OBESITY - A RISK FACTOR FOR CARDIOVASCULAR DISEASES

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OBESITY - RISK FACTOR FOR CARDIOVASCULAR DISEASES (Abstract): Infantile and juvenile obesity is a medical, social and cultural problem, which reaches epidemic proportions worldwide. In Romania, according to the World Health Organization, one out of four Romanians is obese. As far as infantile obesity is concerned, Romania ranks third in Europe. Infantile obesity has a major impact on all body systems and is associated with risk factors for cardiovascular diseases and accelerated atherosclerotic processes, including hypertension, atherogenic dyslipidemia, atherosclerosis, metabolic syndrome and functional and structural cardiac changes. **Aims:** To study the cardiovascular complications of the obesity at children and adolescents. **Material and methods:** Our study was conducted on a group of 188 obese and overweight patients that were hospitalized in the Pediatric Cardiology Department, the “Sfânta Maria” Children’s Hospital of Iaşi between 1 January 2006 and 1 January 2011. The patients’ evaluation was based on: anamnesis, clinical criteria and paraclinical criteria. **Results:** The distribution of cases by age group was the following: 51% of patients were aged 7-13 years, 42% were teenagers and only 6% of patients were aged between 2-6 years. As far as the patients’ origin is concerned, we noted that 58% of them lived in urban areas. In the study group, 21% of the subjects had borderline hypertension, while 16% of them suffered from definite hypertension. The echocardiogram that was performed on all the patients included in the study revealed hypertrophic cardiomyopathy in 12% of the patients. **Conclusions:** Child obesity has a major impact on all the big body systems and it is known to contribute to significant increases in the mortality and morbidity rates. **Keywords:** OBESITY, CARDIOVASCULAR COMPLICATIONS, HYPERTENSION, METABOLIC SYNDROME.

Infantile and juvenile obesity is a medical, social and cultural problem, which reaches epidemic proportions worldwide.

Children whose body mass index are equal to or exceeds 95 percent are considered obese, whereas those whose body mass index ranges between 85 and 95 percents are referred to as overweight (1, 3).

The worldwide prevalence of overweight and obesity in children and adolescents increased considerably from 4.2% in 1990 to 6.7% in 2010. The infantile obesity prevalence is expected to reach 9.1% (about 60 million) in 2020. According to the data collected in 144 countries in 2010, about 43 million pre-school children (of whom 35 million in developed countries) were obese or overweight, while 92 million ran an overweight risk. The infantile obesity prevalence was 8.5% in Africa in 2010, and it is expected to reach 12.7% in 2020. This prevalence was low in Asia, in 2010, as it reached a mere 4.9%, yet the number of concerned children was higher (18 mil-
In America, between 16 and 33% of the children and adolescents are obese (1,2).

In Romania, according to the World Health Organization, one out of four Romanians is obese. As far as infantile obesity is concerned, Romania ranks third in Europe.

Infantile obesity has a major impact on all body systems and is associated with risk factors for cardiovascular diseases and accelerated atherosclerotic processes, including hypertension, atherogenic dyslipidemia, atherosclerosis, metabolic syndrome and functional and structural cardiac changes (1).

Infantile obesity causes the occurrence of the atherosclerotic disease in the child’s vascular structures, which affects especially the aorta and coronary arteries.

Owen et al. argue in their study that the body mass index during childhood is closely related to later cardiovascular disease risks (1, 4).

MATERIAL AND METHODS

Our study was conducted on a group of 188 obese and overweight patients that were hospitalized in the Pediatric Cardiology Department, the “Sfânta Maria” Children’s Hospital of Iași between 1 January 2006 and 1 January 2011.

The patients’ evaluation was based on:
- Anamnesis: which included questions related on the patients’ age, gender, origins, family history of various diseases (close family diagnosed with obesity, hypertension, diabetes mellitus), personal physiological history (small weight at birth, food received during the first months of life, diversification) and personal pathological history (genetic syndromes, endocrine diseases, dyslipidemia, diabetes mellitus).
- Emphasis has been placed on the child’s feeding habits, on investigating possible psychological causes of hyperphagia (separation from parents of the latter’s leaving abroad to work), and also on the child’s lifestyle (practicing different forms of physical activity).
- Clinical criteria: anthropo-metric data (weight, body mass index), arterial tension and heart rate measurement, pulse determination, identification of symptoms of headache, tinnitus, dizziness.
- Paraclinical criteria: haematological checks (glycemia, total lipids and cholesterol dosing, lipid profile), electrocardiogram, Holter monitoring of arterial tension and Holter – EKG monitoring (of patients with high arterial tension values or altered electrocardiogram), echocardiogram, ophthalmological examination, genetic examination, endocrine examination, neuropsychiatric and psychological examination, consult nutritional diseases.

RESULTS

The distribution of cases by age group was the following: 51% of patients were aged 7-13 years, 42% were teenagers and only 6% of patients were aged between 2-6 years (fig. 1, 2).

As far as the patients’ origin is concerned, we noted that 58% of them lived in urban areas, which is attributed to sedentary as well as eating fast food.

Here is the case distribution over the five years of study: 24% of the cases in 2006, 16% in 2007, 30% in 2008, 10% in 2009 and 20% in 2010 (fig. 3, 4).

Study of anthropometric indices (weight, height, body mass index) showed that 63% of patients in the study were obese (BMI greater or equal than percentile 95) while 37% were overweight (BMI of between 85
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and 95 percentiles). When case distribution according to gender was considered, we noted a higher obesity rate in the female sex (59%) than in the male sex (41%).

Fig. 1. Case distribution on age groups

Fig. 2. Case distribution to the patients’ origin

Fig. 3. Case distribution over the years studied

Fig. 4. Case distribution according to sex
The analysis of the data gathered during anamnesis revealed the 33% of the patients had a personal history of various diseases, and 34% of the subjects had immediate family members suffering from arterial hypertension, diabetes mellitus or obesity.

35% of the patients came to the hospital since they experienced specific symptoms such as dyspnoea on effort, tinnitus, headache, dizziness or high arterial tension values detected in the outpatient clinic.

In the study group, 21% of the subjects had borderline hypertension, while 16% of them suffered from definite hypertension (fig. 5).

Another criterion considered was modification of the ECG. Of the 188 patients included in the study group, 10% had sinus tachycardia, 2% had extrasystolic arrhythmia, 5% had sinus arrhythmia, 7% had atrioventricular conduction diseases and 6% had biventricular overstrain.

The ophthalmological examination performed revealed fundus of the eye changes in 5% of the cases, of whom 4% had retina vessels with increased spasticity and only 1% suffered from 1st or 2nd degree hypertensive retinopathy.

One of the diagnosis criteria was the detection of connections between hypertension and fundus of the eye changes. Of the 188 patients, 5% exhibited such connections, 6% suffered only from hypertension and had no fundus of the eye changes, whereas 89% of them did not exhibit such an association.

The echocardiogram that was performed on all the patients included in the study revealed hypertrophic cardiomyopathy in 12% of the patients (fig.6).
8% of the patients in the study group associated hypertension and high cholesterol levels, 16% of them had high blood pressure values yet their cholesterol levels were low and 5% of the patients had high cholesterol levels but no hypertension (fig. 7).

**Fig. 7.** Case distribution according to the association between hypertension and high cholesterol levels

4% of the children in the study group associated high blood pressure values, high cholesterol levels and hypertrophic cardiomyopathy (fig. 8)

**Fig. 8.** Presence of an association between HT + high cholesterol levels +HCM

The psychological and neuro-psychiatric exams carried out revealed that 1% of the 188 studied patients came from over-protecting families, 4% had suffered psychological trauma in their personal history (parents’ divorce/separation), 2% of the subjects suffered from the Italia syndrome, 18% encountered social and family integration difficulties and 14% had a luminal intellect.

**DISCUSSION**

Child obesity has a major impact on all the big body systems and it is known to contribute to significant increases in the mortality and morbidity rates (1,5).

The data gathered so far suggest that atherosclerotic cardiovascular processes commence in early childhood and are influenced over a person’s life by both genetic and modifiable risk factors such as exposure to harmful environmental factors, including obesity (1,6).

According to literature, the obesity rate is higher in pre-school and adolescent children (1,2). The infantile obesity rate has increased twice in pre-school children aged between 2 and 5 and in adolescents be-
between 12 and 19 years of age, and 3 times in 6 to 11 year-old children, over the last three decades. Although the obesity rate is higher in females, the male sex has a higher risk of cardiovascular diseases (1).

High blood pressure values (AT>95%) were detected in 35.4% of the overweight children by a study conducted in Europe (1,8). The data collected by a study conducted in India, on a group of 25000 of school children aged between 5 and 16 years revealed a similar percentage (1,7). In our study, high blood pressures were identified in 10.10% of the normal weight children, in 17.34% of the overweight children and in 18.32% of the obese children (1).

Hypertension and obesity are connected most of the times and they put double pressure on the left ventricle, thus leading to the occurrence of both dilation and muscular hypertrophy (13).

In left pathological ventricular hypertrophy, the increase is not proportional, and the ventricular function is altered, the coronary vessel dilating capacity is reduced and the process regression is impossible (12). Obese subjects are 4 times more likely to suffer from compensatory left ventricular hypertrophy associated with low ejection fraction, reduced myocardial contractility and the need of the left atrium to have more force to fill the left ventricle (11). Concentric remodelling was the most common in obese children, whereas concentric hypertrophy was especially characteristic of those who also suffered from hypertension (13).

In their study, Li et al. performed echocardiograms of 467 young people and reported that a high body mass index during childhood, obesity and systolic hypertension during adulthood, as well as the cumulated burden of obesity and systolic hypertension from childhood up to adulthood are predictive factors of left ventricle muscle mass increase in young adults (10). Ventricular hypertrophy has higher prevalence in obese (33.5%) and overweight (12.4%) children as compared to normal weight children (3.5%). In a study, the patients with borderline hypertension were found to have higher left ventricle muscle mass values than those with normal tension values (13). Obesity, hypertension and concentric hypertrophy are independent predictors of diastolic dysfunction. 52% of the obese children in our study had hypertension, which means that their body mass index, left ventricle dimensions and left atrium muscle mass index were also high. These subjects also exhibited diastolic function changes.

42% of the patients had concentric remodeling (muscular dilation) and 32% of them suffered from concentric hypertrophy, which supports a strong association between hypertension and ventricular remodeling. Previous studies have shown that an excess of body mass is associated with high blood flow values and eccentric hypertrophy. Nevertheless, only 6% of the subjects in our study suffered from such conditions, as most of them exhibited muscular dilation and concentric hypertrophy (13).

On the other hand, cardiovascular diseases, be they inborn or acquired, cause increased obesity prevalence, given the limited physical activity recommended by the cardiologist or preferred by the family or even the patient. A vicious circle is thus created in which obesity worsens heart conditions and lack of physical activity due to heart conditions accentuates obesity (14).

**CONCLUSIONS**

Our research conducted on the study
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group described above enabled us to conclude that high overweight and obesity rates are especially characteristic of the 7-13 years age group. The incidence of obesity is much higher in the urban (58%) than in the rural areas, which is due to the unhealthy fast food available in urban areas. The incidence of obesity is higher in the female (59%) than in the male sex. 37% of the patients suffered from hypertension, 21% of whom had borderline hypertension and 16% suffered from definite hypertension. Changes in the fundus of the eye associated to hypertension were revealed in 5% of the patients, while hypertrophic cardiomyopathy was detected in 12% of the study subjects. 8% of the subjects associated hypertension and high cholesterol levels, and 5% had high cholesterol levels but no hypertension. Only 4% of the subjects associated high blood pressure values, high cholesterol levels and hypertrophic cardiomyopathy.

REFERENCES
8. I’Allemand D, Wiegand S, Reinehr T, Muller et al. – Cardiovascular risk in 26008 European overweight children as established by a multicenter database. Obesity (Silver Spring), St Gallen, Switzerland, 2008.