Parental Anthropometric Indices and Obesity in Children

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Abstract- The aim of this study was to investigate the correlation between each parent's Body Mass Index (BMI) and maternal age with weight status of children. This was an analytic cross-sectional study which was conducted on 12-year-old students from different areas in Rasht, north part of Iran. The checklist included demographic characteristics such as age, maternal age during childbirth, student and maternal height and weight, child rank. Data were analyzed by Pearson correlation analysis, paired *t*-test and ANOVA test and chi-square in SPSS software 19.0. A *P*-value less than 0.05 were considered statistically significant. A total of 200 adolescents participated in this study consisted of 106 (53%) boys. Results showed a significant correlation between students' BMI and parental BMI and father's weight. Also, there was a significant correlation between students' weight with parental BMI and father's weight, and birth rank in conclusion, the role of the family in changing nutritional habits of children must be considered because through parental education and changing their perceptions we can prevent obesity.

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Keywords: Obesity; Parents; Children; Weight; Height

Introduction

Obesity is one of the nutritional and health issues in developing and developed countries (1).

According to a recent report from World Health Organization (WHO), obesity is a disease (2) which is associated with increased morbidity and mortality rate (3) and needs extensive preventive procedures and effective interferences. Etiology of obesity is indicated as physical inactivity (4), hormonal factors, child age at the beginning of the complementary feeding (5), overeating, parental especially maternal obesity (6), parental educational level, maternal smoking (7), parental age, and nutritional habits (8). Children with an obese parent are in danger of becoming obese in their adolescence and adulthood even when trying to keep their weight stable (9).

As the best way to prevent obesity complications is the detection of the risk factors, determining the prevalence of obesity and its risk factors in different age groups in each region is necessary for health programming. Moreover, preventive programs of obesity are effective when parents actively participate in these programs (10).

The aim of this study was to investigate the correlation between each parent's BMI and maternal age with weight status of children.

Materials and Methods

This was an analytic cross-sectional study which was conducted on 12-year-old students from different areas in Rasht, north part of Iran. All of these cases were admitted to routine physical examinations to the 15 urban health centers and examined by a physician.

After classified proportionate to size in different regions of Rasht, the first case in each health center was randomly assigned and then with consideration of interval, the next case was examined. If the parent of the student was not satisfied, the next case was considered as a study subject.

In an appointment preceding the investigation, the study colleagues including physicians; supervisor and executive manager matched for the process of study.

The checklist included demographic characteristics such as age, maternal age during childbirth, student and maternal height and weight, and child rank. The consent form was obtained from each student and parents.

Weight and height were measured by similar tools in

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all centers and calibrated daily to enhance validity and reliability of measurements. Also, the face and content validity of that inventory had been investigated by five physicians.

Data were analyzed by Pearson correlation analysis, paired *t*-test and ANOVA test and chi-square in SPSS software version 19.0. A *P*-value less than 0.05 were considered statistically significant.

Results

A total of 200 adolescent participated in this study which consisted of 106(53%) boys. From the total 200 cases, 113(57.5%) were first child. Table 1 presents the situation of distribution and mean of demographic information (Body Mass Index (BMI), weight, height and age) in students and their parents.

Table 1. Distribution of demographic characteristics in students and their parents

	Student's BMI	Mom's BMI	Dad's BMI	Student's WEIGHT	Student's height	Mom's weight	Mom's height	Dad's weight	Dad's height	Mom's age at birth
N	200	200	200	200	200	200	200	200	200	200
Mean	23.7127	27.8159	26.8999	57.9100	156.4350	72.1750	160.7050	80.5400	173.1350	26.4400
Std. Deviation	5.12953	4.17768	3.44687	14.14611	7.51787	10.89578	6.19028	10.76185	7.19693	5.39927
Kolmogorov-Smirnov Z	1.031	1.463	2.096	.747	1.239	1.806	1.727	1.758	1.304	1.125
Asymp. Sig. (2-tailed)	0.239	0.028	0.000	0.632	0.093	0.003	0.005	0.004	0.067	0.159

Results showed a significant correlation between students' BMI and parental BMI and father's weight. (r=.304, *P*<0.0001)(r=0.257, *P*<0.0001)(r=0.249, *P*<0.0001)(r=0.166, *P*=0.019). Also, there was a significant correlation between students' weight with parental BMI and father's weight and birth rank (Table 2).

Table 2. correlation between students' BMI and parental BMI

		STUDENT'S BMI	STUDENT'S WEIGHT	STUDENT'S HEIGHT
Mom's age at birth	**Pearson Correlation**	0.133	0.065	-0.027
	P	0.060	0.361	0.708
	N	200	200	200
Mom's BMI	**Pearson Correlation**	0.304	0.289	0.124
	P	0.0001	0.0001	0.080
	N	200	200	200
Dad's BMI	**Pearson Correlation**	0.257	0.312	0.250
	P	0.0001	0.0001	0.0001
	N	200	200	200
Mom's WEIGHT	**Pearson Correlation**	0.249	0.291	0.206
	P	0.0001	0.0001	0.003
	N	200	200	200
Mam's HEIGHT	**Pearson Correlation**	-0.075	-0.012	0.184
	P	0.290	0.863	0.009
	N	200	200	200
Dad's WEIGHT	**Pearson Correlation**	0.166	0.314	0.336
	P	0.019	0.000	0.000
	N	200	200	200
Dad's HEIGHT	**Pearson Correlation**	-0.054	0.083	0.212
	P	0.445	0.242	0.003
	N	200	200	200
Birth rank	**Pearson Correlation**	0.126	0.150	0.097
	P	0.076	0.034	0.173
	N	199	199	199

Table 3 shows the correlation between variables in terms of sex.

Table 3. The correlation between variables based on sex

Sex			Student's BMI	Student's weight	Student's height
Boys	Mom's age at birth	Pearson Correlation	0.065	0.022	-0.046
		P	0.510	0.820	0.637
		N	106	106	106
	Mom's BMI	Pearson Correlation	0.293	0.283	0.114
		P	0.002	0.003	0.246
		N	106	106	106
	Dad's BMI	Pearson Correlation	0.247	0.294	0.252
		P	0.011	0.002	0.009
		N	106	106	106
	Mom's weight	Pearson Correlation	0.248	0.343	0.282
		P	0.010	0.000	0.003
		N	106	106	106
	Mom's height	Pearson Correlation	-0.015	0.104	0.330
		P	0.880	0.289	0.001
		N	106	106	106
	Dad's weight	Pearson Correlation	0.118	0.286	0.384
		P	0.230	0.003	0.000
		N	106	106	106
	Dad's height	Pearson Correlation	-0.158	0.035	0.235
		P	0.106	0.719	0.015
		N	106	106	106
	Birth order	Pearson Correlation	0.101	0.155	0.154
		P	0.302	0.113	0.116
		N	106	106	106
Girls	Mom's age at birth	Pearson Correlation	0.211	0.115	-0.006
		P	0.041	0.269	0.955
		N	94	94	94
	Mom's BMI	Pearson Correlation	0.297	0.284	0.122
		P	0.004	0.006	0.242
		N	94	94	94
	Dad's BMI	Pearson Correlation	0.249	0.320	0.238
		P	0.016	0.002	0.021
		N	94	94	94
	Mom's weight	Pearson Correlation	0.226	0.214	0.111
		P	0.028	0.038	0.285
		N	94	94	94
	Mom's height	Pearson Correlation	-0.167	-0.182	-0.009
		Sig. (2-tailed)	0.107	0.079	0.932
		N	94	94	94
	Dad's weight	Pearson Correlation	0.219	0.347	0.276
		Sig. (2-tailed)	0.034	0.001	0.007
		N	94	94	94
	Dad's height	Pearson Correlation	0.096	0.165	0.199
		Sig. (2-tailed)	0.356	0.111	0.054
		N	94	94	94
	Birth order	Pearson Correlation	0.191	0.169	0.038
		Sig. (2-tailed)	0.066	0.105	0.718
		N	93	93	93

In final model of Step wised Multiple linear regression analysis, there were a significant association between BMI in children and father's and mother's BMI and birth order (P=0.001, 0.004, 0.027), respectively (Table 4). These variables can predict 14% of obesity risk in children.

Table 4. Multiple linear regression analysis

Model	Unstandardized Coefficients		Sig.	95.0% Confidence Interval for B	
	B	Std. Error		Lower Bound	Upper Bound
(Constant)	5.709	3.246	0.080	-0.694	12.111
Mother's BMI	0.292	0.085	0.001	0.123	0.460
Father's BMI	0.306	0.104	0.004	0.100	0.512
Birth order	1.093	0.491	0.027	0.125	2.060

Data analysis with world cut off of obesity (85 percentile) in children, show that father's, mother' and parental BMI in obese and non-obese children with *P* value and OR (with range) 0.008, 3.39 (CI95%: 1.4-8.2), 0.04, 2.3 (95%CI: 1.02-5.25) and 0.003, 5.9 (95%CI: 1.94-17.96), respectively have significant difference between obese and overweight and non-obese and overweight children (Table 5).

Table 5. Risk of obesity and overweight in children

		Obesity and overweight children					
		NO OBESITY		OBESITY			
		Count	Row N %	Count	Row N %	*P* value	OR(95% CI)
Mother's BMI	**No obesity**	131	88.5%	17	11.5%	0.04	2.3 (1.02-5.25)
	Obesity	40	76.9%	12	23.1%		
	Total	171	85.5%	29	14.5%		
Father's BMI	**No obesity**	148	88.6%	19	11.4%	0.008	3.39 (1.4-8.2)
	Obesity	23	69.7%	10	30.3%		
	Total	171	85.5%	29	14.5%		
Parental BMI	**NO both parent Obesity**	118	89.4%	14	10.6%	0.003	--
	one parent Obesity	43	84.3%	8	15.7%		1.56 (0.6-3.9)
	Both parent Obesity	10	58.8%	7	41.2%		5.9 (1.94-17.96)
	Total	171	85.5%	29	14.5%		--

In the final model, although child rank had no significant difference (*P*= 0.067, 2.146 (95%CI 0.949-4.856) but in child rank more than 1, a significant difference was noted (Table 6).

Table 6. Multiple linear regression analysis

		B	S.E.	P	OR	95% CI	
						Lower	Upper
Step 1	**Mother' BMI**	0.707	0.498	0.156	2.029	0.764	5.387
	Father's BMI	1.070	0.503	0.033	2.915	1.088	7.809
	Mother age at birth	0.007	0.044	0.880	1.007	0.923	1.098
	Parental BMI	-.403	0.498	0.418	0.668	0.252	1.772
	Child order	0.726	0.478	.0129	2.066	0.809	5.277
	Constant	-2.661	1.145	0.020	0.070	--	--
Final model	**Father's BMI**	1.220	0.457	0.008	3.388	1.384	8.290
	Child order	0.764	0.417	0.067	2.146	0.949	4.856
	Constant	-2.428	0.340	0.000	0.088	--	--

Discussion

In our study, 29 (14.5%) of total participants were obese which was similar to the results of kelishady *et al.,* and Ogden CL *et al*.; they reported 15.1 and 16.9% as the prevalence of childhood overweight and obesity, respectively (1,22). However, in the previous studies conducted in Iran by Shahidi *et al*., (11) and Shakeri *et*

al., (12) and other countries such as Saudi Arabia (13), Canada (14) and USA (15), 20%, 18.5%, 27.5%, 37.7% and 34% of total participants were overweight and obese, respectively. It seems that these differences in prevalence may be due to diverse methods of measurement, different periods of time and change of lifestyle during recent decade, genetic differences, nutritional habits and socioeconomic status which is similar to what Olds T *et al*., reported (16). As investigators solely assessed urban participants and in certain age group, it seems that further randomized investigations with higher sample size can be recommended.

In our study, 76% (152) of mothers and 67.5% (135) of fathers had high BMI and suffered from overweight and obesity. Moreover, in 38% (76) of these students, both parents were obese. However, in the previous study by Maddah *et al*., (2010) in Rasht, the overall prevalence of overweight and obesity was 24.5%. Also, they noted 70.5% and 55.6% as the prevalence of maternal and paternal Overweight and obesity (17). According to the increasing trend in parental obesity during recent decade, it seems that further health planning is needed.

We found that the obesity and overweight in children were associated significantly with paternal overweight and obesity. , However, just maternal obesity was related to obesity and overweigh in children. Furthermore, results showed that both parental obesity and overweight was associated significantly with obesity and overweight in children. While previous studies have mentioned that weight status of parents and especially maternal overweight is related to overweight/obesity in adolescents of Western countries (18,19).

A range of diverse terms, metrics, and cut-off standards have been used to explain and review overweight and obesity in children (20,21) and some recommended changes in terminology for childhood overweight and obesity (22). Although, according to various previous investigations, parental obesity can be noted as a risk factor for children's obesity. However, in this population, if 85% percentile cut-off was used, this relation also existed. Therefore, it seems that 85% cut-off was a good indicator for overweight. But, Flegal *et al*., that assessed these percentiles from 1963 to 1994 have mentioned them as an appropriate index which is not affected by the recent rise in weight (23).

In present study, there was no significant association between birth order and BMI in children. However, regression analysis noted significant relation. Also, results indicated that from second child, the risk of obesity may be higher. While, Howe L. *et al.,* mentioned that the findings do not support an association between birth order and BMI or blood pressure but showed that family size and birth weight in different studies were various (24).

As we did not assess the family size and birth weight in current study. Therefore it can be indicated as study's limitation. However, the authors assumed that this difference may also be due to less attention of parents to nutritional facts and provide fewer health facilities for them.

In conclusion, this study indicates that mother's and father's BMI and birth order are the factors that can predict children's obesity and these variables could have a major role in predicting 14.4 % of high BMI cases. The role of the family in changing nutritional habits of children must be considered, because through parental education and changing their perceptions we can prevent at least 14% of cases.

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