

Predictive Biological Markers in Post-therapeutic Evolution in Obese Patients

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Childhood obesity is a leading public health concern because it represents a risk factor for many comorbid conditions in youth, such as cardiovascular disease, metabolic syndrome and sleep apnea. The purposes of the study were to evaluate the effect of the program at 6 months after the first visit and determine the predictive factors. We realised a retrospective study that included 69 obese children and adolescent, boys and girls, followed-up at Saint Mary Children's Hospital and Regional Center of Diagnosis, Counselling and Monitoring of Overweight and Obese Children from "Grigore T. Popa" University of Medicine and Pharmacy Iasi, Romania, aged 12 to 18 years. The patients were included in two groups: group 1 included 38 patients received a hypocaloric diet only and group 2 included 31 patients received a hypocaloric diet associated with kinetotherapy and psychotherapy. We evaluated the body mass index, total cholesterol and triglycerides before and after treatment. Our results confirm that diet and physical activity affects significantly the serum lipid profile. In this context, decreasing obesity in children through diet and exercise should be an important strategy for preventing cardio-metabolic disease in adult.

Keywords: obesity, body mass index, waist circumference, cholesterol, triglycerides.

Childhood obesity is a leading public health concern because it represents a risk factor for many comorbid conditions in youth, such as cardiovascular disease, metabolic syndrome and sleep apnea [1, 2]. Taking into account that obesity is a chronic condition, we consider that early diagnosis, treatment and multidisciplinary counseling absolutely necessary to prevent long-term disabling complications.

We conducted a complex dietary-exercise-psychological intervention program. The purposes of the study were to evaluate the effect of the intervention program at 6 months after the first visit and determine the predictive factors.

Experimental part

Material and methods

We realised a retrospective study that included 69 obese children and adolescent, boys and girls, followed-up at Saint Mary Children's Hospital and Regional Center of Diagnosis, Counselling and Monitoring of Overweight and Obese Children from Grigore T. Popa University of Medicine and Pharmacy Iasi, Romania, aged 12 to 18 years. The obese patients (body mass index - BMI percentiles between 95 - 97th in obesity and BMI percentiles > 97th in severe obesity) were included in two groups: group 1 included 38

patients received a hypocaloric diet only and group 2 included 31 patients received a hypocaloric diet associated with kinetotherapy and psychotherapy [3].

We assessed obese children and adolescent before and after 6 months of program. Initial screening included physical examination (weight, height, BMI and waist circumference (WC)), fasting blood profile (total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, triglycerides (TG)). Visceral adiposity was assessed by measuring WC, expressed in absolute value and percentile by age and sex [4]. TG and cholesterol values were interpreted according to percentile for sex and age. Hypertriglyceridemia refers to a fasting plasma TG measurement that is increased, typically above the 95th percentile for age and sex: between 10 - 14 years old boys ≥ 125 mg/dL, between 15 - 19 years old boys ≥ 148 mg/dL, between 10 - 14 years old girls ≥ 131 mg/dL, between 15 - 19 years old girls ≥ 124 mg/dL [5]. The diet prescribed was a balanced hypocaloric diet according to the child's age and eating habits. Each child's exercise scheme was prescribed by trained physiotherapists.

Participants with medical illness (diabetes, cardiovascular, renal or neurological diseases), eating disorders, chronic medications were excluded.

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Statistical analysis was performed in SPSS 24. In interpreting the statistical results the reference value of the significance level $p=0.05$ was considered, which corresponds to a confidence interval of 95 %. Continuous type variables were presented as mean \pm standard deviation. For the comparison of the parameters corresponding to the study groups, specific statistical parameters (F-tests, t-test, ANOVA) and non-parametric (Yates Chi-square) were applied depending on the type and characteristics of the analyzed data.

Results and discussions

Group 1: The BMI of our subjects was 30.4 ± 7.8 . 39.5 % of children were obese (BMI between 95 - 97 th percentiles) and 60.5 % of children were severe obese (BMI > 97th percentiles). Mean age was 12.8 ± 1.9 years, 13 ± 1.9 for boys and 12.6 ± 1.9 for girls. After 6 months of hypocaloric diet in 73.7 % of cases WC it was maintained at higher values (WC > 90th percentiles) even though weight and BMI had decreased. It was noted that 26.3% of the cases had a BMI percentile < 90%.

Group 2: The BMI of our subjects was 29.1 ± 3.4 , 45.2 % children were obese (BMI between 95 - 97 th percentiles) and 54.8 % were severe obese (BMI > 97th percentiles). Mean age was 13.7 ± 2.4 years, 13.8 ± 2.2 year for boys and 13.5 ± 2.9 year for girls. After 6 months of hypocaloric

diet and kinetotherapy, 51.6 % of cases WC it was maintained at higher values (WC > 90th percentiles) even though weight and BMI had decreased. It was noted that 26.3 % of the cases had a BMI percentile < 90%. It was noted that 48.4 % of the cases had a BMI percentile < 90%.

BMI and WC values significantly decreased in study group 2, compared to the study group 1. If in the first group at 6 months, 13.2 % had BMI over the 97 % percentile, in the case of the group 2 patients only 6.5 % of them had BMI values over the 97 % percentile (table 1). Similar results have been highlighted for WC (WC > 90 percentiles: group 1 - 73.7 % vs group 2 - 51.6 %), TG and TC (table 1). TG values decreased significantly less for group 1 patients compared to TG decreases in patient group 2. The values of HDL-cholesterol levels were normal in both groups.

The study demonstrated that cardiovascular risk was slightly improved in group 1 patient; the percentage of cases initially presenting an medium risk decreased insignificantly from 7.9 to 5.3 % ($p = 0.068$), while in group 2, the percentage of cases with medium risk decreased significantly ($p = 0.0092$) from 19.4 to 3.23 % at 6 months after initiation of therapy (table 2).

In both groups a positive association was observed between WC and increased risk for cardiovascular disease. The results showed a significant correlation between cardiovascular risk, BMI ($r = 0.65$, $p = 0.002$) and WC ($r =$

Table 1
CLINICAL-BIOLOGICAL PARAMETERS
INITIALLY AND AFTER 6 MONTHS

Group 1 (N=38) female (n=15) male (n=23)		First visit	6 months	p-value†
BMI (>97)	All	23(60.5%)	5(13.2%)	
	Male	7(46.7%)	(3)13.1%	0.024
	Female	16(69.6%)	(2)13.3%	0.015
WC (>90)	All	38(100%)	28(73.7%)	
	Male	(23)100%	19(82.6%)	0.026*
	Female	(15)100%	9(60%)	0.007*
TG (tryglicerides) (>95)	All	9(23.7%)	6(15.8%)	
	Male	5(21.7%)	3(13.1%)	0.035*
	Female	4(26.7%)	3(20%)	0.051
Total cholesterol (>95)	All	5(13.16%)	2(5.3%)	
	Male	1(4.35%)	0(0%)	0.001*
	Female	4(26.7%)	2(13.3%)	0.028*
Group 2 (N=31) female (n=11) male (n=20)		first visit†	6 months†	p-value†
BMI (>97)	All	17(54.9%)	2(6.5%)	
	Male	13(65%)	(1)5%	<0.01*
	Female	4(36.4%)	(1)9.1%	<0.01*
WC (>90)	All	31(100%)	16(51.6%)	
	Male	(20)100%	11(55%)	0.013*
	Female	(11)100%	5(45.5%)	0.002*
TG (tryglicerides) (>95)	All	9(29)	1(3.2%)	
	Male	6(30%)	0(0%)	<0.01*
	Female	3(27.3%)	1(9.09%)	<0.01*
Total cholesterol (>95)	All	7(22.6%)	2(6.5%)	
	Male	4(20%)	2(10%)	0.03
	Female	3(27.3%)	0(0%)	<0.01*

† Values were expressed as number (percent%); (*) Marked effects are significant at $p < 0.05$; ‡ Yates Chi-square test or Fisher's exact test.

Table 2
CARDIOVASCULAR RISK
ASSESSMENT

Group I (N=38)		First visit	6 months	p-value†	p-value**
Cardiovascular risk	Absent	27(71.1%)	35(92.1%)	0.019*	
	Low	6(15.8%)	1(2.6%)	0.036*	
	Medium	3(7.9%)	2(5.3%)	0.068	
	High	2(5.3%)	-	0.001*	
Group II (N=31)		first visit	6 months	p-value†	<0.001*
Cardiovascular risk	Absent	18(58.1%)	29(93.6%)	0.0041*	
	Low	6(19.4%)	1(3.23%)	0.0068*	
	Medium	6(19.4%)	1(3.23%)	0.0092*	
	High	1(3.23%)	-	<0.01*	

† Values were expressed as number (percent%); (*) Marked effects are significant at $p < 0.05$; ‡ Yates Chi-square test or Fisher's exact test. (**) Mark the difference between groups (I vs. II);

Multiple Logistic Regression Positive Evolution vs.	p-value	Exp(B) OR	95% CI for Exp(B)	
			Lower	Upper
Type of therapy	<0.001	5.981	2.187	9.453
TG (tryglicerides)	0.001	3.129	1.907	7.882
Total Cholesterol	0.027	2.874	1.882	8.158
WC (>90)	0.003	2.172	1.855	5.619
BMI (>97)	0.024	1.915	1.682	6.998
OR - Odd ratio; CI - interval de confidență				

Table 3
THE PREDICTIVE FACTORS
REGARDING THE EVOLUTION OF
OBESE PATIENTS

0.71, $p = 0.003$). Decrease of TG was significantly correlated with the decrease of WC in group 2 ($r = 0.084$, $p < 0.001$), while in group 1 the correlation was lower ($r = 0.31$, $p = 0.035$).

After 6 months, it was observed a significantly difference in the TC levels from the subjects who exercised compared to those who were not involved ($p = 0.0053$). A significant decrease of WC ($p < 0.013$) (WC < 90th percentiles), weight and BMI values were observed in group 2, significantly higher compared to that recorded in group 1 ($p = 0.042$). Also, the decrease of TG values showed a significantly greater association ($r = 0.824$, $p = 0.003$) with the decrease of WC values in group 2 compared to group 1. There is a significant correlation ($r = 0.703$, $p = 0.002$) between the decrease of TG values and the reduction of WC in group 2. In group 1, it was observed that the correlation between the decrease of TG and WC values was moderate ($r = 0.358$, $p = 0.037$), similar results being recorded for TC values. In group 2, the correlation between decrease of TG and WC was significant ($r = 0.669$, $p = 0.0132$).

Based on the statistical analysis, the predictive factors regarding the evolution of obese patients could be evaluated (table 3).

Multivariate analysis has shown that the type of therapy represents a significant prognostic factor (OR = 5.9, $p < 0.01$) in the favorable evolution of the child with obesity. Important prognostic factors were the TG and TC values, weight decreases were significantly associated with decreases in these parameters. A lower impact on the patient's post-treatment evolution was seen by BMI value, demonstrating that therapy is more important for favorable evolution, and the initial nutrition status represents just an additional factor. The diet associated with physical exercise is extremely important for decreases cardiovascular risk in obesity.

Limitations of the present study includes the brief follow-up period, the exact assessment of physical activity performed by each child as well as sedentarism outside of specialized kinetotherapy.

In this study were included obese children and adolescents who received only a prescriptive diet alone (group 1) compared with the prescriptive diet and physical activity (group 2). Our results confirm that the hypocaloric diet combined with physical activity is more effective in reducing the weight, BMI, WC and biological parameters (TC, TG), compared to hypocaloric diet without physical activity.

Literature studies had shown that children at high-risk for developing CVD, obesity and abdominal adiposity are associated with high TG, TC, and low HDL cholesterol [6], significant predictors factors in the evolution of obesity.

WC, particularly visceral fat, is an independent risk factor for diabetogenic-atherogenic abnormalities in adolescents [7, 8, 10, 11]. In our study, we found a high percentage of dyslipidemia in obese children. Furthermore, assessing the cardiovascular risk by TC levels, we found that 13,16 % of

patients from group 1 and 22.16 % of patients from group 2 had important risk that needs an early approach. Children with body weight above the 95 percentiles have usually an increased level of TG, being an important cardiovascular risk factor [14].

Dietary constituents of a weight loss diet have a small but significant impact on the lipid level changes. Even in the absence of significant weight loss, dietary therapy can be beneficial and should be encouraged [15].

Duration of exercise had a significant impact on the total cholesterol levels and improves the cardiovascular risk factors [12, 13, 16]. Exercise alone is usually not enough to induce significant weight loss. It is recommended that patients exercise for 150 min or more per week (30 min - 5 times per week). The more intensive exercise program is, the greater the effect on weight and lipid levels will be [18].

Conclusions

The implementation of a multidisciplinary nutrition and kinetotherapy program, doubled by psychological counseling to ensure optimal nutritional control of childhood obesity and superior quality of life is extremely important. Our results confirm that diet and physical activity affects significantly the serum lipid profile. Obesity and overweight remain risk factors for the development of hypercholesterolaemia and hypertriglyceridaemia. In summary, we have found that diet combined with sustained exercise improve WC and cholesterol and tryglicerides levels in obese children, the main risk factors of cardiovascular diseases. In this context, decreasing obesity in children through diet and exercise should be an important strategy for preventing cardio-metabolic disease in adult.

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Manuscript received: 15.02.2018