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## Parental adherence to Mediterranean diet is associated with their adolescents' cereals intake

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### ABSTRACT

The Mediterranean diet (MD), abundant in whole grains, is known to be one of the healthiest dietary patterns. Given the health benefits of whole grain cereals as a rich source of nutrients and phytochemicals, this study examined parental adherence to MD and its association with their adolescents' cereals intake, in 203 parent-adolescent dyads. Adherence to MD was evaluated using the Mediterranean Diet Quality Index for adolescents (13.5±1.2y) and the Short Mediterranean Diet Questionnaire for parents (41.53±5.99y). Although the level of the parents' adherence to MD did not significantly influence the adolescents' weekly consumption frequency of pasta and rice, adolescents whose parents had higher adherence to MD (44.3%) more often ate cereals or grains for breakfast (p=0.045) and less frequently, commercially baked goods or pastries (p=0.043). Adolescents of parents who had lower adherence to MD (55.7%) stated that they would eat more whole grain bakery products (p=0.049) and more breakfast cereals (p=0.039) if those foods were more often available at home. Adolescents with parents who had higher adherence to MD stated that they were more often encouraged by their parents to eat whole grain bakery products (p=0.030), compared with their counterparts whose parents had lower adherence to MD. With this study, we revealed that food environment and parental eating behaviour are notable factors that influence adolescents' dietary intake. Disease prevention health programs should focus more strongly on encouraging parents to adopt MD features in their family food environment.

### Introduction

A Mediterranean diet (MD) is characterised by a high consumption of whole grain cereals, fruits, vegetables, legumes, nuts and olive oil, due to which it has numerous health-benefits, particularly against cardiovascular diseases, and metabolic and psychological health problems (Novak et al., 2017).

Whole grain cereals are of special importance within this dietary pattern due to their numerous nutrients and phytochemicals such as dietary fibre, antioxidants including phenolic compounds, phytoestrogens including lignans, vitamins and minerals (Gil et al., 2011).

Over the past few decades, there has been a gradual shift away from this dietary pattern by the inhabitants of the Mediterranean basin, especially the young generations. Changes to the MD, involving reduced energy expenditure, greater calorie consumption,

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more foods low in nutrient density (such as soft drinks, sweets, bakery products), and different food processing methods (such as flour refinement), have contributed to increasing the risk of deficient intake of valuable nutrients (Serra-Majem et al., 2003).

In designing intervention targeted at children and adolescents it is important to establish how strong is parental influence on food choice. When exploring home and family factors that influence adolescents' dietary habits, it is very important to use the parents' report on their dietary and lifestyle patterns. Although researchers have confirmed parental influence on shaping healthy eating and lifestyle habits, their research was mainly focused on fruit, vegetables, dairy and similar food (O'Dea, 2003; Hanson et al., 2005). To the best of our knowledge there is no study focused on cereals, although this group has numerous health benefits due to its composition. The research question to be addressed in this study is: Do parental adherence to MD and home food environment influence adolescents' intake of cereals?

## Materials and methods

This cross-sectional study included 203 families of two parents living full time with their adolescents, who are 11-16 years of age in Split-Dalmatia County, Croatia. The study was conducted from March to June 2017. For the purpose of this study, two special questionnaires were designed, one for adolescents and one for parents. Prior to the research, a meeting with parents was organized at the school, where the researcher explained both to parents and their children the main purpose of the study and the study protocol. Parents gave their written consent, both for themselves and on the behalf of their children. The adolescents filled out the questionnaire at school during class hours in the presence of the researcher. The researcher was available to explain or clarify questions to the participants. The procedure took about 20 minutes. After filling out the questionnaires, the adolescents put them into previously prepared envelopes with questionnaires for their parents and took them home. After the parents filled out the questionnaire, they put them back into the envelopes and sealed them, and the adolescents brought them back to school. All the procedures involved in this study were approved by the Institutional Review Board of the Faculty of Health Studies, University of Rijeka.

The questionnaire for adolescents consisted of three parts: general information and information about physical activity (Kontogianni et al., 2008), a short (16-items) questionnaire (KIDMED) in order to ascertain compliance with a MD model (Serra-

Majem et al., 2004), and a set of questions related to food availability at home and parental support in healthy eating (Hanson et al., 2005). According to the KIDMED index, the quality of the adolescents' diet was classified as: high ( $\geq 8$  points), medium (4-7 points), and poor ( $\leq 3$ ) (Serra-Majem et al., 2004).

In addition to general and demographic questions, the questionnaire for parents also contained questions about physical activity and inactivity (Wolf et al., 1994), and the Short Mediterranean Diet Questionnaire, based on a nine-question test assessing the frequency of consumption of nine typical food categories (Martinez-Gonzales et al., 2004). The final score ranged from 0 to 9. For the purpose of this study, the parents were divided in two groups; those scoring  $\leq 6$  were placed in the category "Poor adherence to MD", while another category "High adherence to MD" was designed for those scoring  $\geq 7$ . Since this paper examines parental influence in general, mothers and fathers were considered as a dyad, and their adherence to MD was calculated as a mean value of each couple.

## Statistical analysis

Frequencies are presented as absolute numbers and percentages, while the differences between groups were compared using the Chi-square test for categorical variables. All reported p values were compared to a significance level of 5%. The software STATISTICA (version 7.1.) was used for all statistical analysis.

## Results and discussion

This paper is a part of the broader study, aimed at assessing the compliance levels of a group of Croatian adolescents and their parents with the MD. Moreover, one of the research's focuses was the relationship between parental adherence to MD and adolescents' diet quality, taking into account also the willingness of adolescents to eat more healthy food if it were more available in their home environment.

Due to the fact that adolescence is a transitional phase with many changes taking place at the physiological and behavioural level, it represents a crucial life stage in developing healthy nutritional habits (McNaughton et al., 2008). Although food choice in adolescence is influenced by various factors, research has confirmed that the home food environment and parental eating patterns are factors that significantly influence adolescents' dietary intake (Neumark-Sztainer et al., 1999; O'Dea, 2003).

Overall, 203 adolescents (47.3% boys and 52.7% girls) and 203 of their mother-father dyads were included in

this study (Table 1). In the overall adolescent sample, participants were equally distributed from the 5<sup>th</sup> to 8<sup>th</sup> grade (approximately 25% from each grade). The majority of children (94.39% of girls and 87.50% of boys) should be considered normal weight, while 5.60% of girls and 10.41% of boys could be classified as overweight or obese, according to Croatian national standards for children (Jureša et al., 2014).

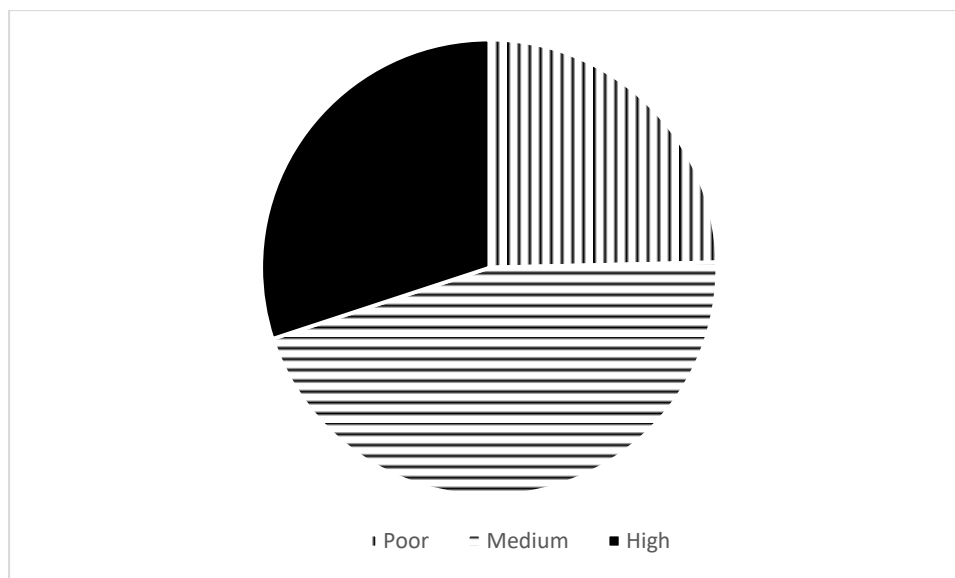
Almost half of the adolescents (45.32%) had medium adherence to MD (4-7 points); 30%, high adherence ( $\geq 8$  points); and 45.32%, poor adherence ( $\leq 3$  points) to MD (Fig. 1). Gender specific difference in favour of girls ( $p < 0.001$ ) was observed only in the group of medium adherence to MD (*data not shown*). Among parents, in 90 dyads (44.33%) the diet could be classified as high adherence to MD, in comparison with 113 dyads (55.67%) whose diet quality could be categorized as

poor adherence to MD. The average score for the KIDMED index was  $5.63 \pm 2.87$  out of a maximum score of 12, while for parents the average value was  $5.93 \pm 1.68$  out of a maximum score of 9 (Table 1).

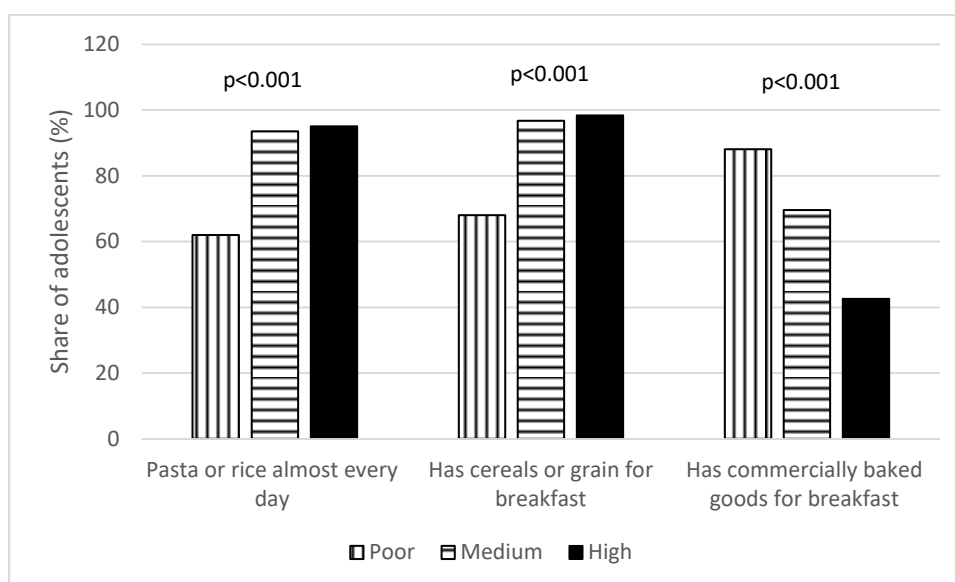
In a very recent review conducted by Idelson et al. (2017) it was confirmed that the KIDMED index has been widely used as a scoring system to evaluate the diet quality of children and adolescents. MD adherence widely varied within Mediterranean countries, with large differences also existing among various European countries, while few data are available for non-Mediterranean countries. Similar to our study, studies conducted in Spain, Italy and Greece have confirmed that the majority of children belong to the group of medium adherence to MD (Serra-Majem, 2004; Mariscal-Arcas et al., 2009; Del Mar Bibiloni et al., 2016).

**Table 1.** Descriptive statistics of adolescents and parents

<b>ADOLESCENTS</b>	
Gender:	n (%)
Boys	96 (47.3)
Girls	107 (52.7)
Total	203 (100)
Age:	
Boys	13.60 $\pm$ 1.18
Girls	13.32 $\pm$ 1.32
Total	13.46 $\pm$ 1.26
Nutritive status:	n (%)
Boys:	
Underweight	2 (2.08)
Normal weight	84 (87.50)
Overweight	8 (8.33)
Obese	2 (2.08)
Girls:	
Underweight	0 (0)
Normal weight	101 (94.39)
Overweight	5 (4.67)
Obese	1 (0.93)
Diet quality (KIDMED index)	Mean $\pm$ st.dev.
Boys	5.71 $\pm$ 2.94
Girls	5.56 $\pm$ 2.83
Total	5.63 $\pm$ 2.87
<b>PARENTS</b>	
Gender:	N
Mothers	203
Fathers	203
Total	406
Age (y):	Mean $\pm$ st.dev
Mothers	39.53 $\pm$ 5.59
Fathers	43.35 $\pm$ 6.39
Total	41.53 $\pm$ 5.99
BMI (kg/m <sup>2</sup> ):	Mean $\pm$ st.dev
Mothers	23.21 $\pm$ 2.85
Fathers	26.96 $\pm$ 3.36
Total	25.08 $\pm$ 3.10
Diet quality (Short Mediterranean diet questionnaire):	Mean $\pm$ st.dev
Mothers	
Fathers	6.02 $\pm$ 1.52
Total	5.86 $\pm$ 1.83
	5.93 $\pm$ 1.68



**Fig. 1.** The distribution of adolescents by level of adherence to MD scored by KIDMED index (poor:  $\leq 3$  points, medium: 4-7 points, and high:  $\geq 8$  points)



**Fig. 2.** The share of adolescents whose consumptions of cereals and bakery products were scored by KIDMED index (poor:  $\leq 3$  points, medium: 4-7 points, and high:  $\geq 8$  points)

To get the insight into the consumption of cereals and bakery products group, the questions dealing with these food groups were extracted from the KIDMED questionnaire and the data obtained are summarized in Fig. 2.

Within the poor MD adherence group, there is a small portion of adolescents who regularly consume pasta/rice or cereals for breakfast ( $p < 0.001$ ). On the other hand, in groups of medium or high adherence to MD, almost all participants consume these foods on a daily basis. The consumption of commercially baked

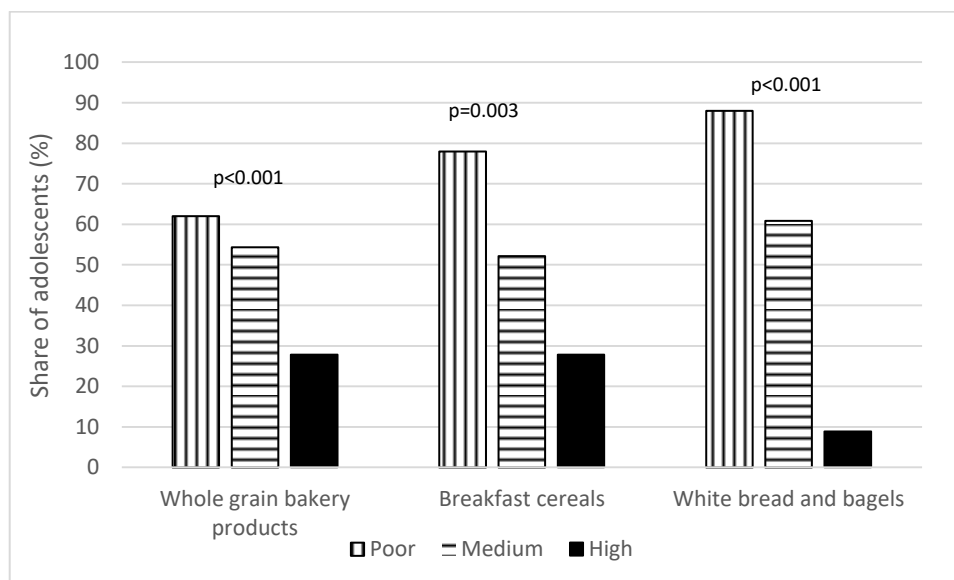
goods for breakfast is negatively scored within the KIDMED index since these products are full of fat and sugar and have a low nutrient density. Consequently, the consumption of this food group was in an inverse relationship with diet quality assessed by adherence to MD ( $p < 0.001$ ) (Fig. 2).

Cereal-based foods, whole grain in particular, including bread, have a vital role in maintaining health and well-being. Studies consistently indicate that the regular consumption of whole grain cereals helps to reduce the risk of cardiovascular diseases,

type 2 diabetes mellitus, certain types of cancer and several gastrointestinal pathologies (Gil et al., 2011). Despite the recommendatory intake of three servings per day of whole-grain products, it was shown worldwide that children and adolescents consume only about one serving of whole-grain products daily (Burgess-Champoux, 2006; Thane et al., 2005; Vereecken et al., 2005). The habits shown in our study sample relating to cereal consumption are better than the results obtained among Greek adolescents in which 37.2% of boys and 34.0% of girls consumed bread daily (Yannakoulia et al., 2004). It is noteworthy that almost three-quarters of our participants reported regular breakfast consumption. Similar to Lazarou and Matalas (2015) we have confirmed that regular breakfast eaters have a higher KIDMED index score. It is generally acknowledged that diet should be assessed holistically, taking into account not only

foods and food groups consumed but also dietary practices such as meal patterns (Hu, 2002).

The home, in which children and adolescents spend a lot of time, is an environment that has great potential for improving their dietary habits. In his ecological model of the home food environment, Rosenkranz hypothesised that three domains affect children's diets: built and natural environments; political and economic environments; and socio-cultural environments (Rosenkranz and Dzewaltowski, 2008). Out of these three, built and natural environments (home accessibility and availability of foods) and socio-cultural environments (parental diet, parenting practices and rules, and family eating patterns) may be opened the most to the intervention because they have the strongest bearing on children's lives. The willingness of adolescents to eat more food from the cereals group, providing this food was more available at their homes, is summarized in Fig. 3.



**Fig. 3.** The share of adolescents who would eat more cereal and bakery products if they were more available at their homes, scored by KIDMED index (poor:  $\leq 3$  points, medium: 4-7 points, and high:  $\geq 8$  points)

**Table 2.** The influence of parental adherence to MD on adolescents' consumption of cereals and bakery products

Adolescents' intake according to KIDMED questionnaire (n=203)	Parental adherence to MD (n=203)		p
	Poor n=113	High n=90	
Consumes pasta or rice almost every day (5 or more times per week)	86 (76.11%)	80 (88.98%)	ns
Has cereals or grains for breakfast	97 (85.84%)	85 (94.44%)	0.045
Has commercially baked goods or pastries for breakfast	84 (74.34%)	55 (61.11%)	0.043

**Table 3.** The influence of parental adherence to MD on adolescents' positive responses to the question: "Would you eat more of a certain food if it were more available at your home"?

Positive responses –n (%)	Parental adherence to MD (n=203)		p
	Poor n=113	High n=90	
Whole grain bakery products	72 (63.71%)	45 (50%)	0.049
Breakfast cereals	75 (66.37%)	48 (53.33%)	0.039
White bread and bagels	72 (63.72%)	63 (70.00%)	ns

**Table 4.** The influence of parental adherence to MD on adolescents' positive responses to the question: "Do your parents encourage you to eat more of certain foods?"

Positive responses –n (%)	Parental adherence to MD (n=203)		p
	Poor n=113	High n=90	
Eats breakfast cereals	88 (77.88%)	63 (79.00%)	ns
Eats whole grain bakery products	75 (66.37%)	72 (80.00%)	0.030

In comparison with other groups  $p < 0.001$ , the group of poor MD adherence expressed a higher percentage of willingness to eat all food from the group of cereal products, i.e. whole grain bakery products (62%), breakfast cereals (78%) and white breads and bagels (89%), if these foods were more available at their homes. As expected, the high MD adherence group has the access to the variety of different foods and only a small percentage of the group expressed a desire to eat more of the certain type of food ( $p < 0.001$ ) (Fig. 3).

Although the level of the parents' adherence to MD did not significantly influence the adolescents' weekly consumption frequency of pasta and rice, adolescents whose parents had higher adherence to MD more often ate cereals or grains for breakfast ( $p = 0.045$ ) and less frequently, commercially baked goods or pastries ( $p = 0.043$ ) (Table 2).

Associations found between parental adherence to MD and the willingness of adolescents to eat more cereal products if they were more available at their homes are presented in Table 3.

Adolescents of parents who had poor adherence to MD stated that they would eat more whole grain bakery products ( $p = 0.049$ ) and more breakfast cereals ( $p = 0.039$ ) if these foods were more often available at home (Table 3). Qualitative and quantitative studies conducted among adolescents consistently demonstrate that adolescents perceive that the availability of healthy food (i.e. fruit, vegetables, dairy) and the absence of unhealthy alternatives influence their intakes of those foods (Nielsen et al., 2002; Neumark-Sztainer et al., 2003; Hanson et al., 2005). In this study similar findings were confirmed for cereal products.

It was recently confirmed that parental support (more mothers' than fathers') was positively associated with adolescents' healthy eating habits (Schoeppe and Trost, 2015). Data about the effect of parental stimulus on adolescents' intake of cereals are summarized in Table 4.

Adolescents with parents who had higher adherence to MD stated that they were more often encouraged by their parents to eat whole grain bakery products ( $p = 0.030$ ), compared with their counterparts whose parents had lower adherence to MD (Table 4). Despite the widespread assumption that parents affect their children's dietary habits, these results have demonstrated that the potential influence parents could exert on their children's food choice might be greater by controlling the availability of food than via norms. This is a topic of interest in research dealing with the process of parental influence on children's attitudes and intakes (Wardle and Cooke, 2008). Despite some evidence indicating that when children and adolescents leave home they tend to keep the dietary beliefs and behaviour established at home, many studies similar to ours have failed to demonstrate strong parent-child resemblance in food preferences and intake. However, the importance of parents who might influence their children through foods purchased and served at home is clearly shown. Because of the influence that familiarity has on children's eating habits, providing opportunities for children to taste a wide selection of new types of food, can be expected to result in healthier eating habits.

Our study has had several limitations. Data on dietary intake and food availability were collected using self-report, which may be affected by social desirability

bias (Herbert et al., 1995). The literature reports that food under-reporting is quite common in epidemiological studies (Ventura et al., 2006). However, in many cases self-reporting is the only feasible method of assessing dietary intake. Considering that a short questionnaire was used to assess the parents' intake, it could be assumed that the short questionnaire may not have yielded results comparable to the estimates obtained from a KIDMED questionnaire for the adolescents' intake. As a result of this limitation, the association between parent and adolescent intake may have been underestimated. Finally, as the design of the study was cross-sectional, future research should focus on a nationally representative sample.

## Conclusions

The adolescents of parents who had higher adherence to MD more often ate cereals or grains for breakfast and less frequently commercially baked goods and pastries. However, the adolescents of parents who had poor adherence to MD stated that they would eat more whole grain bakery products and more breakfast cereals if these foods were more available at their homes. The obtained results revealed that food environment and parental eating behaviour are notable factors influencing adolescents' dietary intake. Current and future health programs should be aimed more at encouraging parents to adopt features of MD in their family food environment.

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