if each food class has a beneficial effect, it is too small to change the incidence of death, and the overall effect is determined by the combination of all nutrients that compose the Mediterranean diet (Trichopoulou et al 2003). The same results are presented by the first study that evaluated the effect of Mediterranean diet upon the life expectancy of older people (17 % reduction in overall mortality) (Trichopoulou et al 1995). The SENECA (Survey in Europe on Nutrition and the Elderly: a Concerned Action) study demonstrates a near 50 % drop of mortality rate from coronary heart diseases, cancer, cardiovascular diseases, in men and women, with age between 70 and 90 years, who had followed a Mediterranean diet. The other beneficial factors were the absence of smoking and the physical activity (Knoops et al 2004).

Age-related cognitive impairment (Alzheimer's disease, vascular dementia) is a very important problem facing any physician who treats older people. Studies have shown that high adherence to Mediterranean diet reduces the risk for probable Alzheimer's disease (AD). Two possible explanations have been described: Mediterranean diet lowers the vascular risk factor implicated in the physiopathology of AD (dyslipidemia, hypertension, abnormal glucose metabolism, coronary heart disease) and the nonvascular mechanism that reduces the risk of AD by inhibition of oxidation and inflammation (Scarmeas et al 2006). Also Mediterranean diet is associated with decreased incidence of mild cognitive impairment (a transitional stage between normal aging and AD). The rate of conversion from mild cognitive impairment to AD is also lowered (Scarmeas et al 2009).

Sofi et al (2008) demonstrate in a meta-analysis that greater adherence to a Mediterranean diet is associated with a significant improvement in health status. The overall mortality rate was reduced by 9 %, mortality from cardiovascular diseases and cancer was lowered by 9 %, respectively 6 %. The incidence of Parkinson's disease and Alzheimer's disease was reduced by 13 %.

The Mediterranean diet is an eating pattern which can be followed by older people who lived independently or who are institutionalized. From a socioeconomic point of view the diet is easier to be supported by the elderly because vegetables, fruits, whole grain bread and fish are cheaper than red meat, poultry, high-fat cheese, sour cream or butter. The only component that is expensive in the Mediterranean diet is the olive oil.

Although the Mediterranean diet is a scientific proved healthy diet, it is less and less applied even in the countries where it was followed for centuries. Another sad fact is

that a large part of world's population is too poor to acquire even the basic nutrients. According to WHO, hunger is the gravest single threat to the world's public health.

**Conclusion.** The Mediterranean diet is a beneficial nutritional pattern for the elderly. It is associated with protective effects against cardiovascular diseases, cancers and dementia.

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