

Original article

Greater Adherence to a Mediterranean Dietary Pattern Is Associated With Improved Plasma Lipid Profile: the Aragon Health Workers Study Cohort

José L. Peñalvo,^{a,*} Belén Oliva,^a Mercedes Sotos-Prieto,^{a,b} Irina Uzhova,^a Belén Moreno-Franco,^c Montserrat León-Latre,^c and José María Ordovás^{a,d}^aÁrea de Epidemiología y Genética de Poblaciones, Fundación Centro Nacional de Investigaciones Cardiovasculares (CNIC), Madrid, Spain^bDepartment of Nutrition, Harvard School of Public Health, Boston, Massachusetts, United States^cUnidad de Prevención Cardiovascular, Instituto Aragonés de Ciencias de la Salud (I+CS), Zaragoza, Spain^dNutrition and Genomics Laboratory, Jean Mayer US Department of Agriculture Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, United States

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ABSTRACT

Introduction and objectives: There is wide recognition of the importance of healthy eating in cardiovascular health promotion. The purpose of this study was to identify the main dietary patterns among a Spanish population, and to determine their relationship with plasma lipid profiles.**Methods:** A cross-sectional analysis was conducted of data from 1290 participants of the Aragon Workers Health Study cohort. Standardized protocols were used to collect clinical and biochemistry data. Diet was assessed through a food frequency questionnaire, quantifying habitual intake over the past 12 months. The main dietary patterns were identified by factor analysis. The association between adherence to dietary patterns and plasma lipid levels was assessed by linear and logistic regression.**Results:** Two dietary patterns were identified: a Mediterranean dietary pattern, high in vegetables, fruits, fish, white meat, nuts, and olive oil, and a Western dietary pattern, high in red meat, fast food, dairy, and cereals. Compared with the participants in the lowest quintile of adherence to the Western dietary pattern, those in the highest quintile had 4.6 mg/dL lower high-density lipoprotein cholesterol levels ($P < .001$), 8 mg/dL lower apolipoprotein A1 levels ($P = .005$) and a greater risk of having decreased high-density lipoprotein cholesterol (odds ratio = 3.19; 95% confidence interval, 1.36–7.5; P -trend = .03). Participants adhering to the Mediterranean dietary pattern had 3.3 mg/dL higher high-density lipoprotein cholesterol levels ($P < .001$), and a ratio of triglycerides to high-density lipoprotein cholesterol that was 0.43 times lower ($P = .043$).**Conclusions:** Adherence to the Mediterranean dietary pattern is associated with improved lipid profile compared with a Western dietary pattern, which was associated with a lower odds of optimal high-density lipoprotein cholesterol levels in this population.

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La mayor adherencia a un patrón de dieta mediterránea se asocia a una mejora del perfil lipídico plasmático: la cohorte del Aragon Health Workers Study

RESUMEN

Introducción y objetivos: Hay un amplio reconocimiento de la importancia de una dieta saludable para la promoción de la salud cardiovascular. El objetivo de este estudio es identificar los principales patrones alimentarios en la población española y determinar su relación con los perfiles lipídicos plasmáticos.**Métodos:** Se llevó a cabo un análisis transversal de los datos obtenidos en 1.290 participantes de la cohorte del Aragon Workers Health Study. Se utilizaron protocolos estandarizados para la obtención de datos clínicos y bioquímicos. Se evaluó la dieta a través de un cuestionario de frecuencia de alimentación, cuantificando el consumo habitual durante los 12 meses previos. Se identificaron los principales patrones de dieta mediante un análisis factorial. Se evaluó la asociación entre la adherencia a los patrones de dieta y las concentraciones plasmáticas de lípidos mediante regresión lineal y logística.**Resultados:** Se identificaron dos patrones de dieta: un patrón de dieta mediterránea, rica en verduras, frutas, pescado, carnes blancas, frutos secos y aceite de oliva, y un patrón de dieta occidental, rico en carnes rojas, comida rápida, productos lácteos y cereales. En comparación con los participantes que se

Palabras clave:

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* Corresponding author: Área de Epidemiología y Genética de Poblaciones, Centro Nacional de Investigaciones Cardiovasculares (CNIC), Melchor Fernández Almagro 3, 28029 Madrid, Spain.

E-mail address: jlpenalvo@cnic.es (J.L. Peñalvo).<http://dx.doi.org/10.1016/j.rec.2014.09.019>

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encontraban en el quintil más bajo de adherencia al patrón de dieta occidental, los que se encontraban en el quintil más alto presentaron cifras de colesterol unido a lipoproteínas de alta densidad 4,6 mg/dl menores ($p < 0,001$) y de apolipoproteína A1, 8 mg/dl menores ($p = 0,005$) y mayor riesgo de mostrar una disminución del colesterol unido a lipoproteínas de alta densidad (*odds ratio* = 3,19; intervalo de confianza del 95%, 1,36–7,5; p de tendencia = 0,03). Los participantes con adherencia al patrón de dieta mediterránea presentaron cifras de colesterol unido a lipoproteínas de alta densidad 3,3 mg/dl mayores ($p < 0,001$) y un cociente de triglicéridos/colesterol unido a lipoproteínas de alta densidad 0,43 veces inferior ($p = 0,043$).

Conclusiones: La adherencia al patrón de dieta mediterránea se asocia a una mejora del perfil lipídico en comparación con lo que se observa con un patrón de dieta occidental, que se asoció a menor probabilidad de que los valores de colesterol unido a lipoproteínas de alta densidad fueran óptimos en esta población.
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Abbreviations

ApoA1: apolipoprotein A1
HDL-C: high density lipoproteins cholesterol
MDP: Mediterranean dietary pattern
TG: triglycerides
WDP: Western dietary pattern

INTRODUCTION

Cardiovascular disease is well recognized as a major public health problem.¹ Given the direct influence of unhealthy dietary habits on its development and progression,² prevention through promoting a healthy way of eating at all population levels is a public health priority.³

The diet-disease relationship can be addressed from different perspectives, from the single nutrient approach to assessment of overall diet quality.⁴ This latter approach accounts for the likely interactions between dietary components and other lifestyle-related habits and may be better suited to identify behavioral determinants of cardiovascular disease rather than explore nutrient-induced etiological mechanisms. Evidence on how the overall diet quality impacts health is also more easily translated to broader audiences and policymakers, helping to underpin effective public health strategies. In this regard, the traditional Mediterranean dietary pattern (MDP), high in plant-based dietary sources, white meat, fish, and olive oil, and low in red meat and processed food, is well known for its cardioprotective effect^{5,6} and is recommended worldwide. Moreover, the traditional MDP has also been proposed as a plausible explanation of the Mediterranean paradox, ie, a high prevalence of cardiovascular disease risk factors along with a low incidence of cardiac events,⁷ and as a priority for primary and secondary cardiovascular disease prevention.⁸

Although the Mediterranean region has recently experienced a transition toward a more westernized dietary pattern and diet varies significantly between the countries of this area, depending on the agricultural and cultural settings, evidence shows that the MDP is associated with improved plasma lipid profile, including increased high-density lipoprotein cholesterol (HDL-C) concentration and decreased levels of low-density lipoproteins, triglycerides (TG), and total cholesterol.^{9–11} Furthermore, the effect of the MDP on apolipoprotein A1 (ApoA1) concentration has also been studied.^{12,13} Some studies have reported an increase of ApoA1 concentrations with Mediterranean diet¹⁴ and reductions in ApoA1 catabolic rate.¹⁵

In view of these findings, our aim was to identify the current major dietary patterns prevalent in a population of Spanish workers, the Aragon Workers Health Study cohort, and to

investigate their association with plasma lipid profile as an intermediate indicator of future cardiovascular outcomes.

METHODS

Study Population

Details of the study design and methodology used have previously been published.¹⁶ In brief, the Aragon Workers Health Study is a prospective cohort aimed at investigating the determinants of the development and progression of subclinical atherosclerosis in a middle-aged population. The study population consisted of a random sample of 5690 employees of the General Motors Spain automobile-assembly plant located in Zaragoza (Spain) who were free of cardiovascular disease at baseline.¹⁶ Each year, a random one-third of the study participants aged 40 to 55 years are selected for subclinical atherosclerosis imaging, clinical and physical examination, and diet, behavior, and lifestyle assessment. The present cross-sectional study was carried out in a subsample of 1593 participants with complete dietary data at baseline. Of these, 104 participants with extreme values for total energy intake (< 800 or > 4200 Kcal, and < 500 or > 3500 for men and women, respectively),¹⁷ and 199 participants with missing data were excluded. The final sample available for analysis consisted of 1290 participants. The study was approved by the central Institutional Review Board of Aragón CEICA (*Comité Ético de Investigación de Aragón*), and all study participants provided written informed consent.¹⁶

Dietary Assessment

Habitual food intakes over the past 12 months were collected through a validated 136-item food-frequency questionnaire, administered by trained dietician.^{18,19} The frequency of consumption varied from “never or almost never” to “more than 6 times per day”. Individuals' total energy and nutrient intakes were derived through a standardized nutrient database (ENDB).²⁰ Using this data, factor analysis was used to determine the main dietary patterns prevalent in our population. Furthermore, to validate the results of factor analysis, previously reported diet quality indices (AHEI [Alternate Healthy Eating Index],²¹ aMED [alternate MD Index],²² MEDAS [MD Adherence Screener],²³ and the recently developed MEDLIFE [MEDiterranean LIFestyle Index]²⁴) were computed. The details of the indices' development and scoring systems are described elsewhere.^{21–24}

Blood and Urine Collection

At baseline, participants provided a clinical history, including the occurrence of any clinical events and hospitalizations over the

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