Effect of education on anthropometric indices in obese parents and children after one year of follow-up

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Abstract

BACKGROUND: Childhood obesity has reached epidemic levels. Children obesity predisposes them to risk of cardiac disease in adulthood. Environmental factors, lifestyle preferences, and cultural environment play pivotal roles in the rising prevalence of obesity worldwide. Furthermore, family life style has a great influence on children obesity. This study aimed to determine the effect of family-oriented weight reduction program on the children's anthropometric measurements.

METHODS: This was a non-pharmacological clinical trial study which was performed on 4-18 years old children attending outpatient clinics of Isfahan Endocrine and Metabolism. Anthropometric measurements were recorded for all the participants. Children took part in one educational session in which they were taught about ways and benefits of having a regular physical activity each day and also benefits of having healthy nutrition. All the participants took part in every 4 months one-hour educational sessions and their anthropometrics were measured.

RESULTS: Fifty eight single-mother families participated in this study. Fourteen single-father families started the intervention but did not follow it to the end. Children's body mass index (BMI) z-score decreased significantly after the study. Children waist circumference (WC) and hip circumference (HC) significantly increased. Mothers WC and waist to hip ratio (WHR) increased significantly. Regression test showed that mother BMI was an independent factor ($B = 0.307$; $P < 0.021$). The effect of the pattern of children's BMI changed across a one-year period.

CONCLUSION: Our study showed significant effect of repetitive family life style education on children's BMI z-score changes. Family, as the first place for children behavior formation, must be regarded as one of the best place to tackle childhood obesity.

Keywords: Children Obesity, Parents, Life Style Intervention, Education, Anthropometric Indices.

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Introduction

Obesity has been considered as the major health problem in many countries since years ago. Along with the increase in incidence of obesity, the complications of obesity also have become more prevalent.[1,2] In the developing and developed countries, obesity is rapidly increasing so that in Iran, obesity has been introduced as the major public health issue.[3-5]

A considerable increase in obesity has occurred in the past three decades. In the United States, the number of these school-age children has reached from 6 percent to 18 percent and in the preschool-age children (2-5 years) has reached from 5 percent to 10 percent. The prevalence of overweight and obesity in children in all over the country was 18.6% and 5.9%. However, different prevalence rate for each of them was reported based on the definition of obesity and overweight.[6,7]

Various factors cause obesity including environmental factors, the role of television, computer games, sleeping pattern and genetic factors.[8-10] In addition, obesity in father or mother would increase the risk of obesity to 2-3 percent.[11] Children obesity was found to be associated with family income and educational level of the family and families with high income and high educational level had higher prevalence of children obesity.[12]

Family is considered as the first source of education and engaging in a health behavior. Family can shape the nutritional behaviors, movement patterns, and physical activities and also plays an important role in establishing interpersonal social relationships. In addition to these unique features,

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family structure affects on the behavior of the entire family members.[13-16] In the study of Mirmiran et al. on 117 families which had 474 children, they studied anthropometric characteristics and nutrition of the subjects and it was indicated that overweight of the children was independently associated with parents' high energy intake.[17]

Parents are the most important factors in creating problems related to children's weight; however, they are less noticed about the overweight risk that their children are posed to. Increase in parents' knowledge is the first step against obesity. A study in Rasht indicated that mothers' knowledge about the issues related to the obesity of children aged 2-6 years was very low and on the other hand, mothers had a more decisive role in children's weight compared to fathers and the effect of mother on boys was far more than girls.[18]

In several studies children were taught alone and separated from the family. In many other studies, parents underwent the educational program without their children. A few studies considered the whole family set simultaneously. Therefore, considering the prevalence of children obesity and its related complications in our society and the role of parents, particularly mothers, and also the role of health education in improving health indicators, in this study it was tired to investigate the effect of simultaneous education of obese children and mothers on controlling cardiovascular diseases (CVD) risk factors.

Materials and Methods

This was a non-pharmacological clinical trial study which was done in 2008 on 58 families including mothers and 4-18 year-old children who were referred to the Isfahan Cardiovascular Research Center.

The families with diabetes, thyroid diseases, neurological problems, renal diseases, hepatic diseases as well as pregnant mothers were excluded from the study. At the beginning of the study, 14 children were referred with their fathers who were excluded from the study due to lack of cooperation.

After obtaining the written informed consent from the parents and also making full explanation for children and adolescents, they underwent anthropometric measurements. The examinations were performed by a professional team including a physician, a trained nurse and under the observation of a pediatrician. Anthropometric measurements included measuring height and weight to calculate body mass index (BMI), waist circumference (WC) and hip circumference (HC).

Height of participants was measured and recorded by Seca stadiometer with 0.1 cm accuracy. Their weight was measured by Seca Scale with 0.1 kg accuracy when subjects put on light clothes and no shoes. Waist circumference was measured using measuring tapes with 0.1 cm accuracy. Measurements were conducted twice and their mean were recorded in a special form.

The mothers and children underwent an educational program (dietary recommendation and increasing physical activity) by the physician at the first visit. Each educational session lasted 45-60 minutes and it was held separately for each family. In the beginning, anthropometric characteristics of the children and mothers were measured and recorded.

The families were recalled at the 4th, 8th and 12th months of the study and anthropometric measurements were done and recorded. During each visit, families were asked about the quality of nutrition and physical activity during the past four months and it was tried to educate them. All the data were registered in special data collection forms.

Data Analysis

The data were analyzed using SPSS version 16. Independent t-test was used to compare numerical data (WC, HC and BMI) before and after the study. Regression test was also used to compare mean changes of anthropometric indices in mothers and children when it was adjusted for age and gender. The obtained results were reported as *mean* ± *Standard Deviation*. P values less than 0.05 were considered statistically significant.

Results

Fifty eight families including 26 boys, 32 girls and their mothers participated in the study during 12 months at four-month intervals. Underlying characteristics of children, adolescents and mothers are shown in table 1. As it is indicated, at the beginning of the study, there was no significant difference between girls and boys in terms of age, BMI, WC and HC; however, there was a significant difference between BMI-z score and WHR which it was higher in boys than in girls.

Table 2 indicates anthropometric changes in subjects. As it is indicated, BMI increased in boys and girls during the study, while BMI z-score decreased in both boys and girls. There was a permanent significant difference between BMI in girls and boys while BMI z-score in boys was significantly higher than girls except in the third visit which was not statistically significant. Mean WC of the boys was higher than girls during the study but it was not

Table 1. Characteristics of the children at baseline

	Waist to height ratio	WHR	HC (cm)	WC (cm)	BMI z-score	BMI	Age (month)
Boy	0.59 ± 0.05	0.92 ± 0.04	88 ± 7.9	82 ± 8.8	2.19 ± 70	23.66 ± 3.1	106 ± 31
Girl	0.57 ± 0.05	0.89 ± 0.06	89 ± 9.7	79 ± 9.7	1.73 ± 0.63	23.43 ± 3.8	109 ± 35
Total	0.58 ± 0.05	0.90 ± 0.05	88 ± 8.8	80 ± 9.3	1.93 ± 0.70	23.53 ± 3.5	108 ± 33
P	0.055	0.002	0.84	0.135	< 0.001	0.587	0.408

WHR: Waist to hip ratio; HC: Hip circumference; WC: Waist circumference; BMI: Body mass index

significant. WC significantly increased during the study. Hip circumference mean was higher in girls at the first and fourth (last) visit which but the difference was not significant. HC significantly increased over time (P < 0.001). WHR in girls had no change during the study. Total WHR insignificantly increased over time. Table 3 represents changes in anthropometric indices of the mothers and children during the study.

A 3% increase in mothers' BMI caused increase of one unit in children BMI (B = 0.307; P < 0.021) (Figure 1). There was not a significant correlation between WC changes of the mothers and WC of the children (B = 0.028, P = 0.845). As it is indicated in table 2, there was a reduction in BMI-z score of studied children.

Table 2. Anthropometric indices of children during the study

		1st visit*	2nd visit	3rd visit	4th visit
Age (month)	Boy	106 ± 31	111 ± 32	114 ± 31	118 ± 32
	Girl	109 ± 35	114 ± 35	119 ± 35	123 ± 35
	Total	108 ± 33	113 ± 33	117 ± 34	121 ± 34
	P	0.408	0.427	0.161	0180
BMI	Boy	23.66 ± 3.1	23.51 ± 3.4	23.63 ± 3.4	24.01 ± 3.5
	Girl	23.43 ± 3.8	23.27 ± 3.9	23.52 ± 3.9	23.84 ± 4.0
	Total	23.53 ± 3.5	23.37 ± 3.7	23.57 ± 3.7	23.91 ± 3.8
	P	0.587	0.588	0.189	0.713
BMI z-score	Boy	2.19 ± 70	2.01 ± 0.80	1.99 ± 0.78	2.06 ± 0.76
	Girl	1.73 ± 0.63	1.57 ± 0.72	1.56 ± 0.69	1.58 ± 0.76
	Total	1.93 ± 0.70	1.76 ± 0.79	1.75 ± 0.76	1.79 ± 0.79
	P	< 0.001	< 0.001	0.468	< 0.001
WC (cm)	Boy	82 ± 8.8/	82 ± 9.3	83 ± 9.4	84 ± 8.7
	Girl	79 ± 9.7	80 ± 8.2	81 ± 8.3	82 ± 7.9
	Total	80 ± 9.3	81 ± 1.8	828.9 ±	83 ± 8.4
	P	0.135	0.147	0.198	0.083
HC (cm)	Boy	88 ± 7.9	89 ± 8.4	90 ± 8.0	91 ± 9.7
	Girl	89 ± 9.7	89 ± 10.0	90 ± 10.0	92 ± 9.9
	Total	88 ± 8.8	89 ± 9.2	90 ± 9.0	91 ± 9.7
	P	0.84	0.763	0.714	0.553
WHR	Boy	0.92 ± 0.04	0.92 ± 0.04	0.92 ± 0.09	0.93 ± 0.08
	Girl	0.89 ± 0.06	0.89 ± 0.05	0.89 ± 0.09	0.89 ± 0.05
	Total	0.90 ± 0.05	0.90 ± 0.05	0.90 ± 0.04	0.91 ± 0.07
	P	0.002	0.002	0.004	0.002
Waist to height	Boy	0.59 ± 0.05	0.59 ± 0.06	0.59 ± 0.05	0.59 ± 0.05
	Girl	0.57 ± 0.05	0.57 ± 0.06	0.57 ± 0.04	0.57 ± 0.04
	Total	0.58 ± 0.05	0.58 ± 0.05	0.58 ± 0.05	0.58 ± 0.05
	P	0.055	0.040	0.043	0.01

WHR: Waist to hip ratio; HC: Hip circumference; WC: Waist circumference; BMI: Body mass index
* mean ± standard deviation

Table 3. Mean of anthropometric indices in mothers during the study

	Index	1st visit*	2nd visit	3rd visit	4th visit	P §
Mothers	BMI	28.12 ± 2.7	28.03 ± 2.8	28.00 ± 2.6	28.13 ± 2.7	0.964
	WC (cm)	96 ± 12.2	90 ± 11.5	98 ± 11.5	99 ± 11.2	< 0.001
	HC (cm)	107 ± 8.3	108 ± 8.0	108 ± 7.8	108 ± 8.0	0.190
	WHR	0.89 ± 0.07	0.90 ± 0.07	0.90 ± 0.07	0.91 ± 0.07	0.004

WHR: Waist to hip ratio; HC: Hip circumference; WC: Waist circumference; BMI: Body mass index; WStR: Waist to stature ratio

* mean ± standard deviation

§ P for the comparison between the 1st and 4th visits

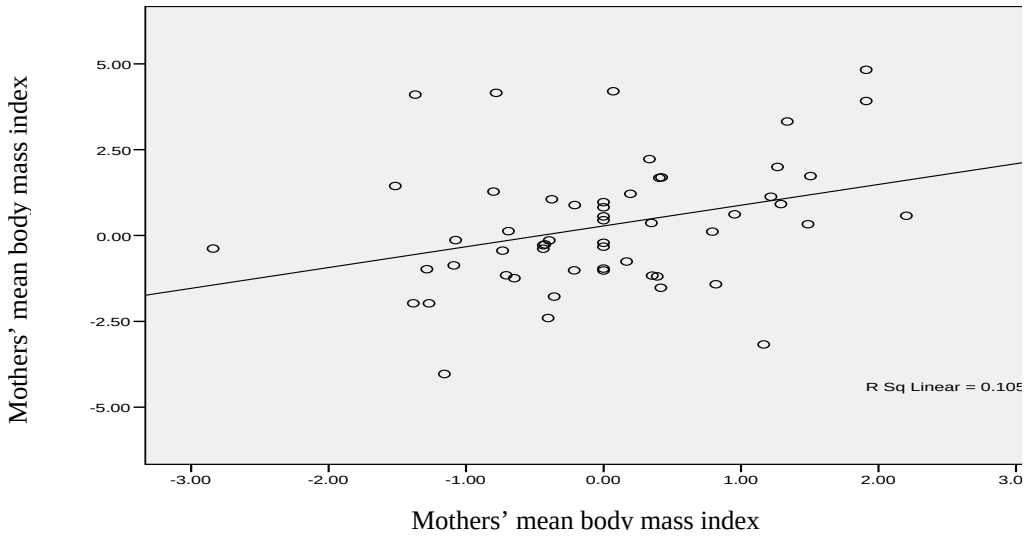

Figure 1. The correlation between mothers' and children's mean body mass index (BMI) changes

Discussion

In the present study, the effect of short-term family-oriented education on children's obesity indices was investigated. Accordingly, it was found that short-term education had a positive effect on reduction of children's BMI z-score. Parents' obesity has been recognized as a dominant risk factor for children's obesity. In this study, the increase in mother's BMI was also found to be associated with child's BMI. BMI z-score and WHR of the boys was significantly higher than girls, it seems that boys were more influenced by their mothers than girls; this finding was in accordance with another study in Belgium.[19] However, physical activity and the quality of nutrition in boys and girls were not studied in the present study, each of which could be the probable cause in this regard. Therefore, it is recommended to investigate the association between parents and children habits in terms of physical activity as well as nutritional pattern. Furthermore, cultural and behavioral habits of the families, in giving more attention to their boys, might cause these changes. In treatment method of children obesity by involving the family, obese child would not be considered as a "patient" but the entire family undergoes a treatment program and this would diminish psychosocial effects of obesity.

Reduction in BMI z-score was seen in children during this study; however, WC and BMI increased in the mothers. In the study of Davison and Deane[20] there was not any significant weight loss in the mothers which was attributed to different responses of the mothers to the treatment of obesity; nonetheless, father had weight loss. In that study, one of the major problems of treatment was the participation and acceptance of the parents in terms of recommended changes in the lifestyle. Many families stated that their spouses do not take the responsibility over their children's obesity and they did not prepare their children's physical activity background.[20] In the present study, this issue also can be justifiable due to the lack of fathers cooperation to the end of the study and also reciprocal impact of obesity of the parents .on each other. Therefore, considering the importance of role of both parents in their children's obesity, it is recommended to design a study to investigate parents' lack of cooperation and

obstacles to establish changes in lifestyle of the family.

In a study, active participation of both parents on changing CVD risk factors caused optimal and desirable change in nutritional behavior of their children.[13] In the present study, the participation of the mothers in constant education for modification of nutritional risk factors led to BMI z-score recovery in the children.

Considering WC more than 88 cm as the central obesity definition in females, a significant increase in WC level occurred in the present study. In Camoes et al. study, there was also a significant increase during 5 years in central obesity in comparison with the overall obesity too (BMI index).[21] Since WC is more strongly associated with CVD and diabetes, it should be given further attention. On the other hand, a study in Tehran showed that mothers with WHR ≥ 0.78 were more exposed to the risk of cardiovascular complications.[22]

One of the limitations of the present study was the involvement of other environmental factors on children's weight change such as the impact of school and peer groups. The other limitation was lack of full cooperation of the fathers which could have a considerable effect on children's BMI.

Conclusion

Considering the prevalence of obesity in children and its complications as well as the role of environment, particularly the family, in creation and stability of obesity in childhood, it is recommended to conduct the interventions on obesity of children in family, the first structure that child's behavior is formed. Moreover, all the family members (especially mothers) should have an active participation in the given education and also should benefit from the cooperation and supports of their spouses.

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Conflict of Interests

Authors have no conflict of interests.

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