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Adherence to a Mediterranean-Style Diet and Its Influence on Cardiovascular Risk Factors in Postmenopausal Women

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ABSTRACT

Background A Mediterranean-style diet (MedSD) is associated with positive health outcomes, particularly reduced risk of cardiovascular disease. It is of interest to assess the feasibility of adherence to a MedSD in a subset of older adults in the United States.

Objective To assess the efficacy of implementing a MedSD intervention in a subset of postmenopausal women living in the United States, and to detect the influence of this dietary pattern on blood lipid levels.

Design A partial feeding, nutrition counseling, pilot study with a one-group longitudinal design.

Participants Sixteen healthy, postmenopausal, American women living in suburban communities in Farmington, CT, with a mean±standard deviation age of 77±6.8 years and a body mass index of 26.1±3.1.

Intervention Participants were counseled by a registered dietitian nutritionist on how to follow a MedSD, which included increased sources of n-3 polyunsaturated fatty acids, fruits, and vegetables, and decreased saturated fat, n-6 polyunsaturated fatty acids, and simple sugars for 12 weeks. To maintain isocaloric conditions, participants were asked to substitute sources of saturated fat and refined carbohydrates for extra virgin olive oil (3 T/day), walnuts (1.5 oz/day), and fatty fish (3 to 5 servings/wk), which were provided at 3-week intervals.

Main outcome measures Dietary adherence measures included the Mediterranean Diet Score, 3-day diet records, and serum fatty acid and lipid profiles.

Statistical analyses Mixed model longitudinal analyses were conducted to assess changes over time (Weeks 0, 12, and 24) in the outcome variables.

Results Mediterranean Diet Score increased by 8.9 points ($P<0.001$) after the MedSD phase. Dietary sugar decreased by 10.8 g ($P<0.05$), total dietary n-3 increased by 1.6 g ($P<0.01$), total dietary n-6 increased by 5.5 g ($P<0.01$), and dietary n-6:n3 ratio decreased by 3.6 units ($P<0.01$). In serum, 22:6 (n-3), 20:5 (n-3), and 18:3 (n-3) increased ($P<0.001$, $P<0.01$, and $P<0.001$, respectively), and 14:0, 16:0, 17:0, 20:4 (n-6), 22:4 (n-6) declined after the intervention ($P<0.01$, $P<0.001$, $P<0.01$, $P<0.01$, and $P<0.001$, respectively), which support a change in dietary intake toward a MedSD. Serum high-density lipoprotein cholesterol levels increased by 3.8 mg/dL (0.098 mmol/L) ($P<0.05$) and serum triglyceride levels decreased by 11.6 mg/dL (0.131 mmol/L) ($P<0.10$).

Conclusions A pilot study of a 12-week MedSD intervention with counseling from a registered dietitian nutritionist can favorably influence the dietary pattern and lipid profile of postmenopausal women living in the United States.

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A MEDITERRANEAN-STYLE DIET (MEDSD) IS ASSOCIated with a variety of positive physical and mental health outcomes, including reduced risk of metabolic disease,[1] type 2 diabetes mellitus,[2] obesity,[3,4] overall mortality,[5] Parkinson's disease,[6] and cancer[7]; and reduced severity of asthma symptoms,[8] mild cognitive impairment, and Alzheimer's disease.[9] In addition, there is strong evidence for the diet's favorable influence on risk for cardiovascular disease,[10] the most common cause of death in

the United States.[11] Due to these significant health benefits, it is of interest to identify effective interventions that will enable individuals to successfully adopt the healthful MedSD as a strategy for prevention of chronic disease.

A traditional MedSD is characterized by high intake of fruits, vegetables, legumes, and nonrefined grains, moderate-to-high intake of fish, moderate intake of dairy, and low intake of red or processed meat and sweets, with the main source of dietary fat being olive oil.[12]

Compared with other diets, the MedSD tends to be higher in monounsaturated fat, polyunsaturated fatty acids (PUFAs), and fiber. It has a lower n-6:n-3, two specific types of PUFAs, and it is lower in saturated fat and sugar.

The Prevención con Dieta Mediterránea (PREDIMED) study was a large-scale, multicenter, randomized, parallel-group intervention trial conducted by registered dietitians (RDs) in Spain, aiming to evaluate a MedSD for the primary prevention of cardiovascular events.[13] The study had three diet groups: a MedSD supplemented with mixed nuts (MedSD+nuts), a MedSD supplemented with extra virgin olive oil (EVOO) (MedSD+EVOO), and a low-fat control group. Compliance was assessed using food frequency questionnaires and biological markers of compliance (plasma oleic and α-linolenic acid proportions, and urinary concentrations of hydroxytyrosol, resveratrol, and ethanol). Participants showed good adherence in the two MedSD intervention arms of the study after individual and group sessions with an RD.[13] However, because the intervention was conducted in a Mediterranean country, the intervention may not be applicable to an American population. Therefore, the aim of this pilot study was to assess the efficacy of a similar intervention conducted in a subset of postmenopausal women living in the United States, and to examine the influence of a MedSD on cardiovascular risk factors.

METHODS

Participants

Participants were recruited using convenience sampling techniques. Letters of inquiry were sent to individuals in the study site's previously recruited database and notifications were posted on the study site's recruiting website. Convenience sampling was used because participants needed to be willing to drive to the site for check-ins.

Participants lived in three suburban communities surrounding UConn Health in Farmington, Hartford County, CT. Data from the Connecticut Economic Resource Center report that in the town of Farmington, 10% of the population are women older than age 65 years and have a median household income of $88,467 (compared with the county median of $64,752 and state median of $69,519).[14] In addition, 57% of the population has a bachelor's degree or higher.

Thirty-eight women were screened via telephone by a research assistant at the site, using a fruit and vegetable screening form, a calcium and vitamin D screening form, and a set of interview questions to determine whether they met inclusion or exclusion criteria. Exclusion criteria included any disease that may affect bone metabolism, cancers of any kind (except basal or squamous cell of the skin) during the past 5 years, use of medication known to affect bone metabolism, participation in physical activity more than 75 min/day for 6 days/wk, dietary behaviors or supplementation in excess of Dietary Reference Intakes upper limits, total vitamin D consumptions from food and supplements in excess of 10,000 IU/day or <400 IU/day, total calcium consumption from food and supplements exceeding 2,000 mg/day or <400 mg/day, following a medically prescribed diet or dietary pattern similar to the MedSD, history of chronic renal or liver disease, history of hip fracture or known vertebral fracture within the past year, alcoholic beverage intake more than 3 drinks per day, having an allergy to fish or nuts, achieving a score >81% (45 out of 55) on the Mediterranean Diet Score assessment form (MDS),[15] consumption of more than 5 servings/day of fruit or vegetables (as determined from the Modified National Cancer Institute Fruit and Vegetable Screener form), consumption of 2 or more servings/wk of fatty fish, or consumption of 3 or more servings/week of any seafood. Recent reports describing the usual intakes of older American adults found that this population normally consumes lower amounts of fruits, vegetables, and seafood,[16,17] which is why individuals who met the current dietary recommendations for these foods were excluded from this study. We also excluded older adults who participated in physical activity more than 75 min/day for 6 days/wk based on literature supporting lower usual physical activity levels among older US adults.[18] Thus, we were interested in recruiting individuals whose usual intake did not reflect a MedSD and who had a physical activity and dietary profile similar to the typical older adult US population.

Sixteen women failed the screening, leaving 22 postmenopausal women who voluntarily enrolled between July 2012 and April 2013. Six of these participants were dropped during the study period secondary to changes in dietary supplement use (meeting exclusion criteria), resulting in a total of 16 participants completing the study. The trial design was a one-group, longitudinal, pilot partial-feeding intervention. Each participant followed a baseline control diet for 12 weeks and then switched to a MedSD. Participants visited the research site approximately every 3 weeks for a total of nine visits.

The study was approved by the Institutional Review Board at the University of Connecticut Health. All participants gave written informed consent.

Diets

Participants followed their typical diets for the first 12 weeks of the study period. They were instructed by an RD not to make any major changes to their typical diet (ie, do not introduce new diet habits or eliminate foods or food groups) and not to start any new nutritional supplements. This period served as the control for the intervention phase.

After 12 weeks, participants were educated by an RD to begin the MedSD. The intervention diet included four components: incorporation of 3 T EVOO daily; incorporation of 3 to 5 servings/wk of high n-3 fish (eg, salmon or tuna, wild-caught from the Pacific ocean); incorporation of 1.5 oz Diamond walnuts (Diamond of California, Inc) daily; and incorporation of increased amounts of fruits, vegetables (goal of 5 servings/day), and whole grains (rather than processed grains). Participants were provided with the first three components of the diet at the research site at 3-week intervals (starting with Week 12), and were instructed on how to make the changes involved in the fourth component on