Research Article

Dietary Supplement Use and Health-Related Behaviors in a Mediterranean Population

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ABSTRACT

Objective: To determine predictors and health-related motivation for supplement use.

Design: Population-based, cross-sectional survey. Food intake was determined by a validated food frequency questionnaire that included questions on dietary supplement consumption. Physical activity, smoking status, educational level, self-perceived mental and physical health, and medical information and drug treatment of diabetes, hypertension, and hypercholesterolemia were recorded. Weight and height were measured.

Setting: Girona, Spain.

Participants: Six thousand three hundred fifty-two men and women aged 35-80 years.

Analysis: Multiple logistic regression analysis to evaluate the association between dietary supplement use and the other variables.

Results: Dietary supplements were consumed by 9.3% of the participants. Positive predictors of supplement use were female sex (odds ratio = 2.44, 95% confidence interval 1.96-3.04), higher educational level ($P < .001$), and a high adherence to the Mediterranean diet pattern ($P < .001$) and to the nutrient adequacy score ($P = .004$). A higher body mass index ($P < .001$) and the awareness of hypertension (odds ratio = 0.69, 95% confidence interval 0.56-0.87) were negatively associated with supplement use.

Conclusions and Implications: The relatively small number of dietary supplement users did not show a clustering of healthy lifestyle habits. Self-perception of mental and physical health and awareness of a cardiometabolic disorder were not motivators for supplement use.

Key Words: dietary supplements, lifestyle, diet, Mediterranean population (*J Nutr Educ Behav*. 2013;45:386-391.)

INTRODUCTION

The use of dietary supplements has sharply increased, particularly in the United States (US), during recent decades.[1,2] It is estimated that about one half of the US population currently uses dietary supplements.[2] The few data on the prevalence of dietary supplement consumption in European countries indicate a north-south gradient, with greater use in northern European countries.[3-5]

Evidence from epidemiological studies shows that use of dietary supplements clustered with a higher socioeconomic status and healthier lifestyle habits such as not smoking and physical activity.[2,6-10] Additionally, dietary supplement users make healthier food choices than non-users. However, most studies focused on the association of dietary supplement consumption and food and/or nutrient intake, but not on association with the holistic approach for estimation of diet quality.[6,11-13]

The consumption of dietary supplements is determined by a combination of social, psychological, knowledge-based, and economic factors. It has been observed that users of dietary supplements are people who want to take care of their health.[14] In this context, it is conceivable that awareness of a metabolic disorder, such as diabetes or hypertension, makes people more receptive to supplement use.

The objectives of the present study were first, to determine the prevalence of supplement use; second, to identify lifestyle, anthropometric, and socioeconomic characteristics of supplement users; third, to assess overall diet quality associated with supplement use; and finally, to analyze whether awareness of a metabolic disorder is a motivator for supplement use in a representative Spanish population.

METHODS

Subjects

Data were obtained from a population-based, cross-sectional survey

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conducted in Girona, Spain in 2005. The methodology has been previously described.[15] Briefly, this survey of randomly selected, free-living men and women included 6,352 individuals aged 35-80 years in 2005 (71.5% response rate). The project was approved by the local ethics committee (Comité Ético de Investigación Clínica – Institut Municipal d'Assistència Sanitària), Barcelona, Spain.

Dietary Assessment

Food consumption during a 12-month period was determined using a validated food frequency questionnaire (FFQ) administered face-to-face by a trained interviewer.[16,17] In a 165-item food list including alcoholic and nonalcoholic beverages, participants indicated their usual consumption and chose from 10 frequency categories ranging from never or less than once per month to 6 or more times per day. Additionally, the FFQ included detailed questions on dietary supplement consumption. Participants were asked to record the commercial name, type, amount, and frequency of dietary supplements consumed during the past year.

Basal metabolic rate (BMR) was calculated using the predictive equations based on sex, age, and body weight.[18] Consistent with recommended cutoffs in the literature,[19] the cutoff used to identify energy intake underreporters was energy intakes/BMR < 1.20, which was chosen on the basis of World Health Organization/Food and Agriculture Organization estimates of the lowest plausible energy intakes at weight maintenance.[20,21] Furthermore, subjects who reported energy consumption corresponding to a physical activity level of more than 2.4 were classified as energy overreporters. A physical activity level of more than 2.4 is unrealistic for the present population because it exceeds the established upper limit for strenuous work or highly active leisure.[22]

Measurement of Diet Quality

The nutrient adequacy score (NAS) and a Mediterranean Diet Score (MDS) were computed to calculate overall diet quality.[17,23] The authors used the age- and sex-specific Dietary Reference Intakes to calculate the proportion of the population meeting adequate dietary intake of carbohydrates, protein, total fat, saturated fat, cholesterol, total fiber, vitamin C, vitamin E, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin A, vitamin D, iron, calcium, magnesium, and zinc.[24] The nutrient adequacy ratios (NAR), defined as average daily intake of a nutrient divided by the age and sex-specific recommended intake of that nutrient, of the 19 aforementioned nutrients were included in the NAS.[23] The NAR of each nutrient included in the NAS was expressed as 0 (ratio < 1.0) or 1 (ratio ≥ 1.0). The final score ranged from 0-19 (population score range: 1-19). This scoring system was designed to ensure that intake of a nutrient with a high NAR would not compensate for consumption of another with a low NAR.

Additionally, adherence to the Mediterranean dietary pattern was measured using the MDS. Higher scores indicate higher adherence to the Mediterranean diet. Distribution values were calculated for all dietary components of the FFQ. The resulting MDS ranged from 10-30. This operative variable for the analysis of associations between diet quality and health outcomes is calculated according to the tertile distribution of food consumption, with the exception of red wine. For cereals, fruit, vegetables, legumes, fish, olive oil, and nuts, the lowest tertile is coded as 1, medium as 2, and highest as 3. For meat and dairy products, the score is inverted, with the highest tertile coded as 1 and the lowest as 3. Moderate red wine consumption (up to 20 ml) is included as a favorable component in the MDS, with a score of 3. Exceeding this upper limit or reporting no red wine consumption is coded as 0.

Determination of Awareness of Metabolic Disorders

The participants' awareness of diabetes, hypertension, and hypercholesterolemia was defined as their having been informed about these metabolic

Table 1. Baseline Characteristics of Users and Non-Users of Dietary Supplements

	Non-Users (n = 5,759)	Users (n = 589)	*P*
Women, %	50	72	< .001
Age, y (mean [SD])	57 (13)	54 (12)	< .001
Age groups, %			
35-49 y	32.8	41.8	< .001
50-64 y	35.8	37.2	
> 64 y	31.4	21.1	
BMI, kg/m^2 (mean [SD])	27.5 (4.6)	25.5 (4.2)	< .001
Leisure time physical activity, METmin/d (mean [interquartile range])	232 (119 - 404)	239 (128 - 390)	.95
Alcohol consumption, g (mean [interquartile range])	3.1 (0 - 11.7)	3.1 (0 -10)	.22
Smokers, %	22.4	21.1	.49
Education level, %			
Primary school	51.7	30.1	< .001
Secondary school	27.2	36.3	
University degree	20.9	33.5	
Type of supplements, %			
Multivitamin, multi-mineral	-	56.8	-
Fatty acids	-	16.8	-
Antioxidants	-	10.1	-
Awareness of hypertension, %	36.4	24.5	< .001
Awareness of hypercholesterolemia, %	33.2	33.3	.98
Awareness of diabetes, %	13.5	7.0	< .001

BMI indicates body mass index; METmin, metabolic equivalents per minute.