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Balearic adults have low intakes of fruits and vegetables compared with the dietary guidelines for adults in Spain

Rogelio Salas, Maria del Mar Bibiloni, Maria Elisa Zapata, Josep Lluís Coll, Antoni Pons, Josep A. Tur*

Research Group on Community Nutrition and Oxidative Stress, University of Balearic Islands, E-07122 Palma de Mallorca, Spain
CIBER: CB12/03/30038 Fisiopatología de la Obesidad y la Nutrición, CIBERobn, Instituto de Salud Carlos III (ISCIII), Spain

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ABSTRACT

Nutrition is recognized as one of the major health determinants, and so a healthy diet may contribute to the delay or prevention of an important number of chronic diseases. The aim of this study was to assess the current food consumption habits of the Balearic Islands adult population. A cross-sectional nutritional survey was carried out in the Balearic Islands, Spain (2009–2010). A random sample ($n = 1388$) of the adult population (16–65 years) was interviewed. Dietary habits were assessed by means of a semiquantitative food frequency questionnaire, and consumption results were compared with dietary guidelines for the Spanish population. According to the dietary guidelines for the Spanish population, only consumption levels of milk and dairy products, nuts, potatoes, cereals, bread, and water were adequate. Intakes of fruit, vegetables, olive oil, eggs, and pulses were below the recommendation levels. These findings indicate that, to fulfill the dietary guidelines for the Spanish population, the Balearic Islands adult population should decrease their consumption of meat, sugar and cakes, buns, butter/margarine, and soft drinks and increase their consumption of olive oil, fruits, vegetables, fish, and pulses.

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1. Introduction

The assessment of food habits in a population is a basic tool to develop public health policies and to promote healthy nutritional habits in line with the evidence drawn from epidemiological research. The periodical repetition of this assessment allows us to see the trends in compliance with nutritional objectives set for the population and also to evaluate the effectiveness of food and nutrition policies and promotion of campaigns to increase health among the inhabitants of a region or a country [1].

In Spain, the National Institute of Statistics has carried out several household budgetary surveys since the 1960s. These

surveys assess the food available for the household members during a specified period. The Spanish Ministry of Agriculture, Fisheries and Food has also carried out several surveys and has developed a system to check a panel of consumption items. Both data sets refer to food availability, but they do not provide food consumption data. A limited number of regional nutritional surveys have been carried out in Spain to assess the nutritional status of the population by a random sampling that considers food consumption at an individual level, anthropometric measurements, and biochemical markers [2]. Since 1990, nutritional surveys among the population of several Spanish regions (Basque Country, Catalonia, Madrid, Murcia, Alicante, Canary Islands, Andalusia, and Balearic

Abbreviations: FFQ, food frequency questionnaire; ANOVA, analysis of variance.

* Corresponding author. Research Group on Community Nutrition and Oxidative Stress, Universitat de les Illes Balears, Guillem Colom Bldg, Campus E-07122 Palma de Mallorca, Spain. Tel.: +34 971 173146; fax: +34 971 173184.

E-mail address: pep.tur@uib.es (J.A. Tur).

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Islands) have been developed and showing a progressive food diversification, changing the traditional eating habits to patterns of Western societies, and scarcely maintaining balanced habits [3].

From a nutritional standpoint, the Balearic Islands inhabitants are in a peculiar situation because their food habits are related to geographical features, food production, and migratory movements (both domestic and foreign), which involve changes in dietary patterns, the introduction of new cooking techniques, and new foods [3]. Considering all these changes and taking into account that their intensity has increased over the last several years, the aim of this study was to assess the current food consumption habits of the Balearic Islands adult population.

2. Methods and materials

2.1. Study design

This study is a population-based, cross-sectional nutritional survey carried out in the Balearic Islands, Spain, between 2009 and 2010.

2.2. Subjects

The target population consisted of all inhabitants aged 16 to 65 years old living in the Balearic Islands; the sample population was derived from residents 16 to 65 years old registered in the official population census of the Balearic Islands [4]. The theoretical sample size was set at 1500 individuals to provide a specific relative precision of 5% (type I error, 0.05; type II error, 0.10) and taking into account an anticipated 70% participation rate. The sampling technique included stratification according to geographical area and municipality size, age (3 strata), and sex of inhabitants that were randomized into subgroups, with Balearic Islands municipalities being the primary sampling units and individuals within these municipalities comprising the final sample units [5]. Pregnant women were not considered in this study. The final sample was 1388 (93% participation).

The present study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving human subjects were approved by the Balearic Islands Ethics Committee. Written informed consent was obtained from all subjects and their parents or legal guardians.

2.3. Assessment of food consumption habits

Dietary questionnaires included a semiquantitative food frequency questionnaire (FFQ) that had previously been validated [6] and applied to other studies and surveys on the Spanish population [3,7–11]. The FFQ, which asked the participant to recall average use over the past year, consisted of 145 items (118 of the original validated FFQ plus the most characteristic Balearic Islands foods) arranged by food type and meal pattern. Frequency of food consumption was based on times that food items were consumed (per day, week, or month). Consumption less than 1 per month was considered

“no consumption.” The period of consumption of seasonal items was also considered. Daily consumption (grams) was determined by dividing the reported amount of the intake by the frequency (days). Volumes and portion sizes were reported in natural units, household measures, or with the aid of a manual of photographs [12]. The FFQ foods items were collapsed to 17 food groups, and conversion of food into energy was made using Spanish [13,14] and European [15] food composition tables and complemented with food composition data available for Majorcan food items [16]. Consumption results were compared with dietary guidelines for the Spanish population [17]. Identification of underreporters of food intake was made using the Goldberg cut-off (energy intake/basal metabolic rate <1.14 classified the individual as an under-reporter) [18]. Underreporters (2.7%) were not considered in this analysis.

2.4. Statistical analyses

Analyses were performed with the SPSS statistical software package version 19.0 (SPSS, Inc, Chicago, IL). To correct age and sex underrepresentation and overrepresentation in the sample, sex and age weights were calculated and appropriate corrections were made proportionally to the population census [4]. Results are expressed as means \pm SD. Differences between means were performed by analysis of variance (ANOVA) 1-way test. Sequential Bonferroni test was applied to control type I error [19]. Significant differences in prevalence of population that met the recommendations stratified by age group and sex were tested by χ^2 . Level of significance for acceptance was $P < .05$.

3. Results

Table 1 shows the distribution of the sample. The final sample size was 1388 individuals (93% participation). Nonparticipation rates included potential subjects that declined to be interviewed (especially men older than age 25 years) as well as involuntary nonparticipants who were excluded due to census error caused by address changes, missing persons, or unavoidable impediments to survey collaboration.

Table 2 shows the average consumption by food group in males and females (grams per day), and Table 3 shows mean consumption by food group and age group. The foods consumed in higher amounts by the Balearic Islands adult population were fruit, milk, dairy products, vegetables, meat, cereals, and soft drinks. Men had significantly higher con-

Table 1 – Characteristics of the sample

Age group	Men (n = 581)		Women (n = 807)		Total (n = 1388)	
	n	%	n	%	n	%
16-25 y	306	51.1	293	48.9	599	43.2
26-45 y	201	35.8	360	64.2	561	40.4
46-65 y	74	32.5	154	67.5	228	16.4

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