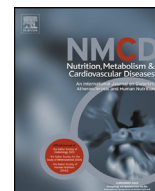


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## Nutrition, Metabolism &amp; Cardiovascular Diseases

journal homepage: [www.elsevier.com/locate/nmcd](http://www.elsevier.com/locate/nmcd)

## Relationship between Mediterranean diet and asymptomatic peripheral arterial disease in a population of pre-menopausal women

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Received 21 June 2017; received in revised form 23 September 2017; accepted 25 September 2017

Handling Editor: A. Siani

Available online ■ ■ ■

**KEYWORDS**Mediterranean diet;  
Antioxidants;  
Women;  
Pre-menopausal

**Abstract** *Background and aims:* The Mediterranean Diet (MedD) is considered a very healthy diet useful in the prevention of cardiovascular disease. The present study aims to evaluate adherence to MedD in unselected premenopausal women and its relation with ankle-brachial index (ABI), an index of preclinical atherosclerosis.

*Methods and results:* A group of 425 patients (age range 45–54 years) was investigated. They were enrolled only if they were asymptomatic for cardiovascular disease. Nutritional parameters were assessed by a self-administered food frequency validated questionnaire (116 items) completed by an interviewer administered 24 h diet recall. They all underwent ABI measurement. The mean MedD Score was  $32.2 \pm 6.1$  (Q1–Q3 range 26–37) comparing with data from Italian population ( $46 \pm 8.3$ ) was significantly lower. Intake of food categories sources of antioxidants was higher in patients with a greater adherence to Med D and was mainly related to fruit and vegetables. Patients were categorized in quartile according to MedD Score and we evaluate the distribution of ABI index within quartile. 31.4% of women in Q1 (lower adherence to MedD) had an ABI lower than 0.9 compared to 18.3% of women in Q4 (higher adherence to MedD);  $p < 0.01$ . Obesity was more frequent in Q1 compared to Q4 and in women with lower ABI.

*Conclusions:* Women with a low MedD Score were more obese and showed instrumental sign of preclinical peripheral atherosclerosis. MedD rich in antioxidants from fruit, vegetables and nuts influenced the development of atherosclerosis and was associated with a lower incidence of asymptomatic atherosclerosis.

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**Background**

The Mediterranean Diet (MedD) is a very healthy diet useful in the prevention of cardiovascular disease (CVD) [1–3]. Several studies suggest that higher intakes of fruit, vegetables, and whole grain are associated to a lower risk of atherosclerosis [2,3]. A possible explanation is a

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<https://doi.org/10.1016/j.numecd.2017.09.011>

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reduction in oxidatively modified LDL. Because of their antioxidant properties, carotenoids, vitamin E, and vitamin C might protect against free oxygen radicals and lipid peroxidation. A high intake of carotenoids and vitamins is essentially the result of a diet rich in fruit and vegetables and possibly low in meat product [4,5].

Peripheral arterial disease (PAD) is still under-diagnosed and under-treated throughout Europe. Under-diagnosis is largely attributable to the fact that up to 50% of PAD patients can be asymptomatic [6]. The ankle-brachial index (ABI) is a symptom-independent tool that can be used reliably to evaluate PAD [7,8].

The present study aims to evaluate adherence to the Mediterranean Diet (MedD) and intake of antioxidants from food in unselected premenopausal women and their relation with ABI index.

## Methods

A retrospective analysis on a group of 650 women (age range 45–54 years) was performed. Patients were referred to our clinic from general practitioners for screening and prevention of CVD. We selected women only if they were free of symptoms of PAD, had ABI evaluation and a complete nutritional assessment. We excluded participants with a previous history of cardiovascular disease, (ischemic heart disease, heart failure and stroke), those who did not complete questionnaire, and those who did not undergo ABI evaluation and who did not sign the consent (Fig. 1 Supplemental Material). From the initial group we analyzed data from 425 women.

The Local Ethical Review Board approved study and participants signed an informed consent.

## Data collection

Nutritional status was assessed by measuring weight, body mass index (BMI), waist circumference and waist-to-hip ratio [9].

The prevalence of nutritional parameters was assessed by a self-administered food frequency questionnaire (FFQ) with 116 items and completed by an interviewer-administered 7-day diet recall questionnaire on the day of first visit [10].

The food list in the FFQ was Italianized, and foods commonly eaten in the Emilia Romagna region of Italy were added. For each food class color photographs of three different portions were displayed. Portion sizes were chosen according to many years of experience in dietary surveys in various parts of Italy [3,9,11].

Food frequency was evaluated using three categories: daily, weekly and monthly and from 1 to 6 number of times (i.e.: once a day, 3 times a week) and was integrated with specific questions on changes in nutrition habits and lifestyle within the last year.

The Mediterranean score was calculated according to Panagiotakos [12] and included 11 food groups: non-refined cereals (whole bread, pasta, rice, other grain,

etc.), fruit, vegetables, legumes, potatoes, fish, meat and meat products, poultry, full fat dairy products (butter, cream, cheese, yoghurt, milk), together with olive oil and alcohol intake. Then the frequency consumption of these foods was assessed by assigning individual ratings (from 0 to 5 or the reverse) in each of the 11 food groups cited above.

According to Panagiotakos, for alcohol evaluation, we assigned score 5 for consumption of less than 300 ml of alcohol/day, score 0 for consumption of more than 700 ml/day and scores 4–1 for consumption of 300, 400–500, 600 and 700 or 0 ml/day (100 ml has 12 g ethanol concentration) respectively [12]. Alcohol intake was also qualitatively assessed: wine, wine during meal, beer, liquor. The score ranges from 0 to 55. Higher values of this diet score indicate greater adherence to the Mediterranean diet. In the Attica Study the mean value of the Med Score was  $25.46 \pm 2.94$  in men and  $27.18 \pm 3.21$  in women and we used these values as references. [12].

MedD score was evaluated in quartiles. The first quartile (Q1) comprised 105 patients with Score  $27 \pm 4.3$ , the second quartile (Q2) 107 patients with Score  $29.8 \pm 3.0$ , the third quartile (Q3) 107 patients with Score  $32.8 \pm 3.4$  and the fourth quartile (Q4) 106 patients with a Score  $34.5 \pm 4.8$ .

A dietician using a database system computed food and nutrient intakes from FFQ and dietary recall. We also investigated the use of nutritive and non-nutritive sweetener that was included in the database.

Caffeine consumption was investigated, and estimated as: number of cups of coffee, type of coffee (espresso, American, decaffeinated, cappuccino), number of chocolate snacks and cola soda drinks usually consumed. We estimated caffeine intake as 1 cup of espresso coffee = 90 mg, 1 cappuccino = 110 mg, 1 cup of American coffee = 160 mg, 1 can of cola soda drink = 42 mg [11].

The nutrient database was compiled from food composition tables [3,11,12]. Antioxidant intake was evaluated by nutrient database that was supplemented with data on total antioxidant concentrations in foods [3].

The value of antioxidants was calculated as the total amount of antioxidants derived from the combinations of individual antioxidants that occur naturally in foods. We also evaluated the percentage of antioxidants from food according to the most well known sources of antioxidants: vegetables, fruits, legumes, coffee, and tea [4].

Smoking was also investigated.

## ABI measurement

All patients underwent ABI measurement. The ABI is a simple, noninvasive test, measuring the SBP from both brachial arteries and from both the dorsalis pedis and posterior tibial arteries after the patient has been at rest in the supine position for 10 min by using a Doppler device. The ABI of each leg is calculated by dividing the higher of the dorsalis pedis pressure or posterior tibial pressure by the higher of the right or left arm blood pressure [6,7].

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