Compliance with Mediterranean Diet Quality Index (Kidmed) and Eating Patterns in School-age Children with Gaziantep, Turkey

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Abstract **Purpose/Aim:** The Mediterranean diet is reported as a healthy eating pattern with protective effects on cardiovascular diseases, cancer, diabetes, obesity and oxidative stress related disorders. The aim of this study was to assess the relationship between Mediterranean Diet Ouality Index (KIDMED), body composition and eating patterns in school-age children of Gaziantep, Turkey. **Methods:** The body weight (kg) and height (cm) are evaluated in accordance with the standards, body mass index (BMI) values >2 SD per age has been classified as obesity, body height under <- 2 SD per age has been evaluated as short body height (stunding), this evaluations are in accordance with World Health Organization (WHO, 2006) standards. The body composition of children is evaluated by Tanita BC 418, the degree of adherence to the Mediterranean diet was assessed by the KIDMED Index. The eating patterns of children have been obtained by 23-item questionnaire method. **Results:** A 26.5 % of the children obesity and 50.4 % shortness have been determined, whereas 7.7 % and 40.6 % have a good and a poor KIDMED index, respectively. A negative and statistically significant relation (p<0.05) has been indicated between the current body fat and the KIDMED index score. It has been determined that 38.4 % of the children omit meals, usually (54.7 %) breakfast is omitted. Also, 37.9 % of children prefer take tea during breakfast. **Conclusion:** Moreover encourage of childrens' adherence to Mediterranean diet in Gaziantep, there is a need for national plans and politicals to minimise childrens' shortness as a best measurement of nutritional status.

Keywords: children, healthy eating, body composition

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1. Introduction

In many advanced countries, the most important principle in the development of children is balanced and adequate diet [1]. The main objective of nutrition in school age children is to ensure healthy growth and development. With an adequate and balanced diet, expected growth and development is provided and resistance to diseases, cognitive development as well as school performance are increased. Also, childhood eating patterns are important in the prevention of some diseases seen in the adulthood [2]. It has been clearly demonstrated, childhood obesity will emerge in adulthood, particularly the risk of cardiovascular diseases [3]. The most frequently seen nutritional problems in the school age children are fatness and thinness. About 11 % of children aged 6-17 in the United States (US) drawing attention to be overweight, obese children are often ostracized by their peers, they are put under psychological stress, insecure, nervous, their situation is emphasized [4]. Wrong eating habits and physical inactivity are two main reasons for overweight and obesity. In the last 20 years 6-11 years overweight status increases more than 2-fold, which was 7 % in 1980 to 18.8 % in 2004. In between the age of 12-19 years, 3 times rate was found to be 5 % to 17.4 %. Overweight children are at risk for the formation of bone fractures, diabetes and sleep apnea [5]. In our country 35.8 % of primary school children is found iron deficiency anemia, that could be the result of their diet based of grain and so calcium, riboflavin minerals was detected insufficient [6]. In two different districts of primary school children in Diyarbakir, Turkey 16.8 % pointed out that insufficient energy and protein intake and 17.6% of them never have breakfast. In 889 children between the age of 9-11 years in Ankara, Turkey, determined that the number of meals consumed has increased in parallel with the socio-economic level, children consume breakfast regularly on the other hand, lunch usually consumed irregularly. Excessive consumption of fast food junk food are stated to be the main reasons of closure of appetite and inadequate nutrient intake [7]. Nutritional preferences and health problems vary from society to society, but population groups who adopt a Mediterranean diet are reported to experience lower rates of chronic diseases. A Mediterranean diet includes a high proportion of fruits, vegetables, unrefined natural cereals, legumes, dried nuts,

poultry, eggs, fish, low fat dairy products and a smal quantity of red meat. It provides antioxidant vitamins and carotens and prevent insufficient micronutrient intake [8]. The present study was designed and conducted to determine the body composition, eating patterns amongst school-age children living in a city, far away from Mediterranean Sea, Gaziantep, Turkey and to detect the extent to which their diet complies with Mediterranean Diet Ouality Index (KIDMED).

2. Material and Methods

The study was conducted in Gaziantep City which located in southeast of Turkey, between March and May, 2014. The study group included 92 boys (59.4 %) and 63 girls (40.6 %) between the age of 9-12 years. Body weights and heights of children were measured by scale and height scale. Body Mass Index (BMI) values was calculated by the formula: body weight (kg) / height (m²). BMI (kg/m^2) values > 2 SD per age has been classified as obesity, body height under <-2 SD has been evaluated as short body height (stunding), this evaluations are in accordance with WHO (2006) standards. The body composition of children is evaluated by Tanita BC 418.

Determination of Compliance to the Mediterranean Diet Ouality Index (KIDMED) and Eating Patterns

Compliance with the Mediterranean diet (KIDMED) index, developed by Serre-Majeur and friends, which includes the characteristics of the Mediterranean diet consisting of a total of 16 questions, that could be self-administered or conducted via a interview (dietitian, pediatrician etc.) (Table 1). The index ranged from 0 to 12

KIDMED, questions denoting a negative connotation with respect to the Mediterranean diet were assigned a value of -1, and those with a positive aspect were scored +1. According to the KIDMED index ≥ 8 points shows "optimal" diet quality (good),) 4-7 points "average" Mediterranean (middle), (3) ≤3 points "very low" diet quality (low).

In addition to the KIDMED index, a eating patterns test developed by the researchers was used to determine the eating patterns of children. The eating patterns test included 23 questions. Researchers were asked to submit a questionare form with questions on eating patterns. Questionnaires were administered face-to-face during course hours. Administering the questionnare took between 10 and 15 minutes. Researhers collected them immediately upon completion.

Statistical evaluation of data

Evaluation of the data, with the SPSS 15.0 statistical software package was used [9]. General descriptive statistics were used in the evaluation of eating habits. In this study, the qualitative data, the number of (n) and percentage (%) values calculated, while quantitative data mean (x), standard deviation (SD), was evaluated by calculating the upper and lower values. KIDMED index scores compared to the appropriateness of the Mediterranean diet and fat mass (kg) by the difference between the very way analysis of variance was evaluated. The relationship between the fat mass and KIDMED index score was determined using the pearson correlation coefficient. All statistical tests were taken as the lowest significance level of 0.05. All individuals in the school administration and informed about the study by researchers who wish to participate and mothers/fathers voluntary participation form (consent) has been signed.

Table 1. KIDMED test to assess Mediterranean diet quality in this study

		YES	NO
1	Every day I eat fruit or freshly squeezed fruit juice.		
2	A second would consume more fruit every day.		
3	Regularly once a day would consume fresh and cooked vegetables.		
4	I consume more fresh or cooked vegetables per day.		
5	I eat fish regularly (at least 2-3 times per week)		
6	To fast-food style restaurant (hamburger) go more than once a week.		
7	I love legumes more than once a week, and I'm exhausted.		
8	I eat pasta and rice almost every day (5 or more per week)		
9	Breakfast cereal (bread) or grain products (cereals) would consume.		
10	I eat nuts regularly (at least 2-3 times per week)		
11	I use olive oil at home		
12	Do not eat breakfast.		
13	I consume milk and dairy products for breakfast.		
14	Ready for breakfast I eat baked goods and pastries.		
15	2 cups daily milk / yogurt and / or a large slice (40g) cheese I consume.		
16	Sweet sugar and sweets several times a day would consume.		

3. Results

Distribution of data on how many times they eat in a day, skipped meals, which meals are skipped, consumption of anything in snack time are shown in Table 2. Data on

skipped meals showed that 71.7 % of children did not skip any meal, while 28.3 % skipped meals. Children who skipped meals included 47.8 % breakfast, 43.4 % lunch, 8.8 % dinner, not shown a significant difference between the sexes. When questioned their preferences at a snack time, 56.7 % stated that they prefer biscuits.

Table 2. The distribution of the data how many times children eat in a day, skipped meals, which meals are skipped, consumption of anything in snack (n = 155)

	Male		Female		Total	
	n	%	n	%	n	%
Meals number						
3	76	57.6	16	69.5	92	59.3
>3	56	42.4	7	30.5	63	40.7
Total	132	100.0	23	100.0	155	100.0
Skip meals						
Yes	27	29.3	17	26.9	44	28.3
No	65	70.7	46	73.1	111	71.7
Total	92	100.0	63	100.0	155	100.0
Skipped meals						
Breakfast	13	44.8	9	53.0	22	47.8
Lunch	14	48.2	6	35.2	20	43.4
Dinner	2	7.0	2	11.8	4	8.8
Total	29	100.0	17	100.0	46	100.0
Snacks						
Yes	67	72.8	52	82.5	119	76.7
No	25	28.2	11	17.5	36	23.3
Total	92	100.0	63	100.0	155	100.0

Mean and standard deviation values of childrens' body weight, height, BMI (kg /m^2), fat mass in their body composition values are shown in Table 3. Obesity and shortness are determined respectively 26.5 % and 50.4 % of children.

Table 3. Mean±SD values of childrens' body weight, height, BMI (kg/m^2), fat mass in their body composition values (n = 155)

Anthropometric measurements	Male (n:92) x±SD	Female (n:63) x±SD	TOTAL (n:155) x±SD
Body weight (kg)	35.4±11.30	30.8±9.43	35.2±10.55
Height (cm)	136.3±11.28	135.8±13.13	136.1±12.03
BMI (kg/m^2)	18.8±4.09	18.7±3.13	18.7±9.72
Body fat (kg)	8.5±5.38	9.4±4.35	8.9±4.99

Table 4. The distribution of answers of children that why they should consume meat, fruits vegetables, milk/yogurt, biscuits/cookies

Why should we eat meat? (n = 150)	n	%
Do not know	3	2.8
Healthy	30	28.5
Growth and development	50	55.9
To eat a balanced diet	9	10.0
Because it is delicious	2	2.8
Why should we eat fruits/vegetables? (n = 154)	**n**	**%**
Do not know	3	2.9
Healthy	64	62.7
For protein	1	0.9
To eat a balanced diet	32	31.3
For energy	2	2.2
Why should we eat milk/yoghurt? (n= 155)	**n**	**%**
Do not know	1	1.0
Healthy	32	31.4
Teeth, bone growth, height growth	68	66.6
To eat a adequate and balanced diet	1	1.0
Why should we eat biscuits/cookies?(n=43)	**n**	**%**
Do not know	4	26.6
For energy	3	20.0
Healthy	2	13.4
For love	6	40.0

In the study 96.8 % of children stated that they should consume meat, 99.4 % stated that they should consume fruit/vegetable, 100 % stated that they should consume milk, yogurt, cheese and 27.7 % stated that they should consume biscuits/cookies. 55.9 % stated that meat should be consumed for growth and development, 62.7 % stated that fruit/vegetables should be consumed for healthy, 66.6 % stated that milk/yogurt should be consumed for bone and height growth, 20 % stated that biscuits/cookies should be consumed for energy (Table 4).

The question of which was the three most important food that we must consume, 58.6 % of them answered meat, 32.4 % of them answered milk/yoghurt, 51 % of them answered egg. On the other hand, the question of which was the three most important food that we must not consume, 61.8 % of them answered cips, 47.1 % of them answered carbonated soft drinks, 23.2 % of them answered sugar.

When asked children where they learn whether the food is healthy and must consumed 81.7 % stated that from parents, 18.3 % stated from their teachers. When asked children where they learn whether the food is unhealthy and must not consumed 66.6 % stated that from the taste, 33.4 % stated that from their parents.

In the study 57.4 % of children stated that there is a food that their parents not allowed to consume, but they

like to consume and 88.4 % of them said it is cips. It is determined that 36.8 % of children consume fast foods once a month, 23.2 % once a week, 21.9 % twice a month, 16.1 % three times a month, 1.3 % everyday. It is determined that 60.6 % of children consume milk everyday, 43.9 % of children consume yoghurt everyday, 31.6 % of children never consume vegetables, 23.9 % of children consume legumes once a week, 50.3 % of children consume egg everyday. The KIDMED index score for boys is 6.7 ± 2.16, compared to 7.2±2.21 for girls. This difference was not found to be statistically significant (p>0.05). 40.6 % of children had a very poor diet, 51.6 % had a diet that needed improvement and 7.7 % followed a diet of optimal quality.

Anthropometric measurements of children according to the KIDMED index scores' are shown in Table 5. The fat mass for children who had a very poor diet was 10.7±7.89 kg, 19.0±3.86 kg for children who had a diet that needed improvement and 7.9±3.97 kg for children who had a diet of optimal quality, no statistically significant difference was found between groups (p>0.005). It was found a statistically significant negative correlation between the body fat mass and KIDMED index scores of children (r = 2.47, p <0.05).

Table 5. Anthropometric measurements of children according to the KIDMED index scores' (n=155)

KIDMED Index Score	Range	Mean±SD
Low (n:12)		
Body weight (kg)	24.7-71.5	38.1±13.76
Height (cm)	117.0-153.0	134.7±10.00
BKI (kg/m^2)	14.7-30.5	20.6±5.45
Body fat mass (kg)	4.7-26.5	10.7±7.89
KIDMED Index Score	**Range**	**Mean±SD**
Medium (n:80)		
Body weight (kg)	20. -72.6	36.1±10.56
Height (cm)	107.0-157.0	137.3±11.38
BKI (kg/m^2)	14.0-31.8	19.0±3.86
Body fat mass (kg)	3.6-27.3	9.39±5.11
Optimal (n:63)		
Body weight (kg)	18.2-69.3	33.4±9.75
Height (cm)	100.0-156.0	134.9±13.16
BKI (kg/m^2)	13.2-28.8	18.0±2.97
Body fat mass (kg)	3.0-25.0	7.9±3.97

4. Discussion

Healthy eating at school age supports proper growth and development, school success, prevents obesity, eating disorders, dental caries, iron deficiency anemia, additionally in the adulthood inhibits heart disease, cancer and stroke (the three main causes of death) [5].

Growth and development refers to physical and mental maturation process. In the evaluation of growth at school-age children body weight for age, height for age, BMI (kg/m^2) for age and weight for height are most commonly used. [10]. At the end of 2006 April, the new growth curves for breastfed children was published by WHO. It has a larger sample (428 boys, 454 girls) and short

measurement intervals (at birth, 7 days, 14 days, 2 months, and then every 2 weeks every month). This WHO curves allow watch rapid changes in growth as specially in early infancy (physiological weight loss in the early days included). WHO weight for height curves are longer than the CDC (Centers for Disease Control and Prevention) (110 cm versus 103 cm), similarly, weight for height curves begin earlier than CDC curves (65 cm versus 78 cm), so it can be more effective in populations with high rates of stunting. For these reasons, we used WHO Child Growth Standards (2006) to assess growth and development of children in our study [11].

In our study children is evaluated according to height and BMI for age, 26.5 % of the children obesity, 50.4 % shortness has been determined. Shortness is found more frequently than the obesity in school-age children in Gaziantep. Local practices, climate, food culture and eating patterns can be associated with different effects in case by playing an active role in the growth and development.

United States Department of Agriculture (USDA) Nutrition Education and Training Program (2000), highlighted that nutrition education must be a fundamental part of all child nutrition school programs, even in summer camps have drawn attention to the promotion of the implementation [12].

In our study childrens' knowledge of whether they must eat meat, fruits/vegetables, milk/ yoghurt and biscuits/cookies and why they should consume or not is evaluated. 96.8 % of the children stated that they should consume meat, 99.4 % stated that they should consume fruit/vegetable, 100 % stated that they should consume milk, yogurt, cheese and 27.7 % stated that they should consume biscuits/cookies. 55.9 % stated that meat should be consumed for growth and development, 62.7 % stated that fruit/vegetables should be consumed for healthy, 66.6 % stated that milk/yogurt should be consumed for bone and height growth, 20 % stated that biscuits/cookies should be consumed for energy. It is shown that our study population is interested in healthy nutrition, although a small group (27.7 %) stated that they should consume biscuits/cookies. This can be explained by the effects of school canteens and advertisements on TV. The question of which was the three most important food that we must consume 58.6 % of them answered meat, 32.4 % of them answered milk / yoghurt, 51 % of them answered egg. On the other hand, the question of which was the three most important food that we must not consume, 61.8 % of them answered cips, 47.1 % of them answered carbonated soft drinks, 23.2 % of them answered sugar. In general, children knows which foods we must consume or not.

When asked children where they learn whether the food is healthy and must consumed 81.7 % stated that from parents, 18.3 % stated from their teachers. When asked children where they learn whether the food is unhealthy and must not consumed 66.6 % stated that from the taste, 33.4 % stated that from their parents.

In a study, students role-model education and nutrition knowledge of the primary school teachers are evaluated. Nutrition knowledge and knowledge resource of 143 teachers working in 15 different cities are evaluated by the questionaire method. Of these 80.9 % had poor nutrition knowledge and 19.1 % had optimal nutrition knowledge was found, it was noticed that they learnt nutrition

information frequently from media. In the result, teachers need nutrition education and the information received from the media will not provide a sufficient level of knowledge is determined. In addition to the faculty of teacher education curricula and nutrition training programs would be appropriate to put has been suggested [13].

Effective nutrition education can be achieved only, all teachers take part in nutrition education programs. It is stated that education programs be more effective when meet the specific needs of teachers and planned of their nutrition knowledge level [4].

In the present study 18.3 % of children stated they learn whether the food is healthy and must consumed from their teachers, so in our country adequate nutrition knowledge of teachers is necessary. Currently in Turkish schools, nutritional programs are still implemented with contributions and the support of the students' families mainly.

In a lot of studies it has been reported that family food choices directly affect childrens'. It has shown that the most effective way to change childrens' eating behaviour is change familys' behaviour and family has a oppurtunity to see the result [4].

In the present study 57.4 % of children stated that there is a food that their parents not allowed to consume, but they like to consume and 88.4 % of them said it is cips. Because of cips high fat and salt content, health advisors said must not consume cips for children.

Data on skipped meals showed that 71.7 % of children did not skip any meal, while 28.3 % skipped meals. Children who skipped meals included 47.8 % breakfast, 43.4 % lunch, 8.8 % dinner, not shown a significant difference between the sexes. When questioned their preferences at a snack time, 56.7 % stated that they prefer biscuits. Skipping meals come to with inadequate nutrition and results growth retardation.

In the present study 37.9 % of children stated that they prefer tea as a drink in the breakfast. In a previous study conducted in school-age children Turkey, found that children who consume tea as a drink the breakfast had a calcium deficiency [14].

Breakfast has an important impact on brain function and cognitive development. After a night starvation, it obtains nutrient for central nervous system and a children who eats breakfast regulary have a well-balanced diet usually [15]. In a study that evaluated impact of breakfast on eating behaviours and school performance in the middle school children, children divided between two groups. One group have a breakfast regularly for 4 months and the others are evaluated as acontrol group. At the end of the study it was detected that BMI values are increased significantly in the control group. There is not any effect was found on school performance, but it is noticed that childrens' satisfaction of school is picking up and prevent the possibility of obesity development. In additionally, specially in adolescents and young adults, school breakfast programs have been suggested the most important way to fight against obesity [16].

It is determined that 36.8 % of children consume fast-foods once a month, 23.2 % every week, 21.9% of twice a month, 16.1 % three times a month, 1.3 % every day in our study. In food culture in Gaziantep kebabs take the biggest portion, so in this age group of children in Gaziantep it is not a suprise finding that fast food consumption is slightly less than in other regions.

In the studies it is found that increase of fruit/vegetables consumption decrease cancer incidence about 6-28 % and the cardiovascular mortality about 6-22 %. In contrast, the average fruit and vegetable consumption in the US for young people 3.6 servings, 4.3 servings for adults [16].

In our study, it is determined that 60.6 % of children consume milk everyday, 43.9 % of children consume yoghurt everyday, 31.6 % of children never consume vegetables, 23.9 % of children consume legumes once a week, 50.3 % of children consume egg everyday.

The environment of food consumption, canteens, foods around the school, nutrition education, nutrition knowledge and support of family effect school-age children eating behaviours, however it is emphasized that social environment is the most critical part in that point [1].

In CDC guidelines school nutrition education programs is defined as help young people to gain right habits, health, provides several chances to feed heathly, make nutrition education activities funny and is an important part of nutrition policy coordination between the teachers, coordinators and community leaders [5].

In additionally, in this study KIDMED index adapt to the Mediterranean diet was evaluated between the relationship with body composition was examined in children aged between 9-12 years living in Gaziantep. The average KIDMED index score of children was determined 6.9 ± 2.19. As in another study, conducted by Kabaran et al. in Turkish Republic of Northern Cyprus (KKTC) there were no differences according to gender [17].

In another study in 3166 children between the age od 6-24 years, it is determined thar as an increase in KIDMED index score, fiber, calcium, potassium, phosphorus and all vitamins (except vitamin E) consumption is increased. In the children with poor KIDMED index score were found insufficient intake of calcium, magnezium, vitamine B6 and C. Therefore concluded that KIDMED index score is an indicator of the nutritional quality index [18]. Lazaro et al [19] noticed that nutrition quality is increased with high KIDMED index score and it can be good measurement to evaluate healthy feeding baheviours in children.

In our study determined that 40.6 % of school-age children in Gaziantep have a poor (KIDMED score≤3), 51.6% of them have a medium (nutritional intervention is required) and 7.7 % of them have a good KIDMED index score.

Another study conducted in Ankara, Turkey included 890 children between the age of 10-14 years, 17.9 % are reported to have a poor KIDMED score [20]. In this case it can be the result of Gaziantep food culture and especially in adulthood brought the necessity to create awareness about the potential risks are inevitable.

In another study conducted in Turkey by Samur et al [20], included 84 elementary school students between the ages of 10-12 years. Of those, 76.2 % had optimal KIDMED index score and negative correlatin was found between the BMI (kg/m^2) and KIDMED index score. In our study there was no relationship was found between the KIDMED index score and body weight, height and BMI (kg/m^2), but it was found a statistically significant negative correlation between the body fat mass and KIDMED index score ($r = 2.47$, $p < 0.05$).

Reduction of body fat mass (kg) with the increase of KIDMED index score confirmed the protective effect of the Mediterranean diet. High fiber content and suitable fatty acid pattern are the basic elements that contribute to this property.

5. Conclusion

In the study results show that KIDMED index, therefore, adequate and balanced diet plan at school-age children, maintains body fat mass reduction and prevents growth retardation.

In contrast with the accretion in obesity throught the country, school-age children in Gaziantep shortness is found high incidence and lower compliance with the Mediterranean diet. Because of the lack of study that evaluate the nutritional status of children in Gaziantep, our study is important with the findings of growth retardation and relation between the eating patterns in this age group. But it is inevitable design a prospective study to investigate the relationship between Mediterranean diet and obesity. Also investigation of nutrition-related problems, assessment of nutritional status and nutrient deficiencies in Gaziantep must be identified with future studies are needed.

To ensure a healthy future for our children, school administrators, community administrators, parents, school nutritionists should take responsibility and support in the implementation of nutrition education programs. Governments should dupport the food industry in producing helathy food and the state, family, schools and related sectors shoul cooperate in improving health.

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