



Trabajo Original

Association between parental attitudes towards their offspring's diet and children's actual dietary habits — The SENDO project

Asociación entre las actitudes de los padres hacia la dieta de sus hijos y los hábitos alimentarios reales de los niños: el proyecto SENDO

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Abstract

Introduction: the preschool stage is a critical period for teaching and modeling healthy habits to positively influence children's health and wellbeing throughout their lifetime.

Objectives: to evaluate the association between parental attitudes towards their offspring's dietary habits in Spanish children aged 4 to 7 years participating in the *Follow-up of Children for Optimal Development (SENDO)* project.

Methods: we defined an index to measure information on parental attitudes towards their offspring's diet (0 to 8 points), and another one to measure children's actual dietary habits (0 to 19 points). A higher score meant healthier attitudes and healthier habits, respectively. Information was collected through an online questionnaire completed by parents. We calculated crude and multivariable-adjusted odds ratios (OR) and 95 % confidence intervals (CI) for children's healthy dietary habits associated with parental scores in the parental attitudes index. Generalized estimation equations (GEE) were used to account for intra-cluster correlation between siblings.

Results: a total of 423 preschoolers (52.3 % boys, mean age 5.3 years) were included in the analyses. Half of the children (51 %) reported unhealthy dietary habits, whereas 56 % of parents reported high adherence to the healthy eating index. Compared to those in the lowest category, the children whose parents were in the highest category in the parental attitudes index showed significantly higher odds of having healthy dietary habits (OR: 2.91; 95 % CI: 1.30-6.53, p for trend = 0.004).

Conclusions: our results support a direct association between parental attitudes and their offspring's dietary habits, suggesting that public health interventions aimed at improving children's dietary habits should shift from the individual- to a family-based approach.

Keywords:

Parental attitudes.
Preschoolers. Eating habits. Breakfast. Dietary indices.

Resumen

Introducción: la etapa preescolar es un período crítico para enseñar y modelar hábitos saludables que influyan positivamente en la salud y el bienestar de los niños a lo largo de su vida.

Objetivos: evaluar la influencia de las actitudes de los padres en los hábitos alimentarios de sus hijos (entre 4 y 7 años) participantes en el proyecto Seguimiento del Niño para un Desarrollo Óptimo (SENDO).

Métodos: se definieron dos índices diferentes para medir la información sobre las actitudes alimentarias de los padres (0 a 8 puntos) y los hábitos alimentarios de los niños (0 a 19 puntos). Las puntuaciones más altas reflejaban actitudes y hábitos más saludables, respectivamente. La información se recopiló a través de un cuestionario *online* cumplimentado por los padres. Se calcularon las *odds ratios* (OR) bruta y ajustada, así como sus intervalos de confianza (IC) del 95 % para los hábitos alimentarios saludables de los niños asociados con las actitudes alimentarias de los padres. Se utilizaron ecuaciones de estimación generalizada (GEE) para tener en cuenta la correlación intra-grupo entre hermanos.

Resultados: se incluyeron 423 niños en edad preescolar (52,3 % varones, edad media 5,3 años), teniendo el 51 % de los niños hábitos alimentarios poco saludables, mientras que el 56 % de los padres presentaban una alta adherencia al índice de actitudes alimentarias saludables en los progenitores. En comparación con la categoría más baja, los niños cuyos padres estaban en la categoría más alta en el índice de actitudes paternas presentaban una mayor probabilidad de tener hábitos alimentarios saludables (OR: 2,91; IC del 95 %: 1,30-6,53, p de tendencia = 0,004).

Conclusiones: estos resultados indican una asociación directa entre las actitudes alimentarias de los padres y los hábitos alimentarios de sus hijos, lo que sugiere que las intervenciones de salud pública dirigidas a mejorar los hábitos alimentarios en la etapa escolar deben pasar del enfoque individual a un abordaje familiar.

Palabras clave:

Actitudes alimentarias de los padres. Niños en edad preescolar. Hábitos alimentarios. Desayuno. Índices dietéticos.

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INTRODUCTION

The preschool stage is characterized by rapid growth and development. Early childhood is characterized by rapid growth and development including the establishment of eating habits, food preferences, and activity behaviors that may influence children's health in later childhood and on into adulthood. Hence it is a critical period for teaching and modeling healthy habits to positively influence children's health and wellbeing throughout their lifetime (1).

Children's eating and activity behaviors are influenced by intrinsic (genetics, age, gender) and environmental factors (family, peers, community, and society) (2). The family environment is one of the most important determinants for the development of healthy eating behaviors in childhood (3). Socioeconomic status and educational level are the main factors associated with parental knowledge about healthy behaviors, which are crucial in the development and consolidation of healthy attitudes and habits (4,5). However, few studies have assessed parental knowledge about the Spanish Society for Community Nutrition (SENC) dietary guidelines, which include recommendations on portion sizes and consumption frequencies of both healthy and unhealthy foods groups using a food pyramid as an icon (6,7).

In this regard, it is known that children whose mothers have a high educational level consume more fruit and vegetables, and are more likely to have daily breakfast than those children whose mothers have a low educational level (3).

Parents play an essential role as their offspring's health promoters and are responsible for shaping healthy eating behaviors in their children (4). Thus, children's eating habits and food consumption are likely to be influenced by their parent's nutritional knowledge and dietary attitudes (8).

Attitudes are defined as emotional, motivational, perceptive, and cognitive beliefs that influence in a positive or negative way the behavior of an individual (9). Attitudes may explain why an individual adopts one practice and influences future behaviors regardless of that individual's knowledge. Measuring dietary attitudes is challenging, and very few of the questionnaires or instruments used nowadays have been validated. Therefore, the evidence available in this regard is difficult to extrapolate or replicate (10,11).

Dietary intake is also difficult to measure, especially in children. The Food Frequency Questionnaire (FFQ) is the most efficient instrument to examine dietary intake, and is one of the most widely used dietary assessment tools in epidemiological studies. FFQs are useful to assess diet quality by calculating food intake and defining dietary patterns that can be compared with dietary guidelines (10,12).

Evidence of an association of parental attitudes towards their offspring's diet with children's actual eating habits is scarce. The main aim of this study was to determine if parental attitudes towards their offspring's dietary habits were associated with children's actual dietary habits in a sample of Spanish preschoolers included in the *Follow-up of Children for Optimal Development* (SENDO) project. Additionally, we investigated the association between parental attitudes towards their offspring's diet and children's breakfast habits.

METHODS

STUDY AIM, DESIGN, AND SETTING

The SENDO project was designed to study the longitudinal influences of diet and other lifestyle behaviors on the health of children (<https://www.proyectosendo.es/>). The project began as a 2-year pilot study with a small sample of participants in Pamplona (Navarra, Spain), and involved an open enrollment study recruiting children nationwide. The SENDO project follows the model of previous prospective cohort studies in a Spanish population, such as the SUN (*Seguimiento Universidad de Navarra*) study (13). Inclusion criteria included: 1) children from 4 to < 7 years of age, and 2) residing in Spain. The only exclusion criterion was lack of an internet-enabled device. Parents or legal tutors signed an informed consent at recruitment. The study was conducted in accordance with the Declaration of Helsinki, and all procedures involving human subjects were approved by the ethics committee for clinical research of the Government of Navarra (Pyto2016/122).

The present study is a cross-sectional analysis of data collected between 2015 and 2019.

EXPOSURE ASSESSMENT

A baseline questionnaire was not developed specifically for this study; baseline information of participants was taken from the SENDO project, and included medical history, anthropometric measures, eating habits, dietary intake, and physical activity.

Body mass index (BMI) was calculated as weight (in kilograms) divided by squared height (in meters) to classify participants according to their nutritional status using the International Obesity Task Force (IOTF) standard of reference (14), which includes sex- and age-specific BMI cut-off points for normal weight, overweight, and obesity.

Physical activity was collected with a questionnaire that included 14 activities, including sports, and 9 categories of response from "never" to "more than 11 hours/week". The METs-h/week for each activity were calculated by multiplying the number of Metabolic Equivalent of Task (MET) of each activity by weekly participation, weighted according to the months dedicated to that activity. Total physical activity was quantified by summing the METs-h/week dedicated to all activities performed during leisure time.

The baseline questionnaire included 16 questions to assess parental knowledge (based on the SENC children's dietary guidelines) (7) (Table I). These questions asked about consumption frequencies by food groups in children. We assigned 1 point if consumption frequencies were according to the SENC children's dietary guidelines published in 2018, and 0 points if otherwise. This parental knowledge score ranged from 0 to 16 points.

The baseline questionnaire of the SENDO project included also 8 closed (yes/no) questions about certain parental attitudes towards their children's eating habits (Table II). With them, we developed an index to capture the aggregated information from

Table I. Criteria used to calculate the parental nutrition knowledge score (based on the children's dietary guidelines by the SENC) (7)

	Never or almost never	1-3 times/mo	1 time/wk	2-4 times/wk	5-6 times/wk	1 time/day	2-3 times/day	4-6 times/day	≥ 6 times/day
How often do you think your child should consume these foods to follow a healthy diet?									
Dairy	0	0	0	0	0	0	1	0	0
Fruit	0	0	0	0	0	0	1	0	0
Vegetables	0	0	0	0	0	0	1	0	0
Cereal and grains	0	0	0	0	0	0	0	1	0
Meat	0	0	0	1	0	0	0	0	0
Fish	0	0	0	1	0	0	0	0	0
Eggs	0	0	0	1	0	0	0	0	0
Pulses	0	0	0	1	0	0	0	0	0
Nuts	0	0	0	1	1	0	0	0	0
Olive oil	0	0	0	0	0	0	1	1	0
Other meats	0	0	1	0	0	0	0	0	0
Sausage	0	1	0	0	0	0	0	0	0
Snacks	1	0	0	0	0	0	0	0	0
Sweets	1	0	0	0	0	0	0	0	0
Soft drinks	1	0	0	0	0	0	0	0	0
Pastries	1	0	0	0	0	0	0	0	0

Table II. Criteria used to calculate the parental attitudes towards their children's dietary habits score

Do you make sure your child...	No	Yes
Eats fruit?	0	1
Eats fiber?	0	1
Eats vegetables?	0	1
Eats fish?	0	1
Avoids butter consumption	0	1
Reduces fat intake	0	1
Reduces meat consumption	0	1
Reduces eating sweets and pastries	0	1

the 8 questions: we assigned 1 point if the attitude was presumed to be healthy and 0 if it was presumed to be unhealthy. Thus, participants received 1 point for each "Yes" answer if they made sure their children ate more fruit, more vegetables, more fiber, more fish, less fat, less meat, and less sweets and pastries, and if they tried to avoid the consumption of butter, and 0 otherwise.

When these 8 items were summed, the parent attitudes score could potentially range from 0 to 8 points, with higher scores meaning healthier attitudes towards their children's diet. The final score was expressed as a percentage of the maximum possible

score (8 points). Finally, parents were classified into three groups: low (< 40 %), medium (40-70 %) and high (> 70 %) index scores. The lowest category was used as the reference group.

OUTCOME ASSESSMENT

The children's food consumption was evaluated with a validated semi-quantitative parent-reported FFQ that included 140 food items and 9 possible responses that ranged from "never or almost never" to "more than 6 times per day" (15). A trained team of dietitians derived nutrient content of each food item, calculated by multiplying intake frequency by the edible portion and nutrient composition of the specified portion size. We used data from updated Spanish food composition tables (16), and from online databases (17,18) to calculate total energy and nutrient intakes.

We also collected information on children's eating habits through 19 questions including habits and behaviors at meal-times (breakfast, lunch, and dinner). Each question had 6 possible answers from "never or almost never" to "everyday". If the answer complied or not with dietary recommendations, it was scored as 1 or 0, respectively (Table III); thus, the final score ranged from 0 to 19 points. This children's eating habits score was not previously validated. Participants were classified according to their score as having unhealthy (≤ 14 points) or healthy (≥ 15 points) eating habits.

Table III. Criteria used to calculate the children’s dietary habits score

Dietary habits	Never or almost never	1-3 times/month	1 time/week	2-3 times/week	4-6 times/week	All days
<i>Breakfast</i>						
Has breakfast	0	0	0	0	0	1
Consumes a fruit	0	0	0	0	0	1
Consumes a cereal	0	0	0	0	0	1
Consumes a dairy product	0	0	0	0	0	1
Consumes pastries occasionally	1	1	0	0	0	0
<i>Lunch</i>						
Lunch at home	0	0	0	0	1	1
Lunch at fast-food restaurants	1	1	0	0	0	0
Watches television during lunch	1	0	0	0	0	0
Lunch accompanied by an adult	0	0	0	0	0	1
<i>Dinner</i>						
Dinner at home	0	0	0	0	0	1
Dinner at fast-food restaurants	1	1	0	0	0	0
Watches television during dinner	1	0	0	0	0	0
Dinner accompanied by an adult	0	0	0	0	0	1
<i>Other habits</i>						
Mid-morning snack	0	0	0	0	1	1
Mid-afternoon snack	0	0	0	0	1	1
Eats between meals (pecking)	1	1	1	0	0	0
Takes fruit for dessert	0	0	0	0	1	1
Eats fried foods at home	1	1	1	0	0	0
Consumes fried foods outside home	1	1	0	0	0	0

For further analysis we also developed a breakfast quality index based on the questions regarding children’s habits and behaviors at breakfast (5 questions). The breakfast quality index ranged from 0 to 5 points (Table IV).

COVARIABLES

Covariables included: age (continuous), sex (male and female), body mass index (BMI) (continuous), energy intake (kcal/day) (continuous), parental education (no studies, graduate, high school,

college degree, master or doctorate), and parental nutrition knowledge (continuous).

STATISTICAL ANALYSIS

Participant’s baseline characteristics were presented divided in categories according to the children’s score in the dietary habits index. The Chi-squared test and Student’s t-test were used to compare categorical variables and quantitative variables, respectively.

Table IV. Criteria used to calculate the breakfast quality score

Dietary habits	Never or almost never	1-3 times/month	1 time/week	2-3 times/week	4-6 times/week	All days
Has breakfast	0	0	0	0	0	1
Consumes a fruit	0	0	0	0	0	1
Consumes a cereal	0	0	0	0	0	1
Consumes a dairy product	0	0	0	0	0	1
Consumes pastries occasionally	1	1	0	0	0	0

We calculated: 1) crude and multivariable-adjusted odds ratios (OR) and 95 % confidence intervals (CI) for the children's healthy eating habits, and 2) β coefficients and 95 % CIs for the children's breakfast quality score associated with their score in the parental attitudes index, using Generalized Estimating Equations (GEE) to account for intra-cluster correlation between siblings. Tests of linear trend across categories were fit, assigning median values to each category and treating variables as continuous.

To account for confounders, we ran progressively adjusted models. To assess the strength of our findings we performed several sensitivity analyses using different cut-off points to classify participants according to the eating habits index.

Analyses were carried out using the Stata version 12.0 package. All p-values were two-tailed. Statistical significance was determined at the conventional cut-off point of $p < 0.05$.

RESULTS

A total of 423 participants from the SENDO project were included in the present analyses (Fig. 1). Children's and parents' baseline characteristics according to the children's dietary habits score are presented in table V. The mean age of participants was 5.3 years (SD: 0.9), 52.3 % were boys, and 49.1 % reported having healthy eating habits. Children with healthier eating habits scores belonged to larger families and were more likely to have normal weight. No differences were observed between groups for anthropometric measures or physical activity.

Participants' mean food consumption and energy and macronutrient intake according to their score in the eating habits index is described in table VI. Healthy eating habits were significantly associated with higher consumption of fruits and lower consumption of processed meat and candies. Regarding macronutrients, higher carbohydrate intake and lower fat intake were observed in children with healthy eating habits scores.

Regarding children's eating habits score, we found that more than 80 % of the participants reported being accompanied by an adult for lunch, having dinner at home, and taking mid-morning or mid-afternoon snacks (Fig. 2). Fried foods were often consumed both at home (41.4 %) and outside (20.6 %). Moreover, 39 % of the participants reported watching television during dinner and 20.6 % during lunch.

Compared to the lowest category, a higher score in the parental attitudes index was associated with higher odds of healthy dietary habits in their offspring (OR: 3.05; 95 % CI: 1.40-6.65) in the crude model. The association was slightly attenuated but remained significant in the fully adjusted model (Table VII). Hence, children whose parents were in the highest category of the parental attitudes index showed an almost 3-fold increase in the odds of having healthy dietary habits (p for trend = 0.004).

Figure 3 shows the proportion of participants that scored positively in each of the questions included in the breakfast quality index by their score in the parental attitudes index. Significant differences ($p < 0.05$) were observed for the following items: 1) having breakfast regularly, 2) consuming some fruit, and 3) consuming some dairy at breakfast.

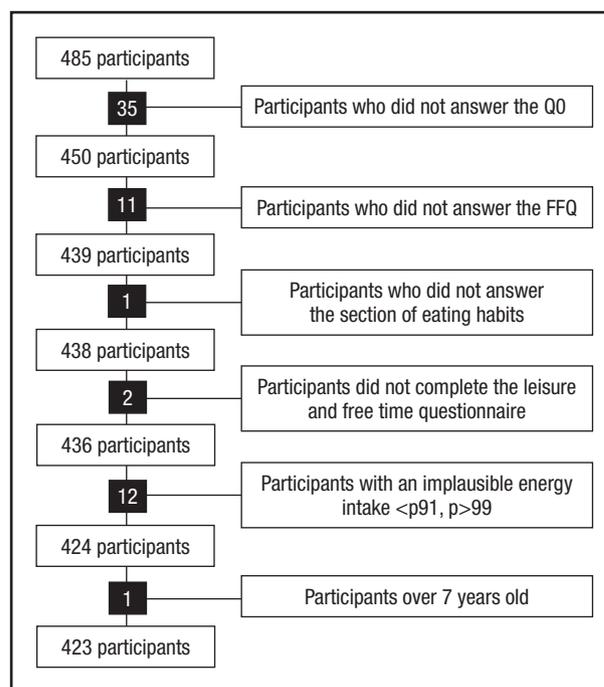


Figure 1. Flowchart of participants recruited into the SENDO project, 2015-2019.

In further analyses of the association between parental attitudes and their offspring's breakfast habits we did not find any significant trend (Table VIII).

DISCUSSION

In this study with a sample of Spanish children from the SENDO project we found that children whose parents reported healthier eating attitudes had higher odds of adhering to healthy eating habits. These results reinforce the previously published idea whereby parental attitudes might be more important than parental nutritional knowledge alone to foster healthy eating habits in their offspring (19).

To the best of our knowledge, this is the first study in Spain, aimed at specifically investigating the influence of parental knowledge about national children's dietary guidelines and parental attitudes about their preschool children's eating habits on child dietary intake. Overall, parents have an impact on what, how, how much, how often, where, and with whom their children eat, and on the eating habits that they will develop in the future (20,21). In Spain, data from a nationally representative survey of households with children ages 0-10 years, found that 54 % of children aged 5-10 years had excess weight (22). Several studies reported that unhealthy eating habits such as skipping breakfast, non-participating in family meals, unestablished meals schedule, avoiding shopping list, overeating, and eating unhealthy food are associated with children's overweight and obesity (23-26).

Table V. Baseline characteristics of the 423 participants from the SENDO project and their parents, according to the children's score in the dietary habits index. Numbers are means (standard deviations) or percentages

	Dietary Habits Score	
	Unhealthy	Healthy
Range	0-14	15-19
n	215	208
<i>Children characteristics</i>		
n (%)	50.8	49.1
Age (years)	5.3 (0.9)	5.3 (0.9)
Boys (%)	51.6	52.9
White race (%)	97.2	98.6
Supplement use (%)	3.8	3.9
<i>Weight category (%)</i>		
Low weight	15.3	13.5
Normal weight	69.4	76
Overweight	11.5	9.5
Obesity	3.8	1.0
Body mass index (BMI) (kg/m ²)	15.8 (1.8)	15.6 (1.4)
Waist/Height ratio	0.5 (0.3)	0.5 (0.1)
Physical activity (MET-h/week)	39.5 (30.5)	40.0 (27.2)
<i>Parental characteristics</i>		
<i>Age (years)</i>		
Father	39.7 (4.3)	40.0 (3.7)
Mother	39.5 (4.3)	39.8 (3.7)
<i>University education (%)</i>		
Father	45.3	44.7
Mother	57.5	57.2
Large family (≥ 3 children) (%)	23.7	27.9
Do you consider your children's weight as normal? (%)	76.1	80.2
Mother fills the questionnaire (%)	95.7	97.6
Usually makes the shopping list? (%)	88.2	91.2
Has a schedule for meals at home? (%)	97.2	98.0

The recommended calorie intake for boys and girls aged 4-7 years with moderate physical activity is 1400-1600 kcal/day (27). In the SENDO project, children with unhealthy eating habits reported higher energy intakes (2047 kcal/day), which exceed the recommendations (7). Similar findings have been reported in previous studies with Spanish children (28,29). Those results could reflect an excess of food consumption, but also a parental overestimation of their offspring's food consumption derived to the FFQ, which is commonly used in nutritional epidemiology to estimate the distribution of usual intake (4,30-32).

For children aged 4-8 years old, the recommended energy intake from carbohydrates, protein, and fats is 45-65 % of total energy intake, 10-35 %, and 20-35 %, respectively (27). In our study, the percentage of total energy intake from carbohydrates, protein, and fats was 45 %, 18 % and 36-37 %. Our results agree with those reported by the ENALIA project (29).

Suggs et al. concluded that children's food choice and eating habits may be influenced by the presence of others and by the place where they eat (33). More specifically, they reported that eating at home and accompanied by a family member was associated with smaller amounts of food consumed and better eating habits. In this regard, we observed that the percentage of children that had lunch or dinner every day was 82.5 % and 92 %, respectively. In our study, only a 24.1 % of the participants reported having lunch at home, whereas a 93.9 % reported having dinner at home in weekdays. The percentage of Spanish children having lunch at home varies across studies. A previous study found that 67 % of children had lunch at home, whereas another study with children from Madrid (Spain) found that 63 % of participants had lunch at school (34,35).

Evidence suggests that breakfast is a key meal of the daily intake of children.

Table VI. Mean food and macronutrients intake of the 423 participants of the SENDO project according to children's score in the dietary habits index. Numbers are means (standard deviations)

	Dietary Habits Score	
	Unhealthy	Healthy
Range	0-14	15-19
n	215	208
<i>Food group (g/day)</i>		
Dairy products	574.7 (240.7)	580.6 (192.6)
Eggs	25 (11.9)	26.5 (15)
White meat	42.3 (17.4)	43.5 (19.9)
Red meat	43.6 (25.3)	42.1 (24.7)
Processed meat	69.5 (30.3)	61.3 (21) [‡]
Fish	56.2 (26.1)	58.3 (25)
Vegetables	255 (158.4)	258.9 (125.9)
Fruits	362.6 (181.7)	433.2 (241.1) [‡]
Legumes	24.9 (9.5)	25.5 (11.9)
Cereals	112.2 (46)	117.4 (45.6)
Extra virgin olive oil	9.9 (9.3)	10.1 (8)
Nuts	2.2 (5.9)	1.8 (5.1)
Candies	13.3 (10.7)	10 (9.9) [‡]
Soft drinks and juices	32 (81.8)	21.4 (71.3)
Sweets	23.4 (23.8)	21.8 (20.2)
Water	1002.5 (366.1)	997.4 (394.6)
Miscellany (pizza, lasagna, salt...)	67.5 (29.1)	63.5 (28.7)
<i>Macronutrients</i>		
Energy (kcal/day)	2047 (449)	2038 (450)
Carbohydrates (% total energy)	44.7 (4.8)	45.6 (4.7)*
Proteins (% total energy)	18.2 (1.9)	18.3 (2.2)
Fats (% total energy)	37.2 (4.5)	36.1 (4.3)*

* $p < 0.05$; [‡] $p < 0.01$; [†] $p < 0.001$.

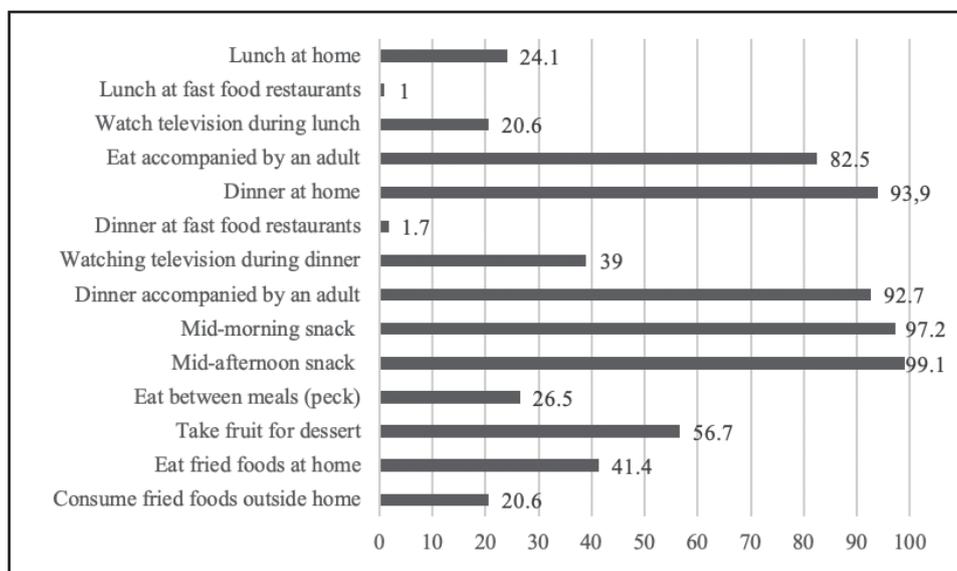


Figure 2. Percentage of positive answers to the children's eating habits index.

Table VII. Crude and multivariable adjusted odds ratio (OR) and 95% Confidence Intervals (CI) for children’s healthy-eating habits associated with the parental score in the parental attitudes towards their child’s dietary habits index

Healthy eating habits	Parental Eating Attitudes Score				p for trend	
	Low < 40 %	Medium 40-70 %		High > 70 %		
		OR	95 % CI	OR		95 % CI
n	29	155		239		
% of children with > 15 points	27.6	42.0		56.5		
Crude model	1 (Ref.)	1.83	0.82, 4.10	3.05*	1.40, 6.65	0.002
Multivariable model 1	1 (Ref.)	1.86	0.83, 4.14	3.11*	1.43, 6.80	0.001
Multivariable model 2	1 (Ref.)	1.89	0.84, 4.28	3.20*	1.45, 7.09	0.001
Multivariable model 3	1 (Ref.)	1.89	0.83, 4,32	3.21*	1.43, 7.17	0.001
Multivariable model 4	1 (Ref.)	1.78	0.79, 4.03	2.91*	1.30, 6.53	0.004

Ref.: reference; Multivariable 1: adjusted for age (continuous) and sex (male and female); Multivariable 2: additionally adjusted for BMI (continuous); Multivariable 3: additionally adjusted for energy intake (continuous) and parental university education (no studies, graduate, high school, college degree, master or doctorate); Multivariable 4: additionally adjusted for nutrition knowledge (low, medium and high). *p < 0.05.

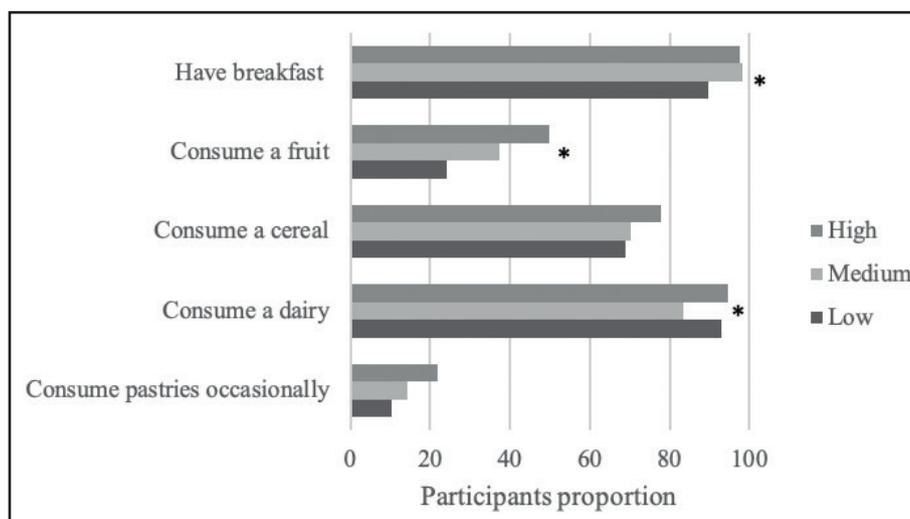


Figure 3. Proportion of positive answers to the breakfast habits index according to parental attitudes towards their children’s dietary habits. *p < 0.05.

Table VIII. Crude and multivariable-adjusted difference and 95 % confidence interval (CI) in the breakfast quality index associated with parental score in the parental attitudes towards their children’s dietary habits index

Healthy breakfast score	Parental Eating Attitudes Score				p for trend	
	Low < 40 %	Medium 40-70 %		High > 70 %		
		β	95 % CI	β		95 % CI
n	29	155		239		
Crude	0 (Ref.)	1.02	0.65, 1.60	1.40	0.88, 2.24	0.066
Multivariable 1	0 (Ref.)	1.02	0.65, 1.58	1.39	0.87, 2.21	0.069
Multivariable 2	0 (Ref.)	1.02	0.66, 1.58	1.39	0.88, 2.21	0.067
Multivariable 3	0 (Ref.)	1.04	0.68, 1.58	1.40	0.90, 2.18	0.051
Multivariable 4	0 (Ref.)	0.96	0.62, 1.50	1.27	0.79, 2.03	0.175

Ref.: reference; Multivariable 1: adjusted for age (continuous) and sex (male and female); Multivariable 2: additionally adjusted for BMI (continuous); Multivariable 3: additionally adjusted for energy intake (continuous) and parental university education (no studies, graduate, high school, college degree, master or doctorate); Multivariable 4: additionally adjusted for nutrition knowledge (low, medium and high).

Although the content depends on cultural reasons, there is quite a lot of agreement that breakfast must be varied and in sufficient quantity to provide the 20-25 % of daily total energy intake (36,37). The Study of Growth, Food, Physical Activity, Child Development and Obesity Surveillance in Spain (ALADINO) 2019 (38) analyzed the breakfast of Spanish children aged 6 to 9 years and found that most commonly reported breakfast meals consisted of a combination of dairy and pastries/cookies (30.3 % study population), and that only 2.2 % of the Spanish children had a full and healthy breakfast, including at least three food groups. The authors of a previous study in Spanish children defined a breakfast quality index that included the consumption of dairy products, cereals and fruits. The authors found that less than 10 % of the participants were classified as having a high-quality breakfast and that fruit was missing for 70 % of the participants.

In our study we found that 90 % of the participants had breakfast regularly, but also that less than 50 % consumed a fruit at breakfast. The proportion of children having breakfast regularly was in line with a study conducted in Madrid with children aged 3 to 12 years old (34), and with another study in Switzerland with children aged 4-6 years (35).

Our results showed a direct trend between the children's score in the breakfast quality index and parental score in the parental attitudes towards children's dietary habits index, but changes across categories were non-significant. Van Ansem et al. (20) found that families with higher socioeconomic status reported having breakfast more often than those with lower socioeconomic status. Our analyses are not adjusted for socioeconomic status, but we adjusted for parental educational level and nutritional knowledge, which may be considered as proxies of the socioeconomic status. To our knowledge, no previous studies have evaluated that association in Spanish families. Therefore, we consider that further studies with larger sample sizes are needed to elucidate whether parental attitudes towards their children's dietary habits are associated with children's breakfast habits independently of socioeconomic status.

Despite our findings, we acknowledge several limitations. First, our sample may be not fully representative of the Spanish population. However, cohort studies are not based on representative samples of the study population and as far as the variability in the sample allows a comparison of the hypotheses investigated, the representativeness is not necessary (39). Second, most of the participants in the SENDO project are white and come from high-educated families. Although we controlled for parental education, we cannot totally deny the possibility of residual confounding by unmeasured factors. Third, since information was reported by parents, a misclassification bias is possible (40). Nevertheless, since it is unlikely that misreporting was associated with parental attitudes, in case of error the estimate would be biased toward the null, not affecting our main results. Some of the information reported by parents in the SENDO project has been validated (41), but neither parental attitudes index, nor children's eating habits index, nor the breakfast quality index have been validated yet. Nevertheless, a study using the parental attitudes index in the SENDO project has been previously published (19).

Although this index has not been previously validated, we considered that it might be useful to identify parents more concerned about their children's diet. Besides, this score had been used in the SUN cohort to assess change (42) and its association with the risk of weight gain (43) or cardiovascular disease (44). Finally, in this study we did not exclude children who had some illness or food-related conditions that may have influenced their eating attitudes and eating habits. However, we think that parent attitudes towards children's diet and children's eating habits had changed in consonance and the associations would not be affected. Lastly, studies that evaluated the influence of parental attitudes on their offspring's eating habits are very scarce, particularly in Spain, therefore comparing our results was challenging.

CONCLUSION

In this cohort there is an association between parental attitudes towards their children's diet and children's actual eating habits, supporting that nutritional education programs should focus on fostering healthy eating attitudes beyond nutritional knowledge. Moreover, our findings suggest that public health interventions aimed at promoting healthy eating habits among children should shift from an individual perspective to a family-based one. Finally, our results will serve as a basis for future research on the impact of parental attitudes on their offspring children's dietary behaviors.

REFERENCES

1. Paroche MM, Caton SJ, Vereijken CMJL, Weenen H, Houston-Price C. How infants and young children learn about food: A systematic review. *Front Physiol* 2017;8. DOI: 10.3389/fpsyg.2017.01046
2. De Cosmi V, Scaglioni S, Agostoni C. Early taste experiences and later food choices. *Nutrients* 2017;9(2):1-9. DOI: 10.3390/nu9020107
3. Scaglioni S, De Cosmi V, Ciappolino V, Parazzini F, Brambilla P, Agostoni C. Factors Influencing Children's Eating Behaviours. *Nutrients* 2018;10(6):706. DOI: 10.3390/nu10060706
4. Adamo KB, Brett KE. Parental perceptions and childhood dietary quality. *Matern Child Health J* 2014;18(4):978-95. DOI: 10.1007/s10995-013-1326-6
5. Sotos-Prieto M, Santos-Beneit G, Pocock S, Redondo J, Fuster V, Peñalvo JL. Parental and self-reported dietary and physical activity habits in preschool children and their socio-economic determinants. *Public Health Nutr* 2015;18(2):275-85. DOI: 10.1017/S1368980014000330
6. Molina-montes E, Uzhova I, Molina-portillo E, Huerta J, Buckland G, Amiano P, et al. Adherence to the Spanish dietary guidelines and its association with obesity in the European Prospective Investigation into Cancer and Nutrition (EPIC) -Granada study. *Public Health Nutr* 2014;17(11):2425-35. DOI: 10.1017/S1368980014000688
7. Aranceta J, Blay Cortes G, Carrillo Fernández L, Fernández García JM, Garaulet Aza M, Gil A, et al. Guía de la Alimentación Saludable para Atención Primaria y Colectivos Ciudadanos. Sociedad Española Nutrición Comunitaria; 2018.
8. Zarnowiecki D, Sinn N, Petkov J, Dollman J. Parental nutrition knowledge and attitudes as predictors of 5-6-year-old children's healthy food knowledge. *Public Health Nutr* 2012;15(7):1284-90. DOI: 10.1017/S1368980011003259
9. Macias YF, Glasauer P. Guidelines for assessing nutrition-related Knowledge, Attitudes and Practices manual. Food and Agriculture Organization of the United Nations; 2014. p. 4-18.
10. Spronk I, Kullen C, Burdon C, O'Connor H. Relationship between nutrition knowledge and dietary intake. *Br J Nutr* 2014;111(10):1713-26. DOI: 10.1017/S0007114514000087
11. Bukenya R, Ahmed A, Andrade JM, Grigsby-toussaint DS, Muyonga J, Andrade JE. Validity and Reliability of General Nutrition Knowledge Questionnaire for Adults in Uganda. *Nutrients* 2017;1-11. DOI: 10.1096/fasebj.30.1_supplement.896.13

12. Faught E, Vander Ploeg K, Chu YL, Storey K, Veugelers PJ. The influence of parental encouragement and caring about healthy eating on children's diet quality and body weights. *Public Health Nutr* 2015;19(5):822-9. DOI: 10.1017/S1368980015002049
13. Carlos S, De La Fuente-Arillaga C, Bes-Rastrollo M, Razquin C, Rico-Campà A, Martínez-González MA, et al. Mediterranean diet and health outcomes in the SUN cohort. *Nutrients* 2018;10(4):1-24. DOI: 10.3390/nu10040439
14. Cole TJ, Lobstein T. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. *Pediatr Obes* [Internet] 2012 [cited 2021 Jun 9];7(4):284-94. Available from: <https://pubmed.ncbi.nlm.nih.gov/22715120/>. DOI: 10.1111/j.2047-6310.2012.00064.x
15. Zazpe I, Santiago S, de la O V, Romanos-Nanclares A, Rico-Campà A, Álvarez-Zallo N, et al. Validity and reproducibility of a semi-quantitative Food Frequency Questionnaire in Spanish preschoolers: The SENDO project. *Nutr Hosp* 2020;37(4):672-84.
16. Moreiras O, Carbajal Á, Cabrera L, Cuadrado C. *Tablas de Composición de Alimentos (Food Composition Tables)*. 9th ed. Pirámide, editor. Madrid; 2005.
17. Selfnutritiondata [Internet] [cited 2021 Apr 4]. Available from: <https://nutritiondata.self.com/>
18. Spanish Food Composition Database. Spanish Agency for Consumer Affairs, Food Safety and Nutrition [Internet] [cited 2021 Apr 4]. Available from: <https://www.bedca.net/>
19. Romanos-Nanclares A, Zazpe I, Santiago S, Marín L, Rico-Campà A, Martín-Calvo N. Influence of Parental Healthy-Eating Attitudes and Nutritional Knowledge on Nutritional Adequacy and Diet Quality among Preschoolers: The SENDO Project. *Nutrients* 2018;10(12):1875. DOI: 10.3390/nu10121875
20. van Ansem WJC, Schrijvers CTM, Rodenburg G, van de Mheen D. Maternal educational level and children's healthy eating behaviour: Role of the home food environment (cross-sectional results from the INPACT study). *Int J Behav Nutr Phys Act* 2014;11(1):1-12. DOI: 10.1186/s12966-014-0113-0
21. Vaitkeviciūtė J, Petrauskienė A. The Associations between Body Mass Index of Seven- and Eight-Year-Old Children, Dietary Behaviour and Nutrition-Related Parenting Practices. *Medicina (Buenos Aires)* 2019;55(1):24. DOI: 10.3390/medicina55010024
22. Vaquera E, Jones R, Klose PM, Klose MM. Unhealthy weight among children in Spain and the role of the home environment. *BMC Res Notes* 2018;11:1-8. DOI: 10.1186/s13104-018-3665-2
23. Brug J, van Stralen MM, Te Velde SJ, Chinapaw MJM, De Bourdeaudhuij I, Lien N, et al. Differences in weight status and energy-balance related behaviors among schoolchildren across Europe: the ENERGY-project. *PLoS One* 2012;7(4):15-26. DOI: 10.1371/journal.pone.0034742
24. Smetanina N, Albaviciute E, Babinska V, Karinauskienė L, Albertsson-wikland K. Prevalence of overweight / obesity in relation to dietary habits and lifestyle among 7 – 17 years old children and adolescents in Lithuania. *BMC Public Health* 2015;15:1-9. DOI: 10.1186/s12889-015-2340-y
25. Eng S, Wagstaff DA, Kranz S. Eating late in the evening is associated with childhood obesity in some age groups but not in all children: The relationship between time of consumption and body weight status in U.S. children. *Int J Behav Nutr Phys Act* 2009;6:1-8.
26. Au N, Marsden G, Mortimer D, Lorgelly PK. The cost-effectiveness of shopping to a predetermined grocery list to reduce overweight and obesity. *Nutr Diabetes* 2013;3:3-7. DOI: 10.1038/nu12013.18
27. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 2015 – 2020 Dietary Guidelines for Americans (8th edition); 2015.
28. Royo-Bordonada MA, Gorgojo L, Martín-Moreno JM, Garcés C, Rodríguez-Artalejo F, Benavente M, et al. Spanish children's diet: Compliance with nutrient and food intake guidelines. *Eur J Clin Nutr* 2003;57(8):930-9. DOI: 10.1038/sj.ejcn.1601627
29. 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* 2019;58(2):705-19. DOI: 10.1007/s00394-018-1676-3
30. Martín-Calvo N, Martínez-González MÁ. Controversy and debate: Memory-Based Methods Paper 4 [Internet]. Vol. 104, *Journal of Clinical Epidemiology*. Elsevier USA; 2018 [cited 2021 Mar 24]. p. 136-9. Available from: <https://pubmed.ncbi.nlm.nih.gov/30121377/>. DOI: 10.1016/j.jclinepi.2018.08.004
31. Martín-Calvo N, Martínez-González MÁ. Controversy and debate: Memory-Based Dietary Assessment Methods Paper 2 [Internet]. Vol. 104, *Journal of Clinical Epidemiology*. Elsevier USA; 2018 [cited 2021 Mar 24]. p. 125-9. Available from: <https://pubmed.ncbi.nlm.nih.gov/30121376/>. DOI: 10.1016/j.jclinepi.2018.08.005
32. Vereecken C, Covents M, Huybrechts I, Kelly C, Maes L. Changes in children's food group intake from age 3 to 7 years: Comparison of a FFQ with an online food record. *Br J Nutr* 2014;112(2):269-76. DOI: 10.1017/S0007114514000762
33. Suggs LS, Della Bella S, Rangelov N, Marques-Vidal P. Is it better at home with my family? The effects of people and place on children's eating behavior. *Appetite* 2018;121:111-8. DOI: 10.1016/j.appet.2017.11.002
34. Manuel J, Villares M, Pipaón MS De, Sanz AC, José J, Martín D, et al. Study on the nutritional status and feeding habits in school-children in Madrid City (Spain) during the economic crisis. *Nutr Hosp* 2018;35(5):1054-8. DOI: 10.20960/nh.1824
35. Ebenegger V, Marques-Vidal P, Barral J, Kriemler S, Puder JJ, Nydegger A. Eating habits of preschool children with high migrant status in Switzerland according to a new food frequency questionnaire. *Nutr Res* 2010;30(2):104-9. DOI: 10.1016/j.nutres.2010.01.006
36. Monteagudo C, Palacín-Arce A, Bibiloni MDM, Pons A, Tur JA, Olea-Serrano F, et al. Proposal for a Breakfast Quality Index (BQI) for children and adolescents. *Public Health Nutr* 2013;16(4):639-44. DOI: 10.1017/S1368980012003175
37. Ruiz E, Valero T, Rodríguez P, Díaz-Roncero A, Gómez A, Ávila JM, et al. Estado de situación sobre el desayuno en España. *Fundación Española de la Nutrición*; 2018.
38. Estudio ALADINO 2019. Aesan - Agencia Española de Seguridad Alimentaria y Nutrición [Internet] [cited 2021 Mar 25]. Available from: https://www.aesan.gob.es/AECOSAN/web/nutricion/detalle/aladino_2019.htm
39. García Blanco L, Ciriza Barea E, Moreno-Galarraga L, Martín-Calvo N. Why is the representativeness of the sample not always important? Vol. 88, *Anales de Pediatría*. Elsevier Doyma; 2018. p. 361-2. DOI: 10.1016/j.anpedi.2017.12.001
40. Lundahl A, Kidwell KM, Nelson TD. Parental Underestimates of Child Weight: A Meta-analysis. *Pediatrics* 2014;133(3):e689-703. DOI: 10.1542/peds.2013-2690
41. Moreno-Galarraga L, Álvarez-Zallo N, Oliver-Olid A, Miranda-Ferreiro G, Martínez-González MÁ, Martín-Calvo N. Parent-reported birth information: birth weight, birth length and gestational age. Validation study in the SENDO project. *Gac Sanit* 2021;35(3):224-9. DOI: 10.1016/j.gaceta.2019.08.012
42. Andrade L, Zazpe I, Santiago S, Carlos S, Bes-Rastrollo M, Martínez-González MA. Ten-Year Changes in Healthy Eating Attitudes in the SUN Cohort. *J Am Coll Nutr* 2017;36(5):319-29. DOI: 10.1080/07315724.2016.1278566
43. Zazpe I, Bes-Rastrollo M, Ruiz-Canela M, Sánchez-Villegas A, Serrano-Martínez M, Martínez-González MA. A brief assessment of eating habits and weight gain in a Mediterranean cohort. *Br J Nutr* [Internet] 2011 [cited 2021 Mar 24];105(5):765-75. Available from: <https://pubmed.ncbi.nlm.nih.gov/21138604/>. DOI: 10.1017/S0007114510004149
44. Santiago S, Zazpe I, Gea A, de la Rosa PA, Ruiz-Canela M, Martínez-González MA. Healthy-eating attitudes and the incidence of cardiovascular disease: the SUN cohort. *Int J Food Sci Nutr* 2017;68(5):595-604. DOI: 10.1080/09637486.2016.1265100