

The Traditional Mediterranean Diet: Lessons Learned

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Abstract *The Mediterranean diet has evolved over several millennia. While the Mediterranean diet varies from one country to another, the commonalities include a plant-based diet with substantial amounts of greens, pulses, fruits, nuts, seeds, whole grains and olive oil. The traditional diet of Crete is considered to exemplify such a diet because of the superlative health status and longevity of its people, as demonstrated in the renowned Seven Countries Study. There is a large and growing body of evidence that such a diet, taken as a whole package, is strongly associated with a multitude of measurable health benefits. With the current rise in the prevalence of metabolic syndrome, diabetes, obesity and other degenerative conditions, the implications of the Mediterranean diet for preventive health care are enormous. For people who have adopted a Westernized diet, their health status has deteriorated. Conversely, people who adhere to a traditional Mediterranean diet have superior health outcomes.*

Introduction

Historically the term Mediterranean diet (MeDiet) was loosely derived from the concept of a diet of the peoples living in the Mediterranean basin. By no means homogeneous, the diet varies from one country to another; the commonalities include a plant-based diet with substantial amounts of greens, pulses, fruits, nuts, seeds, whole grains and olive oil. The benefits of the MeDiet were shown in the renowned Seven Countries Study: over 12,000 healthy middle-aged (40–59 years old) men—agricultural or railroad workers—from Finland, the United States, Netherlands, Yugoslavia, Italy, Japan and Greece were studied in 1958–1964. The results were published in 1970 by the physiologist Dr. Ancel Keys (a.k.a. ‘Mr. Cholesterol’ of the University of Minnesota). It showed the lowest mortality rates due to cardiovascular disease (CVD) in Crete (Greece was subdivided into two regions), at 9 per 100,000 population over

10 years; the highest rates were in the US and Finland, 424 and 466, respectively.^{1,2} In 1993 the Oldways organization, Harvard School of Public Health and World Health Organization introduced the concept of the Mediterranean diet “a delicious, pleasurable, and very healthful way to eat” (www.oldwayspt.org).

A large and growing body of evidence links the MeDiet with lower risks of CVD,^{3–5} stroke,⁶ certain cancers,^{7,8} obesity and diabetes,^{9–11} depression,¹² cognitive impairment,^{13,14} and with benefits to general health and longevity.^{15–19}

In the European Prospective Investigation into Cancer and Nutrition cohort (EPIC), Trichopoulos and others (2005) showed that greater adherence to the MeDiet was associated with a significant reduction in the mortality of individuals with coronary heart disease (CHD). A higher adherence by 2 units (out of a 10-unit diet score) was associated with a 27% lower mortality.²⁰ In the Spanish EPIC

cohort study of 41,000 participants from five centres, over a mean follow-up of 10 years, Buckland and others used an 18-unit relative MeDiet score. The study showed that high adherence, versus low adherence, can reduce the risk of a first cardiac event by 40%; even a 1-unit increase in the diet score was associated with a 6% reduction in risk of CHD. The study supported the role of the MeDiet in primary prevention of CHD.²¹ Another EPIC cohort study of 485,000 subjects aged 35-70 from ten European countries, over a mean follow-up of 8.9 years, showed a significant reduction in the risk of incident gastric adenocarcinoma with a higher adherence to the MeDiet. A 1-unit (out of an 18) increase was associated with a reduction in the risk of gastric adenocarcinoma by 5%.²²

Components of the Mediterranean Diet

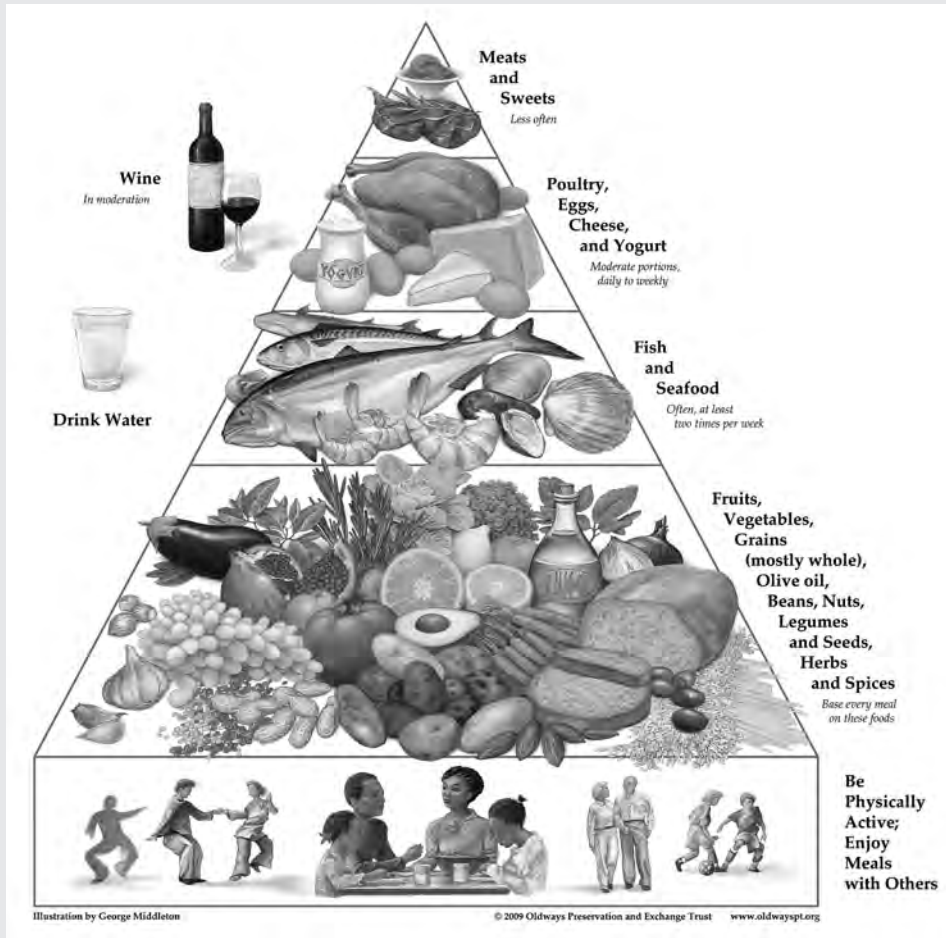
The Mediterranean Diet Pyramid was developed in 1993 according to numerous

scientific studies on nutrition and health. "This preliminary concept of a pyramid to represent a healthy, traditional Mediterranean Diet is based on the dietary traditions of Crete, much of the rest of Greece and southern Italy circa 1960, structured in light of current nutrition research."²⁵ Oldways has since updated the original version (Figure 1, p.111) by placing all plant foods together as the staple of most meals; increasing the frequency of fish and seafood to at least twice weekly; and adding herbs and spices to reflect their role in not only enhancing the palatability of the foods, but also health promotion. The main constituents are listed in Table 1 (below).

Olive oil is an integral constituent of the MeDiet with numerous health promoting benefits. It is high in monounsaturated fats and rich in antioxidant phytochemicals and micronutrients, which can be destroyed by heat and chemical refining. Therefore ex-

Table 1. Components of the Traditional Mediterranean Diet

- Vegetables include leafy greens, pulses (peas, beans and lentils), roots, tubers and so on form the staple of the MeDiet. Aside from cooked vegetables, raw salads are often added daily.
- Fruits are frequently ingested - more than once daily. They are plentiful in the Mediterranean basin.
- Grains include whole grains from barley, wheat, oats, corn and rice, and are mostly unrefined.
- Nuts and seeds provide, as with legumes, fibre and protein.
- Yogurt and cheese, especially from goat and sheep, are eaten in small to moderate quantities.
- Eggs and seafood are also consumed fairly regularly and provide high-quality protein.
- Meats, including poultry, are eaten only in small portions in the MeDiet. On special festive occasions there may be goat or lamb added to the meal.
- Herbs are important as condiments or for medicinal purposes (see Table 2).
- Desserts may be served during celebrations; otherwise they are not eaten on a regular basis. (Honey is often used as a sweetener instead of refined sugar.)
- Wine is consumed in some, though not all, of the Mediterranean countries, and generally in small quantities (here, a little may be good but a lot is definitely not better).
- Olive oil – "liquid gold," as Homer called it - is an essential component of the Mediterranean diet.

Figure 1. The Mediterranean Diet Pyramid

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tra-virgin ('cold-pressed') olive oil, with its greenish-gold tint, is the best kind. Its many benefits include improving lipid profiles and endothelial function, as well as protection against pro-inflammatory states and some cancers.^{7,8,23,24} Although most of the research has been on extra-virgin olive oil, consumption of whole olives is also likely beneficial. The olive tree (*Olea europaea*) is indigenous to the Mediterranean basin and the production of olive oil likely started in the early Minoan period (circa 4,000 BC). Greece is now the largest producer of extra-virgin olive oil in the world (and third in total olive oil production).

The Traditional Diet of Crete

Because of the superlative health parameters, including lowest CHD rates and highest longevity in Crete, the traditional diet of Crete can be considered the prototypical MeDiet. The earliest archaeological evidence of the systematic cultivation and use of large quantities of olives for oil dates back to the Middle Minoan period (2,160-2,000 BC).³⁶ Crete was an important olive-producing area and traded with the Aegean islands and beyond. The main livestock were sheep and goats. Hare and ibex were some of the wild species that supplemented the diet

of the early people of Crete. Protein residues in the skeletal material of human bones from the Neolithic, Minoan and Mycenaean periods have been subjected to stable radioisotope analysis, showing a mixture of plants and meats, with variable amounts of seafood.³⁷ Available evidence suggests that, through some five thousand years until the past few decades, the people of Crete, especially in the rural areas, maintained basically a similar traditional diet.³⁸

Crete has the highest consumption of olive oil of all the Mediterranean countries (about a third of the total caloric intake comes from olive oil and olives). Vegetables, pulses, fruits and whole grains are consumed in large quantities, whereas meat is used mainly for celebrations, and eaten in modest amounts. Depending on the location, dairy and fish are also consumed in moderate to small amounts (lactose intolerance is quite common in the adult population in Crete and Greece).²⁶ Wine (one to two glasses) is often included with dinner as part of socializing.²⁷

Herbs are an important and indispensable daily fare because of their savoury as well as medicinal value.²⁸ Their purported uses and characteristics are based mainly on tradition and custom (Table 2, p. 113). However, there are known antioxidant properties in a number of herbs (such as thyme, Greek sage, wild sage and spearmint).²⁹ Herbal teas of dittany, sage, thyme, marjoram and chamomile are popular, as are mint with lemon balm or basil. A 'mountain tea' popular in western Crete containing ironwort (*Sideritis syriaca*) is often mixed with other herbs.

Nuts and seeds are consumed regularly. Sabaté and others (2010) pooled 25 nut consumption trials conducted in seven countries among 583 people³⁰ and showed improvement in blood lipid levels in a dose-related manner in nut consumption, especially among subjects with higher low-density lipoprotein-cholesterol (LDL-C) or with lower Body Mass Index (BMI). Frequent intake of nuts then can be protective against CHD; consumption of different kinds of nuts lowers total and LDL-C and the low-density lipoprotein: high-density lipoprotein

ratio in healthy subjects or those with moderate hypercholesterolemia.³¹ Nuts have a high unsaturated to saturated fatty acid ratio, as well as beneficial macro- and micro-nutrients including phytosterols, protein, folic acid, alpha-tocopherol and so on. Further, nuts can blunt the postprandial glycemic response of a high carbohydrate meal, and thus may have a role in the glycemic control of patients with diabetes or prediabetes.³² The intake of tree nuts, peanuts and seeds is higher in the south of Europe compared to the north. Jenab, Sabaté and others³³ also found that the most popular tree nuts were walnuts, almonds and hazelnuts which, in general, were more widely eaten than peanuts or seeds. In the Mediterranean region the annual per capita nut consumption was highest in Lebanon (averaging 16.5kg), Greece (11.9kg) and Spain (7.3kg), followed by Israel and Italy (FAO, 2001).³⁴ A systematic review by López-Uriarte and others³⁵ of *in vitro* and *in vivo* studies in animals and humans, on the effect of nuts on oxidation, found that although high in total fat, no harmful effects on oxidation were reported; on the other hand, the presence of antioxidant activity appeared to be beneficial. Thus, frequent nut intake is associated with a lowered risk of CHD, type 2 diabetes and death by all-cause mortality.

The MeDiet vs 'Western'-type of Food Habits

Bringing all this forward, much has changed since the 1950s and 60s. Those countries that have increased the consumption of vegetables and cut down on animal fats have improved health parameters such as CVD rates. Conversely, those countries that have wandered away from the MeDiet showed worsening parameters. Twenty-five years after the Seven Countries Study almost 6,000 of the 12,763 men had died. The CHD mortality in Greece was 5%; that of Finland, 30%.³⁸ Although traditional lifestyles were maintained in some segments of the Greek population, they have, in the urban areas, given way to a 'Western'-type of diet with a decrease in consumption of fruits by 31% and bread by 70%, and an increase in consump-

Table 2. Some Common Herbs and their Purported Uses^{27,28}

- **Basil** (*Ocimum basilicum*): It is used for its enriching flavour with tomato, vegetables, meats and baked products. Traditionally it is said to be good for gastric disturbances, abdominal cramps, and even colds and influenza (Hippocrates considered it good for the heart and stomach).
- **Rosemary** (*Rosemarinus officinalis*): This evergreen shrub, with its sweet scent, is used to flavour fish, poultry, meat and cheese as well as soups and fruit salads. It is also a spasmolytic and its tea can help with pharyngitis and oral ulcers; in addition, the leaves can be used topically for sprains and arthralgias.
- **Thyme** (*Coridothymus capitatus*): Probably imported from Egypt - a sprig of it was found in the tomb of Tutankhamen - it was considered in antiquity to be a "cheap herb" because of its abundance. It is used to flavour many things, sprinkled on bread, olive oil, as well as added to other herbs to make tea. It is an antiseptic, expectorant and spasmolytic; thus, it is used for certain respiratory infections and intestinal disorders.
- **Sage** (*Salvia fruticosa*): This condiment, with its pungent scent, can be added in conservative amounts to fish, meat and legumes and used to make sage tea, with or without the addition of other herbs. As a medicinal plant, salvia (from the Latin *salvare*, to save) has many uses, such as a mucolytic for respiratory affections, a spasmolytic for gynaecological disorders, an astringent, an aphrodisiac and - by Dioscurides (first century AD) - a hemostatic. As a salve (lotion) it is used for skin eruptions. It is a strong herb that should not be used to excess.
- **Marjoram** (*Origanum majorana*): The leaves and shoots of this shrub are used for seasoning all sorts of dishes with tomato, fish, meats and pasta. It is believed to have antispasmodic and antiseptic properties as well as be good for asthma and digestive disorders.
- **Oregano** (*Origanum spp*): This popular seasoning is used for a wide variety of dishes. Its medicinal value lies in its antimicrobial (anti-viral and anti-fungal) properties, and is used to treat respiratory infections, colds, influenza, menstrual disorders and - by Hippocrates - for eye infections (trichiasis). (Caution: pregnant women should not use it to excess).
- **Fennel** (*Foeniculum vulgare*): This herbaceous plant, found throughout Greece, has been in use since antiquity by people of Egypt and the eastern Mediterranean, and was mentioned on Linear B tablets (the oldest form of writing of Greece: 1,450-1,100 BC). It is used with vegetables, seafood, soups, tomato sauce, olives and salads; the seeds impart a sweet scent to baked products. Medicinally, it is used for gynaecological conditions and as a tonic. Dioscurides believed it assisted lactation, treated nausea and vomiting, and eye afflictions.
- **Dictamnus** (Dittany of Crete, *Origanum dictamnus*): Indigenous to Crete, this short shrub grows wild on steep slopes. According to mythology Aeneas was saved from dying from a serious arrow wound with dittany. Aristotle and others also mentioned how a wild goat was cured of its arrow wound by eating dittany. To the ancients dittany symbolized birth (as a uterine stimulant) and love (as an aphrodisiac). It supposedly benefits the kidneys, liver and spleen. Used also in tonic drinks such as teas, it is said to have germicidal properties and may alleviate gastrointestinal symptoms. (Pregnant women should avoid its use).

tion of meat by 160% and cheese by 366%. Concomitantly their lifestyle became more sedentary and smoking prevalence rose. The average BMI, blood pressure, cholesterol level and rate of diabetes also rose. CHD mortality saw an increase, as did the rate of cancer (especially of the lung). In the same period of time the USA and Finland saw a decrease in their CHD mortality.⁴⁰ Alcohol consumption in Greece increased by 15%

between 1970 and 1981; still, it was 59% that of Italy and 50% that of France. With the mechanization of agriculture, physical activity among rural people saw a drop. In Crete between 1960 and 1982 the frequency of very overweight people (BMI ≥ 30 kg/m²) increased ten-fold.⁴⁰ Four decades after the Seven Countries Study, even among the farmers of Crete, the "gold standard of health," mean weight gain was 20 kg.⁴¹

Discussion

More data have emerged showing the benefits of such a plant-based MeDiet on acid-alkaline balance,^{42,43} BMI,⁴⁴ blood pressure, metabolic syndrome,⁴⁵ diabetes,⁴⁶ mental health (depression), cognitive function and Alzheimer's disease.⁴⁷⁻⁴⁹ Such a diet provides plant (phyto-) sterols which can lower serum cholesterol,⁵⁰⁻⁵² and even increases the success of couples undergoing fertility treatment (In Vitro Fertilization/Intra Cytoplasmic Sperm Injection) in achieving pregnancy (odds ratio 1.4).⁵³ The MeDiet is associated with a lower risk of cancer at several sites,⁵⁴ including prostate cancer.^{55,56} Although some components of such a diet—olive oil, fibre, folate, carotenoids and flavonoids—show an inverse relation with cancer risk, other important nutrients and components with such a favourable effect remain as yet undefined.^{57,58} Various nutrients and antioxidants may work in synergy.⁵⁹ Furthermore, higher fish and omega-3 fatty acids intake is associated with beneficial effects on a number of diseases,^{60,61} including a lower risk of CVD,^{62,63} certain mental disorders,⁶⁴⁻⁶⁷ and depression.^{68,69}

Although CHD mortality in Canada has decreased over several decades it remains the major cause – one-third – of deaths. With the increasing prevalence of the metabolic syndrome, obesity, diabetes and so on, the burden of CVD is expected to rise in the next decade.⁷⁰ First Nations people, because of their significantly increased risk for obesity, diabetes and CHD, require special attention. By targeting what is known to be associated with high risk of such diseases, preventive measures can have a profound impact.

With thousands of years of history the MeDiet, exemplified by the traditional diet of Crete, has evolved to become one of the healthiest diets in the world. In order to advocate, protect and preserve the traditional Mediterranean diet, the United Nations Educational, Scientific and Cultural Organization (UNESCO), in November 2010, added it to the 'intangible' Cultural Heritage List.⁷¹

Conclusion

It is recognized that in observational studies, association may not be equal to causality. Results based on questionnaires and recall of dietary patterns by study subjects can contain inaccuracies; further, it is difficult to control for other important lifestyle factors. Nonetheless, numerous studies on men and women in various countries over the past several decades, especially since the inception of the Seven Countries Study, have shown convincingly strong links between a plant-based diet of whole foods, and good health and longevity—not just longer lives but also more disease-free years. The closer the adherence to the traditional Mediterranean diet, the better the health outcomes: the data are compelling. The key determinant of health remains the habitual diet of the populace.

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Competing Interests

The author declares that he has no competing interests.

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