Short communication

Vitamin E diary dietary intake in premenopausal healthy women and its relationship with the recommended diary dietary intake

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Abstract: Background: The health benefits arising from the antioxidant vitamin E is well recognized and its recommended dietary intake for the general population have been established. However, there is still a need for assessing antioxidant vitamin intake in different population groups. Objective: To assess intake of antioxidant vitamin E and to identify its major sources in the diets of healthy premenopausal women from Extremadura. Material and methods: The study group consisted of 123 premenopausal women from Spanish population. Antioxidant vitamin dietary intake was assessed by individual 7-day records. Data was analyzed using updated "Spanish Food Composition Tables". Results: The average daily intake of antioxidant vitamin E was: 2.58±0.85 mg/day. Dietary vitamin E was around 76.54% lower than that recommended. Diets that were deficient in vitamin E were recorded in the 100% of the interviewed premenopausal women from Extremadura. Conclusions: The average intake of antioxidant vitamin E was not found to be in recommended range, no significant differences were observed between the lowest and the highest intake. They were no differences in the consumption of food products recognized as major sources of vitamin E in the study population. It is therefore necessary to increase the consumption of foods that provide a valuable dietary source for this vitamin.

Keywords: Vitamin E; antioxidants; diet records; micronutrients; nutrition

1. Introduction

The human body is constantly subjected to the action of free radicals arising from either metabolism or the environment. Vitamin E is contemplated as an antioxidant nutrient and is extensively found in vegetables or vegetable-derived nutriments. The likely health benefits of vitamin E are well identified and they play a primary role in managing the barrier facing an overload of free radicals in plasma [1, 2]. It is also strongly reported that dietary antioxidants have a powerful impact on human well-being and health. [3]

Vitamin E functions as an antioxidant in hydrophobic environments as found in cell membranes and plasma lipoproteins. A decrease in the currency of some forms of malignancy has been established to be a critical and favorable effect of a diet rich in foodstuffs incorporating these vitamins [2]. Additionally, adequate antioxidant activity has been reported being dependent on the concentrations/combinations of vitamin E and others.[1]. Accordingly, is important, that correct doses of these nutrients are incorporated from the different food groups. Previous research in Spain has generated contrary data, where results have diverged between the studied areas [4-8]. These indicated that the dietary vitamin E intake observed was inconsistent. The dietary intake of vitamins also depends on the dietary habits and economic status of the populations investigated. Study objectives were to assess the dietary content of the antioxidant vitamin E in a selected group of premenopausal women residing in Extremadura as well as determining the dietary sources of that vitamin.

2. Materials and Methods

Vitamin E consumption data was obtained from a survey of 123 adult volunteers, (premenopausal healthy women). The study subjects did not take dietary supplements and all were neither pregnant nor lactating. Dietary intake was estimated through a 7-day food record. Subjects had previously been trained by a nurse on how to assess the sizes of portions consumed by means of a 'Photographic album of food

products and dishes". Recorded data were analyzed using Food Composition Tables [9]. Dietary intake of antioxidant vitamin E was assessed. The obtained data was compared to reference values for vitamin E, for the Spanish adult population. The main dietary sources of antioxidant E vitamin were also determinate. Dietary consumption of vitamin E was presented as arithmetic means, standard deviation and also in graphical form. Table 1 provides the anthropometric data for the studied women.

Table 1. The anthropometric characteristic of studied sample (mean ± standard deviation)

Parameters	Mean ± SD	Range
Age (years)	36±10	18-54
Body weight (kg)	58.40±5.04	46-70
Height (cm)	161±6.2	145-174
BMI (kg/m2)	22.52±1.,56	19.14-24.92

3. Results

The average dietary content of vitamin E in the study population was found to be 2.58±0.85 mg/day (Table 2).

Table 2. The nutrient intake in daily diets of premenopausal healthy Spanish women (mean ± standard deviation) and Nutritional Standards for vitamin E for the Spanish female adult population.

Component	Mean ± SD	Range	Adequate intakes (AI)*
Energy (Kcal)	1971.4±385.1	928,8-2582.4	data
Vitamin E (mg/day)	2.58±0.85	1,055-5.801	11 mg/day [1]

[1] Source: EFSA's nutrition expert's dietary reference values for vitamin E

The average dietary intake of vitamin E was therefore 76.54% less than the AI. No one of the surveyed subjects had a vitamin E intake according to the recommendations. Dietary vitamin E was derived from meat (14.88%), vegetables (14.72%), fruits (14.26%), fish (14.21%), eggs (14.10%), dairy (14.01%) and cereals (13.84%).

Vitamin E intake by age groups is showed in figure 1. There were no differences between age groups (P=0.417).

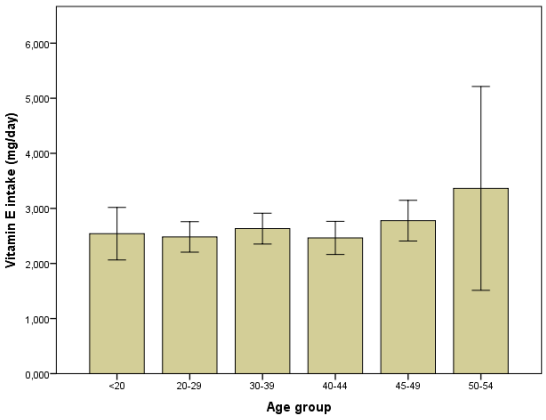

Figure 1. Vitamin E intake by age groups. No statistical differences were found (P=0.417). Error bars represent C.I. 95% for the mean.

Characteristics of the participants according to quintiles of vitamin E intake were compared to the Serra-Majem study [7] in table 3. Similarly all the quintiles were under the vitamin E recommendations for the Spanish adult women.

Table 3. Characteristics of the participants in the study and the participants in the University of Navarra's cohort according to quintiles of vitamin E intake (mean values and standard deviations)

	Quintile of vitamin E intake									
	Q1		Q2		Q3		Q4		Q5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Vitamina E (mg/day)	1.5	0.2	2.0	0.1	2.5	0.1	2.9	0.1	3.9	0.6
Serra-Majem (2009)	6.7	2.7	6.9	3.1	7.0	3.1	7.2	3.2	7.2	3.4

Q: quintile; SD: Standard Deviation

4. Discussion

The study outcomes were referenced to suggestions made by the EFSA's nutrition authority for vitamin E. Primary four dietary origin of vitamin E in the diet of Spanish population have been determined as fats and oils, vegetables, fruits, meat and nut and seeds [10]. These results illustrate that the dietary pattern of the investigated women is greatly misbalanced to the dietary intake of meat as it produces the primary source of vitamin E. The current investigation showed that the diets of premenopausal Spanish women were defective in vitamin E, according to other published investigations [4, 7]. The study of Agudo and colleagues [4], a study based in the Spanish cohort of EPIC study, an extensive prospective European research analyzing the association among nutrition and malignancies [11], comprehended a sample of 41 440 healthy volunteers aged 29–69 *yrs* who were enlisted between 1992 and 1996 in 5 different areas from Spain: Asturias, Guipúzcoa, and Navarra (northern areas) and Granada and Murcia (southern areas). The attendance quota varied between the areas from 55% to 60%. Each subject provided data on usual dietary patterns, a lifestyle factors, anthropometric measurements, and a blood sample at baseline. Vitamin E intake documented in this study was of 8.5 mg/day; equivalent to the observation data in our study, beyond de 75% of the referred study sample was under the AI of vitamin E. Other investigation in Spain reported mean vitamin E intakes higher than the reported in the USA (138 v. 85 and 8·5 v. 6·4 mg/d respectively) [5], but also under the guidance for adult females.

In 2009 Serra-Majem and colleagues [7] reported results from the subjects involved in the prospective SUN cohort study [12]. The SUN study was conceived to analyze the relations among the dietary patterns and the incidence of chronic conditions (i.e. obesity) by a self-administered questionnaire. The SUN cohort are all university graduates from all Spanish provinces. The enrollment of this cohort began in 1999, and as of the time the investigation was developed (February 2008) included 19,057 subjects. After excluding potential confounders and lost values in the studied outcomes, 17,197 participants continued. Subjects completed a Food Frequency Questionnaire (FFQ) that was previously validated in Spanish population [13]. Similarly to our study, 94% of the study population in the Serra-Majem study was below the guidance of vitamin E dietary intake for the Spanish adult population.

In 2004 a cross-sectional investigation involving the Spanish cohort of the European Prospective Investigation in Cancer and Nutrition was conducted to evaluate the main dietary sources of vitamin E in adult subjects. The mean ages of participants were 50.8 (males) and 48.4 (females) years respectively and the participation rate was between 55–60%. Garcia-Closas and colleagues [5] investigated the regular dietary intake in the prior year, considering the possible seasonal variations. Study was developed by means of a personal interview through a computerized version of a FFQ. The FFQ was developed and validated especially for the EPIC study (1997a [14]; 1997b [15]; 1997c [16]). This research demonstrated that when confronting sources of vitamin E among regions in the south and the north of Spain, it is remarkable that in the south olive oil and nuts rated higher for vitamin E intake. Consistently, the primary sources of vitamin E were observed in vegetable oils, which is the type of supplemental fat most frequently consumed by the cohort. Despite the rather low amount of vitamin E in fruits and vegetables, they rated for >25% of its dietary intake due to a main presence in the total diet. Similarly, in our study fruits and vegetables accounted for approximately the 29%.

The study also reported that the primary dietary sources of vitamin E in the USA were fats and oils which differed from the data observed in our study. Garcia-Closas and colleagues reported that the account of meat to the dietary intake of vitamin E was approximately an 8% and in the USA [17] also about at 8%. Related to the primary dietary sources of vitamin E, the dietary intake of vegetable margarine was estimated in approximately 2.5 g/d in Spain [5] and almost four times higher in countries from the north of Europe,

while vegetable oil consumption was almost eleven times higher in Spain (about 27.0 *vs*. 2.5 g/d; [10]). Unfortunately no data from margarine intake was evaluated in our study.

5. Conclusions

In summary, the present report shows a significant variation between within a sample of premenopausal healthy women from Extremadura in their dietary intake of the studied antioxidant, vitamin E. We propose that the intake of vitamin E, via its main dietary source of fruit and vegetables, should be increased due to its essential role in preserving the health.

Conflicts of Interest: The author declares no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

AI: Adequate intakes.
EFSA: European Food Safety Authority
EPIC: European Prospective Investigation into Cancer and Nutrition.
FFQ: Food Frequency Questionnaire
SUN: Seguimiento Universidad de Navarra (University of Navarra Tracing)
USA: United States of America

References

1. Chen, J.; Shi, J.; Macnaughton, L.; Kakuda, Y.; Xue, S. J.; Ma, Y. et al. The scavenging capacity of combinations of Lycopene, β-carotene, Vitamin E, and Vitamin C on the free radical 2,2-Diphenyl-1-Picrylhydrazyl (DPPH). Journal of Food Biochemistry, 2009 33(2), 232-245. https://doi.org/10.1111/j.1745-4514.2009.00214.x
2. Lobo, V., Patil, A., Phatak, A., & Chandra, N. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacogn Rev. 2010 Jul;4(8):118-26. https://doi.org/10.4103/0973-7847.70902 PMID:22228951
3. Nunez-Cordoba, J. M., & Martinez-Gonzalez, M. A. Antioxidant vitamins and cardiovascular disease. Curr Top Med Chem. 2011;11(14):1861-9 https://doi.org/10.2174/156802611796235143 PMID:21506930
4. Agudo, A.; Cabrera, L.; Amiano, P.; Ardanaz, E.; Barricarte, A.; Berenguer, T; et al. Fruit and vegetable intakes, dietary antioxidant nutrients, and total mortality in Spanish adults: findings from the Spanish cohort of the European Prospective Investigation into Cancer and Nutrition (EPIC-Spain). Am J Clin Nutr. 2007 Jun;85(6):1634-42. https://doi.org/85/6/1634 PMID:17556703
5. Garcia-Closas, R., Berenguer, A., Jose, T. M., Jose, S. M., Quiros, J. R., Navarro, C. et al. Dietary sources of vitamin C, vitamin E and specific carotenoids in Spain. Br J Nutr. 2004 Jun;91(6):1005-11. PMID:15182404
6. Juarez, M. L., Alegria, M. I., Marin, C., Lopez-Jimenez, J. A., Perez-Llamas, F., & Zamora, S. [Evaluation of vitamin intake in a group of people at the University of Murcia]. Nutr Hosp. 1997 Jul-Aug;12(4):210-4. Retrieved from PMID:9617185
7. Serra-Majem, L., Bes-Rastrollo, M., Roman-Vinas, B., Pfrimer, K., Sanchez-Villegas, A., & Martinez-Gonzalez, M. A. Dietary patterns and nutritional adequacy in a Mediterranean country. Br J Nutr. 2009 Jul;101 Suppl 2:S21-8. https://doi.org/10.1017/S0007114509990559 PMID:19594961
8. Tur, J. A., Serra-Majem, L., Romaguera, D., & Pons, A. (2005). Does the diet of the Balearic population, a Mediterranean type diet, still provide adequate antioxidant nutrient intakes? Eur J Nutr. 2005 Jun;44(4):204-13. Epub 2004 Jul 7. https://doi.org/10.1007/s00394-004-0512-0 PMID:15309419
9. Moreiras, O. Tablas de composición de alimentos guía de prácticas. Ciencia y técnica (Pirámide) (10a. ed ed.). 2006. Madrid: Pirámide.
10. Linseisen, J., Bergstrom, E., Gafa, L., Gonzalez, C. A., Thiebaut, A., Trichopoulou, A. et al. Consumption of added fats and oils in the European Prospective Investigation into Cancer and Nutrition (EPIC) centres across 10 European countries as assessed by 24-hour dietary recalls. Public Health Nutr. 2002 Dec;5(6B):1227-42. https://doi.org/10.1079/PHN2002401 PMID:12639229
11. Bingham, S.;Riboli, E. Diet and cancer--the European Prospective Investigation into Cancer and Nutrition. Nat Rev Cancer. 2004 Mar;4(3):206-15. https://doi.org/10.1038/nrc1298 PMID:14993902
12. Segui-Gomez, M., de la Fuente, C., Vazquez, Z., de, I. J., & Martinez-Gonzalez, M. A. Cohort profile: the 'Seguimiento Universidad de Navarra' (SUN) study. Int J Epidemiol. 2006 Dec;35(6):1417-22. Epub 2006 Oct 22. https://doi.org/10.1093/ije/dyl223 PMID:17060332

13. Martin-Moreno, J. M., Boyle, P., Gorgojo, L., Maisonneuve, P., Fernandez-Rodriguez, J. C., Salvini, S. et al. Development and validation of a food frequency questionnaire in Spain. Int J Epidemiol. 1993 Jun;22(3):512-9 PMID:8359969

14. Relative validity and reproducibility of a diet history questionnaire in Spain. I. Foods. EPIC Group of Spain. European Prospective Investigation into Cancer and Nutrition. (1997a). Int J Epidemiol. 1997; 26 Suppl 1:S91-9. PMID:9126537

15. Relative validity and reproducibility of a diet history questionnaire in Spain. II. Nutrients. EPIC Group of Spain. European Prospective Investigation into Cancer and Nutrition. (1997b). Int.J.Epidemiol. 1997; 26 Suppl 1, S100-S109. PMID:9126538

16. Relative validity and reproducibility of a diet history questionnaire in Spain. III. Biochemical markers. EPIC Group of Spain. European Prospective Investigation into Cancer and Nutrition. (1997c). Int.J.Epidemiol. 1997; 26 Suppl 1, S110-S117. PMID:9126539

17. Cotton, P. A., Subar, A. F., Friday, J. E., & Cook, A. Dietary sources of nutrients among US adults, 1994 to 1996. J Am Diet Assoc. 2004 Jun;104(6):921-30. https://doi.org/10.1016/j.jada.2004.03.019 PMID:15175590