Nutrición Hospitalaria

Comparación de la calidad de la dieta entre niños pequeños y adolescentes en la cuenca mediterránea y la influencia de los hábitos de vida

Comparison of diet quality between young children and adolescents in the Mediterranean basin and the influence of life habits

10.20960/nh.2110

OR 2110

Comparison of diet quality between young children and adolescents in the Mediterranean basin and the influence of life habits

Nuria Giménez Blasi[1,2], José Antonio Latorre[1], Manuel Martínez Bebia[1], Fátima Olea Serrano[3], Miguel Mariscal Arcas[3] and Cecilia Monteagudo[3]

[1]Department of Food Technology, Nutrition and Food Science. Universidad de Murcia. Lorca, Murcia. Spain. [2]School of Health Science. Universidad de Isabel I. Burgos, Spain. [3]Research Group on Nutrition, Diet and Risk Assessment (AGR-255). Department of Nutrition and Food Science. Universidad de Granada. Granada, Spain

Received: 08/06/2018
Accepted: 14/10/2018
Correspondence: Fátima Olea Serrano. Department of Nutrition and Food Science. University of Granada. Campus de Cartuja, s/n. 18071 Granada, Spain
e-mail: folea@ugr.es
DOI: 10.20960/nh.2110

ABSTRACT

Introduction: the dietary intake patterns of children should be monitored because of their influence on health in adulthood. It is now widely accepted that childhood nutrition is linked to specific diseases such as obesity and to risk factors for cardiovascular disease in adulthood. Therefore, knowledge of dietary intake during childhood may be useful to identify possible risk factors for disease in adulthood. The main focus of research into children’s diets has been the contribution of macronutrients and micronutrients.

Objective: several indices have been developed for assessing the diet quality of previously defined population groups. The aim of the present study was to compare the nutritional status of Andalusian children and adolescents and examine the relationship between their diet quality and socio-demographic or lifestyle factors.

Results: the food intake of the younger children in this study was closer to RDIs compared with the adolescents, who generally reported a lower energy supply in their diet than the recommended. The mean (SD) diet quality score was 12.1 (1.9) for the younger children (6-9 years) and 9.4 (3.2) for the older group (10-17 years), a statistically significant difference. A good correlation was found between energy intake (MJ/kg body weight) and estimated energy (MET MJ/kg body weight).

Key words: Diet quality. Young people's diet. Southern Spain. MET.

INTRODUCTION

The traditional food of Andalusia is a specific expression of the Mediterranean diet and includes stews with vegetables, pulses and/or meats or fish, with variations that reflect local differences in climate and soil. The use of olive oil was inherited from the Romans; seasonings, herbs, and species, from the Arabs; and desserts, from the Jews, alongside a tradition among shepherds of simple stews cooked in the open (1).

The health benefits of the Mediterranean diet have been attributed to its low saturated fatty acid contents, high complex carbohydrates and dietary fiber contents and antioxidant properties. The diet is rich in vitamins and minerals derived from vegetables and fruits, wholemeal cereals, virgin olive oil, fish and wine, minimizing the risk of a deficient micronutrient intake (2,3). Thus, consumption of the vitamin B group (B_1, B_2, niacin, B_6, folate, and B_{12}) and antioxidant vitamins E and C was found to be more than adequate in the Mediterranean basin (4). However, epidemiological studies have signaled a rapid change in dietary patterns in Mediterranean countries towards a higher consumption of animal products and saturated fat to the detriment of plant-based foodstuffs (5). This trend increases the risk of the deficient intake of some vitamins (e.g., folate and vitamins A, E and D) and minerals, especially in certain population groups (6-8).

The dietary intake of children should be monitored because of its influence on their health in later life (9). It is now widely accepted that childhood nutrition is linked to diseases such as obesity (10,11) and to a higher risk of cardiovascular disease when adults (12,13). Analysis of dietary intake during childhood may therefore be useful to identify possible risk factors for disease in adulthood (12,18).

Several indices have been developed for assessing the diet quality of previously defined population groups. Since Kant et al. (19) published the dietary diversity score, based on the daily consumption of foods classified in five groups, several indices and modifications have been proposed. The Healthy Eating Index (HEI) (20) rated the diet of participants aged ≥ 2 years in the Continuing Survey of Food Intakes by Individuals (CSFII) (21). An adaptation of the HEI for children led to the Youth Healthy Eating Index (YHEI) (22). Kim et al. (23) developed the Diet Quality Index-International (DQI-I), based on food frequency questionnaires (FFQs) and the quantitative assessment of reference nutrients, and it has been modified to evaluate adherence to the Mediterranean diet (7,24).

The objectives of this study were to compare the nutritional status of Andalusian children and adolescents in a sample divided between sportspeople and non-sportspeople and to examine the relationship between their diet quality and socio-demographic or lifestyle factors.

SUBJECTS AND METHODS

Subjects

The study population included 288 young people (168 males and 120 females) aged 6-17 years living in the Granada province, in Southern Spain; 20.6% were < 10 years old and 79.6% were ≥ 10 years old. They were recruited from among young federated skiers at the High-Performance Centre (CAR) of Sierra Nevada (n = 88, 53 males and 35 females) and from among students at two schools in the city of Granada (n = 200, 88 males and 112 females). Informed written consent to participation was obtained from the parents/guardians. The study was approved by the Ethics Committee of the University of Granada. This sample of children and adolescents was previously investigated by our group (7,25,26).

Anthropometric measurements

Height was measured to the nearest 1 mm using a mobile anthropometer (Kawe, France), with the head in Frankfurt plane. Body weight was determined to the nearest 100 g using a Tefal 9210 digital scale (Tefal®, Rumilly, France). Subjects were weighed in bare feet and underwear. All anthropometric measurements were performed by a single observer to avoid between-observer variations. Body mass index (BMI) was calculated as kg/m^2.

Questionnaires

The study was based on the 24-h recall and food frequency questionnaires (FFQ) previously utilized in this population to calculate their DQI (7). This FFQ contains 92 food items classified by food group, gathering data on the consumption or not of an item, the number of times it was consumed per week, and the amount consumed each time (in household measures) (7,23,24). An additional questionnaire was administered on lifestyle characteristics and daily activities, which included items on the educational level of the parents and the setting of lunch. Daily activity data were derived from reports by participants on activities performed during the 24-h period before the interview. Lifestyle findings were correlated with diet quality estimations, and 24-h activity recall data were used to estimate MET values (27). Three 24-h dietary recalls were performed between February and May. These data were processed using the DIAL v.2 diet program (28). Questionnaires were administered at the center/school by well-trained dieticians between Tuesday and Friday.

Exclusion of questionnaires as unreliable was based on the criteria of Goldberg et al. (29), taking account of energy intake (EI) results, based on the three 24-h dietary recalls, and the daily total energy expenditure (TEE), estimated from the 24-h activity recall data.

Outcome variables were the daily EI; the intake of carbohydrates, lipids, proteins, vitamins and minerals; and the MET, i.e., the ratio of energy expended (kcal/kg^{-1}/h^{-1}) in a specific activity to the basal metabolic rate (27).

The nutritional adequacy of the diet was assessed by comparison with the recommended daily intake (RDI) (30) for Spaniards (31) of 14 items (protein, energy, Fe, Ca, Mg, Zn, Se, I, vitamins B_1 and B_2, niacin and vitamins A, C and E). A score of 1 was assigned for an intake < 2/3 of the RDI (2,7) and a score of 0, for an intake below this level, giving a score range for dietary adequacy of 0 (worst) to 14 (best).

Energy intake values did not differences in food intake and nutritional habits between Spanish adolescents who engage in ski activity and those who do not differ between ski and non-ski groups, either between SP and N-SP females or between SP and N-SP males. For all study groups, the energy intake was highly significantly below Spanish recommendations for these age groups (32).

Socio-demographic, lifestyle and dietary factors

Analyses of socio-demographic, lifestyle and dietary factors potentially associated with the food intake of this population were conducted, including: participants sex and age; parental education level (low = no/only primary, medium = secondary, high = university); their physical activity level, classified as sedentary or active (33) according to MET values (27); and their BMI, classifying participants as underweight, normal weight or overweight/obese according to cut-off points established for each sex at different ages (34).

Statistical analysis

SPSS version 20 (IBM SPSS, Chicago, IL, USA) was used for the statistical analyses. The Chi-square test was used to compare characteristics of participants between age groups (6-9 years *vs* 10-17 years) and the Student's t-test was applied to compare their intake of energy and nutrients. Multivariate logistic regression analysis was performed with diet quality score (high *vs* low) as dependent variable, entering socio-demographic, lifestyle and dietary results as independent variables and calculating crude and adjusted odds ratios (ORs) with 95% confidence intervals. $p < 0.05$ was considered as significant.

RESULTS

Out of a total of 288 completed questionnaires, eleven were excluded from the study after applying the criteria of Goldberg et al. (27,32). Table I displays the socio-demographic and lifestyle characteristics of the 277 children and adolescents in the final study sample. A similar percentage of the 6 to 9-year-old group (23.8%) and 10 to 17-year-old group (22.6%) was classified as overweight. The only significant difference between sexes was in the physical activity of the 10 to 17-year-old ($p < 0.001$; $\chi^2 = 11.94$). Participants mainly had meals at home. Most 6 to 9-year-old individuals spent 10-20 minutes on breakfast and 15-60 minutes each on lunch and dinner, whereas most 10 to 17-year-old individuals spent < 10 minutes on breakfast and 15-30 minutes each on lunch and dinner. Most subjects talked or experienced distractions during lunch, especially among the 6 to 9-year-old participants. The vast majority of subjects did not consider breakfast to be an important meal.

Table II exhibits the mean (SD) daily energy and nutrient intakes of participants. Intakes of energy per kg body weight, MET per kg body weight, minerals and vitamins (Fe, Ca, Mg, Zn, Se, iodine, vitamin B_2, niacin, vitamin E) were significantly higher in 6 to 9-year-old participants than in the 10 to 17-year-old group. A good correlation was found (data not shown) between energy intake (MJ/kg body weight) and estimated energy (MET MJ/kg body weight) ($r = 0.739$; $p < 0.001$). The mean (SD) diet quality score was 12.1 (1.9) for the younger children (6-9 years) and 9.4 (3.2) for the older group (10-17 years), showing a significant ($p < 0.001$) difference.

Univariate analyses of socio-demographic and lifestyle variables (Table III) revealed that a higher diet quality score was associated with higher age, weight-for-height status and physical activity values. These factors were entered in the multivariate analysis, which showed that the diet quality score was positively associated with higher age and physical activity and inversely associated with weight-for-height status.

DISCUSSION

The sex and age distribution of the sample did not significantly differ from that recorded in Southern Spain (35). Under-reporters were excluded from the analysis of dietary patterns and nutrient intake to avoid the typical respondent bias in dietary recall methods.

The habits of this population at the table show interesting trends. The younger children spent more time eating and reported more distraction during meals, as previously observed (36-38). Most participants talked at the table, which has been described as a positive factor, implying family participation and favoring diet quality and the habit of taking breakfast (26,29,40).

These young people showed an elevated consumption of total fat (40.9% of total energy intake in 6 to 9-year-old participants and 41.8% in the 10 to 17-year-old group) and protein (14.8% of total energy intake in 6 to 9-year-olds and 14.9% in 10 to 17-year-olds), and a reduced consumption of carbohydrates (44.2% of total energy intake in 6 to 9-year-olds and 43.4% in 10 to 17-year-olds). In both groups, the contribution of SFA to the total energy intake was above the recommendations, while the contribution of PUFA was below recommendations. These findings are similar to those obtained in young people by other epidemiological studies in Spain and the United States (6,41-43).

In comparison to recommendations, the intake of iodine was lower than recommended in the younger group and the intakes of iron, calcium, magnesium, zinc, iodine, vitamin B_2, and vitamin E were lower in the adolescents (44). These deficiencies represent a risk factor for metabolic disease in adulthood (45) and may reflect a shift from the traditional Mediterranean diet, which provides an adequate supply of these micronutrients. The lesser change observed in the younger children may reflect a greater control by parents on their dietary habits in comparison to adolescents.

Disruptions in the balance between nutrient requirements and intake during adolescence have an effect on subsequent health. Early adoption of healthy eating habits may contribute to a lower incidence of disease in adulthood and improved quality of life in later life. Dietary habits are complex in nature and many factors influence food practices (46). Adolescence is a transitional stage and many changes take place at physiologic and behavioral levels. Socio-cultural factors, i.e., parental occupational status, maternal level of education, cultural and/or religious habits, the role of family, patterns of beauty, etc., are factors that have a strong influence on eating habits and nutrient intake in this age group (47,48). It has previously been reported that parental educational level should be considered when developing childhood obesity prevention programs (49) and that further information is required on parent and child perceptions of diet and physical activity (50). The best diet quality scores were observed in active young people of normal weight, as previously reported in Spanish university students (51). A good correlation was found between the energy intake (MJ/kg body weight) and estimated energy (MET MJ/kg body weight), validating this estimation method.

In conclusion, the food intake of the younger children in this study was closer to recommendations in comparison to the adolescents, who generally reported a lower energy supply in their diet than recommended. The adolescents obtained a significantly lower diet quality score in comparison to the younger group.

ACKNOWLEDGEMENTS

The authors are very grateful to the participants and their families, who gave their time to the study. They also thank Richard Davies and Layla Davies for their assistance with the English version. This paper will be the methodology part of Nuria Giménez Blasi's and Jose Antonio Latorre Rodríguez´s doctoral thesis, being completed as part of the Food Technology, Nutrition and Food Sciences Program at the University of Murcia, Spain. This work was supported by grants from the Andalusian Regional Government (AGR255). This work was supported by grants from the Spanish Ministry of Health (FEDER-ISCIII PI14/01040).

REFERENCES

1. Trichopoulou A, Martínez-González MA, Tong TY, Forouhi NG, Khandelwal S, Prabhakaran D, et al. Definitions and potential health benefits of the Mediterranean diet: views from experts around the world. BMC Med 2014;12:112.

2. Aranceta J, Serra-Majem Ll, Pérez-Rodrigo C, Llopis J, Mataix J, Ribas L, et al. Vitamins in Spanish food patterns: the eVe Study. Public Health Nutr 2001;4:1317-23.

3. O'Brien KM, Stacey FG, Wyse RJ, Clinton-McHarg T, Tzelepis F, James EL, et al. Interventions for increasing fruit and vegetable consumption in children aged five years and under. Cochrane Database Syst Rev 2018;5:CD008552. DOI: 10.1002/14651858.CD008552.pub5

4. Bach-Faig A, Geleva D, Carrasco J, Ribas-Barba L, Serra-Majem L. Evaluating associations between Mediterranean diet adherence indexes and biomarkers of diet and disease. Public Health Nutr 2006;9(8A):1110-7.

5. Vareiro D, Bach-Faig A, Raidó Quintana B, Bertomeu I, Buckland G, Vaz de Almeida MD, et al. Availability of Mediterranean and non-Mediterranean foods during the last four decades: comparison of several geographical areas. Public Health Nutr 2009;12(9):1667-75.

6. Serra-Majem L, Aranceta J. Nutritional objectives for the Spanish population. Consensus from the Spanish Society of Community Nutrition. Public Health Nutr 2001;4:1409-13.
7. Mariscal-Arcas M, Romaguera D, Rivas A, Feriche B, Pons A, Tur JA, et al. Diet quality of young people in southern Spain evaluated by a Mediterranean adaptation of the Diet Quality Index-International (DQI-I). Br J Nutr 2007;98:1267-73.
8. Monteagudo C, Mariscal-Arcas M, Palacin A, López M, Lorenzo ML, Olea-Serrano F. Estimation of dietary folic acid intake in three generations of females in Southern Spain. Appetite 2013;67:114-8.
9. Corkins MR, Daniels SR, De Ferranti SD, Golden NH, Kim JH, Magge SN, et al. Nutrition in children and adolescents. Med Clin North Am 2016;100(6):1217-35.
10. Xu J, Hardy LL, Guo CZ, Garnett SP. The trends and prevalence of obesity and morbid obesity among Australian school-aged children, 1985-2014. J Paediatr Child Health 2018;54(8):907-12. DOI: 10.1111/jpc.13922
11. Das JK, Lassi ZS, Hoodbhoy Z, Salam RA. Nutrition for the next generation: older children and adolescents. Ann Nutr Metab 2018;72(Suppl 3):56-64. DOI: 10.1159/000487385
12. Cohen JFW, Lehnerd ME, Houser RF, Rimm EB. Dietary approaches to stop hypertension diet, weight status, and blood pressure among children and adolescents: National Health and Nutrition Examination Surveys 2003-2012. J Acad Nutr Diet 2017;117(9):1437-44.e2.
13. Damsgaard CT, Biltoft-Jensen A, Tetens I, Michaelsen KF, Lind MV, Astrup A, et al. Whole-grain intake, reflected by dietary records and biomarkers, is inversely associated with circulating insulin and other cardiometabolic markers in 8- to 11-year-old children. J Nutr 2017;147(5):816-24.
14. Lee AM, Gurka MJ, DeBoer MD. Correlation of metabolic syndrome severity with cardiovascular health markers in adolescents. Metabolism 2017;69:87-95.

15. Psaltopoulou T, Hatzis G, Papageorgiou N, Androulakis E, Briasoulis A, Tousoulis D. Socioeconomic status and risk factors for cardiovascular disease: impact of dietary mediators. Hellenic J Cardiol 2017;58(1):32-42.
16. Anania C, Perla FM, Olivero F, Pacífico L, Chiesa C. Mediterranean diet and nonalcoholic fatty liver disease. World J Gastroenterol 2018;24(19):2083-94. DOI: 10.3748/wjg.v24.i19.2083
17. Chiavaroli L, Kendall CWC, Braunstein CR, Blanco Mejia S, Leiter LA, Jenkins DJA, et al. Effect of pasta in the context of low-glycaemic index dietary patterns on body weight and markers of adiposity: a systematic review and meta-analysis of randomised controlled trials in adults. BMJ Open 2018;8(3):e019438. DOI: 10.1136/bmjopen-2017-019438
18. Mytton OT, Forouhi NG, Scarborough P, Lentjes M, Luben R, Rayner M, et al. Association between intake of less-healthy foods defined by the United Kingdom's nutrient profile model and cardiovascular disease: a population-based cohort study. PLoS Med 2018;15(1):e1002484. DOI: 10.1371/journal.pmed.1002484
19. Kant AK. Indexes of overall diet quality: a review. J Am Diet Assoc 1996;96:785-91.
20. Kennedy ET, Ohls J, Carlson S, Fleming K. The healthy eating index: design and applications. J Am Diet Assoc 1995;95:1103-8.
21. Bowman SA, Lino M, Gerrior SA, Basiotis PP. The healthy eating index, 1994-96. Fam Econ Nutr Rev 1998;11:2-14.
22. Feskanich D, Rockett HR, Colditz GA. Modifying the healthy eating index to assess diet quality in children and adolescents. J Am Diet Assoc 2004;104:1375-83.
23. Kim S, Haines PS, Siega-Riz AM, Popkin BM. The Diet Quality Index-International (DQI-I) provides and effective tool for cross-national comparison of diet quality as illustrated by China and the United States. J Nutr 2003;133:3476-84.
24. Tur JA, Romaguera D, Pons A. The Diet Quality Index-International (DQI-I): is it a useful tool to evaluate the quality of the Mediterranean diet? Br J Nutr 2005;93(3):369-76.

25. Mariscal-Arcas M, Rivas A, Velasco J, Ortega M, Caballero AM, Olea-Serrano F. Evaluation of the Mediterranean Diet Quality Index (KIDMED) in children and adolescents in Southern Spain. Public Health Nutr 2009;12(9):1408-12.
26. Monteagudo C, Palacín-Arce A, Bibiloni M del M, Tur JA, Olea-Serrano F, Mariscal-Arcas M. Proposal for a Breakfast Quality Index (BQI) for children and adolescents. Public Health Nutr 2013;16(4):639-44.
27. Ainsworth BE, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, et al. Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exerc 2000;32(9 Suppl):S498-504.
28. Ortega Anta RM, López Sobaler AM, Carvajales PA, Requejo Marcos AM, Aparicio Vizuete A, Molinero Casares LM, et al. Programa DIAL software for assessing diets and food calculations (for Windows Copyright© 2015 Alce Ingeniería). Available from: http://www.alceingenieria.net/nutricion/descarga.htm
29. Goldberg GR, Black AE, Jebb SA, Cole TJ, Murgatroyd PR, Coward WA, et al. Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. Eur J Clin Nutr 1991;45(12):569-81.
30. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (2002/2005). Dietary reference intakes for water, potassium, sodium, chloride, and sulfate (2005). Available from: http://www.nap.edu
31. Food and Agriculture Organization of the United Nations (FAO). Food-based dietary guidelines – Spain. FAO; 2008. Available from: http://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/spain/en/Food-based
32. Mariscal-Arcas M, Monteagudo C, Hernández-Elizondo J, Benhammou S, Lorenzo ML, Olea-Serrano F. Differences in food intake and nutritional habits between Spanish adolescents who engage in ski activity and those who do not. Nutr Hosp 2014;31(2):936-43.

33. FAO/WHO/UNU. Human energy requirements. Report of a Joint FAO/WHO/UNU Expert Consultation. Rome; 2001.
34. Cole TJ, Lobstein T. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. Pediatr Obes 2012;7(4):284-94.
35. Spanish National Institute of Statistics (INE). Population and residence census 2017. Madrid: INE; 2017.
36. Serra-Majem L, Aranceta Bartrina J, Pérez-Rodrigo C, Ribas-Barba L, Delgado-Rubio A. Prevalence and determinants of obesity in Spanish children and young people. Br J Nutr 2006;96(Suppl 1):S67-72.
37. Zandian M, Ioakimidis I, Bergström J, Brodin U, Bergh C, Leon M, et al. Children eat their school lunch too quickly: an exploratory study of the effect on food intake. BMC Public Health 2012;12:351.
38. Skeer MR, Yantsides KE, Eliasziw M, Tracy MR, Carlton-Smith AR, Spirito A. Sociodemographic characteristics associated with frequency and duration of eating family meals: a cross-sectional analysis. Springerplus 2016;5(1):2062.
39. Hanna AC, Bond MJ. Appetite. Relationships between family conflict, perceived maternal verbal messages, and daughters' disturbed eating symptomatology. Appetite 2006;47(2):205-11.
40. Fernández-Aranda F, Krug I, Granero R, Ramón JM, Badia A, Giménez L, et al. Individual and family eating patterns during childhood and early adolescence: an analysis of associated eating disorder factors. Appetite 2007;49(2):476-85.
41. Serra Majem L, Ribas Barba L, Armas Navarro A, Álvarez León E, Sierra A. Equipo de investigación de ENCA. Energy and nutrient intake and risk of inadequate intakes in Canary Islands (1997-98). Arch Latinoam Nutr 2000;50(1 Suppl 1):7-22.
42. Kenney EL, Lee RM, Brooks CJ, Cradock AL, Gortmaker SL. What do children eat in the summer? A direct observation of summer day camps that serve meals. J Acad Nutr Diet 2017;117(7):1097-103.

43. Naude CE, Visser ME, Nguyen KA, Durao S, Schoonees A. Effects of total fat intake on bodyweight in children. Cochrane Database Syst Rev 2018;2:CD012960.
44. López-Sobaler AM, Aparicio A, Rubio J, Marcos V, Sanchidrián R, Santos S, et al. Adequacy of usual macronutrient intake and macronutrient distribution in children and adolescents in Spain: a National Dietary Survey on the Child and Adolescent Population, ENALIA 2013-2014. Eur J Nutr 2018. DOI: 10.1007/s00394-018-1676-3
45. World Health Organization (WHO). Guideline: assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition: updates for the integrated management of childhood illness (IMCI). Geneva: WHO; 2017.
46. La Torre G, Mannocci A, Saulle R, Sinopoli A, D'Egidio V, Sestili C, et al. Improving knowledge and behaviors on diet and physical activity in children: results of a pilot randomized field trial. Ann Ig 2017;29(6):584-94.
47. Tur JA, Puig MS, Benito E, Pons A. Associations between sociodemographic and lifestyle factors and dietary quality among adolescents in Palma de Mallorca. Nutrition 2004;20:502-8.
48. Pérez-Farinós N, Villar-Villalba C, López Sobaler A, Dal Re Saavedra M, Aparicio A, Santos Sanz A, et al. The relationship between hours of sleep, screen time and frequency of food and drink consumption in Spain in the 2011 and 2013 ALADINO: a cross-sectional study. BMC Public Health 2017;17(1):33. DOI: 10.1186/s12889-016-3962-4
49. Miguel-Berges ML, Zachari K, Santaliestra-Pasias AM, Mouratidou T, Androutsos O, Iotova V, et al. Clustering of energy balance-related behaviours and parental education in European preschool children: the ToyBox study. Br J Nutr 2017;118(12):1089-96.
50. Thorn JE, DeLellis N, Chandler JP, Boyd K. Parent and child self-reports of dietary behaviors, physical activity, and screen time. J Pediatr 2013;162(3):557-61.
51. Sánchez-Ojeda MA, De Luna-Bertos E. Healthy lifestyles of the university population. Nutr Hosp 2015;31(5):1910-9.

Table I. Characteristics of the sample (n = 277)

	6-9 years old	*10-17 years old*	χ^2	*p*
Sex				
Men	55.6%	58.5%	0.136	0.713
Women	44.4%	41.5%		
Physical activity				
Active	60.0%	65.6%	0.513	0.474
Sedentary	40.0%	34.4%		
Obesity level				
Underweight	4.8%	3.8%		
Normal weight	71.4%	73.6%	0.122	0 .941
Overweight	23.8%	22.6%		
Education level of father				
Low	13.5%	21.5%		
Medium	48.6%	44.0%	1.248	0 .536
High	37.8%	34.4%		
Educational level of mother				
Low	10.5%	21.6%		
Medium	34.2%	44.2%	6.129	0 .013
High	55.3%	34.1%		
Location of lunch				
Home	54.1%	83.9%	16.665	
School	40.5%	14.7%		0.001
Other	5.4%	1.4%		
Time spent on breakfast (min)				
< 10	26.5%	68.5%	27.152	
10-20	64.7%	25.9%		0.001
> 20	8.8%	1.9%		
Time spent on lunch (min)				
< 15	0.0%	7.9%		
15-30	54.1%	61.6%	5.522	0 .019
30-60	45.9%	29.2%		
> 60	0.0%	0.5%		
Time spent on dinner (min)				
< 15	0.0%	15.9%		
15-30	69.4%	64.0%	6.578	0 .010
> 30	30.6%	19.6%		
Activity during lunch				
No distractions	13.2%	9.1%		
Distractions	42.1%	28.8%	3.319	0 .068
Talking	44.7%	62.1%		
Breakfast is considered to be important				
Yes	5.4%	3.2%		
No	94.6%	93.5%	1.455	0.228
Don't know	0.0%	3.2%		

Table II. Daily intakes of energy and nutrients (mean ± SD) in young people of Southern Spain (n = 277)

	6-9 years old	*10-17 years old*	*T*	**p*
Energy intake				
MJ/day	8.2 (2.0)	8.2 (2.9)	0.138	0.891
%RDI	103.2 (25.3)	79.3 (28.4)	4.687	0.001
MJ/kg b.wt.	0.5 (0.3)	0.2 (0.1)	9.280	0.001
Estimated energy expenditure				
MET (MJ/day)	9.2 (0.9)	9.2 (1.4)	-0.199	0.843
MET (MJ/kg b.wt.)	0.5 (0.3)	0.3 (0.2)	10.976	0.001
Nutrients	% energy			
Carbohydrates	44.2 (7.7)	43.4 (9.5)	0.480	0.631
Lipids	40.9 (8.6)	41.8 (8.7)	-0.536	0.593
SFA	13.3 (3.4)	13.6 (4.3)	-0.380	0.704
MUFA	15.7 (4.9)	15.9 (5.7)	-0.189	0.850
PUFA	4.5 (1.8)	4.9 (2.1)	-1.120	0.264
Proteins	14.8 (4.6)	14.9 (3.7)	-0.145	0.885
	%RDI			
Fe	110.7 (41.1)	84.4 (34.4)	4.049	0.001
Ca	121.8 (45.6)	75.9 (35.1)	6.830	0.001
Mg	108.5 (38.7)	65.3 (26.8)	8.191	0.001
Zn	118.5 (49.4)	84.2 (43.5)	4.223	0.001

Se	201.7 (120.8)	155.3 (89.1)	2.690	0.008
I	93.5 (44.3)	48.0 (27.6)	8.134	0.001
Vit B_1	210.2 (92.5)	184.2 (127.4)	1.157	0.248
Vit B_2	139.4 (56.5)	96.1 (41.2)	5.423	0.001
Niacin	142.5 (76.0)	105.4 (61.1)	3.197	0.002
Vit A	227.4 (171.9)	199.9 (173.5)	0.867	0.387
Vit C	180.6 (143.3)	159.8 (131.6)	0.855	0.394
Vit E	101.7 (59.0)	75.8 (56.1)	2.506	0.013
Diet quality score†	12.11 (1.89)	9.39 (3.21)	4.870	0.001

%E: percentage of energy; b.wt.: body weight; %RDI: percentage of recommended dietary intake. *Significant differences between 6 to 9-year-old and 10 to 17-year-old subjects by ANOVA. †A diet quality score was computed considering the risk of inadequate intake of the nutrients considered. A value of 0 or 1 was assigned to each of the 14 nutrients. Individuals whose consumption was < 2/3 of the RDI for each nutrient were assigned a value of 0, and those whose consumption was ≥ 2/3 of RDI were assigned a value of 1. Hence, the total score ranged from 0 (very poor quality) to 14 (high quality).

Table III. Socio-demographic and lifestyle characteristics of individuals with low and high diet quality scores (n = 277)

	*Low score**	*High score*[†]	*Crude OR*[‡] *(95% CI)*	*Adjusted OR*[§] *(95% CI)*
Sex				
Male	55.4%	54.5%	1.04 (0.53-2.03)	1.08 (0.47-2.49)
Female	44.3%	45.4%	1.00 (ref.)	1.00 (ref.)
Age group				
< 10 years	4.3%	38.2%	0.06 (0.01-0.24)**	0.06 (0.01-0.30)[¶]
10-12 years	21.7%	23.6%	0.45 (0.13-1.53)	0.43 (0.11-1.62)
13-15 years	55.4%	29.1%	0.94 (0.30-2.94)	0.93 (0.27-3.28)
16-18 years	18.5%	9.1%	1.00 (ref.)	1.00 (ref.)
Father's educational level				
Low	18.6%	14.8%	1.18 (0.43-3.24)	0.85 (0.15-4.88)
Medium	41.9%	48.1%	0.81 (0.39-1.72)	0.81 (0.47-4.19)
High	39.5%	37.0%	1.00 (ref.)	1.00 (ref.)
Mother's educational level				
Low	17.9%	14.8%	1.62 (0.59-4.44)	0.90 (0.16-4.97)
Medium	47.6%	38.9%	1.64 (0.77-3.48)	0.44 (0.14-1.32)
High	34.5%	46.3%	1.00 (ref.)	1.00 (ref.)
Weight-for-height status				
Underweight	5.6%	4.0%	0.52 (0.08-3.49)	0.23 (0.02-2.32)
Normal weight	67.8%	86.0%	0.30 (0.11-0.84)[‖]	0.19(0.06-0.61)[¶]
Overweight and obesity	26.7%	10.0%	1.00 (ref.)	1.00 (ref.)
Physical activity				
Sedentary	69.6%	83.6%	0.45 (0.19-1.04)	0.31 (0.11-0.88)[‖]
Active	30.4%	16.4%	1.00 (ref.)	1.00 (ref.)

*Individuals with low diet quality score (≤ 9 points). †Individuals with high diet quality score (≥ 13 points). ‡Univariate analysis (logistic regression analysis considering the effect of only one explanatory variable). §Multivariate analysis (multiple logistic regression analysis considering the simultaneous effect of all explanatory variables). ‖$p < 0.05$; ¶$p < 0.01$; ** $p < 0.001$.