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Growth, the Mediterranean diet and the buying power of adolescents in Greece

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Abstract

Background: The aim of the present cross-sectional study was to evaluate associations between pocket money, Mediterranean diet (MD) adherence and growth among Greek adolescents.

Methods: A total of 319 (157 boys and 162 girls) Greek adolescents, aged 10–18 years participated in the study. Pocket money was recorded, MD adherence was assessed with the KIDMED score and growth was evaluated using the World Health Organization (WHO) growth charts.

Results: Participants receiving pocket money exceeding 6.0€ daily demonstrated increased fast-food consumption and breakfast skipping. Overall, a negative relationship was revealed between pocket money and obesity. However, lower allowance receivers were less likely to be obese, consume fruit per day and more likely to consume breakfast and sweets, compared to average pocket money receivers. Increased MD adherence was associated with a lower risk of overweight and as expected, unhealthy eating habits were observed among obese adolescents.

Conclusions: Interrelationships tend to exist between MD adherence, pocket money and growth among adolescents.

Keywords: adolescence; body mass index (BMI); daily allowance; KIDMED; nutrition; obesity; overweight; pocket money.

Introduction

Among others, Southern Europeans seem to be particularly affected by the phenomenon of nutrition transition [1, 2]. Literature suggests that adults [1, 3], youngsters [4] and children [2, 5] appear to deviate from the traditionally healthy dietary pattern of the Mediterranean basin, in favor of a more Westernized diet, characterized by increased processed meat, sugar and fat consumption.

In parallel, the south of Europe, and Greece in particular, is affected by excessive childhood and adolescent obesity rates [6, 7], known as the European geographical gradient in childhood obesity [8] and attributed to differences in the climate and socio economic status (SES) compared to the north of the continent [9]. Several factors have been researched in an effort to explain excessive overweight and deviations from the traditional Mediterranean diet (MD) in Greek youth, including genetic/familial factors [10], geographic prevalence [7], SES [11] and sedentary behavior [12]. However, according to the literature, pocket money is an

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equally important, often underestimated, factor modifying food choices among youngsters that increases the consumption of unhealthy food [13–15], and subsequently, the prevalence of overweight [16, 17].

Overall, research appears unanimous on the detrimental effects of pocket money on adolescent diet quality. Pocket money increases the consumption of sugar [13, 14, 17] and out-of-home snacks [14, 15, 18]. In parallel, it appears to be a significant predictor of overweight and obesity, as well as of physical inactivity [15–17, 19]. Despite the compelling evidence indicating the importance of pocket money on youth's nutrition and health, the number of relevant studies conducted in developed countries is limited, while additionally, parents and stakeholders appear oblivious to the effects of daily allowance on adolescent health.

The present study was designed to evaluate associations between pocket money, MD adherence and growth among Greek adolescents.

Materials and methods

Sample characteristics

A total of 398 adolescents, aged 10–18 years (mean age 12.7 ± 2.0 years), via advertisement at nutrition-related events for the public, volunteered to participate in the study. Of these, those with missing data were excluded and the final sample consisted of 319 adolescents (157 boys and 162 girls), originating from 34 districts throughout Greece. When participants were grouped in age categories, 28.5% were primary, 56.1% were secondary and the remaining 15.4% were high-school students. The sample was equally distributed to urban-rural adolescents, with 50.2% residing in urban and 49.8% in rural areas of the country, based on a the 10,000 resident cut-off [20].

Ethical approval

Ethical permission for the study was provided from the Aristotle University's Bioethics Committee, in compliance to all the relevant national regulations, institutional policies and in accordance with the tenets of the Helsinki Declaration and its latter amendments. This research received no specific grant from any funding agency or commercial or not-for-profit sectors.

Instruments and procedures

MD adherence was evaluated with the mediterranean diet quality index for children and adolescents (KIDMED) index [21], a short questionnaire appropriate for youngsters. The KIDMED has a total of 16 questions with dichotomous positive/negative answers, grading the overall MD

adherence of adolescents. The domains measure the consumption of fruits, vegetables, fish, pasta/rice, cereals, yoghurt/cheese, nuts, dairy and commercial baked goods; breakfast intake, frequency of skipping breakfast, fast-food intake, sweet and candy consumption as well as the use of olive oil during cooking at home are also measured. The majority of questions (12) are based on good dietary practices according to the MD regimen and may increase the score (+1 point), while the remaining four questions may decrease the score (-1 point). Therefore, the overall score can range from 0 to 12 points. Three tiers of MD adherence have been proposed to grade the overall score [21]: (1) KIDMED \geq 8 indicates optimal MD adherence; (2) $4 \leq$ KIDMED \leq 7 shows the need for improvement according to the MD pattern; (3) KIDMED \leq 3 indicates the adoption of a very low diet quality.

Weight and height of all participants were measured during the morning hours, with a Seca 874 digital scale and a Seca 214 stadiometer (Seca GmbH & Co., Hamburg, Germany). Body mass index (BMI) was calculated for each adolescent as the ratio of the body weight (kg) divided by the square of stature (m^2) and the World Health Organization (WHO) Anthro software [22] was used to calculate BMI-for-age (BMIz) and height-for-age (HAZ) z-scores for each participant. Underweight (i.e. acute malnutrition) (BMIz \leq -2.0), normoweight (-1.99 \geq BMI < 1.0), overweight (1.0 \geq BMI < 2.0) and obesity (BMIz \geq 2.0) were defined according to the WHO criteria [23] and stunting (chronic malnutrition) as HAZ \leq -2.0.

Statistical analyses

Statistical analysis was performed using PASW Statistics 21.0 (IBM® SPSS® Inc., Chicago, IL, USA). Descriptive data are presented as means ± standard deviations (SD) for continuous variables, or as percentages when categorical variables were concerned. Normality of continuous variables was assessed using the Kolmogorov-Smirnov test and equality of variances with the Levene's test. As continuous variables were not normally distributed. Kruskal-Wallis and χ^2 -tests were applied to evaluate differences between groups. Relationships between KIDMED components, pocket money categories and body weight tiers were assessed with binary logistic regression, after adjustment for potential confounders (gender, age and residence status). Subsequently, KIDMED and pocket money categories were inserted as predictors in the multinomial logistic regression models, in order to assess their impact on body weight status. In further detail, in the first step, unadjusted odds ratios (uOR) with their corresponding 95% confidence intervals (95% CI) were calculated separately for each predictor (model 1 for KIDMED and model 2 for pocket money). In the second step, the models were adjusted for potential confounders (age, gender and residence status) and their adjusted OR (aOR) with the 95% CI were calculated. Finally, a multivariable model was employed to assess the simultaneous effect of the two predictors on body weight status (model 3), and it was also adjusted for the same potential confounders. Multicollinearity was assessed via the tolerance and the variance inflation factor (VIF) [24]. We controlled for the effect of the stunted children on the analysis, by excluding them from the aforementioned models. The significance level was set at p < 0.05.

Results

Obese, overweight and normal-weight participants composed 19.4%, 26.6% and 53.9% of the sample, respectively (Table 1). Overall, nine adolescents were stunted (six of normal weight, two overweight and one obese).

KIDMED and pocket money

The likelihood of each KIDMED component to appear either in average or high pocket money tiers vs. the lower allowance category, was compared via logistic regression. Average allowance receivers were twice as likely as low allowance receivers to consume a fruit per day (OR=2.00, 95% CI = 1.06 - 3.79; p = 0.033), almost 1.7 times more likely to skip breakfast (OR=1.69, 95% CI=1.01–2.83; p=0.047) and 64% less likely to consume sweets and candies several times daily (OR = 0.36, 95% CI = 0.21-0.60; p < 0.001). High allowance receivers were approximately 2.6 times more likely than low allowance receivers to consume fast food (OR = 2.64, 95% CI = 1.20 - 5.79; p = 0.015), and about twice as likely to skip breakfast (OR = 2.08, 95% CI = 1.05 - 4.12; p = 0.035).

KIDMED and body weight status

When the same analysis was repeated with body weight status, obese adolescents were more likely compared to their normoweight peers to consume fast food more than

once per week (OR = 3.35, 95% CI = 1.53-7.33; p = 0.002), to consume baked foods and pastries for breakfast (OR = 2.21, 95% CI = 1.17 - 4.18; p = 0.015), to consume sweets and candies several times daily (OR = 2.09, 95% CI = 1.09 - 4.00; p = 0.025) and they were 76% less likely to consume pulses more than once per week (OR = 0.24, 95% CI = 0.13 - 0.48; p < 0.001) and 65% less likely to consume fish at least 2-3 times weekly (OR = 0.35, 95% CI = 0.17 - 0.71; p = 0.004). On the other hand, overweight participants were 2.2 times more likely than normoweight adolescents to consume two vegetables daily (OR = 2.20, 95% CI = 1.14-4.24; p = 0.018).

The results of the multinomial logistic regression model 1 for the impact of KIDMED on weight status are presented in Table 2. Low KIDMED participants were 2.8 times more likely to be obese compared to high MD adherers (uOR=2.78, p=0.030). This relationship was supported and enhanced in the adjusted model (aOR=4.2, p = 0.005). Overweight status was not associated with any KIDMED category (all p>0.05) and followed an inverse relation with all (all OR < 1.0).

Pocket money and body weight status

Allowance categories were inversely related to obesity and overweight (Table 2, model 2). Having an average allowance, as compared to the lowest pocket money tier, entailed a 54% lower risk of obesity (uOR = 0.46, p = 0.019), a result consistent in the adjusted analysis (aOR=0.44, p = 0.021).

Table 1: Sample characteristics among body weight status tiers (Mean and SD, or %).

Characteristic	Normoweigh	t (n=172)	Overweigl	ht (n=85)	Obes	se (n=62)	p-Value
Gender							
Boys, %	36		52	43			< 0.001
Age, years (mean SD)	13.2	2.2	12.5	1.8	11.8	1.5	0.026a
KIDMED (mean SD)	6.5	2.8	6.6	2.4	5.6	2.2	0.049ª
Low, %	13.4		9.4		21.0		0.073
Average, %	52.3		51.8		59.7		
High, %	34.3		38.8		19.4		
Pocket money, € (mean SD)	4.5	3.6	4.8	4.1	4.1	5.0	0.026a
Low (0.0-2.9€), %	34.3		36.5		53.2		0.128
Middle (3.0–5.9€), %	47.1		44.7		33.9		
High (≥6.0€), %	18.6		18.8		12.9		
Residence							
Urban, %	52.9		49.4		43.5		0.444
Rural, %	47.1		50.6		56.5		

^aAccording to the Kruskal-Wallis test. SD, standard deviation.

Table 2: Univariate and multivariate logistic regression models of the impact of KIDMED and pocket money on body weight status.

	Predictors	Obese vs. normow	moweight		Overweight vs	Overweight vs. normoweight	
		u	uOR (95% CI)	aOR (95% CI)	u	uOR (95% CI)	aOR (95% CI)
Model 1	KIDMED, categories						
	Low	13/23	$2.78 (1.11-6.98)^a$	4.20 (1.54–11.42) ^b	8/23	0.62 (0.25-1.55)	0.76 (0.29–1.96)
	Average	37/90	2.02 (0.98-4.20)	2.04 (0.95-4.38)	44/90	0.87 (0.5–1.53)	0.87 (0.48-1.55)
	High	12/59	Ref	Ref	33/59	Ref	Ref
Model 2	Pocket money, categories	ories					
	>0.0€	8/32	0.45 (0.19–1.08)	0.40 (0.15-1.04)	16/32	0.95 (0.45–2.00)	0.87 (0.39-1.95)
	3.0-5.9€	21/81	$0.46 (0.24 - 088)^{a}$	$0.44 (0.22-0.88)^{a}$	38/81	0.89(0.50-1.60)	0.84 (0.45-1.56)
	0.0-2.9€	33/59	Ref	Ref	31/59	Ref	Ref
Model 3	KIDMED, categories						
	Low	13/23		4.20 (1.51-11.65) ^b	8/23		0.74 (0.29-1.93)
	Average	37/90		2.01 (0.93-4.36)	44/90		0.86 (0.48-1.54)
	High	12/59		Ref	33/59		Ref
	Pocket money, categories	ories					
	>0.0€	8/32		$0.36(0.13-0.98)^a$	16/32		0.89 (0.40-1.99)
	3.0-5.9€	21/81		0.46 (0.23-0.95) ^a	38/81		0.84 (0.45-1.56)
	0.0-3.0€	33/59		Ref	31/59		Ref

a/bSignificantly different from univariable or multivariable logistic regressions at ap<0.05, bp<0.01. uOR, unadjusted odds ratios; aOR, adjusted odds ratios for gender, age and residence status; CI, confidence intervals; Ref, reference category.

Simultaneous effect of KIDMED and pocket money on body weight status

Results of the multivariable logistic regression are presented in Table 2 (model 3). Low MD adherers were 4.2 times more likely to be obese (aOR=4.2, p=0.006), a result consistent with the logistic model 1. Average and high allowance receivers were 54% (aOR = 0.46, p = 0.035) and 64% (aOR=0.36, p=0.045), respectively, less likely to be obese compared to low allowance receivers. This significant inverse relationship between high allowance and obesity was the only observed difference between models 2 and 3.

Effect of stunting on the analyses

We explored the effect of stunting on our models by excluding the stunted adolescents (n=9). This adjustment failed to produce different results or change the significance of the relationship between low KIDMED adherents and obesity on the logistic model 1 (aOR = 4.2, 95% CI=1.53–11.51; p=0.005). Significant relationships and lowered risks were revealed however, among the three allowance categories and obesity, in contrast to the second model, where only the effect of average allowance revealed significant findings. In further detail, both the highest and average allowance categories exhibited lower obesity risk (aOR = 0.37, 95% CI = 0.14-0.97; p = 0.044 and aOR = 0.39, 95% CI = 0.19-0.79; p = 0.009, respectively). An analysis of the simultaneous effect of our predictors on logistic model 3 was not altered substantially in terms of the relation trends, obesity risks or significance. An analysis of overweight status with the exclusion of stunted participants yielded similar results.

Discussion

Our study verifies the relationship between adolescent buyer power, MD adherence and overweight. Participants receiving pocket money exceeding 6.0€ daily demonstrated an increased fast-food consumption and breakfast skipping. Overall, a negative relationship was revealed between pocket money and obesity. However, average allowance receivers as compared to the lower receivers, were less likely to be obese, consume a daily fruit and more likely to have breakfast and sweets compared to average pocket money receivers. Increased MD adherence was associated with a lower risk of overweight, and as

expected, unhealthy eating habits were observed among obese adolescents.

Several studies have associated children's daily allowance with unhealthy eating habits during the last vears. Throughout the literature children with greater daily allowance tend to consume more soft drinks [13]. In Tunisia [14] and Vietnam [18] and China's mega-cities [25], pocket money has been associated to increased snacks, fast-food and out-of-home consumption. In Greece [15], pocket-money was correlated with the total energy, fat, saturated fat, cholesterol, sugar and carbohydrate intake of adolescents and additionally, among girls, diet quality measured by healthy eating index declined, with the increase in pocket money [15]. Apart from unhealthy eating habits, pocket money has been associated with increased health issues and addiction problems including tobacco [26, 27] and drug usage [28]. Parents, however, are not oblivious to their children's use of pocket money; in China [25], parents who were concerned about their children's health and eating habits tended to reduce their daily allowance.

Previous studies have suggested that eating outside the home occurs mainly during breakfast and for snacks [18], and according to our results increased pocket money was associated with breakfast skipping. As the preparation of breakfast is often a mother's responsibility, Taha and Marawan [29] argued that maternal employment might be a factor attributing to an increased breakfast skipping prevalence among today's children. Given that independent of all sociodemographic factors the availability of pocket money is considered as a key predictor of eating outside home [18], it becomes evident that breakfast skipping can be controlled via the reduction of the daily allowance and the availability of a prepared meal to every student, before leaving for school.

In Egypt [29], Jordan [19], Greece [15, 17] and China [25], the relationship between pocket money and increased adiposity among children and adolescents appears unanimous and extends beyond the consumption of unhealthy food. In our sample, however, greater pocket money receivers were less likely to be obese compared to lower allowance receivers, corroborating the results from the USA [16]. Three possible explanations could drive this phenomenon. The first is that our sample used adolescents and according to Frye and Heinrich [30], daily allowance is increasing by age, with adolescents receiving greater pocket money compared to younger children, whereas the majority of the literature has included a mixed sample of children, aged until mid-adolescence. Additionally, the prevalence of obese adolescents in Greece appears to be declining with increasing age [6], thus the use of late adolescence participants, who tend to receive greater pocket money, might explain the observed lower prevalence of obesity among greater allowance receivers. This difference in the sample used herein compared to the samples in the majority of the literature increases the amount of pocket money received by participants in the present study, while entailing a reduced obesity prevalence. The second explanation could lie in the SES of the participants, which however, was not assessed herein. Parents of high SES children are more likely to be educated and monitor their children's diet [31]. According to Choukem and associates [32], children of high SES families are more likely to consume three meals per day, subsequently limiting the amount of food eaten outside home, while ameliorating diet quality [33]. Additionally, a negative gradient has long been described between the SES and overweight/obesity among children in the developed world [16, 30, 34] and Europe in particular [35], providing further verification to our findings. As in the present study, in the USA [16], students who received more pocket money demonstrated a reduced obesity risk. Thirdly, as Wang et al. [16] have promptly pointed out, parents of overweight/obese children are more likely to limit their children's pocket money, leading to a reverse relationship between overweight and daily allowance.

However, in accordance with the literature, when average and low allowance receivers herein were compared, the first were more likely to be obese, a fact that could be attributed to a possible lower SES of these participants, leading to an effect similar to that demonstrated in the developing countries. Overall, in the developing world, families with greater income have been suggested to provide increased allowance to their children [36], and the relationship between SES and overweight/obesity is known to be a positive one [37]. Research has showed that children growing up in high SES families in the developing world have more chances of being overweight [24, 34–38], a finding attributed to several factors. Many children in high SES families appear to be living in obesogenic environments of abundance, leading to a positive energy balance, characterized by a concurrent physical inactivity and increased energy intake. For instance, high SES children in the developing world are more likely to be transported to school, consume more meals per day and have access to electronics, resulting in greater screen-time [32], which, concurrently increases metabolic risk [39]. Apart from the increased family income, other factors appear to contribute to an increased daily allowance toward minors. Family characteristics, such as maternal employment [29, 40], children studying in private vs. public schools [41], mothers frequently eating out of home and rare family dinners [25], have also been proposed as pocket money boosters. According to research from Turkey, the consumption of chips, hamburgers and fast food by minors increases concurrently with the increase in the income level of families [41]. As per Kululu's suggestion [36], low SES children are more likely to have lunch at home and in parallel, eat snacks at school, when they can afford it. The limited intake of fresh commodities such as fruits has also been described among low SES children in Cameroon [32].

As seen in previous research [42, 43], the present study verified the reduced risk of overweight among youngsters with increased MD adherence. According to recent findings, MD adherence appears to be associated with both SES [44, 45] and the cultural background of individuals [46]. Several components of the MD have been associated with lower BMI, including frequent legume, fresh fruit, vegetable and nut intake. As a result, today, numerous interventions aiming to tackle obesity are using MD education strategies [47, 48].

Regarding the limitations of the present study, our findings are biased by the cross-sectional nature of the experimental design and the use of a relatively small, non-purposeful convenience sample instead of a representative one. Additionally, SES of participants was not recorded as it is difficult to accurately categorize a family's SES when interviewing minors. However, the results herein agree to the majority of the literature and offer an insight on the effect of pocket money on MD adherence and weight status, during adolescence.

The effect of pocket money on health was first proposed nearly a century ago, by Wilkins [23, 49], when examining differences in the diet between children in New Zealand and the UK. As adolescents are not presumed to give high priority to their long-term health prospects, the daily allowance might often lead to an unhealthy dietary intake [13]. With an increasing number of mothers working full time and a parallel increase in single-parent families, the daily allowance of minors becomes a crucial factor contributing to their diet. During the last decade, nutrient-specific taxes have been suggested as a useful tool to induce healthier nutritive bundles. However, despite the early wake-up calls and the variety of scientific data, the purchasing power of adolescents is not accounted for when developing interventions to improve their diets [18]. Thus, scientists and parents need to pay more attention on the effects that pocket money entails on the diet and weight status of children, both at the primary and secondary prevention level.

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