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Nutrition transition and health status of Cretan women: evidence from two generations

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Abstract

Objective: Research has suggested the abandonment of the traditional Mediterranean diet (MD) by youngsters for a more Westernized regime. The present study aimed (i) to delineate differences in the consumption of traditional Cretan dishes and key nutrients in the MD between two contiguous generations of women and (ii) define how these dietary changes contribute to the morbidity of the younger generation.

Design: Cross-sectional.

Setting: The island of Crete, Greece.

Subjects: Eighty pairs of mothers and daughters, all living in their own households, were recruited from Crete. Information regarding the consumption of traditional Cretan dishes and two previous-day recalls were collected. The health status of the participants was also recorded. Simple correspondence analysis (SCA) was used to assess associations between differences in the food intake of daughters compared with their mothers and the prevalence of disease.

Results: The younger women showed increased intakes of rusks and meat dishes and decreased consumption of green vegetables, pulses and wine compared with their mothers. When nutrients were accounted for, only sugar consumption of the younger women surpassed the intake reported by their mothers. SCA associated hypercholesterolaemia in the daughters with increased cheese and meat intakes; allergies and respiratory problems were associated with lower cheese, fish and oil intakes; being overweight was associated with higher baked goods, oils, desserts, fish and alcohol intakes; and Fe-deficiency anaemia was associated with lower consumption of green vegetables.

Conclusions: Results showed that, although a trend towards a more Westernized diet was noted in the younger women, the differences between the two generations appear to be small. Therefore, in Crete, the MD is still the primary diet regime.

Keywords
Traditional diet
Obesity
Diabesity
Overweight
Greek diet
Cretan diet
Mediterranean diet
Diabetes
Hypercholesterolaemia
Asthma
Hypertension

Apart from the halo effect that the Mediterranean diet (MD) has on the health of the population, it also reflects the identity, diversity and lifestyle of inhabitants along the Mediterranean basin[1]. On the advocacy of these unique features, Italy, Greece, Spain and Morocco launched a joint initiative for candidature of the MD as an Intangible Cultural Heritage by UNESCO[2]. MD is transmittable and is in constant evolution in response to changes in the environment, abundance and history of each country[1,3–5]. During the last decades, modernization and affluence have had an effect on adherence to the MD, especially in the youngest populations; however, the impact was not sufficient for squashing the dietary model[3,4].

In Crete, the *locus in quo* of the MD, certain aspects of the model appear to have been abandoned by youngsters[6], but the actual transition of the diet between generations has not been delineated. Data from the FAO suggest that in the early 1960s Greece was the country with the highest ranking in the Mediterranean adequacy index worldwide, whereas 40 years later the country stands in tenth place[7]. Similar dietary indices are widely used in the evaluation of MD adherence; however, the majority of them include pitfalls. They fail to reflect the actual diet quality and are limited by subjectivity in selection of the scoring components[3,8]. It is of great importance to define the evolution of the traditional MD not only in terms of nutrients and food groups, but also in terms of traditional recipes. Up until now, such surveys have been performed in France, Italy, Malta and Spain[4,9,10], whereas in Greece only retrospective studies have been conducted[11].

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The purpose of the present cross-sectional study was threefold: (i) to delineate differences in the consumption of traditional Cretan dishes between two contiguous generations of women; (ii) to define how these dietary changes contribute to the morbidity of the younger generation; and (iii) to assess differences in the consumption of staple nutrients in the traditional MD between the two generations examined.

Materials and methods

Subjects

In a one-wave recruitment lasting from September 2008 to February 2009, eighty pairs of mothers and daughters who had their own families and households were selected through personal acquaintances from the island of Crete. Inclusion criteria for the selected pairs were as follows: (i) living in different households; (ii) being of Cretan origin; and (iii) living in Crete. The participants were inhabitants of the four Cretan prefectures (Lasithi, Rethymna, Heraclion and Chania). Immigrants and daughters-in-law were excluded from the present study. The mothers were aged between 45 and 80 years and their daughters were between 22 and 54 years. The protocol was approved by the Alexander Technological Educational Institute and all women provided their consent before participation.

Food and dietary intake

All data were collected through a personal interview with a field investigator dietitian at the participants' home. Fifty-five traditional Cretan dishes were identified from Lambraki[11] and the frequency of their weekly consumption was recorded for each participant. The dishes were also categorized into food groups. The oils group included olive oil and olives. The cheese group included malaka, graviera, kefalotyri, mizithra, ksynomizithra and piktogalo (the last three have the Certificate of Origin DOC). Pies included tourta (the Cretan shepherd's pie), sfiakianes pites (with mizithra cheese), sarikopites (with goat cheese), boureki (with sesame, tomatoes, cheese and zucchini), kserotigana, kalitsounia, kalitsounia anevata and kalitsounia with spinach. The alcoholic beverages group included wine and raki. The green vegetables group consisted of stamnagathi (spiny chicory), askolibri (*Scolymus hispanicus*), avronies (*Asparagus*) and vrouves (wild mustard greens). The selected stuffed vegetables dishes comprised dolmadakia (vineyard leaves filled with rice), zucchini and gemista (tomatoes and peppers filled with rice). The selected baked goods group consisted of dakos and rusks. Desserts comprised Saint Fanourios pie, moustalevria, petimezi, bigarade, grapes, honey and quince sweets. The meat group included omathies, tsiladia, gamopilafo (risotto with lamb and chicken), apaki, pork with lemon sauce, sausages, rabbit, giouvetsi and rooster. The fish, crustaceans and molluscs group included fish soup, skarus, kakavia, cod, octopus with pasta, octopus with wine, squid, echinus salad, snails fried and snails with fennel. The selected pulses were lady's fingers, chickpeas and yellow lentils fava.

Two previous non-consecutive-day food recalls were collected on weekdays for each participant through personal interview with a dietitian, as suggested by Hoffmann *et al.*[11], in order to describe the habitual dietary intake of the sample. Data were analysed with dietary analysis software (Food Processor 7·4; ESHA, Portland, OR, USA) with the addition of traditional Cretan recipes[12]. Habitual intakes of energy, protein and lipids were assessed from the median of the two recorded days. Energy expenditure was calculated through the Institute of Medicine equations[13], with respect to the physical activity level of each participant calculated by the spreadsheet of Gerrior *et al.*[14]. The median of the recorded energy intake of each participant was compared with the energy expenditure in order to assess the validity of the dietary records with the Goldberg cut-offs[15]. In cases where the ratio declined from the cut-offs, a third dietary record was collected.

Health and anthropometric data

The frequency of type 2 diabetes (T2D), hypercholesterolaemia, CVD, cancer, diabesity (coexistence of T2D and obesity (OB))[16], respiratory/pulmonary problems and allergies was self-reported by the participants. Anthropometric indices included weight and height (Seca 789), as well as waist and hip circumferences measured with a non-elastic tape. A Lange set of calipers (Beta Technology, Santa Cruz, CA, USA) was used to measure biceps, triceps, suprailiac and subscapular skinfolds, and the Durnin and Womerslay equations were applied for the calculation of percentage of body fat in Caucasian adult women[17]. All measurements were taken during morning hours, by the same examiner. BMI, fat mass index (FMI) and fat-free mass index (FFMI) were calculated for each participant[18]. Overweight/OB (OW/OB) was diagnosed in participants with BMI $\geq 25\,kg/m^2$. Abdominal OB was defined as waist circumference $>88\,cm$.

Statistical analyses

Analysis was carried out with MiniTab® version 14·1 (Minitab Inc., State College, PA, USA) and the Statistical Package for the Social Sciences statistical software package version 15·0 (SPSS Inc., Chicago, IL, USA). A simple correspondence analysis (SCA) was used to identify associations between the prevalence of disease in daughters and differences in the consumption of food groups, compared with the previous generation. SCA consists of a method that allows categorical data to be presented graphically in a single plot in order to reveal relationships among variables[19]. This method has recently been used in

nutrition studies[20,21] and has been suggested as a successful complement method in exploring epidemiological data[22]. Independent samples *t* tests and Mann–Whitney and Kruskal–Wallis tests were used. The Wilcoxon ranks test evaluated differences in nutrient intake and anthropometry as well as in the frequency of disease in the pairs of mothers and daughters.

Results

No difference was recorded in the weight, BMI, FMI, FFMI or percentage of body fat between mothers and daughters (Table 1). The daughters were significantly younger and taller ($P \leq 0{\cdot}001$) with a lower waist-to-hip ratio ($P \leq 0{\cdot}046$) than the previous generation. The overall prevalence of OW/OB was 40·6%, including 48·8% of the mothers' and 32·5% of the daughters' population. Abdominal OB was diagnosed only in 11·9% of the total sample. The mothers showed increased odds for OW/OB, slightly increased odds for abdominal OB and had almost double the chances of being hypertensive, hypercholesterolaemic or diabetic. On the other hand, the daughters were at increased risk for Fe-deficiency anaemia and allergies. None of the participants reported being diagnosed with CVD, diabesity or cancer. Diseases of the respiratory tract showed a similar frequency between the two generations (3·75%), whereas participants with hypertension, hypercholesterolaemia and T2D did not exceed 1% of the total sample. When mothers and daughters were examined as pairs, the Wilcoxon test revealed differences in the prevalence of OW/OB ($P \leq 0{\cdot}028$) and hypercholesterolaemia ($P \leq 0{\cdot}001$) within families.

From the foods traditionally consumed in Crete, the older generation had increased intakes of bigarade, wine, Saint Fanourios pie, avronies, vrouves, stuffed zucchini, chickpeas and lentils (Table 2). The daughters reported increased consumption of rusks, tourta, pork with lemon sauce and echinus salad.

Energy intake of the mothers reached 5·6 (SD 1·1) MJ/d, whereas that of the daughters was significantly higher, 6·1 (SD 1·5) MJ/d ($P \leq 0{\cdot}013$). Table 3 describes the nutrient composition (% energy intake) of the diet of participants. Only the sugar intake of daughters surpassed that of their mothers ($P \leq 0{\cdot}001$).

The SCA symmetric plot revealed four classes associating the prevalence of disease in the daughters' population with changes in food group consumption, compared with the reported parental food intake (Fig. 1). Each class associates a disease with changes in food consumption patterns. The class located in the lower part of the graph associates the prevalence of Fe-deficiency anaemia with lower green vegetables intake. In the class on the left, allergies and respiratory problems of the daughters are associated with attenuated oils, cheese and fish intakes. The class located at the centre of the graph associates OW/OB with increased intakes of baked goods, fish, alcohol, pies, desserts and lower consumption of vegetables. The class located on the right of the graph associates hypercholesterolaemia with increased meat, cheese and oil intakes and attenuated consumption of green vegetables.

Table 1 Anthropometric characteristics and health status of the participants: mothers and daughters, Crete, Greece, 2008–2009

	Mothers (*n* 80)		Daughters (*n* 80)				
	Mean	SD	Mean	SD	Significance*	OR for mothers	95% CI
Age (years)	57·1	8·8	33·5	7·5	$P \leq 0{\cdot}001$	–	–
Weight (kg)	67·0	9·9	67·3	16·4	NS	–	–
Height (m)	1·62	0·06	1·65	0·06	$P \leq 0{\cdot}001$	–	–
BMI (kg/m^2)	25·4	3·0	24·5	5·3	NS	–	–
Waist-to-hip ratio	0·77	0·06	0·75	0·06	$P \leq 0{\cdot}046$	–	–
% Body fat	26·6	3·2	25·7	5·0	NS	–	–
FMI (kg/m^2)	6·9	1·7	6·5	3·0	NS	–	–
FFMI (kg/m^2)	18·6	1·4	18·0	2·3	NS	–	–
	n	%	*n*	%			
OW/OB	37/2	48·8	20/6	32·5	$P \leq 0{\cdot}044$	1·5	1·018, 2·210
Abdominal obesity	10	12·5	9	11·3	NS	1·1	0·671, 1·676
Hypertension	2	2·5	0	0·0	NS	2·0	1·730, 2·372
Hypercholesterolaemia	43	53·8	9	11·3	$P \leq 0{\cdot}001$	2·4	1·807, 3·224
T2D	1	1·3	0	0·0	NS	2·0	1·721, 2·353
Diabesity	0	0·0	0	0·0	NS	–	–
CVD	0	0·0	0	0·0	NS	–	–
Cancer	0	0·0	0	0·0	NS	–	–
Fe-deficiency anaemia	1	1·3	5	6·3	NS	1·7†	1·155, 2·534
Respiratory/pulmonary disease	3	3·8	3	3·8	NS	1·0	–
Allergies	1	1·3	4	5·0	NS	1·6†	1·023, 2·602

FMI, fat mass index; FFMI, fat-free mass index; OW, overweight; OB, obesity; T2D, type 2 diabetes.
*Parametric variables were tested with the independent samples *t* test and non-parametric variables were tested with the Mann–Whitney and Kruskal–Wallis tests.
†OR for daughters.

Table 2 Weekly consumption frequency of traditional Cretan dishes by mothers (*n* 80) and daughters (*n* 80), 2008–2009

		Mothers		Daughters		
Food groups	Foods	Mean	SD	Mean	SD	Significance*
Oil and olives	Olive oil	6·0	0·0	6·0	0·0	$P = 1·000$
	Olives	3·3	0·9	3·1	0·8	NS
Desserts	Bigarade	2·3	0·7	2·0	0·7	$P \leq 0·02$
	Grapes	2·0	0·4	2·1	0·5	NS
	Honey	5·1	0·6	5·1	0·7	NS
	Quince	2·1	0·4	1·9	0·5	NS
	Moustalevria – grape must pudding	2·0	0·1	2·0	0·1	$P = 1·000$
	Petimezi – molasses	3·4	0·9	2·8	0·8	NS
	St. Fanourios pie – sponge cake with raisins and cinnamon	1·9	0·3	1·8	0·4	$P \leq 0·02$
Alcoholic beverages	Wine	2·9	2·1	2·1	1·8	$P \leq 0·016$
	Raki/tsikoudia – anise-flavoured spirit	1·2	0·6	1·2	0·7	$P = 1·000$
Bread and toasts	Rusks	3·9	1·4	4·5	1·0	$P \leq 0·003$
	Dakos – bruschetta, thick slices of grilled or toasted crusty country bread	3·2	1·2	3·5	1·0	NS
Pies	Sfakianopites – with mizithra cheese	2·5	0·7	2·6	0·8	NS
	Sarikopites – with goat cheese	1·1	0·3	1·1	0·3	NS
	Boureki – with sesame, tomatoes, cheese and zucchini	2·8	0·5	2·8	0·5	$P = 1·000$
	Tourta – lamb and cheese baked in pie crust with sesame seeds	1·2	0·4	1·4	0·6	$P \leq 0·001$
	Kserotigana – fried pastry ribbons	2·5	0·6	2·6	0·5	NS
	Kalitsounia – with ksinomizithra/piktogalo, malaka cheese and parsley	2·8	0·8	2·7	0·7	NS
	Kalitsounia anevata – with mizithra cheese, cinnamon and sugar	1·4	0·5	1·4	0·6	$P = 1·000$
	Kalitsounia with spinach	3·1	0·5	3·1	0·5	NS
Cheese	Ksinomizithra†/mizithra† – made of sheep's or goat's whey or a mixture of both with the addition of milk	1·5	0·6	1·6	0·7	NS
	Malaka – soft cheese made of sheep's milk, similar to mozzarella	1·2	0·5	1·4	0·5	NS
	Graviera†/kefalotyri – made of sheep's or goat's milk	3·3	1·1	3·3	0·8	NS
	Piktogalo† – made exclusively of non-pasteurized sheep's milk or a mixture of sheep's and goat's milk	1·3	0·5	1·2	0·4	NS
Green vegetables	Stamnagathi – spiny chicory	3·8	0·8	3·7	0·8	NS
	Askolimpri – *Scolymus hispanicus*	1·8	0·5	1·7	0·5	NS
	Avronies – asparagus	2·0	0·4	1·8	0·5	$P \leq 0·011$
	Vrouves – wild mustard greens	2·0	0·4	1·9	0·5	$P \leq 0·046$
Vegetables stuffed with rice filling	Dolmadakia – vineyard leaves stuffed with rice	2·7	0·5	2·7	0·5	NS
	Zucchini – zucchini stuffed with rice and veal minced meat	2·0	0·5	1·9	0·5	$P \leq 0·027$
	Gemista – oven-baked tomatoes/peppers stuffed with rice	3·6	0·5	3·7	0·6	NS
Meat dishes	Tsiladia – pork soup	1·0	0·1	1·0	0·1	$P = 1·000$
	Omathies – pork sausages with rice and groats filling	1·0	0·1	1·0	0·1	NS
	Apaki – smoked pork meat	1·1	0·3	1·2	0·5	NS
	Pork sausages	1·1	0·3	1·5	0·5	$P \leq 0·001$
	Pork with lemon sauce	2·7	0·5	2·9	0·3	$P \leq 0·034$
	Gamopilafo – risotto with chicken and lamb meat	2·5	0·6	2·6	0·5	NS
	Rabbit stew – with shallots and wine	1·2	0·4	1·2	0·5	NS
	Giouvetsi – chicken meat‡ baked with pasta and tomato sauce	2·7	0·5	2·6	0·5	NS
	Rooster – usually assorted with hylopites (home made tagliatelles)	1·3	0·5	1·3	0·5	NS
Fish, molluscs and crustaceans	Fish soup	3·5	0·7	3·4	0·8	NS
	Skarus	1·6	0·5	1·7	0·5	NS
	Kakkavia – traditional fish soup with potatoes and shallots	1·1	0·3	1·2	0·3	$P = 1·000$
	Cod	1·4	0·5	1·5	0·5	NS
	Octopus with pasta	2·2	0·7	2·3	0·7	NS
	Octopus with wine	1·4	0·6	1·5	0·6	NS
	Squid stew – with shallots	2·3	0·5	2·3	0·5	NS
	Echinus salad – raw echinus with olive oil and lemon juice	1·5	0·5	2·0	0·2	$P \leq 0·001$
	Snails fried	1·0	0·3	1·1	0·3	NS
	Snails with fennel – snails fired with onions, fennel and tomato sauce	2·1	0·6	2·0	0·7	NS
Pulses	Lady's fingers	1·0	0·3	1·1	0·3	NS
	Chick peas	1·4	0·6	1·2	0·4	$P \leq 0·01$
	Yellow lentils fava – cold dish with boiled yellow lentils, onions, olive oil and lemon juice	2·2	0·6	2·0	0·6	$P \leq 0·028$

*Independent samples *t* test.
†DOC cheese.
‡The Greek mainland uses veal meat.

Discussion

The present study aimed to elucidate the transition of the Cretan diet in terms of traditional dishes and key nutrient intake and to describe associations between the frequency of disease and changes in the consumption of traditional dishes between two contiguous generations of women. The examination of traditional recipes showed persistence to the local cuisine with only minor differences from the previous generation. The younger women showed increased intakes of rusks and meat dishes and decreased consumption of green vegetables, pulses and wine compared with their mothers. When the intake of the key nutrients of the MD was assessed, only sugar consumption of the younger women surpassed the intake reported by their mothers. These findings suggest that the reputation of the MD in Crete is strong and has a significant effect on the food choices of local women. In addition, it postulates the theory that, although a trend towards a more Westernized diet has been suggested in the youngsters, this might be only a temporary habit that changes when women are responsible for their own houses/families.

In accordance with the present findings, the comparison of diet between mothers and daughters in Malta and Sardinia showed that the MD is not disappearing[4]. According to the authors, insular environments of considerable length, such as in Crete, Malta and Sardinia, have meant a priori less external influence on their diet[4], as through the years the inhabitants have been forced to become more self-sufficient in food production for reasons of preservation. Simultaneously, the local cuisine was formed in total exploitation of the regional goods enhancing the islands' trade and economy. This production–consumption loop is apparent in Crete and is a feasible explanation for

Table 3 Nutrient composition of the diet: mothers and daughters, Crete, Greece, 2008–2009

	Mothers (*n* 80)		Daughters (*n* 80)		
	Mean	SD	Mean	SD	Significance*
Total fat	40·8	8·0	39·9	7·6	NS
SFA	13·8	5·3	12·8	3·9	NS
MUFA	18·1	5·2	17·5	5·1	NS
PUFA	4·9	2·5	4·3	1·4	NS
P:S ratio	0·42	0·27	0·37	0·18	NS
Trans fatty acids (g)	0·22	0·73	0·34	0·94	NS
Protein	14·6	3·5	13·9	3·1	NS
Complex carbohydrates	21·0	8·2	18·9	8·4	NS
Sugar	11·9	4·6	15·5	5·4	$P \leq 0{\cdot}001$
Fibre (g)	16·4	5·2	16·7	5·7	NS

P:S ratio, ratio of polyunsaturated to saturated fat. Nutrient composition in % of energy, unless otherwise noted.
*Mann–Whitney *U*-test.

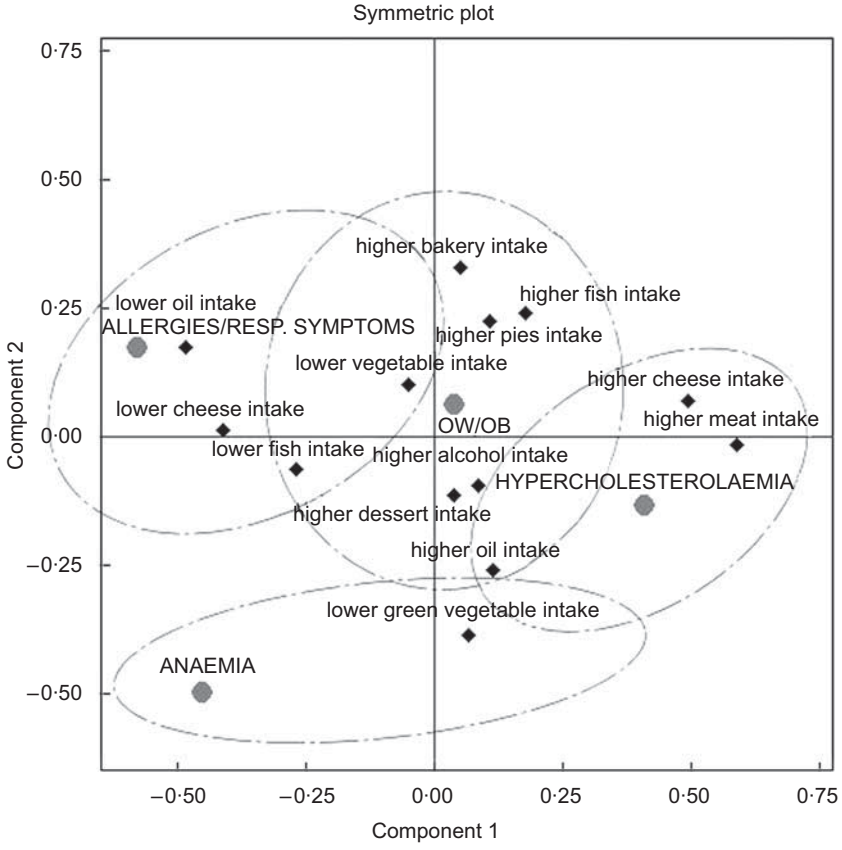

Fig. 1 Simple correspondence analysis between the health status of daughters and the difference in the intake of certain food groups compared with their mothers (dotted lines represent an approximate classification). OW/OB, overweight/obesity

enhanced adherence to traditional cuisine. However, Malta and Sardinia underwent a different evolution in terms of economy, history and migration and therefore had a different evolution in dietary trends.

In comparison with the initial study by Keys *et al.*[23] conducted in the 1960s, the Cretan population half a century ago was consuming a diet lower in protein (10·5 %), total fat (36·1 %), saturated fat (7·7 %), PUFA (2·5 %) and P:S ratio (0·32), but higher in MUFA (25·8 %), compared with modern Cretan women. Therefore, the consumption of olive oil, the premium source of MUFA in Greece, appears to have been reduced in favour of animal and solid fat, although no difference was recorded in the consumption of olive oil between mothers and daughters. Between the examined generations, younger women reported an increased sugar intake, a finding indicative of the impact of a more Westernized diet on MD.

A high prevalence of OW was seen in the female Cretan population, as observed in other Mediterranean samples[24]. Although in the past the high intake of olive oil had been implicated in weight gain[25], results from the Greek European Prospective Investigation into Cancer and Nutrition (EPIC) Study[24] showed that physical inactivity rather than an obesogenic diet was responsible for the high prevalence of OW in the Mediterranean region. However, OB comorbidities reported by the participants (T2D, hypertension, CVD, etc.) were rare in the sample, a fact that has been explained by numerous studies as an epigenetic health-promoting result of the MD[26,27]. According to the SCA plot, OW/OB daughters consumed more baked goods, pies, desserts, alcohol and fewer vegetables compared with their mothers. In other words, an increased consumption of energy-dense foods and a decreased vegetable consumption were quite logically associated with OW. On the lower class of the SCA graph, iron-deficiency anaemia was associated with decreased green vegetable intake and foods with increased Fe content.

The green vegetables commonly eaten by the Greeks have been the focal point in a plethora of chemical research. Su *et al.*[28] were the first to present the rich carotenoid content of sow thistle, amaranth, purslane, dandelion, chicory and endive, whereas a study from the Mediterranean Agronomic Institute of Chania[29] showed the antioxidant components of stamnagathi (spiny chicory), a vegetable commonly consumed in Crete. These antioxidant-rich vegetables represent the prophylactic umbrella of the Cretans against CVD disease and hypercholesterolaemia. In the SCA plot, hypercholesterolaemia was associated with decreased vegetable intake and a high consumption of meat, cheese and oils. There are numerous studies indicating that the adoption of a diet rich in animal fat and oils and low in vegetables contributes to the development of hyperlipidaemia and increases CVD risk[30]. According to Spence[31], the actual effect of diet on health is greater than what would be predicted by measuring the effects on fasting lipids, since humans are in a fasting state for only 8 h. Bondia-Pons *et al.*[32] conducted a study for the identification of foods contributing to the dietary profile of Mediterraneans. Their findings suggested that, in a population of women, oil was the highest contributor to the total fat intake, whereas saturated fat was consumed mainly through cheese (43·8 %) and meat (17·0 %).

Burns *et al.*[33] showed that low dietary vitamin E and *n*-3 fatty acid intakes are associated with increased odds for chronic bronchitis symptoms, wheezing and asthma. Mayes[34] postulated that *n*-3 fatty acids integrate into the cell membranes of the respiratory epithelium and modulate the inflammatory cascade; therefore, attenuated fish intake may contribute to problems in respiratory health. This effect can be further enhanced by low vitamin E intake, which tends to make the respiratory epithelium more susceptible to oxidative stress and increases the occurrence of asthmatic symptoms[35]. Cheese, on the other hand, a food item associated with respiratory health in the present study, is rich in Ca and is deemed as a protector against wheezing and eczema[36].

No cases of CVD or cancer were reported in the present sample. In the Lyon Diet and Heart Study[37], a 60 % reduction in cardiac death and myocardial infarction (MI) was achieved after adoption of the Cretan MD by survivors of MI. This health-protective effect of the MD has been shown in other regions throughout the Mediterranean basin as well[38]. One possible reason might be the broad antioxidant components in conjunction with the increased B-complex vitamin content of the MD that contributes to lower levels of plasma homocysteine[38]. A significantly reduced incidence of overall cancer has also been associated with MD adherence in the Greek EPIC prospective cohort study[39]. Numerous studies have validated the above findings and today the MD is considered a model diet for health and longevity[40].

When considering dietary factors associated with the frequency of a disease, we must also take into account the fact that the present study focused on the consumption of traditional recipes and not on all commodities traditionally consumed in Crete. Therefore, the experimental design excluded raw fruits, cereals, potatoes and nuts, all basic clusters of the Greek MD, which might have contributed to the explanation of the diseases classified in the SCA plot. Although this was a pitfall in terms of methodology, it also consists of an advantage, as Cretan foods and traditional dishes have never been described so thoroughly.

However, our study is not without caveats. The small differences in the consumption of traditional Cretan dishes between the two generations are not indicative of MD adherence, but reflect the trend towards MD evolution in Crete. We aim to assess MD adherence of the present sample in a second study through a semi-quantitative FFQ. These data were omitted from the present paper because of lack of space. Our study is simple in design, but important in defining alterations in the MD as a possible

result of modernization. Studies on nutrition transition tend to have a longitudinal design as cross-sectional studies are often biased by the effect of proper timing; however, the particular hypothesis could not have been implemented through another design. The relatively small sample size and the recruitment of participants living in urban Crete are limitations, but the study can inspire future studies conducted on larger populations. As the participants were not randomly selected, it is also possible that they were more health conscious; therefore, differences between the two generations tended to disappear. However, no other similar study was found with which to compare our results. Another limitation is that the health status of the participants was self-reported, as medical examinations were not included in the study. It is possible that medical examinations would have altered the frequency of the reported diseases. In addition, another limitation is that several sociodemographic characteristics of the sample were not recorded, and it is possible that some might have explained the health consciousness of the sample. It is also possible that if relationships between disease and differences in the intake of traditional dishes in the daughters were assessed with multivariate analyses, the results would have been different.

Conclusions

The comparison between two generations corroborated the theory that the MD is still being followed by the female population of Crete. This finding was verified by two comparisons: consumption of traditional Cretan dishes and intake of key nutrients in the MD. A tendency was shown towards a greater sugar intake in the younger generation, possibly as a result of a more Westernized diet. Morbidity of the younger generation was associated with deviations in the consumption of several food groups compared with the previous generation.

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