

Association between Family Meals and the Adherence to the Mediterranean Diet in Spanish Adolescents

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Abstract

Introduction: Few studies have assessed the role of family meals in the Mediterranean diet (MD). Simultaneously, family meal frequency (FMF) has been associated with healthier lifestyles.

Objective: The aim of this study was to assess the association between FMF and MD adherence in Spanish adolescents.

Methods: A cross-sectional analysis with the baseline data of a multi-center (11 schools from the province of Barcelona) trial was performed. Socio-demographic and anthropometric data, as well as frequency of family breakfast, lunch and dinner were analyzed. MD adherence was assessed with the KIDMED questionnaire. The association between FMF and KIDMED was evaluated with a linear mixed effects regression model.

Results: Adolescents (n=1473) reported a weekly frequency of family breakfast, lunch and dinner of 2.1, 4.5 and 5.6 times, respectively. MD adherence was medium in 58.4% of the adolescents, low in 16.0% and high in 25.6%. As MD adherence increased, there was an increase in the proportion of males and of adolescents with university-educated parents, as well as a higher frequency of the three family meals. The model showed that MD adherence was associated with parental education and with the frequency of family breakfast and dinner.

Conclusion: This is the first study to document the association between family meals and MD adherence. Family dinner and breakfast appear to be associated with MD adherence, and since breakfast shows low frequency it should be taken into account in the design of health interventions.

Keywords: Family meals; Mediterranean diet; KIDMED; Adherence; Spain

Introduction

Numerous studies have shown the health-promotion and disease-prevention characteristics of the Mediterranean diet (MD) [1-3]. The MD has been postulated as a protective factor against different diseases, including hypertension and coronary heart disease [4-7]. Nevertheless, a gradual abandonment of the MD has been reported in Mediterranean children and adolescents in recent decades [8-10]. The MD is more than just a dietary pattern, it is a lifestyle derived from millennia of exchanges involving the people, cultures and foods of the countries around the Mediterranean Sea. The MD combines food, recipes, cooking methods, shared meals, celebrations and traditions, as well as moderate physical exercise. The Mediterranean Diet Foundation has developed a new nutritional pyramid that goes beyond nutritional recommendations by also integrating social and cultural aspects, including the participation of all, or most, family members in

food consumption [11]. However, few studies have assessed the role of family meals in the MD.

One characteristic pattern among Mediterranean regions is that meals are considered to be an important aspect of social life, especially family meals [12]. Unfortunately, there have been very few Mediterranean studies of family meal frequency (FMF) [9], so as far as we know, there are no records of FMF and it is not known whether FMF has changed in the Mediterranean countries in recent decades. In other regions, such as the United States (U.S.), a reduction in FMF has been reported in recent decades [13]. FMF has been inversely associated with risk behaviors in adolescents, such as the use of substances and drugs, aggressive behavior, poor school performance, disordered eating patterns and low-quality diet [14-19]. Regarding the latter, most prospective studies of FMF have found that adolescents who frequently eat meals with their family are more likely to observe healthier lifestyles when they grow older, especially in terms of the quality of food consumed, compared to adolescents who rarely eat meals with their families [20,21].

Most of the information about the benefits of FMF comes from U.S. samples [16] and since eating patterns differ between cultures, it is useful to determine whether the same benefits are observed in other regions. Although the traditional diet in Mediterranean regions includes the act of eating meals with the family, to our knowledge, no studies have assessed the importance of FMF in adherence to the MD. Therefore, the aim of this study was to assess the association between two factors within the MD lifestyle, FMF and MD dietary patterns, in Spanish adolescents.

Materials and Methods

Design

The present data are part of the MABIC study, a multi-center, non-randomized, controlled, effectiveness trial for the reduction of risk factors associated to eating and weight-related problems in adolescents. Here, a cross-sectional analysis was performed with the baseline data, prior to any intervention, from the 2010-11 academic year [22].

Ethical standards disclosure

This study was conducted in accordance with the Declaration of Helsinki and all procedures were approved by the ethics committee of the Parc Taulí Health Corporation. Parental consent and adolescent assent were obtained. The confidentiality of participating adolescents was protected with coded data and the data was processed anonymously.

Participants

Adolescents taking Mandatory Secondary Education in the Spanish system (7th to 10th grades in the U.S.) were included in the study, and were recruited from 11 schools in the province of Barcelona to complete in-class surveys. A total of 1573 adolescents were invited to participate in the MABIC study but 71 did not participate – 7 did not provide consent/assent and 64 refrained from participating for other motives. Adolescents were excluded from the current analysis if they did not complete the KIDMED questionnaire at baseline.

Measures

Assessment of adherence to the Mediterranean diet: Adolescents' MD adherence, the dependent variable, was assessed with the KIDMED questionnaire. This self-administered tool is a 16-question test where questions denoting a negative or positive connotation with respect to the MD are scored with -1 and +1, respectively. The total KIDMED score ranged from -4 to 12, and the sum of the values is classified on three levels: ≥ 8 as high/optimal MD adherence, 4–7 as medium MD adherence, and ≤ 3 as low MD adherence [10]. The total KIDMED score was used in the data modeling, while the three levels of KIDMED (categorical variable) were used to describe the sample.

Family meals: Frequency of family breakfast, lunch and dinner, the main independent variables, was assessed with the question "During a normal week (7 days), how many times did all or most of your family living in your house eat a meal together?" [20,23,24] Response categories ranged from 0 to 7 times. The frequency of each family meal was treated as both a continuous and categorical variable – 0-1 (low), 2-4 (medium) and 5-7 times (high) [15,23,25].

Socio-demographic and anthropometric data: Adolescents provided information regarding their age, both their father's and mother's place of birth (Spain, European countries excluding Spain, Spanish-speaking American countries or Brazil, North African countries, Sub-Saharan countries, other countries/regions), university education (yes/no) and paid work at the time of the study (yes/no). The adolescents' ethnicity was recorded from the parents' country/region of birth, where the adolescent was of the same specific ethnicity as both parents; otherwise their ethnicity was considered mixed [26]. Weight and height were measured in situ by trained research staff in a private room using standard equipment and procedures. Students were weighed without shoes and wearing light clothing. Weight values were subsequently corrected by subtracting 0.9 kg from the boys and 0.7 kg from the girls, which were average values estimated after weighing several similar sets of clothes to those worn at the time of the assessment. Body mass index (BMI) was calculated and used as an adjusted continuous variable in the regression model and as a categorical variable to describe the sample following the International Obesity Task Force cut-offs [27].

Statistical analysis

The sample was described with continuous variables using mean and standard deviation (SD) and with categorical variables using absolute (i.e., counts) and relative (i.e., percentages) frequencies.

To assess the association between FMF and parental characteristics with MD adherence, a linear mixed effects (LME) regression model with random intercepts was used, with total KIDMED score as the dependent variable, and FMF, sex, along with both parents' education and work status as independent variables. Parental education-work status interaction was also included in the model. The LME model was adjusted by BMI, age and ethnicity [19,28,29]. Two models were obtained according to FMF treatment – continuous or categorical variable. Since adolescents at the same schools are likely to display similar correlated values for several variables, the school was used as a cluster variable in the modeling. Two models were obtained, a full model that included all the variables and the parents' education-work status interaction, and a reduced model with those variables and interactions that showed an association with KIDMED. All statistical analysis was performed using Stata 12/SE, and the level of significance was set at 0.05.

Results

A total of 1502 adolescents completed the in-class surveys of the MABIC study. Twenty-nine were excluded from the current analysis since they had not completed the KIDMED questionnaire at baseline. Thus, a total of 1473 adolescents were analyzed, for a response rate of 95.5%. Around half of the sample was male, the mean age was 14.1 (SD=1.1) years and the mean BMI was 21.1 kg/m² (SD=3.8). The majority of the sample was of Spanish (71.9%) or Hispanic-American (13.0%) origin. Less than 20% of parents had a university education and more than 80% had a paid job (Table 1). The mean total KIDMED score was 5.9 (SD=2.4). The mean weekly FMF was medium for breakfast (2.1 times [SD=2.5]) and lunch (4.5 times [SD=2.5]), and high for dinner (5.6 times [SD=2.2]) (Table 2).

Sixteen percent of adolescents (N=235) had low MD adherence, 58.4% (N=861) medium adherence, and 25.6% (N=377) optimal adherence. As MD adherence increased, the proportion of male adolescents and adolescents with parents (father or mother) that had a

university education increased. The same trend was also observed, in general, for the mean frequency of the three family meals. Overall, it was observed for each meal that as MD adherence increased, the proportion of adolescents with 0-1 family meals per week decreased,

while the proportion of those with 5-7 family meals per week increased. No significant differences were observed for age, BMI or ethnicity in terms of MD adherence (data not shown).

	Total (N=1473)
Adolescent's characteristics	
Age*	14.1 (1.1)
Ethnicity	
Spanish	1055 (71.9%)
European	32 (2.2%)
Hispanic-American	191 (13.0%)
Others	190 (12.9%)
BMI*	21.1 (3.9)
Weight Status	
Underweight	7.8%
Normal weight	66.5%
Overweight	19.9%
Obese	5.8%
Parents' characteristics	
University education	
Father	185 (12.6%)
Mother	222 (15.1%)
Paid work	
Father	1460 (99.1%)
Mother	1208 (82.0%)
N, number of adolescents; BMI, body mass index. Values are indicated as N (absolute frequencies), except those with *, which are indicated as means (standard deviation)	

Table 1: Socio-demographic characteristics.

	Low adherence to the MD (N=235)	Medium adherence to the MD (N=861)	Optimal adherence to the MD (N=377)	Total (N=1473)
Males	106 (45.1%)	456 (53.0%)	212 (56.2%)	774 (52.5%)
KIDMED total score*	2.2 (0.9)	5.6 (1.1)	8.8 (1.0)	5.9 (2.4)
Family meal frequency				
Breakfast* (n/w)	1.6 (2.3)	2.1 (2.4)	2.5 (2.5)	2.1 (2.5)
0-1	140 (59.8%)	405 (47.5%)	137 (36.5%)	682 (46.6%)
2-4	59 (25.2%)	284 (33.3%)	148 (39.5%)	491 (33.6%)
5-7	35 (15.0%)	164 (19.2%)	90 (24.0%)	289 (19.8%)
Lunch* (n/w)	4.2 (2.4)	4.6 (2.5)	4.5 (2.3)	4.5 (2.4)

0-1	29 (12.4%)	86 (10.0%)	26 (6.9%)	141 (9.6%)
2-4	93 (39.7%)	295 (34.5%)	153 (40.8%)	541 (36.9%)
5-7	112 (47.9%)	476 (55.5%)	196 (52.3%)	784 (53.5%)
Dinner* (n/w)	5.0 (2.5)	5.6 (2.2)	6.0 (1.8)	5.6 (2.2)
0-1	32 (13.7%)	75 (8.8%)	12 (3.2%)	119 (8.1%)
2-4	53 (22.6%)	113 (13.2%)	54 (14.4%)	220 (15.0%)
5-7	149 (63.7%)	667 (78.0%)	310 (82.4%)	1126 (76.9%)
Parents with university education				
Father	13 (5.5%)	98 (11.4%)	74 (19.6%)	185 (12.6%)
Mother	19 (8.1%)	119 (13.8%)	84 (22.3%)	222 (15.1%)
Parents in paid work				
Father	233 (99.1%)	855 (99.3%)	372 (98.7%)	1460 (99.1%)
Mother	192 (81.7%)	714 (82.9%)	302 (80.1%)	1208 (82.0%)

N, number of adolescents; n/w, number of family meals per week; MD, Mediterranean diet. Values are indicated as N (column percentage), except those with *, which are means (standard deviation).

Table 2: Dietary and socio-demographic characteristics according to the MD adherence classification.

	Effects	SE	p Value	95% CI
Sex: Boys	0.20	0.12	0.102	-0.04 to 0.43
Family Meal				
Breakfast	0.09	0.03	0.001	0.03 to 0.14
Lunch	-0.02	0.03	0.511	-0.07 to 0.04
Dinner	0.13	0.03	<0.001	0.07 to 0.18
University education				
Father	0.76	0.19	<0.001	0.38 to 1.14
Mother	0.73	0.19	<0.001	0.36 to 1.10
No paid work				
Father	0.59	0.63	0.356	-0.66 to 1.83
Mother	0.22	0.16	0.181	-0.10 to 0.54
Studies x No paid work				
Father	NA			
Mother	-0.38	0.57	0.507	-1.49 to 0.74
Random effect				
School	0.28	0.10	0.0013	0.13 to 0.57

CI, confidence Interval; NA, not applicable; SE, Standard error. Model adjusted for body mass index, age and ethnicity.

Table 3: Full linear mixed model predicting adolescents' KIDMED index from family meal frequency as continuous variable.

	Effects	SE	p Value	95% CI
Family Meal				
Breakfast	0.09	0.03	<0.001	0.04 to 0.14
Dinner	0.12	0.03	<0.001	0.07 to 0.18
University Education				
Father	0.76	0.19	<0.001	0.38 to 1.13
Mother	0.69	0.18	<0.001	0.34 to 1.05
Random effect				
School	0.28	0.10	0.0011	0.14 to 0.57

Model adjusted for body mass index, age and ethnicity. CI, confidence Interval; SE, Standard error

Table 4: Reduced linear mixed model predicting adolescents' KIDMED index from family meal frequency as continuous variable.

The full LME model of the KIDMED score with FMF as the continuous variable is shown in Table 3. The same model with FMF as the categorical variable can be found in the supplementary material. It is important to note that there were no cases in which any fathers with a university education were unemployed, so this interaction was not included in the model. The model shows an association between adolescents' MD adherence and the weekly frequency of family breakfast, weekly frequency of family dinner, and parental education (father or mother) ($p \leq 0.001$, all cases). All the associations were positive for MD adherence. The reduced LME model confirmed that these variables had a significant positive association with MD adherence (Table 4). The same model with FMF as the categorical

variable can be found in the supplementary material. The strongest association was observed for both the father's and mother's education. The models also showed that school is relevant for MD adherence ($p=0.0013$).

Discussion

The results of the present study suggest that MD adherence in Spanish adolescents is directly associated with the weekly frequency of family breakfast, weekly frequency of family dinner, having fathers with a university education and having mothers with a university education. The results also suggest that the school environment is relevant to MD adherence. Spanish adolescents reported a weekly frequency of family breakfast, lunch and dinner of 2.1, 4.5 and 5.6 times, respectively. In addition, 3 out of 20 Spanish adolescents had low MD adherence while 5 and 12 out of 20 adolescents had high and medium MD adherence, respectively.

The fact that eating breakfast and dinner with the family is shown to be positively associated with MD adherence, and therefore with a better quality diet, is important as the new Mediterranean nutrition pyramid indicates that family meals are a relevant component. To our knowledge, this is the first study to document the association between family meals and MD adherence. It also suggests that a better quality diet among adolescents is not only associated with eating dinner with the family, as most U.S. studies of FMF have shown [20,21,24,30,31], but also with eating breakfast with the family. Like in the present study, an Italian study also observed a significant association between MD adherence and eating breakfast with the family [9]. It is not known whether this association is exclusive to Mediterranean areas or has yet to be identified in the U.S.

High MD adherence in adolescents has also been associated with the education level of both parents, or only of the mother, in Greece [32], Turkey [33] and Italy [9]. A higher education level may be associated with multiple factors that encourage a healthy lifestyle; for example, higher income makes healthier foods more available, while a more detailed understanding of nutrition might offer additional support or motivation to maintain healthy lifestyles [32].

The Spanish sample studied here showed a higher weekly frequency of having dinner as a family than in U.S. samples, 5.6 vs. 4.3-4.5 [24,34]. Likewise, the proportion of adolescents that have at least 5 dinners per week with the family was higher in Spain than in the U.S., Canada or New Zealand; 77% vs. 57% [35], 59% [36] and 60% [37], respectively. Although FMF has been measured in many countries, comparisons are difficult because there is no standard operationalization [16]. However, one common result reported by most studies is the proportion of adolescents that eat dinner daily with the family, which in our Spanish sample (65%) was lower than in Japanese (~81%) [38] and Italian (78%) [39] samples, but higher than Finnish (54%) [40] and British (44%-62%) [41,42] ones.

Frequency of family lunch seems to be very high, since it showed a similar mean to that found for family dinner in the U.S. Other studies have also shown a high frequency of family lunch in Mediterranean countries, for instance in Greek rural areas it has been reported that up to 99% of adolescents have lunch with the family every day [43]. This high proportion is an interesting result, considering that 99% of fathers and 82% of mothers had a paid job. However, in Spain the traditional work schedule consists of 5 hours in the morning (e.g., from 9 am to 2 pm) and 3 hours in the afternoon (e.g., from 4 pm to 7 pm), with a 2-hour lunch break, which allows some workers to eat most of their

meals, including lunch, at home with some members of their family [44,45], especially with adolescents who are at school from 8 am to 2 pm every weekday and from 3 pm to 5 pm twice a week. Moreover, having parents in paid employment was not associated with MD adherence, probably because work and school schedules are usually coordinated, thus allowing parents to share all, or most, meals with their children.

MD adherence in our sample was similar to that found in other Mediterranean countries, such as Greece [43], Italy [46] and Turkey [33]. However, compared to the Spanish sample studied by Serra-Majem et al. [10], the proportion of adolescents in our sample who had low MD adherence was higher (16% vs. 4%), while the proportion of those with high MD adherence was lower (26% vs. 46%). This discrepancy is possibly due to the wide age range of the Serra sample; 2-24 years vs. 12-17 years. The gap in time between the two measurements might also explain the discrepancy (1998-2000 [47] vs. 2011), since it is widely believed that there has been a gradual abandonment of the MD diet in Mediterranean regions [8-10].

This study has both strengths and limitations. The clearest limitation is its cross-sectional nature, since it is not possible to draw conclusions about causal influences of FMF and parental education on MD adherence; nor can we discard the possibility of causal relations in the opposite direction. Likewise, the use of self-report-based surveys with proxy report measures as the source of the data represents another limitation whereby the information on some measures was not validated with other sources. However, we should stress that during data collection, trained staff were present in each classroom to resolve doubts and monitor the adolescents during the survey, to ensure that the data was collected in the best possible way and to mitigate the risks of data inaccuracy that often occur in self-report-based surveys. Likewise, data entry was performed by trained personnel in a standardized database with error control. However, since this is the first study in Spain to measure family meal frequency, more studies are needed to corroborate our findings. Other strengths, besides the data collection methodology and error control of data entry, included using the KIDMED questionnaire, which is the gold standard for assessing MD adherence, as well as measuring the FMF with a range from 0 to 7 times, avoiding grouped response options.

Since MD is considered one of the healthiest dietary patterns and lifestyles due to its health-promotion and disease-prevention characteristics, the findings of this study could be taken into account in the design of public health interventions in Spain. They suggest that a higher weekly frequency of family breakfast and dinner, and having fathers and mothers with a university education are associated with higher MD adherence in Spanish adolescents. The most important conclusion to be taken from this work is the supporting evidence for family meals as a relevant psychosocial factor in the MD. The particular importance of family breakfast should be highlighted, not only because it was associated with MD adherence but also because of its low frequency, so this too should be taken into account in the design of public health interventions.

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