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CHILDREN`S LIFESTYLE BEHAVIORS IN RELATION TO ANTHROPOMETRIC INDICES: A FAMILY PRACTICE STUDY

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Abstract

Introduction. *Obesity prevention in children represents one of the main concerns in primary care. In order to develop into a healthy adult, the child has to follow a healthy lifestyle in all aspects: nutritional, behavioral, physical and recreational. Our main goal was to identify which habits may influence the children's somatic development.*

Method. *Our study, performed in a family practice, consisted in a questionnaire regarding physical activity, diet and use of electronic devices.*

After obtaining the parent's and child's informed consent to participate in our cross-sectional study, 98 consecutive children aged 5-15 years, examined in the family practice, were enlisted. After collecting the answers, weight, height, waist circumference, wrist circumference, subscapular skinfold thickness were measured and body mass index was calculated.

Results. *The analysis of the relationship between the anthropometric data showed a significant difference between girls and boys only in respect of the wrist circumference. The groups performing daily household activities had a significantly increased weight, BMI, abdominal and wrist circumference. Participation in physical education classes in school was associated significantly only with the wrist circumference. Frequent change of the option for extracurricular sport showed a significant difference in weight, waist circumference, and wrist in favor of the group that practiced many sports. Fast food diet and the type of alimentary habits of the family (home cooked, pre-cooked, or ordered food) showed differences between medians of the anthropometric indices with higher values for those eating more frequently fast food or ordered food, yet without reaching statistical significance.*

Conclusion. *Both girls and boys, in the presence of an unhealthy lifestyle (lack of recreational and educational physical activity, food habits, inappropriate time spent in front of a screen) had unfavorable adiposity indices.*

Keywords: child obesity, anthropometric indices, life style, family practice

Introduction

Prevention is a matter of general interest in all medical specialties and is of major importance in primary care. In order to develop into a healthy adult, the child has to follow a healthy lifestyle in all its aspects: nutritional, behavioral, physical, and recreational. Obesity in children is growing in prevalence worldwide, as well as in our country. It is necessary to develop interventional programs in early childhood, targeted at the child's food and physical activity habits. The lack of intervention on child obesity will result in an increased prevalence of metabolic, cardiovascular, osteo-articular diseases and psychiatric disorders. A lower weight is not the main aim, the healthy behavior regarding nutrition and physical activity being much more important. By educating the parents we may achieve early corrections,

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thus avoiding unhealthy habits in children.

Our main goal was to identify which habits may influence the children's somatic development.

Material and methods

After obtaining the parent's and child's informed consent to participate in our cross-sectional study, 98 consecutive children aged 5-15 years, examined in the family practice, were enlisted. Exclusion criteria were the refusal to take part in the study and chronic diseases. After collecting the answers, weight, height, waist circumference, wrist circumference, subscapular skinfold thickness were measured, and body mass index was calculated. We encountered no refusal and the measurements were performed by the same person.

Weight was measured twice (Seca® 861 scales) with the child barefoot and in light clothing. Height was measured twice, using a wall stadiometer (Kawe® 222), with the child barefoot and upright and with the sagittal midline touching the back board. Waist circumference and wrist circumference were measured two times using a flexible tape. Waist circumference was measured at 2 cm below the navel at the end of a normal expiration. Subscapular skinfold thickness was measured two times using a Holtain Ltd. calliper (0.2 mm accuracy and a consistent pressure between valves of 10 g/mm^2). Body mass index was calculated as weight in kilograms divided by the square of the height in meters.

The questionnaire was designed in compliance with several validated questionnaires on the quality of life, eating habits, and physical, educational and recreational activity. The questions were grouped in three categories:

-educational and recreational physical activity performed by child and parent;

-food history, dietary habits and types of food;

-time spent in front of a screen (TV, computer, mobile phone).

Data analysis

Counts and percentages were used for categorical data; means and standard deviations were used for normally distributed continuous data, while median and interquartile range was used for skewed continuous data. Independent groups of skewed continuous data were compared with Wilcoxon rank sum test. Univariate linear regressions models were built with BMI as dependent variable and different demographic or lifestyle characteristics as independent variables. Next we built several models keeping in the model variables known from the literature that might influence the BMI, along with different demographic or lifestyle characteristics that we wanted to explore. We checked the models for multicolinearity, heteroskedasticity, and linearity. The regression coefficient, along with 95% confidence interval and p-value was provided for each independent variable. For all statistical tests used, the two tailed p value was calculated and checked against the 0.05 level of significance.

All statistical analyses were computed with the R environment for statistical computing and graphics, version 3.2.3

Results

Females represented 44.9% (n=98), less numerous than the boys (55.1%) (n=98). The majority of the children were living in an urban area.

At the time of the study first born child prevailed (68.37%) (n=98), while less than a third of the families had two siblings (28.57%) (n=98).

The group living in a house was less numerous - 6.12% (n=98), lower than the 53.6% (n=98), who lived in a condominium apartment.

The details of the demographic anthropometric characteristics of the subjects are presented in Table I.

Table I. Demographic and anthropometric characteristics of subjects.

Characteristics	Number (%) (n=98)
Gender (female)	44 (44.9)
Age (years), average (DS)	9.65 (3.2)
Height (cm), average (DS)	145.93 (17.4)
Weight (kg), median	35.25 (27-49.75)
BMI (kg/m2), median (IQR)	17.7 (14.83-20)
Subscapular skinfold thickness (mm), median (IQR)	4 (3-8)
Abdominal circumference (cm), median (IQR)	64 (57-74),
Wrist circumference (cm), median (IQR)	13.75 (12.5-15)
Area of living (rural vs. urban)	7 (7.14)
Rank child	0: 1 (1.02) 1: 67 (68.37) 2: 28 (28.57) 4: 1 (1.02) 5: 1 (1.02)

BMI – body mass index. Normally distributed continuous data are presented as average and standard deviation (SD) and those not normally distributed are presented as median and interquartile range (IQR).

Percentage distribution of the groups considering the analyzed variables, grouped into habits linked to every day physical activity (way of transportation to school, work, household activity, physical education at school or out of school, time spent by the child and parent in front of the screen, individual and family history and eating habits) are presented in Table II.

The analysis of the relationship between the anthropometric indexes - weight, height, subscapular skinfold thickness, abdominal and wrist circumference and gender of children- did not found statistically significant differences between the parameters of girls and boys, the only present significant difference being in respect of the wrist circumference (Table III).

Table II. Lifestyle and nutrition.

Question	n (%)
Do you live in a house?	46 (46.94)
Are you active daily in the household?	64 (65.31)
Do you go to work by...?	you walk: 28 (28.57) by public transport: 23 (23.47) your own car: 47 (47.96)
Mode of transport to school	on foot: 28 (28.57) by public transport : 23 (23.47) your own car: 47 (47.96)
The child takes part in physical education classes at school	93 (94.9)
The child practices an extracurricular sport	54 (55.1)
Did the child change his option for a sport frequently?	14 (14.29)
Are the parents doing sports?	44 (44.9)
Do you have physical activity together with your children ?	62 (63.27)
The children was breastfed	76 (77.55)
Duration of breastfeeding	none: 21 (21.43) at least six months: 48 (48.98) until one year: 29 (29.59)
Fed with formula	59 (60.2)
Do you eat home-cooked food?	95 (96.94)
Do you eat fast food?	1 x / month: 51 (52.04) 2 x / week.: 26 (26.53) > 2 x / week.: 21 (21.43)
Do you eat pre-cooked deep-frozen food? (yes vs. no)	16 (16.33)
Do you order food?	1 x / month: 61 (62.24) 1 x / week.: 4 (4.08) 2 x / week.: 8 (8.16) > 2 x / week.: 25 (25.51)
Do you eat fresh fruit and vegetables?	< 2 x /week.: 11 (11.22) 2 x / week.: 27 (27.55) daily: 60 (61.22)
Food preference	carbohydrates: 43 (43.88) lipids: 18 (18.37) proteins: 37 (37.76)
Do you consider yourself an obese person? (sick vs. healthy)	60 (61.22)

Table III. Anthropometric characteristics in relation to gender.

Gender:	F (n=44)	M (n=54)	P
Weight (kg), median (IQR)	34.5 (26.75-46.25)	40 (27-53.75)	0.44
BMI (kg/m2), median (IQR)	17.45 (15.17-19.52)	17.8 (14.8-20.38)	0.565
Subscapular fold thickness (mm), median (IQR)	4 (2 7.25)	4.5 (3-9)	0.205
Abdominal circumference (cm), median (IQR)	63 (57-72)	66 (56.25-76.75)	0.265
Wrist circumference (cm), median (IQR)	13 (12-14)	14 (13-15)	0.018

BMI – body mass index. Not normally distributed continuous data are presented as median and interquartile range (IQR).

Table IV. Anthropometric characteristics comparison based on daily activity in the household.

Are you active daily in the household?	Yes (n=64)	No (n=34)	P
Weight (kg), median (IQR)	43 (32-53.25)	27 (23.12-33.75)	< 0.001
BMI (kg/m2), median (IQR)	18.6 (16.08-20.33)	14.95 (14.22-17.75)	< 0.001
Subscapular skinfold thickness (mm), median (IQR)	4.5 (3-8)	3 (2.25-5.75)	0.108
Abdominal circumference (cm), median (IQR)	67.5 (61-75.25)	57 (53.25-65.25)	< 0.001
Wrist circumference (cm), median (IQR)	14 (13-15.12)	12.5 (12-13.38)	< 0.001

BMI – body mass index. Not normally distributed continuous data are presented as median and interquartile range (IQR).

The area of living and type of family home were not significantly associated with the measured and calculated anthropometric indexes. The groups performing daily household activities had a statistically significantly increased weight, BMI, abdominal and wrist circumference (Table IV).

The means of transport to school or work were not statistically significant related to the measured parameters.

Participation in physical education classes in school was statistically significant, but associated only with the wrist circumference.

Neither practicing a sport out of school nor the number of weekly sport hours showed any significant differences. Frequent change of option for extracurricular sport showed a significant difference in weight, waist circumference and wrist in favor of the group that practiced several sports (Table V).

Practicing a sport by parents, the physical activities spent together with their children and the time spent by parents in front of a screen (TV, computer, phone) did not yield statistical differences for the measured parameters.

The "screen hour" reported by children was not statistically significant associated with any anthropometric index.

Breastfeeding, its duration, and infant formula had no statistically significant relation with anthropometric data in the analyzed age group.

Fast food diet and the type of alimentary habits of the family (home cooked, pre-cooked or ordered food) showed differences between the anthropometric indices with higher values for those eating more frequently fast food or ordered food, yet without reaching statistical significance.

Median of weight, BMI and waist circumference of children who consumed daily fresh fruit and vegetables was higher than for children who ate fruits and vegetables only twice a week but smaller than for those who rarely ate of these foods, all of them without reaching statistical significance.

The differences between anthropometric parameters used in the analysis group of children regarding the food preferences were not statistically significant.

Perception of obesity in terms of the appreciation of an obese person as healthy or sick, showed higher values of weight, BMI and circumferences for the group considering obesity as a disease, without reaching a statistically significant difference (Table VI).

Table V. Anthropometric characteristics comparison based on the frequent changing of the option for sport.

The child changes his option for a sport frequently	**Yes (n=14)**	**No (n=84)**	**P**
Weight (kg), median (IQR)	44.5 (36.5-58.5)	34 (26.5-48.25)	0.031
BMI (kg/m2), median (IQR)	19.2 (16.23-21.22)	17.5 (14.73-20)	0.088
Subscapular fold thickness (mm), median (IQR)	5 (4-7.5)	4 (2.75-8)	0.427
Abdominal circumference (cm), median (IQR)	68.5 (64.25 - 79)	63 (56-72.5)	0.029
Wrist circumference (cm), median (IQR)	15 (13.25 - 16.5)	13.5 (12-15)	0.023

Table VI. Univariate analysis of BMI (kg/m²) as a dependent variable according to different demographic or lifestyle characteristics.

	B	**(95% CI)**	**P-value**	**R^2**
Gender (M vs. F)	0.68	(-0.81-2.17)	0.369	0.008
Age (years)	0.49	(0.28-0.7)	< 0.001	0.183
Area of living (urban vs. rural)	-0.21	(-3.1-2.68)	0.886	0
You live in a house (yes vs. no)	-0.49	(-1.97-1)	0.517	0.004
Mode of transportation to school – on foot	-0.59	(-2.1-0.92)	0.441	0.006
How much time does your child spend in front of the PC, TV (hours) (>2 vs. <2)	-0.6	(-2.26-1.05)	0.47	0.007
Active in the household / day	2.29	(0.79-3.78)	0.003	0.088
How many times a week does your child play network games	2.71	(1.1-4.33)	0.001	0.104
The child takes part in physical education classes at school	-0.49	(-1.97-1)	0.517	0.004
Do you have any physical activity together with your children	2.29	(0.79-3.78)	0.003	0.088
The child practices an extracurricular sport	-0.49	(-1.97-1)	0.517	0.004
The child was breastfed	-1.15	(-2.92-0.62)	0.199	0.017
Do you eat fast food (> = 2 x / week vs. 1 x / month)	0.83	(-0.65-2.31)	0.266	0.013
Do you order food (> 1 x / month vs. 1 x / month)	0.4	(-1.14-1.93)	0.609	0.003
Do you eat fresh fruits and vegetables (daily vs. <= 2 x / week.)	0.34	(-1.18-1.87)	0.659	0.002
Food preference (lipids vs. carbohydrates)	-0.45	(-2.52-1.62)	0.665	0.008
Food preference (proteins vs. carbohydrates)	0.44	(-1.22-2.09)	0.602	0.008
Do you consider yourself an obese person (sick vs. healthy)	-0.77	(-2.29-0.75)	0.317	0.01

Table VII. Multiple linear regression of BMI regressed on several characteristics.

	B	(95% CI)	p
(Intercept)	13.7733204920509	(10.97-16.58)	< 0.001
Age (years)	0.44	(0.2-0.67)	< 0.001
The child practices an extracurricular sport	-0.52	(-1.91-0.86)	0.453
The child was breastfed	-1.3	(-2.96-0.35)	0.121
Do you eat fast food (> = 2 x / week. vs. 1 x / month)	-0.03	(-1.46-1.39)	0.963
Active daily in a household	1.36	(-0.15-2.87)	0.077
Food preference (lipids vs. carbohydrates)	0.5	(-1.43-2.43)	0.608
Food preference (proteins vs. carbohydrates)	0.86	(-0.67-2.38)	0.267
Do you consider yourself an obese person (sick vs. healthy)	-0.43	(-1.83-0.97)	0.543

The univariate analysis of the dependent variable abdominal index (ratio of height/abdominal circumference) according to different demographic or lifestyle showed no significant differences.

The children who practiced an extracurricular sport, those who were breastfed and the subjects who consider obesity a disease had a small BMI value. The children who prefer proteins vs carbohydrates were heavier than those preferring lipids vs carbohydrates (Table VII).

We constructed a multiple linear regression model, using as a dependent variable BMI kg/m². The model had an adjusted coefficient of determination of 0.18.

Discussion

An important body of literature data shows an increase in prevalence of obesity among children and demonstrate the role of dietary habits, physical activity and the importance of family education for prevention [1]. In north-eastern Romania, the prevalence of overweight and/or obesity is 18.5% and twice as high in urban areas (28.5%) [2].

Of the 98 children measured, 17 (17.34%) wereoverweight or obese considering obesity by age and BMI [3].

A high value of waist circumference in children indicates an increased risk for cardiovascular disease, dyslipidaemia, impaired glucose tolerance and should be evaluated on specific growth curves. Waist circumference fits in the age-specific percentiles and insignificantly differs by gender at this age, having significantly higher values for those who frequently change the option for the type of sport [4].

Quality of life questionnaires in children are widely used and can be applied research regarding the children and family habits [5]. Interventions targeting lifestyle change should be addressed to both the child and the parents. Child obesity often continues with adult obesity and its related chronic diseases. The difficulties in treating obesity in the adult are well known, therefore an intervention in childhood should be easier to deal with. The family role in shaping the children's lifestyle may achieve better results if focused on the parents' practices in early childhood.

The fact that most parents and children use their own car for going to work and school does not influence the nutritional status of children. Less than half of parents practice some sport or physical activities with their children (walks, games, hikes) without a significant outcome on the anthropometric indexes. A Norwegian study on a larger number of randomly selected children and adolescents demonstrated that active commuting, especially cycling, is associated with a favorable body composition and better cardiorespiratory and muscular fitness as compared to passive commuting [6].

Domestic work done by children seems to be related with significantly increased weight, BMI and abdominal circumference. This may be explained by the fact that children with higher anthropometric indices are more likely to be asked to do household duty and are rewarded with sweets.

Educational or recreational physical activity of children (classes of physical education school/ extracurricular sport) seems to diminish in favor of the increasing demands for accumulation of academic knowledge [7].

Lack of physical activity is mostly "justified" by the lack of time due to a busy schedule of both parents and children. Nowadays children tend to spend more time at school, so this institution can positively influence the lifestyle of children and parents [8].

The children enrolled in our study were taking part in physical education classes, had no permanent exemptions from physical education, and 54% of them practiced extracurricular sport. There were no significant differences in the values of indices of obesity among groups and only the wrist circumference was significantly higher in boys and in children who practice an extracurricular sport. This issue can probably be explained rather by gender and somatotype. Interestingly, we found significant differences in body weight, waist and wrist circumference in children who frequently changed option for sport. Higher values can be explained either by obtaining food (snacks, juices, sweets) as a reward, or by the fact that changing

frequently the sport options is equivalent to inefficient and discontinuous workout.

Interventional studies as MOVI-KIDS propose to ensure access for a period of two years during breaks to playgrounds having a wide range of equipment and facilities and assess the effect on obesity and attention deficit in children [9].

The idea that school offers optimal opportunities for structured physical activity for children and hence for population-based physical activity interventions is confirmed by other studies. Considering these aspects physical programs in schools should be established by a team of physical education teachers, doctors and psychologists. Schools can become key sites for preventive public health initiatives that eventually will be embedded within school culture [10].

Our research is consistent with the results on short and long term of the "Lifestyle Triple P" study (Positive Parenting Program) that evaluated the results of an intervention counselling the parents in regard of the consumption of juices, food portions control and time spent in front of the screen and found no differences between BMI, waist circumference and skin folds [11].

Questionnaires on eating habits of children aim at highlighting the child's relationship with food and a certain pattern of nutrition for the child and family [12,13].

Our society still seems to be a traditional one in terms of eating habits as in most families food is cooked at home, ordering food less than once a month while very few prefer frozen precooked meals. An explanation may lie in the less favored economic status of families consisting of three generations living together and having traditional alimentation.

Eating fast food is present in more than half of the children questioned but at a reduced frequency, once a month.

More than half of children in our study ate fruit and vegetables daily without association with markers of obesity. Food preference for carbohydrates (bread, pasta, pastries, sweets) did not significantly link with the BMI. The interventions in the child's diet, when necessary, should consist in the lowering of the energetic value of the diet through the reduction of fat consumption and quantity and quality changes with respect to carbohydrates consumption while providing the physiological amount of protein [14].

Many papers emphasize the fact that weight itself should not be a priority target, much more important being the acquisition by the child and family of appropriate food habits and physical activity education [15].

Obesity indexes (BMI, abdominal circumference, subscapular skinfold thickness and abdominal index) were insignificantly higher in children considering excessive weight a disease. Obviously it is easier to choose this explanation than to accept the necessity to change habits. Many data in the literature consider the correct assessment of one nutritional status as the most powerful motivation for weight loss [16].

Conclusion

Both girls and boys, in the presence of an unhealthy lifestyle (lack of recreational and educational physical activity, food habits, inappropriate screen-hour) have unfavorable adiposity indicators.

Potential role models (physicians, teachers, family members) should pay more attention to the example they set for children regarding a healthy lifestyle.

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