



Original/*Valoración nutricional*

Cross-sectional study to evaluate the associated factors with differences between city and districts secondary school students of the southeast of Spain (Murcia) for their adherence to the Mediterranean diet

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Abstract

Introduction: The "Mediterranean diet" is recognized as one of the healthiest dietary patterns but, even in Mediterranean countries it is gradually being lost. Adolescence is a crucial period for changes in dietary patterns.

Objectives: The purpose of this study was to evaluate the Adherence to Mediterranean diet (AMD) of secondary school students and evaluate possible variations between those residents in the city or in the districts.

Methods: A cross-sectional study was designed with 379 secondary school students. To assess the AMD a self-administered questionnaire KIDMED was used. They were classified according to sex and residence (city or districts).

Results: The body mass index (BMI) for the whole sample was 22.34 in boys and 20.79 in girls ($p<0.05$). Students from the city resulted more physically active than those from the districts ($p<0.05$). The average AMD score was 5.8, with 20.3% of students showing good adherence. In general, there was a low consumption of fruits, vegetables and pasta or rice, all foods included in the bottom of the dietary pyramid and the consumption of olive oil and legumes was very positive. Around 25% of students skip breakfast regularly.

Conclusions: Although BMI was in general in the range of normality, AMD of secondary school students is lower than expected attending to previous studies. Consume of fruits and vegetables several times per day, having breakfast daily and regular physical activity should be promoted. Educational and informative activities should be designed for adolescents and also for their parents since in these stages menus at home are usually established by them.

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ESTUDIO TRANSVERSAL PARA EVALUAR LOS FACTORES ASOCIADOS CON LAS DIFERENCIAS ENTRE LA CIUDAD Y LAS PEDANÍAS DE ESTUDIANTES DE LA ESCUELA SECUNDARIA DEL SURESTE DE ESPAÑA (MURCIA) PARA SU ADHESIÓN A LA DIETA MEDITERRÁNEA

Resumen

Introducción: La "dieta Mediterránea" está reconocida como uno de los patrones dietéticos más saludables pero, incluso en los países mediterráneos, su seguimiento está disminuyendo. La adolescencia es un período crucial durante el cual se producen cambios en los hábitos alimentarios.

Objetivos: El objetivo de este estudio fue evaluar la adherencia a la dieta Mediterránea (ADM) de los estudiantes de educación secundaria y evaluar las posibles diferencias entre los residentes en la ciudad o en las pedanías.

Métodos: Se diseñó un estudio transversal con 379 estudiantes. Para evaluar la ADM se facilitó el cuestionario KIDMED. Los estudiantes se clasificaron de acuerdo al sexo y la residencia (ciudad o pedanía).

Resultados: El índice de masa corporal (IMC) fue en global de 22.34 en hombres y 20.79 en mujeres ($p<0.05$). Los estudiantes de ciudad resultaron más activos físicamente que los de pedanías ($p<0.05$). La puntuación media de ADM fue de 5.8 en el total de los estudiantes, con un 20.3% que mostraron una buena adherencia. En general, hubo un bajo consumo de frutas, verduras y pasta o arroz, todos los alimentos incluidos en la base de la pirámide alimentaria y el consumo de aceite de oliva y legumbres fue positivamente elevado. Alrededor del 25% de los estudiantes no desayunan regularmente.

Conclusiones: A pesar de que el IMC, en general, se sitúa en el rango de la normalidad, la ADM de los estudiantes es menor de lo esperado atendiendo a estudios previos. Es conveniente promover el consumo de frutas y verduras varias veces al día, hacer del desayuno una práctica diaria así como la realización regular de ejercicio físico mediante el planteamiento y diseño de programas de información y actuación para los adolescentes y también para sus padres, ya que en estas etapas de la vida suelen ser los que seleccionan los alimentos que se consumen en el hogar.

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Introduction

The Mediterranean Diet (MD) involves a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and especially the sharing and consumption of food¹.

The traditional MD is characterized by a high intake of plant foods (legumes, cereals, olive oil, seeds, fruits, and nuts), a moderate intake of fish, seafood, and alcohol (principally wine during meals), low-to-moderate intake of dairy products (cheese and yogurt) and eggs, and a low intake of meat, accompanied by other habits such as the “siesta” or after-meal nap².

During the last few decades Spain’s dietary patterns have changed in several important aspects. While consumption of vegetables has remained steady and fruits are more popular today, other plant food as potatoes, legumes, cereals, and all their by-products have decreased considerably. Consequently, the percentage of animal food in the diet has reached almost 50%³, with a higher consumption of saturated fats and lower intake of complex carbohydrates and fibre. Other changes are less time dedicated to meals, more meals taken outside of the home, and less time for the siesta⁴.

However, some of these dietary changes also occur along an individual’s lifespan, especially during adolescence. In this period, teenagers starts to take decisions on their own as an assessment of their identities and independence, so this phase is crucial period for preventing bad dietary habits from forming^{5,6}.

In the south-east of Spain, as in most of the country, the population is concentrated in cities where changes in customs tend to be faster than in the countryside. In the rural districts, people tends to keep more in contact with the land, the “huerta”(vegetable garden or fields typical of Spain) , and traditional customs associated with MD, but there is no evidence about possible differences in dietary patterns between students in the city and in the districts.

Many studies have previously analysed the diet of secondary school students⁶⁻⁹, but we have not found any study that compares dietary patterns in the town relative to the districts or nearby rural environment.

The aim of this study is to evaluate the adherence to Mediterranean Diet (AMD) in secondary school students and demonstrate possible differences between city and districts residents.

Material and methods

Subject

The cross-sectional study was designed to evaluate and compare the eating habits among students from different territories of the Spanish city of Murcia and some surrounding districts. The sample (Table I) comprised 379 students in secondary school, 245 from the

Table I
Distribution of the sample

	Total	Gender	
		Women	Men
Total	379 (100%)	172 (45.4%)	207 (54.6%)
Districts	245 (64.6%)	101 (41.2%)	144 (58.8%)
City	134 (35.4%)	71 (53.0%)	63 (47.0%)

Alquerias and Llano de Brujas districts (144 males and 101 females) and 134 from the city of Murcia (63 males and 71 females).

This study did not need ethical approval because no invasive procedures were necessary. All students volunteered for the study.

Methods

To assess the AMD a self-administered questionnaire KIDMED was used. Development of the KIDMED¹⁰ index was based on principles that sustain Mediterranean dietary patterns and on those that undermine it. The questionnaire contains 16 questions and the index ranges from 0 to 12. Four questions denote a negative connotation with respect to the Mediterranean diet and assign a value of -1, while the rest of the questions have a positive aspect and give a score of +1. The sums of the values from the administered test were classified into three levels: good AMD (8-12), average AMD (4-7), and poor (0-3).

Apart from the KIDMED questionnaire students were asked about height, weight (in order to determine BMI), and frequency of physical activity (less than twice, 2-3 times, or more than three times per week).

Statistical analysis

The statistical software package IBM SPSS Statistics v19.0 (SPSS Inc.; Chicago, IL, USA) was used for data analysis. Chi-square analysis was performed to evaluate relationships between qualitative variables and Student-t test to compare quantitative variables between groups. Differences were considered significant at $p < 0.05$.

Results

As table II shows, the mean recorded BMI of participant is 20.79 for females and 22.34 for males; it was similar between urban and rural students but in all cases there were significant differences between sexes ($p < 0.05$).

The distribution related to BMI (Table III) shows 15.2% of females and 7.3% of males were underwei-

Table II
BMI of the sample (mean±SD)

	Gender	
	Women	Men
Total	20.79±2.65*	22.34±3.33*
Districts	20.93±2.60*	22.19±3.43*
Ciudad	20.45±2.77*	22.55±3.20*

*significant statistical differences by T-Student test at p<0.05 between gender.

ght, while the percentage of students with overweight was higher in boys than in girls (14.6% vs. 4.2%). In both cases results were significantly different between sexes (p<0.05). Analysing results in different territories, they were similar in both sexes and no significant differences were found.

About physical activity (Table IV) we found that, in general, boys are more active than girls, practicing more than 3 times per week 52.4% vs. 27.9% respectively (p<0.05), and in the opposite side, 10.4% of boys and 20.4% of girls (p<0.05) present sedentary lifestyle (less than twice per week). This pattern was also found in the city, where only 11.6% of boys but 32.8% of girls were sedentary (p<0.05), while 56.5% of boys exercised more than 3 times a week vs. 23.0% of girls (p<0.05). Comparing physical activity between areas, we found a more sedentary way of life (less than twice per week) in students from the city than from the districts (21.5% vs. 12.8%; p<0.05) caused largely by the girls (32.8% vs. 15.0%;

p<0.05), as the figures for urban and rural boys were similar (11.6% vs. 9.5%).

Regarding dietary patterns, the KIDMED index (Table V) came out to be 5.8 in the overall sample (5.6 for girls and 6.0 for boys). In the city it was 5.8 (5.6 for girls and 6.0 for boys) and in the districts 5.8 (5.6 for girls and 6.0 for boys). There was thus no significant difference in AMD between city and districts or between boys and girls. 20.3% of students had good adherence to the optimal MD (23.1% in the city and 18.8% in the districts) while 15.6% had poor adherence (17.2% vs. 14.7%). No significant differences were found either between area or residence or sex with respect to dietary patterns.

If we use the whole sample to analyse the differences between sexes on each question of the test separately, we find that boys consumed more pasta and rice (50.6% vs. 39.1%; p<0.05) and nuts (51.7% vs. 41.5%; p<0.05), while girls consumed more sweets and candies (30.4% vs. 18.6%; p<0.05).

In the city, girls were greater consumers of sweets (38.8% vs. 18.3%; p<0.05) and commercial bakery products for breakfast (33.3% vs. 18.3%; p<0.05) than boys and consumed one portion of vegetables daily more frequently (71.4% vs. 53.5%; p<0.05). On the other hand, in the districts boys consumed more fish 2-3 times per week than girls (60.4% vs. 46.5%; p<0.05).

Comparing the two areas of residence, students from the city consumed commercial bakery products for breakfast more often than students from the districts (25.4% vs. 14.3%; p<0.05), a difference largely attributable to girls' habits (33.3% vs. 13.9%; p<0.05).

Table III
Distribution of the sample by categories of BMI

	Total		City		Districts	
	Women	Men	Women	Men	Women	Men
Underweight	29 (15.2%)*	12 (7.3%)*	10 (17.9%)*	4 (5.8%)*	19 (14.1%)	8 (8.4%)
Normoweight	153 (80.1%)	124 (75.6%)	42 (75.0%)	55 (77.5%)	111 (82.2%)	69 (72.6%)
Overweight	8 (4.2%)*	24 (14.6%)*	4 (7.1%)	7 (10.1%)	4 (3.0%)*	17 (17.9%)*
Obese	1 (0.5%)	4 (2.4%)	0	3 (4.2%)	1 (0.7%)	1 (1.1%)

*significant statistical differences at p<0.05 by chi-square between gender.

Table IV
Distribution of the sample according to physical activity practice

	Total			Ciudad			Districts		
	Total	Women	Men	Total	Women	Men	Total	Women	Men
<2 times/week	15.9	20.4*	10.4*	21.5 [‡]	32.8 ^{‡*}	11.6*	12.8 [‡]	15.0 [‡]	9.5
2-3 times/week	45.2	51.7*	37.2*	37.7 [‡]	44.3	31.9	49.4 [‡]	55.0*	41.1*
>3 times/week	38.9	27.9*	52.4*	40.8	23.0*	56.5*	37.9	30.0*	49.5*

*significant statistical differences at p<0.05 by chi-square between gender in the same category (Total, city, Districts)

[‡]significant statistical differences at p<0.05 by chi-square between different categories (City, Districts).

Table V
Results for KIDMED test for total students and by categories

	Total			City			Districts			
	Total	Women	Men	Total	Women	Men	Total	Women	Men	
Takes a fruit or fruit juice every day	76.3	76.8	75.6	76.9	84.1	70.4	75.9	73.6	79.2	
Has a second fruit every day	40.4	41.5	39.0	42.5	39.7	45.1	39.2	42.4	34.7	
Has fresh or cooked vegetables regularly once a day	59.4	59.9	58.7	61.9	71.4&*	53.5*	58.0	54.9&	62.4	
Has fresh or cooked vegetables more than once a day	22.2	23.2	20.9	18.7	17.5	19.7	24.1	25.7	21.8	
Consumes fish regularly ($\geq 2-3$ times per week)	54.6	50.2	59.9	59.0	58.7	59.2	52.2	46.5*	60.4*	
Likes legumes and eats them more than once a week	88.1	90.3	85.5	87.3	88.9	85.9	88.6	91.0	85.1	
Consumes pasta or rice almost every day (≥ 5 per week)	44.3	39.1*	50.6*	47.8	42.9	52.1	42.4	37.5	49.5	
Has cereals or grains (bread, etc.) for breakfast	64.4	62.3	66.9	70.1	73.0&	67.6	61.2	57.6&	66.3	
Consumes nuts regularly ($\geq 2-3$ times per week)	46.2	41.5*	51.7*	44.0	39.7	47.9	47.3	42.4	54.5	
Uses olive oil at home	94.7	94.2	95.3	95.5	93.7	97.2	94.3	94.4	94.1	
Has breakfast everyday	75.2	72.9	77.9	73.9	69.8	77.5	75.9	74.3	78.2	
Has a dairy product for breakfast (yoghurt, milk, etc.)	81.3	77.8	85.5	79.9	74.6	84.5	82.0	79.2	86.1	
Has commercially baked goods or pastries for breakfast	18.2	19.8	16.3	25.4&	33.3&*	18.3*	14.3&	13.9&	14.9	
Goes more than once a week to a fast-food (hamburger)	28.0	27.1	29.1	23.9	27.0	21.1	30.2	27.1	34.7	
Takes two yoghurts and/or some cheese (40 g) daily	52.5	55.6	48.8	47.0	49.2	45.1	55.5	58.3	51.5	
Takes sweets and candy several times every day	25.1	30.4*	18.6*	27.6	38.1*	18.3*	23.7	27.1	18.8	
KIDMED index	5.8 \pm 2.1	5.6 \pm 2.2	6.0 \pm 2.1	5.8 \pm 2.2	5.6 \pm 2.2	5.9 \pm 2.2	5.8 \pm 2.1	5.6 \pm 2.1	6.0 \pm 2.0	
Adherence to Mediterranean Diet	Poor (≤ 3)	15.6	17.4	13.4	17.2	17.5	16.9	14.7	17.4	10.9
	Average (4-7)	64.1	63.8	64.5	59.7	61.9	57.7	66.5	64.6	69.3
	Good (≥ 8)	20.3	18.8	22.1	23.1	20.6	25.4	18.8	18.1	19.8

*significant statistical differences at $p < 0.05$ by chi-square between gender in the same category (total, city, districts).

&significant statistical differences at $p < 0.05$ by chi-square between different categories (city, districts).

Discussion

The BMI results were 20.79 for females and 22.34 for males (Table II) and were similar between urban and rural students, but BMI was in all cases significantly higher in boys ($p < 0.05$). Our results are in the range of normality and they are lower than those described in other regions of Spain such as Guadalajara⁸ but significantly different than another study in the Canary Islands¹¹, where BMI in girls was higher than in boys. Classifying students according to BMI (Table III) we found a greater proportion of students with normal

weight (75.6% for boys and 80.1% for girls). The cases of overweight were higher in males (14.6% vs. 4.2%; $p < 0.05$), while underweight was more frequent in females (15.2% vs. 7.3%; $p < 0.05$). Cases of obesity were very low in both sexes, a result notably different from another study of 3rd-year secondary school students in Valencia (Spain)¹², which reported obesity in 26.3% of boys and 12.0% of girls. While girls tended to be underweight, boys tended to be overweight. We think this tendency can be explained because in these years, girls are more concerned about body shape and sometimes a “desirable” body shape can be conflated with a noticea-

ble and risky degree of thinness. Girls are surrounded by misleading messages by much of the media (sales of fashion magazines, billboard, music and video content, etc) so accurate information about healthy dietary patterns should be provided in order to discourage behaviours that are dangerous to health.

The practice of physical activity reveals that boys were more active than girls (Table 4), a result that is in line with other studies¹¹. In our study 52.4% of boys but only 27.9% of girls practice exercised more than 3 time per week ($p<0.05$). On the other hand, 10.4% of boys and 20.4% of girls, especially urban girls (32.8%), exercised less than twice a week ($p<0.05$).

We also noticed that students from the city were more sedentary than those in the districts (21.5% vs. 12.8%; $p<0.05$) especially in the case of girls (32.8% vs. 15.0%; $p<0.05$). One possible reason is that in the country there are more public places dedicated to the practice of sports so young people can engage in them easily and, in general, boys like to practice sports, like soccer or basketball, as a pastime more than girls at time that the relative influence of elite men's sports is higher than elite women's sports

After analysing the results of the KIDMED questionnaire we found a low mean adherence to the optimal MD, at 5.8 for the whole sample with a high of 6.0 for boys from the districts and a low of 5.6 in the case of girls in both territories. The level of AMD was also alarming. Most of the sample presents average AMD but only 20.3% have a good adherence to the MD with a high of 25.4% in boys from the city and a low of 18.1% in girls from the districts. That means that 79.3% of students overall (combining the 15.6% with poor and the 64.1% with average adherence) need to improve their dietary pattern. Differences between sex or territory showed no statistical significance ($p>0.05$). Our results are lower than others published on Mediterranean regions of Spain like Valencia¹² and Granada¹³. In the Valencia study, between 32.0% and 36.4% of secondary school students had good AMD, depending on the age of students, while around 50% of young people in Granada between 10 and 16 years old had good AMD.

The analyses of each question revealed several negative aspects. First of all we observed a very low consumption of fruit and vegetables. 76.3% of students consumed at least one piece of fruit daily, with the best being 84.1% in the case of girls from the city. That means that the remaining 15.9% did not consume fruit habitually being even 29.6% in the case of boys from the city. Another result that should be taken in account is that only 40.4% of students consumed fruit twice a day, which decreased to 34.7% in the case of boys from the districts. In the case of vegetables, the tendency was similar. 59.4% of students reported having one portion of vegetables daily but only 22.2% had two or more. On this question, girls from city were greater consumers of vegetables than those from the districts ($p<0.05$).

Fruits and vegetables are the main source of vitamins, minerals, and fibre and a low consumption of these foods may lead to some metabolic diseases. Some educational programs, such as "five a day," suggest consuming five portions of plant foods, have already been established, but they are not effective in certain populations. Other information techniques should be considered, since they have previously demonstrated their effectiveness^{14,15}.

In the case of consumption of pasta or rice, the main source of carbohydrates, results were also lower than recommendations. Only 44.3% of students in general consumed them almost daily, with boys being more likely to do so than girls (50.6% vs. 39.1%; $p<0.05$). Looking at city and country residents separately, consumption was also higher in boys but the difference is not significant ($p>0.05$). Differences between sexes may be due to the relationship between pasta and high energy intake, so girls may tend to avoid it more than boys. This kind of food should be the main source of energy of any balanced diet and is located at the bottom of the food pyramid. Energy from carbohydrates should cover 50-55% of the total daily needs; using alternatives to these staples means higher consumption of fat or proteins with consequent negative aspects^{16,17}.

Another factor to take into account is the low consumption of nuts, mainly in girls (41.5% vs. 51.7%; $p<0.05$). Despite this low result in this study in Murcia, it was slightly higher than what was described in the 2- to 14-year-old population¹⁰ and much higher than the Granada study, where almost no nut consumption was recorded in the 10- to 16-year-old population¹³. Nuts in general supply high levels of energy because of their high fat content, which may be the reason for its low consumption, especially in girls, but this food also provides many essential fatty acids and minerals and is highly recommended in the MD as it is associated with a substantial reduction in the risk of major cardiovascular events among high-risk persons¹⁸.

Skipping breakfast was another aspect that this study detected. 75.2% of students had breakfast every day, meaning that 24.8% did not usually take a meal in the morning. Skipping breakfast reached 30.2% in the case of girls from the city. Breakfast is the most important meal of the day, as it breaks the overnight fast and provides energy to start the day in good physical and intellectual condition¹⁹⁻²², both of which are even more important in teenage students. Although skipping breakfast is a typical technique for losing weight, there is a controversy about its efficacy in this regard and in some cases it has even been associated with a tendency to overweight^{23,24}. The percentage of students that skipped breakfast on this study is much higher than those described in previous studies in Spain^{11,13}.

There was a high percentage of students that consumed dairy products for breakfast (81.3%). The KIDMED questionnaire did not ask for more information from students who did not consume these products, but many circumstances as intolerances, allergies, or alter-

native dietary patterns such as vegans or vegetarians could be responsible for at least part of the 18.7% who did not consume dairy products at breakfast. It is recommended that a complete breakfast should include dairy products, a source of cereals, and fruit, but any alternative to this should supply energetic (carbohydrates and fat), structural (high-quality proteins), and protective nutrients (minerals, vitamins and fibre) covering 20-25% of the total daily energy needed^{25, 26}.

We also detected a significant percentage of students who consumed commercial bakery products for breakfast, with higher numbers in the city (25.4% vs. 14.3%; $p < 0.05$), especially among girls (33.3% vs. 13.9%; $p < 0.05$). Bakery products are an easy way to include dairy products in breakfast, but parents and children must be conscious of the negative nutritional properties of these products since they contain a high amount of simple sugars and saturated and trans fats that are partly responsible for the prevalence of overweight and obesity among children and adolescents²⁷⁻²⁹. Commercial bakery products was the only category with significant differences between the city and the districts. It may be that in the city the importance of a healthy breakfast is becoming lost, although the rest of dietary pattern revealed through KIDMED was similar in both areas.

Fast food is another question that requires analysis, since 28.0% of students reported going to fast-food restaurants more than once a week, with a high of 34.7% in the case of boys from the countryside. This kind of food is well-known for its high content of saturated and trans fatty acids, sugar, and salt with the consequent risk of metabolic disorders^{30, 31}. In recent years, it has become a common social engagement for teenagers to go out with friends to these restaurants and indeed there are not many alternatives for young people. Adolescents are attracted to inexpensive restaurants, rapid delivery of food, and predictable taste of food. Fast food offers all these options, despite its unwelcome nutritious aspects.

The study did find positive aspects. The consumption of olive oil was very high (94.7%). Almost all students used it at home, even for cooking. It is important to emphasise the use of this fat over others to increase levels of oleic fatty acid and antioxidants in diet³².

Another positive aspect was the consumption of legumes (88.1%), an important source of complex carbohydrates, including dietary fibre, and high-quality proteins which, as described in a previous study, may reduce the risk of hypertension if taken daily³³.

Conclusions

Secondary school students of Murcia present an average to low adherence to the Mediterranean diet. Although their lifestyles are different in several aspects, such as rural students being more active, urban and rural teenage dietary patterns appear to be similar

and no significant differences were found with respect to adherence to AMD except for the higher consumption of commercial bakery products for breakfast in the city. It would be valuable to know if these students choose what they eat or whether their parents take most of the decisions regarding food. A previous study in Murcia shows better AMD in university students, especially among those living on their own³⁴, which could be interpreted to mean that with information and better choices students tend to improve their dietary pattern. Information and intervention programmes on secondary school are certainly needed focused on benefits of consumption of fruits and vegetables, pasta and rice and specially the importance of having breakfast daily. Nevertheless these programmes about benefits of physical activity and healthy dietary pattern should be designed for both students and their parents in order to achieve both objectives at one time.

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