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RESEARCH ARTICLE

Food consumption and weight status among students in the third cycle of basic education and their parents: a cross-sectional study

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ABSTRACT

Introduction: Eating behaviors acquired in childhood tend to be perpetuated in adulthood, so adherence to a healthy diet from an early age becomes important to prevent the onset of the occurrence of diet-related chronic non-communicable diseases. The aim of this study is to evaluate the food consumption of students in the third cycle of basic education and their parents and its relationship with weight status.

Methodology: This is a cross-sectional study. Data from 358 students and 318 parents living on Terceira Island (Azores, Portugal) were included in the study. A questionnaire was developed to collect sociodemographic, dietary habits and anthropometric data, this was applied between May and June 2015. A food frequency questionnaire was used, and weight and height were used to calculate the body mass index. A descriptive analysis of the variables under study was performed and the Mann–Whitney's test was used to compare the means between groups.

Results: A high prevalence of pre-obesity/obesity (students: 33.0%; parents: 62.4%) was found. Vegetables are consumed most often by parents while fruits, fast food and sweets are consumed more frequently by students. Normal weight students reported a higher frequency of soy, olive oil, sunflower oil, and sweets compared with overweight students, on the other hand overweight parents reported a higher frequency of consumption of milk, pork, fatty fish, potatoes, vegetables, citrus fruits, and sunflower oil, compared with normal weight parents.

Conclusions: Given the high prevalence of pre-obesity/obesity found, as well as the high frequency of consumption of unhealthy foods, it is recommended that health promotion measures be taken in these schools.

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> **Consumo de alimentos y estado de peso en estudiantes de tercer ciclo de educación básica y sus padres: un estudio transversal**

RESUMEN

Introducción: Las conductas alimentarias adquiridas en la infancia tienden a perpetuarse en la edad adulta, por lo que la adherencia a una dieta saludable desde edades tempranas cobra importancia para prevenir la aparición de enfermedades crónicas no transmisibles relacionadas con la dieta. El objetivo de este estudio es evaluar el consumo de alimentos de los estudiantes del tercer ciclo de educación básica y sus padres, y su relación con el estado de peso.

Metodología: Este es un estudio transversal. Se incluyeron datos de 358 alumnos y 318 padres residentes en la Isla Terceira (Azores, Portugal). Se elaboró un cuestionario para recoger datos sociodemográficos, de hábitos alimentarios y antropométricos, fue aplicado directamente entre mayo y junio de 2015. Se utilizó un cuestionario de frecuencia de alimentos y se utilizó el peso y la talla para calcular el índice de masa corporal. Se realizó un análisis descriptivo de las variables en estudio y se utilizó la prueba de Mann-Whitney para comparar las medias entre grupos.

Resultados: Se encontró una alta prevalencia de pre-obesidad/obesidad (estudiantes: 33,0%; padres: 62,4%). Las verduras son consumidas con mayor frecuencia por los padres, mientras que las frutas, la comida rápida y los dulces son consumidos con mayor frecuencia por los estudiantes. Los estudiantes normopeso reportaron una mayor frecuencia de consumo de soya, aceite de oliva, aceite y dulces en comparación con los estudiantes con sobrepeso, mientras que los padres con sobrepeso reportaron una mayor frecuencia de consumo de leche, cerdo, pescado graso, papas, verduras, cítricos y aceite, en comparación con los padres de peso normal.

Conclusiones: Dada la alta prevalencia de pre-obesidad/obesidad encontrada, así como la alta frecuencia de consumo de alimentos poco saludables, se recomienda tomar medidas de promoción de la salud en estas escuelas.

PALABRAS CLAVE

Escuela;

Adolescentes;

Niños;

Padres;

Alimentos.

KEY MESSAGES

1. A high prevalence of excess weight was reported in children and their parents.

2. Vegetables are consumed most often by parents while fruits, fast food and sweets are consumed more frequently by students.

3. Normal weight students reported a higher frequency of soy, olive oil, sunflower oil, and sweets.

4. Overweight parents reported a higher frequency of consumption of milk, pork, fatty fish, potatoes, vegetables, citrus fruits, and sunflower oil.

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INTRODUCTION

An unbalanced diet, that is, rich in processed foods and/or with low consumption of fruit and vegetables, is a key risk factor in the etiology of many chronic diseases, such as cardiovascular diseases, certain types of cancer, diabetes, and obesity[1]. In Portugal, more than half of the adult population (57.1%) was overweight for their height: 22.3% of the population was classified as obese and 34.8% as pre-obese[2]. In childhood, the most recent study by Childhood Obesity Surveillance Initiative (COSI Portugal) 2019[3] reports that 11.9% of children were obese and 29.7% were overweight (including obesity). The Autonomous Region of the Azores had the highest prevalence of childhood overweight in the country (35.9%)[3]. Portugal presents a decrease in the prevalence of childhood obesity, following the trend of some countries[4,5], even so, in 31 European countries, Portugal is the 14th with the highest prevalence of childhood obesity[3].

The Portuguese dietary guidelines (Roda dos Alimentos) consist of 7 food groups of different sizes, the recommended number of servings depends on individual energy needs (Cereals and derivatives, tubers – 4 to 11; Vegetables – 3 to 5; Fruit – 3 to 5; Dairy products – 2 to 3; Meat, fish, and eggs – 1.5 to 4.5; Pulses – 1 to 2; Fats and oils – 1 to 3). It is recommended that children aged 1 to 3 years should be guided by the lower limits and active men and adolescent boys by the upper limits; the rest of the population should be guided by the intermediate values[6]. However, studies have shown that these recommendations have not been followed[2,3].

The Portuguese population has a consumption of "Fruit" and "Vegetables" below the recommended values (13% vs. 20% and 14% vs. 23%, respectively) and a consumption of "Meat, fish and eggs" above the recommended values (17% vs. 5%)[2]. In the case of children, in the 5th COSI Portugal round, it was observed that the daily consumption of meat, between 2016 and 2019, decreased from 17.3% to 9.2%, maintaining, in 2019, this consumption was higher than that of fish (3.8%)[3]. About 80.0% of the child population consumed cookies/sweet cookies, cakes, and donuts up to 3 times a week and 71.3% consumed sugary soft drinks[3].

Deviation from healthy eating guidelines is also found in other countries that report poor eating habits, characterized by a low intake of fruits, vegetables, and dairy products, along with a high intake of sugary drinks and frequent consumption of sweets and snacks[7,8].

Eating habits from a very early age tend to be maintained throughout the life cycle, with implications such as being very selective and having little food variety, or high responsiveness to food stimuli and an increased risk of overweight[9]. It is known that children's eating behaviors and weight are difficult to directly modify, however parents' eating practices are a potential target for interventions to promote healthy eating habits and prevent overweight in children[9]. It is important to study food consumption among children and parents for the development of more effective community or clinical interventions to promote healthy eating habits and health-promoting foods. This study aims to evaluate and relate the food consumption of certain foods and the weight status of students in the third cycle of basic education and their parents.

METHODOLOGY

Study design and sample

This study consists of a cross-sectional observational analysis that used data from the "Health-promoting foods in a school context - more knowledge, better growth" project that aimed to improve knowledge and consumption of health-promoting foods in the school community of Terceira Island (Azores, Portugal). Data collection took place between May and June 2015. The population of this study was students of the 3rd cycle of basic education (with an expected age between 12 and 14 years old) and their respective parents from basic schools on Terceira Island. On this island there are 7 organic units of the regional education system (4 in the municipality of Angra do Heroísmo and 3 in the municipality of Praia da Vitória). Of these, 5 schools agreed to participate in the study: 3 in the municipality of Angra do Heroísmo (1 was in a rural zone, another in the city center, and another in the city outskirts), and 2 in the municipality of Praia da Vitória (1 was in a rural zone and the other in the city center). From these schools, at least 50% of the classes of each year of education of the 3rd cycle were selected randomly. Thus, our sample consisted of at least 50% of the classes in the third cycle of basic education from the 5 schools that agreed to participate in the study.

To participate in the study, students had to be enrolled in the third cycle of basic education, accept to participate in the study, and have authorization from their parents (through an informed consent form in accordance with the Declaration of Helsinki principles).

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Procedure and questionnaire

The direct application questionnaire was developed to meet the objectives of the project, and was distributed by the schools, and the distribution and collection of the same by the classes were carried out by the teachers. Questionnaires for students were completed in the classroom and those for parents were completed at home. In this study, sections of the questionnaire referring to sociodemographic characterization, anthropometric assessment, and food consumption were analyzed.

The food frequency questionnaire applied was validated for the adult population[10,11], comparing the information reported in it with 7-day food diaries at 4 times of the year and with samples of adipose tissue[12], in addition, this questionnaire was also validated for adolescents from 13 years old[13]. It´s also important to highlight that this food frequency questionnaire has two versions: one for self-completion by the participant (which requires a higher level of literacy) and one to be applied by an interviewer, which has an extra section for recording the portions consumed (equal to, higher or lower than the standard average portion described)[13]. Since the questionnaire would be applied in that direct way, we simplified its application, and therefore we opted for a qualitative version. Thus, the questionnaire was adapted and was composed of a scale with nine frequency levels (never or less than once a month, one to three times a month, once a week, two to four times a week, five to six times a week, once a day, two to three times a day, four to five times a day, six or more times a day), and a list of 46 foods/ set of foods grouped into seven categories (dairy; meat, fish, and eggs; bread, cereals and similar; vegetables; fruits; fats; drinks and miscellaneous). From this questionnaire, for the students, some foods (yogurt with probiotics, fiber-rich yogurts, fermented beverages for cholesterol reduction, and margarine with phytosterols) were excluded because they are not recommended for children and could be difficult to identify by them.

Weight and height were self-reported, the body mass index (BMI) was calculated by the formula weight (kg) / (height^2) (m)[14], and its classification was performed according to the criteria of the World Health Organization (for students[15]: BMI-for-age [5-19 years] — thinness/underweight: <-2SD, normal weight: between -2SD and +1SD, overweight: >+1SD [equivalent to BMI 25 kg/m^2 at 19 years], obesity: >+2SD [equivalent to BMI 30 kg/m^2 at 19 years]; and adults[16]: underweight [<18.5 kg/m^2], normal weight (18.5 e 24.9 kg/m^2), overweight [pre-obesity and obesity: >24.9 kg/m^2]). The detailed information regarding the projects' methodology can be found in a previous study[17].

Statistical analysis

Statistical treatment was performed with the support of IBM SPSS Statistics, version 26.0 for Windows. For the descriptive analysis, categorical variables are presented as frequencies (n and %), and continuous variables as means with standard deviations (SD). The normality was analyzed using the kurtosis and skewness, which confirmed the non-normal distribution of the sample, the Mann–Whitney´s test was used to compare, the means and mean ranks of independent groups, respectively. In the application of the Mann-Whitney test, two independent groups were assumed: students and parents; normal weight students and overweight students; normal weight parents and overweight parents; the ordinal variable consisted of the frequency of food consumption. The association between variables was measured using Spearman's correlation coefficient (ρ). A value of $p<0.05$ was accepted for the statistical significance of the hypothesis tested.

RESULTS

The sociodemographic characterization of the participants (students and parents) is presented in Table 1. Most students were female (56.8%), were 14 (SD=1.2) years old, lived in Angra do Heroísmo (73.9%), were Portuguese (97.8%), had a household size of 4 members (43.4%). Regarding parents, most were female (92.5%), were 42 (SD=5.9) years old, married (83.9%), lived in Angra do Heroísmo (72.1%), were Portuguese (98.1%), had completed the second cycle of basic education (corresponding to six years of schooling - 30.3%), had a household composed of four elements (48.1%) and were employed (68.1%).

Regarding nutritional status, about 30% of students and 60% of parents were classified as being pre-obese/obese. A relationship between parents' BMI and students' BMI (r: 0.352; p<0.001) was found.

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Table 1. Sociodemographic characteristics.

	Students n (%)	Parents n (%)
Sex	**n=358**	**n=318**
Male	153 (42.4)	24 (7.5)
Female	205 (56.8)	294 (92.5)
Age (years) - Mean (standard deviation)	14 (1.2)	42 (5.9)
Marital status	–	**n=317**
Single	–	10 (3.2)
Married	–	266 (83.9)
Divorced	–	33 (10.4)
Widower	–	8 (2.5)
Nationality	**n=358**	**n=318**
Portuguese	353 (97.8)	312 (98.1)
Other	5 (1.4)	6 (1.9)
City of residence	**n=356**	**n=305**
Angra do Heroísmo	263 (73.9)	220 (72.1)
Praia da Vitória	93 (26.1)	85 (27.9)
Education	–	**n=310**
Basic Education - 1st cycle incomplete	–	14 (4.5)
Basic Education - 1st cycle	–	31 (10.0)
Basic Education - 2nd cycle	–	94 (30.3)
Basic Education - 3rd cycle	–	51 (16.5)
High school	–	59 (19.0)
University education	–	61 (19.7)
Professional situation	–	**n=311**
Employee	–	211 (68.1)
Domestic	–	72 (23.2)
Unemployed	–	24 (7.7)
Retired	–	3 (1.0)
Household	**n=358**	**n=320**
Two elements	16 (4.5)	12 (3.8)
Three elements	79 (22.1	79 (24.7)
Four elements	155 (43.4)	154 (48.1)
Five or more elements	107 (30.0)	75 (23.4)
Weight status*	**n=312**	**n=294**
Low weight	4 (1.3)	5 (1.7)
Normal weight	205 (65.7)	105 (35.8)
Pre-obesity	75 (24.0)	112 (38.2)
Obesity	28 (9.0)	71 (24.2)

***Classification was performed according to the criteria of the World Health Organization (for students[15]: BMI-for-age [5-19 years] — thinness/underweight: <-2SD, normal weight: between -2SD and +1SD, overweight, >+1SD [equivalent to BMI 25 kg/m² at 19 years], obesity: >+2SD [equivalent to BMI 30 kg/m² at 19 years]; and adults[16]: underweight [<18.5 kg/m²], normal weight [18.5 e 24.9 kg/m²], overweight [pre-obesity and obesity: >24.9 kg/m²]).**

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Table 2 reports the food consumption among students in the third cycle of basic education and their parents. In general, students and parents have a high frequency of dairy consumption (about 30% to 80%). Lean and red meat and eggs are consumed more frequently on a weekly basis (about 40% to 50% "two or more times a week") than fish (about 20% to 30% "two or more times a week"). In relation to the group of bread, cereals and tubers, there is a daily consumption of bread, and a frequent weekly presence of rice, pasta, and potatoes. Whole grains and sweet potatoes have a low frequency of consumption, with about 70% of students and parents never consuming flaxseed or consuming less than once a month. Vegetables, fruits, and pulses have a considerable weekly consumption based on "two or more times a week", but about 70% of the participants consume less than once a month or never consume soy. The same happens for fatty fruits and berries (50%). The consumption of oils and fats has a weekly basis with around 50% consumption two or more times a week. Of note is the low daily prevalence of olive oil consumption, which is consumed by less than 40% of the participants. Regarding beverages, there is a high daily consumption by about 80% of the participants, and weekly consumption of juices enriched with vitamin C (50%) and soft drinks (50%). About 40-50% of participants consume sweets and fast-food weekly and consume vegetable soup daily. About 40% of participants consume less than once a month or never drink green tea.

As for food consumption among students and parents it was found that students consume milk more often than parents and less often yogurt. Meat from the Azores (beef), rice, pasta, potato, and fennel are consumed more frequently by students. Vegetables, roots, bulbs, and pulses are consumed most often by parents. Regarding fruits, apples, bananas, citrus fruits, and berries, are consumed more frequently (two or more times per day) by students. As for fats, parents report consuming olive oil more often than students. Finally, in the drinks and miscellaneous group, green tea and soup are consumed more frequently by parents, while juices enriched with vitamin C, soft drinks, sweets, and fast food are consumed more frequently by students. Most parents never consume or consume less than once a month: yogurt with probiotics, fiber-rich yogurts, fermented beverages for cholesterol reduction, and margarine with phytosterols.

Table 3 shows the differences in the frequency of food consumption between normal weight and overweight students and parents (with statistical significance). Normal weight students reported a higher frequency of soy, olive oil, sunflower oil, and sweets compared to students classified as being overweight. Overweight parents reported a higher frequency of consumption of milk, pork, fatty fish, potatoes, vegetables, citrus fruits, and sunflower oil, compared to parents classified as normal weight.

DISCUSSION

This cross-sectional study aimed to evaluate the food consumption of certain foods by students in the third cycle of basic education and their parents. It is also intended to report your food consumption with your weight status. A high prevalence of pre-obesity/obesity was found in both groups of your sample.

In fact, our results are consistent with recent studies[2] on the prevalence of overweight/obesity in Portugal, which point out the Autonomous Region of the Azores as having one of the highest prevalence of pre-obesity/obesity at the national level (adults: Portugal – 58,1%, Azores – 61.6%; children: Portugal [10-17 years old] – 32,3%[2], Azores [6-8 years old] – 35,9%[3]).

Like other studies[18–20], a relationship between parents' BMI and students' BMI was found. In fact, parents model children's eating behavior[9] and lifestyle[21,22]. However, this study does not establish a causal relationship between these variables, so the interpretation must be careful, parents are not necessarily "blamed" for children's overweight.

In general, our dietary results are in line with those reported for the Portuguese population[2], however, it appears that both children and parents do not comply with the recommendations of the Portuguese dietary guidelines[6] (in terms of frequency of food consumption).

The high consumption of milk and dairy products in the Azores was corroborated by another study[23]. It is also worth noting that the dairy sector in the Azores is of great importance since there is a large production of milk and dairy products there, having a relevant impact on the archipelago's economy[24]. Besides that, it is now well established that the regular consumption of fermented foods could be beneficial to health[25].

In relation to the high frequency of consumption of meat and eggs (weekly basis), it refers to what is reported in the literature that the Portuguese consume "Meat, fish and eggs" above the recommended values[2]. Although

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Table 2. Food consumption among students of third cycle of basic education and their parents.

Foods	Students (S)/ Parents (P)	n	Never or less than once a month n (%)	One to three times per month n (%)	Once a week n (%)	Two or more times per week n (%)	Daily n (%)	Two or more times per day n (%)	p*
Dairy									
Milk	S	348	6 (1.7)	7 (2.0)	9 (2.6)	69 (19.8)	88 (25.3)	169 (48.6)	<0.001
	P	306	18 (5.9)	13 (4.2)	16 (5.2)	47 (15.4)	128 (41.8)	84 (27.5)	
Yogurts (flavors, pieces)	S	349	41 (11.7)	40 (11.5)	60 (17.2)	111 (31.8)	63 (18.1)	34 (9.7)	0.021
	P	296	44 (14.9)	23 (7.8)	28 (9.5)	79 (26.7)	94 (31.8)	28 (9.5)	
Yogurt with Probiotics	P	280	159 (56.8)	33 (11.8)	29 (10.4)	27 (9.6)	24 (8.6)	8 (2.9)	–
Fiber-rich yogurts	P	287	162 (56.4)	35 (12.2)	28 (9.8)	32 (11.1)	23 (8.0)	7 (2.4)	–
Fermented beverages for cholesterol reduction	P	292	245 (83.9)	25 (8.6)	8 (2.7)	9 (3.1)	3 (1.0)	2 (0.7)	–
Cheese	S	349	37 (10.6)	34 (9.7)	57 (16.3)	113 (32.4)	63 (18.1)	45 (12.9)	0.673
	P	299	18 (6.0)	27 (9.0)	54 (18.1)	120 (40.1)	65 (21.7)	15 (5.0)	
Meat, fish and eggs									
Lean meat (chicken, turkey, rabbit)	S	350	14 (4.0)	43 (12.3)	85 (24.3)	158 (45.1)	29 (8.3)	21 (6.0)	0.051
	P	308	6 (1.9)	20 (6.5)	79 (25.6)	158 (51.3)	39 (12.7)	6 (1.9)	
Red meat (beef, duck, etc.)	S	348	37 (10.6)	51 (14.7)	68 (19.5)	142 (40.8)	28 (8.0)	22 (6.3)	0.426
	P	304	22 (7.2)	43 (14.1)	81 (26.6)	129 (42.4)	20 (6.6)	9 (3.0)	
Meat from the Azores (beef)	S	346	20 (5.8)	51 (14.7)	85 (24.6)	143 (41.3)	27 (7.8)	20 (5.8)	0.020
	P	300	24 (8.0)	45 (15.0)	82 (27.3)	127 (42.3)	17 (5.7)	5 (1.7)	
Pork	S	347	13 (3.7)	51 (14.7)	94 (27.1)	134 (37.1)	32 (9.2)	23 (6.6)	0.387
	P	289	10 (3.5)	30 (10.4)	88 (30.4)	138 (47.8)	17 (5.9)	6 (2.1)	
Lean fish (hake, pout, sea bream, etc.)	S	349	57 (16.3)	88 (25.2)	106 (30.4)	70 (20.1)	18 (5.2)	10 (2.9)	0.475
	P	289	74 (24.8)	54 (18.1)	75 (25.2)	79 (26.5)	12 (4.0)	4 (1.3)	
Fatty fish: sardines, mackerel, tuna, salmon, etc.	S	349	44 (12.6)	92 (26.4)	91 (26.1)	103 (29.5)	10 (2.9)	9 (2.6)	0.739
	P	309	29 (9.4)	70 (22.7)	116 (37.5)	77 (24.9)	12 (3.9)	5 (1.6)	
Eggs	S	345	8 (2.3)	34 (9.9)	101 (37.7)	162 (47.0)	26 (7.5)	14 (4.1)	0.296
	P	302	1 (0.3)	19 (6.3)	113 (37.4)	146 (48.3)	18 (6.0)	5 (1.7)	

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Foods	Students (S)/ Parents (P)	n	Never or less than once a month	One to three times per month	Once a week	Two or more times per week	Daily	Two or more times per day	p*
			n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Bread, cereals and similars									
Bread	S	347	1 (0.3)	8 (2.3)	15 (4.3)	100 (28.8)	80 (23.1)	143 (41.2)	0.370
	P	293	2 (0.7)	6 (2.0)	7 (2.4)	43 (14.7)	129 (44.0)	106 (36.2)	
Whole grains (including wholemeal bread)	S	347	91 (26.2)	32 (9.2)	45 (13.0)	82 (23.6)	53 (15.3)	44 (12.7)	0.064
	P	294	109 (37.1)	28 (9.5)	17 (5.8)	51 (17.3)	72 (24.5)	17 (5.8)	
Rice	S	347	3 (0.9)	12 (3.4)	41 (11.7)	215 (61.6)	34 (9.7)	44 (12.6)	<0.001
	P	307	4 (1.3)	11 (3.6)	55 (17.9)	199 (64.8)	24 (7.8)	14 (4.6)	
Pasta	S	348	4 (1.1)	13 (3.7)	50 (14.4)	203 (56.3)	40 (11.5)	38 (10.9)	<0.001
	P	301	4 (1.3)	15 (5.0)	61 (20.3)	185 (61.5)	21 (7.0)	15 (5.0)	
Potato	S	347	11 (3.2)	19 (5.5)	59 (17.0)	189 (52.4)	41 (11.8)	28 (8.1)	0.001
	P	304	5 (1.6)	19 (6.3)	74 (24.3)	168 (55.3)	24 (7.9)	14 (4.6)	
Sweet potato	S	343	141 (41.1)	76 (22.2)	47 (13.7)	54 (15.7)	16 (4.7)	9 (2.6)	0.001
	P	296	58 (19.6)	115 (38.9)	55 (18.6)	46 (15.5)	17 (5.7)	5 (1.7)	
Flax seeds	S	346	235 (67.9)	39 (11.3)	33 (9.5)	23 (6.6)	12 (3.5)	4 (1.2)	0.257
		286	210 (73.4)	24 (8.4)	12 (4.2)	22 (7.7)	12 (4.2)	6 (2.1)	
Vegetables									
Vegetables (kale, cabbage, lettuce, broccoli, etc.)	S	348	32 (9.2)	33 (9.5)	66 (19.0)	140 (40.2)	39 (11.2)	38 (10.9)	<0.001
	P	305	3 (1.0)	11 (3.6)	26 (8.5)	148 (48.5)	69 (22.6)	48 (15.7)	
Fennel	S	346	206 (59.5)	56 (16.2)	41 (11.8)	29 (8.4)	9 (2.6)	5 (1.4)	0.010
	P	280	192 (68.6)	48 (17.1)	14 (5.0)	15 (5.4)	8 (2.9)	3 (1.1)	
Roots (carrots, beets, turnips, radishes, etc.)	S	348	64 (18.4)	52 (14.9)	87 (25.0)	98 (28.2)	25 (7.2)	22 (6.3)	<0.001
	P	295	26 (8.8)	28 (9.5)	47 (15.9)	124 (42.0)	45 (15.3)	25 (8.5)	
Bulbs (garlic, onion, etc.)	S	347	49 (14.1)	42 (12.1)	73 (21.0)	120 (34.6)	40 (11.5)	23 (6.6)	<0.001
	P	293	9 (3.1)	8 (2.7)	23 (7.8)	126 (43.0)	83 (28.3)	44 (15.0)	
Vegetable Fruits (tomatoes, peppers, cucumbers, pumpkin, etc.)	S	347	46 (13.3)	61 (17.6)	67 (19.3)	117 (33.7)	30 (8.6)	26 (7.5)	<0.001
	P	308	12 (3.9)	27 (8.8)	52 (16.9)	126 (40.9)	57 (18.5)	34 (11.0)	
Pulses (beans, chickpeas, peas)	S	347	42 (12.1)	62 (17.9)	96 (27.7)	100 (28.8)	30 (8.6)	17 (4.9)	<0.001
	P	304	8 (2.6)	34 (11.2)	76 (25.0)	141 (46.4)	28 (9.2)	17 (5.6)	
Soy	S	361	248 (71.5)	35 (10.1)	24 (6.9)	20 (5.8)	13 (3.7)	7 (2.0)	0.110
		288	221 (76.7)	29 (10.1)	12 (4.2)	16 (5.6)	7 (2.4)	3 (1.0)	

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Foods	Students (S)/ Parents (P)	n	Never or less than once a month n (%)	One to three times per month n (%)	Once a week n (%)	Two or more times per week n (%)	Daily n (%)	Two or more times per day n (%)	p*
Fruits									
Pineapple	S	346	118 (34.1)	117 (33.8)	51 (14.7)	42 (12.1)	15 (4.3)	3 (0.9)	0.622
	P	291	99 (34.0)	107 (36.8)	44 (15.1)	25 (8.6)	12 (4.1)	4 (1.4)	
Apple	S	347	10 (2.9)	32 (9.2)	66 (19.0)	126 (36.3)	71 (20.5)	42 (12.1)	<0.001
	P	307	7 (2.3)	13 (4.2)	29 (9.4)	122 (39.7)	101 (32.9)	35 (11.4)	
Banana	S	347	30 (8.6)	34 (9.8)	74 (21.3)	120 (34.6)	47 (13.5)	42 (12.1)	0.014
	P	302	18 (6.0)	19 (6.3)	46 (15.2)	129 (42.7)	67 (22.2)	23 (7.6)	
Citrus fruits (orange, lemon, etc.)	S	348	41 (11.8)	46 (13.2)	62 (17.8)	120 (34.5)	43 (12.4)	36 (10.3)	<0.001
	P	292	17 (5.8)	16 (5.5)	41 (14.0)	125 (42.8)	71 (24.3)	22 (7.5)	
Fatty fruits (walnuts, almonds, hazelnuts)	S	346	175 (50.6)	91 (26.3)	36 (10.4)	30 (8.7)	9 (2.6)	5 (1.4)	0.790
	P	298	157 (52.7)	72 (24.2)	31 (10.4)	16 (5.4)	12 (4.0)	10 (3.4)	
Berries (blackberries, raspberries, etc)	S	347	131 (37.8)	103 (29.7)	50 (14.4)	43 (12.4)	14 (4.0)	6 (1.7)	<0.001
	P	293	166 (56.7)	63 (21.5)	32 (10.9)	18 (6.1)	10 (3.4)	4 (1.4)	
Others (pear, peach, etc.)	S	345	31 (9.0)	74 (21.4)	70 (20.3)	110 (31.9)	28 (8.1)	32 (9.3)	0.263
	P	296	22 (7.4)	61 (20.6)	57 (19.3)	98 (33.1)	46 (15.5)	12 (4.1)	
Fats									
Olive oil	S	349	35 (10.0)	43 (12.3)	91 (26.1)	120 (34.4)	38 (10.9)	22 (6.3)	<0.001
	P	293	3 (1.0)	15 (5.1)	31 (10.6)	131 (44.7)	80 (27.3)	33 (11.3)	
Sunflower oil	S	343	30 (8.7)	61 (17.8)	86 (25.1)	123 (35.9)	28 (8.2)	15 (4.4)	0.723
	P	292	36 (12.3)	47 (16.1)	75 (25.7)	94 (32.2)	31 (10.6)	9 (3.1)	
Butter	S	346	11 (3.2)	19 (5.5)	47 (13.6)	149 (43.1)	73 (21.1)	47 (13.6)	0.204
	P	279	27 (9.1)	8 (2.7)	23 (7.8)	104 (35.1)	106 (35.8)	28 (9.5)	
Margarine	S	346	134 (38.7)	51 (14.7)	49 (14.2)	60 (17.3)	33 (9.5)	19 (5.5)	0.242
	P	279	102 (36.6)	29 (10.4)	41 (14.7)	60 (21.5)	39 (14.0)	8 (2.9)	
Margarine with phytosterols	P	289	207 (71.6)	20 (6.9)	15 (5.2)	21 (7.3)	19 (6.6)	7 (2.4)	–

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Foods	Students (S)/ Parents (P)	n	Never or less than once a month	One to three times per month	Once a week	Two or more times per week	Daily	Two or more times per day	p*
			n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Drinks and Miscellaneous									
Water	S	346	2 (0.6)	12 (3.5)	10 (2.9)	48 (13.9)	31 (9.0)	243 (70.2)	0.487
	P	301	6 (2.0)	5 (1.7)	4 (1.3)	26 (8.6)	51 (16.9)	209 (69.4)	
Green Tea	S	345	165 (47.8)	61 (17.7)	32 (9.3)	46 (13.3)	19 (5.5)	22 (6.4)	0.006
	P	290	124 (42.8)	32 (11.0)	20 (6.9)	50 (17.2)	34 (11.7)	30 (10.3)	
Vegetables soup	S	345	18 (5.2)	25 (7.2)	48 (13.9)	135 (39.1)	60 (17.4)	59 (17.1)	<0.001
	P	301	2 (0.7)	8 (2.7)	21 (7.0)	100 (33.2)	100 (33.2)	70 (23.3)	
Juices enriched with Vitamin C	S	348	28 (8.0)	41 (11.8)	69 (19.9)	132 (37.9)	39 (11.2)	39 (11.2)	<0.001
	P	295	68 (23.1)	49 (16.6)	50 (16.9)	70 (23.7)	38 (12.9)	20 (6.8)	
Soft drinks (coca-cola, iced tea, etc.)	S	349	41 (11.7)	77 (22.1)	79 (22.6)	96 (26.6)	24 (6.9)	32 (9.2)	<0.001
	P	306	142 (46.4)	64 (20.9)	46 (15.0)	37 (12.1)	9 (2.9)	8 (2.6)	
Sweets (chocolates, gummies, etc.)	S	348	21 (6.0)	72 (20.7)	94 (27.0)	109 (31.3)	23 (6.6)	29 (8.3)	<0.001
	P	307	71 (23.1)	90 (29.3)	79 (25.7)	55 (17.9)	8 (2.6)	4 (1.3)	
Fast food (hamburgers, pizzas, fries, etc.)	S	350	24 (6.9)	93 (26.6)	126 (36.0)	82 (23.4)	14 (4.0)	11 (3.1)	<0.001
	P	313	62 (19.8)	133 (42.5)	90 (28.8)	24 (7.7)	3 (1.0)	1 (0.3)	

*p<0.05; Mann-Whitney test.

Note: For data presentation, the scale levels "two to four times a week" and "five to six times a week" were merged into "two or more times per week" and the "two to three times a day", "four to five times a day" and "six or more times a day" were merged into "two or more times per day".

meat and meat products are a source of micronutrients, including iron, zinc, selenium, vitamin D, and vitamin B_{12}, their excessive consumption can lead to several health problems (overconsumption of energy, and fat, resulting in excess weight, obesity and an increased risk of chronic diseases, like cardiovascular disease and type 2 diabetes)[26]. Therefore, the consumption of meat, and meat products, when integrated into a healthy diet, provides a rich source of high-quality dietary protein and essential nutrients[27].

Unlike other studies, a low frequency of fish consumption was found[2,28]. In fact, it is known that the main motivating factors for the purchase of fish are the species, the price, and health, and that the importance of factors differs between social classes, with the price being more important for social classes with lower incomes[29]. It should

be noted that a news item from the time when the study was carried out already reported that the quantity of fish dropped by 18% between 2010 and 2015 and the price increased by 7.8% in Azores[30].

Higher consumption of olive oil would be expected since Portugal is considered a country where the Mediterranean food pattern prevails and where olive oil is the fat of choice and consumed daily. The low frequency of consumption of olive oil (daily based) reported by students may be because students who have their meals in the canteen do not identify olive oil as the fat used in the preparation of these meals. On the other hand, according to the National Food and Physical Activity Survey[2], 31% of the Portuguese have low adherence to the Mediterranean dietary pattern, with moderate adherence representing 50% of the population. It is recommended to promote the

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Table 3. Frequency of food consumption between normal weight and overweight students and parents.

		n	Never or less than once a month n (%)	One to three times per month n (%)	Once a week n (%)	Two or more times per week n (%)	Daily n (%)	Two or more times per day n (%)	p*
Students									
Soybeans	Normal weight	196	129 (65.8)	24 (12.2)	15 (7.7)	15 (7.7)	8 (4.1)	5 (2.6)	0.043
	Overweight	101	78 (77.2)	7 (6.9)	9 (8.9)	3 (3.0)	3 (3.0)	1 (1.0)	
Olive oil	Normal weight	197	15 (7.6)	19 (9.6)	55 (27.9)	75 (38.1)	21 (10.7)	12 (6.1)	0.045
	Overweight	102	12 (11.8)	19 (18.6)	26 (25.5)	30 (29.4)	11 (10.8)	4 (3.9)	
Sunflower oil	Normal weight	195	11 (5.6)	30 (15.4)	50 (25.6)	78 (40.0)	18 (9.2)	8 (4.1)	0.049
	Overweight	98	11 (11.2)	18 (18.4)	25 (25.5)	34 (34.7)	6 (6.1)	4 (4.1)	
Sweets	Normal weight	197	6 (3.0)	40 (20.3)	49 (24.9)	73 (37.1)	13 (6.6)	16 (8.1)	0.018
		101	9 (8.9)	25 (24.8)	30 (29.8)	24 (23.8)	5 (5.0)	8 (7.9)	
Parents									
Milk	Normal weight	100	11 (11.0)	6 (6.0)	8 (8.0)	16 (16.0)	38 (38.0)	21 (21.0)	0.002
	Overweight	174	5 (2.9)	7 (4.0)	8 (4.6)	24 (13.8)	78 (44.8)	52 (29.9)	
Pork meat	Normal weight	94	4 (4.3)	9 (9.6)	36 (38.3)	42 (44.7)	2 (2.1)	1 (1.1)	0.029
	Overweight	167	4 (2.4)	18 (10.8)	44 (26.3)	85 (50.9)	12 (7.2)	4 (2.4)	
Fatty fish	Normal weight	101	10 (9.9)	26 (25.7)	40 (39.6)	23 (22.8)	2 (2.0)	0 (0.0)	0.044
	Overweight	176	15 (8.5)	34 (19.3)	67 (38.1)	48 (27.3)	9 (5.1)	3 (1.7)	
Potato	Normal weight	98	0 (0.0)	6 (6.1)	31 (31.6)	56 (57.1)	3 (3.1)	2 (2.0)	0.033
	Overweight	173	4 (2.3)	10 (5.8)	37 (21.4)	98 (56.6)	17 (9.8)	7 (4.0)	
Vegetables	Normal weight	101	1 (1.0)	1 (1.0)	13 (12.9)	56 (55.4)	19 (18.8)	11 (10.9)	0.044
	Overweight	167	1 (0.6)	9 (5.8)	12 (7.0)	73 (42.4)	44 (25.6)	33 (19.2)	
Citrinus fruits	Normal weight	98	6 (6.1)	8 (8.2)	15 (15.3)	44 (44.9)	20 (20.4)	5 (5.1)	0.017
	Overweight	165	7 (4.2)	5 (3.0)	20 (12.1)	75 (45.5)	46 (27.9)	12 (7.3)	
Sunflower oil	Normal weight	93	17 (18.3)	17 (18.3)	25 (26.9)	27 (29.0)	4 (4.3)	3 (3.2)	0.017
	Overweight	169	13 (7.7)	27 (16.0)	47 (27.8)	60 (35.5)	19 (11.2)	3 (1.8)	

*p<0.05; Mann-Whitney test.
Note 1: For data presentation, the scale levels "two to four times a week" and "five to six times a week" were merged into "two or more times per week" and the "two to three times a day", "four to five times a day" and "six or more times a day" were merged into "two or more times per day".
Note 2: Body Mass Index classification (cut-off points): students[15] (BMI-for-age [5-19 years]: normal weight: between -2SD and +1SD, overweight: >+1SD [equivalent to BMI 25 kg/m² at 19 years]); parents[16] (normal weight [18.5 e 24.9 kg/m²], overweight [pre-obesity and obesity: >24.9 kg/m²]).

consumption of olive oil as a source of fat in the context of a healthy diet. The literature has demonstrated several health benefits of olive oil consumption, namely beneficial effects on the cardiovascular system and can help to prevent cancer and diabetes mellitus[31]. These properties have been associated with the content of nutrients and phytochemicals, especially polyphenols and fatty acids present in olive oil[32].

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Although water was identified in this study as the most consumed beverage, the high consumption of soft drinks and/or juices enriched with vitamin C is a reality, especially among students, which about 20% consume them daily. These data are supported by some studies[2,33,34]. Consumption of soft drinks and sugary drinks only provide energy and have few nutritional benefits lacking micronutrients, vitamins, and minerals. It should also be noted that its consumption can contribute to the deterioration of health in general, with special emphasis on oral health[34]. Therefore, its consumption should be avoided.

According to National Food and Physical Activity Survey[2], food products such as cakes, sweets, cookies, salty snacks, pizzas, soft drinks, nectars, and alcoholic beverages, which should not be part of our daily diet, represent around 21% of total consumption in the Portuguese population. These results agree with ours, especially among students.

The students in this study can be framed in an unhealthy diet pattern, like about half of Portuguese adolescents, since they have low consumption of fruits, vegetables, and pulses and higher consumption of sweets and fast food[35].

Thus the consumption of fruits and vegetables and fish should be promoted, and the consumption of fast food and sweets should be discouraged, in order to adopt a healthy diet[1]. It cannot be stressed enough that a diet rich in processed foods and/or with low consumption of fruit and vegetables, is a key risk factor for the emergence of many chronic diseases like cardiovascular diseases, certain types of cancer, diabetes, and obesity[1]

The results of the differences in the frequency of food consumption between normal weight and pre-obese/obese students and parents may suggest the existence of some myths related to food[36], namely that foods considered healthy or with health benefits can be consumed in large quantities such as milk, fruits, vegetables, and olive oil. In the case of the higher frequency of consumption of sweets by normal-weight students, a possible explanation is a compensation of the energy ingested with physical activity, however, this was not evaluated in this study.

According to a study[37] that aimed to determine strategies that could increase the consumption of fruits and vegetables in children, some that can be used in a school context were highlighted, namely: use relevant motivators for children to increase their preference for fruit and vegetables; increase food literacy education across a range of settings; and develop salient key messages and cooking tips that could be done with parents. In this way, food education sessions and cooking workshops could be developed for students and parents. Integrate health-promoting food-related content into the school curriculum to increase health/food literacy. Admitting the importance of consuming foods of local origin, not only at an economic level, but also at an environmental level, and having verified a low consumption of some of these foods, their consumption could be promoted in these community-based interventions.

Limitations and strengths

This study has some limitations, namely its cross-sectional nature, which does not allow an assessment of the temporal relationship between food frequency and weight status, nor extrapolate the results to the general population. In addition, the use of self-administered questionnaires could lead to a social desirability bias, which may have led to the over-reporting of healthy foods and/or under-reporting of unhealthy foods or weight. However, this appears to be more likely to occur in adults than in children[38].

On the other hand, it should be noted that this is a pioneering study in the Azores region that crosses data from students with their parents. In addition, the results of this study can be used to develop community-based interventions at the school level, and involve parents, in a broader way.

CONCLUSIONS

A high prevalence of pre-obesity/obesity was found. Normal weight students reported a higher frequency of soy, olive oil, sunflower oil, and sweets, on the other hand, overweight parents reported a higher frequency of consumption of milk, pork, fatty fish, potatoes, vegetables, citrus fruits, and sunflower oil. Our results suggest that is necessary to adopt public policies, involving schools, parents, and government to implement healthy eating habits and demystify some beliefs, to promote the consumption of health-promoting foods, especially the ones produced locally, to make food sustainable and contribute to the local economy.

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