

# THE DYNAMIC OF OBESITY EPIDEMIOLOGY AND RISK FACTORS INVOLVED IN THE DEVELOPMENT OF CHILD OBESITY IN A GROUP OF CHILDREN FROM TIMIS COUNTY

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## Abstract

Child obesity is a multifactorial disease. At present, prevention is the most effective approach. Aim: To determine the dynamic of overweight and obesity and the presence of some of the already known risk factors. Material and Methods: The retrospective study was performed in IInd Clinic of Pediatrics, Timisoara for a 3 year period. The study group included 174 children, 88 boys and 86 girls, with a mean age 11.87 +/- 3.33 years, evaluated for excessive weight. The first evaluation included complete personal and medical history, and complete physical exam including anthropometric indexes and specific biochemical tests. Results and discussions: Out of the study children 8.05% were overweight, 40.23% had mild and moderate obesity, and 51.72 % had severe obesity. The majority (71.83%) of cases were from urban areas. Positive family history of obesity was seen in 31.03% (n = 54) of children. More than half of these children, (62.96%) were severely obese. A small percent (15.73%) were SGA or LGA. 74.84% were naturally born and only 25.16% by caesarean section. More than half of the obese children, (55.08%) were breastfed for one or two months or fed with formula or cow milk from the beginning. Conclusion: Positive family history for obesity is a strong predictor for child obesity. Mode of delivery, birth weight, breastfeeding are also involved in child obesity development but evaluated separately seem to play less important roles.

**Key words:** child obesity, risk factors, family history, birth weight, breastfeeding.

## Introduction

Child obesity remains an important pediatric problem. There is no unanimity regarding the most effective treatment, so prevention is still the most important approach. It is well known that obesity is the result of interaction between multiple environmental and genetic factors.

Identification of children at high risk of obesity is challenging, and the data on this subject in Romania are scarce. Numerous risk factors have been recognized to be involved in the onset and development of childhood obesity.

Family history of obesity has been shown to be one of the main predictors for child obesity (1, 2), not only for the genetic component, but also for the environmental ones like eating habits and pattern, perception on child obesity. Another important group of related childhood obesity risk factors are those concerning the birth (birth weight and delivery by caesarean section or vaginally) and the first year of life. The World Health Organization recommends exclusive breastfeeding for the first six months of life and the introduction of complementary food in children after six months. It also recommends that partial breastfeeding continue up to two years of old (3).

The aim of this study was to establish the dynamic of the obesity epidemiology in a geographic region and the relationship between family history of obesity, mode of delivery, birth weight, breastfeeding, the introduction of new complementary food before six months of age and child obesity.

## Material and methods

The retrospective study took place in IInd Clinic of Pediatrics, County Clinical Emergency Hospital “Pius Branzu” Timisoara between 1st January 2010 and 31st December 2012. The study group was formed of 174 children, ranging from 3.5 to 19.1 years old, which were evaluated for excessive weight. The first evaluation included a complete personal and medical history, complete physical exam including anthropometric indexes and specific biochemical tests. The children were measured without shoes, wearing light outdoor clothes. Height was measured using a rigid stadiometer to the nearest 0.1 centimetre, and weight using a calibrated electronic scale to the nearest 0.5 kilograms. Two different measurements were performed, and the mean was recorded. The 2007 WHO growth standards were used for diagnosis and classification of obesity. Overweight was defined as a BMI z-score above 1SD but lower than 2 SD, mild and moderate obesity defined as a BMI z-score between 2 SD and 3 SD and severe obesity when BMI z-score was over 3 SD.

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Former small for gestational age (SGA) was defined by birth weight below the 10th percentile for gestational age and sex, while large for gestational age (LGA) was defined as above 90th percentile for gestational age and sex, according to WHO growth standards. All children with birth weight in between these limits were considered appropriate for gestational age. Children born before 37 weeks of gestation were excluded from the initial study group. The analysis included the following variables: family history, birth weight, birth by caesarean section or vaginal, breastfeeding, breastfeeding duration. Quantitative data with normal distribution were presented as mean +/- standard deviation (SD).

### Results and discussion

From the initial study group (n = 174), 37.93% of children were evaluated in the first year, 25.86% were evaluated in the second year and 36.20% in the third year. This study results were different from the ones found in another Romanian study (4). We found no increase in the annual incidence of obesity. Moreover, a slight decrease in the number of patients addressing the clinic during the second year. The both studies had significant limitations: the relatively small number of subjects included and, maybe the most important is the children selection. All children addressing for excessive weight were included. So these results do not represent the prevalence and incidence of child obesity. It can rather be an indicator of recognizing the problem, being informed and searching for medical help.

Most of the cases were from urban areas (71.83%), and the sex ratio male was approximately 1:1 (88M: 86F), and the mean age was 11.87 +/- 3.33 years. Children were divided into four age groups: under 7 years; from 7.1 to 10 years; from 10.1 to 14 years and above 14.1 years old. The incidence by age group and sex is shown by years in Figure 1. The highest incidence of obesity was seen in the third year of study in the 10.1 to 14 years group, 39.08% (n = 68).

Using BMI 2007 WHO criteria and growth standards for age and sex, the study group was divided into three groups: A: overweight (n = 14: 13 F and 1 B) – 8.05%; B: mild and moderate obesity (n = 70: 38 F and 32 B) – 40.23%; and C: severe obesity (n = 90: 35 F and 55B) – 51.72 %. It is thus alarming that more than half of the evaluated children came to the doctor only when they were severely obese, and just a small number (under 10%) when the weight problems began.

It is known that family history is a significant predictor for child obesity and children with one obese progenitor had four times (1) higher risk to have weight problems (5,6). It seems that BMI during infancy was more strongly associated with maternal than paternal obesity overall (7). Analyzing the family history was showed that 31.03% (n = 54) of children had at least one overweight or obese parent or grandparent. More than half of these children (62.96%) were severely obese. Correlating these data with the age of the child, it was found that the number of children with

positive family history was higher in the 7.1 to 10 years of age group (43.58%), followed by the group of children aged under 7 (33%). Heredity, therefore, may play an important role during the first years of life, but up to prepuberty and during puberty and adolescence this role is taken by other factors such as nutritional habits, hormonal changes and so on. These results are similar with the ones published by Cosoveanu S. and al. (8) in which 21% of overweight and 23% of obese kindergarten children had one obese parent, while 6% and 9% respectively had both parents obese. When analyzing the primary school children, in the same study, 12% of overweight and 32% of obese children had one obese parent, while 11% and 9% had both parents obese. A smaller percent was found in another Romanian study (9) in which only 10% had a positive history of obesity. The authors concluded that the prevalence of obesity is increasing by approximately three times in children with positive family history of obesity.

Birth weight it is considered to be a risk factor as well. Twelve children from the initial study group were excluded because of the lack of information on pregnancy evolution, type of delivery, birth weight and length. Another three cases were excluded because of low birth weight due to prematurity. Hence, the new study group has been divided into three subgroups using this variable: SGA (n = 8), AGA (n = 134) meaning 84.27% and LGA (n=17) – Figure 2. Therefore, a small percent (15.73%) of overweight and obese children were SGA or LGA. Some studies have found that there is a linear relationship between birth weight and childhood obesity (10, 11). One of these studies suggested the use of ponderal index as a predictor of later adiposity rather than just the use of birth weight (11). The direct relationship between birth weight and fat distribution during childhood seems to be influenced by parental weight. Lower birth weight is more frequent associated with central adiposity among children of overweight parents. Among children, with normal weight parents, there was a significant association only for birth weight and later subscapular skinfold, but this association was less significant compared to the parents group with excess weight (12).

Another risk factor is the mode of delivery. The mechanism underlying this association is unknown. There are a few theories: one is related to the different intestinal flora in children born naturally versus those borne with caesarean, other are related to effects on inflammation, immune and endocrine function. So, 74.84% of children were born vaginally and only 25.16% were borne by caesarean section. These percentages might not be accurate as in the last 5 years the number of on demand caesareans alarmingly increased. In a 3 years prospective study Huh et al. concluded that birth by caesarean section is associated with two-fold higher odds of obesity at three years of age (13). In another smaller Chinese study, the children born by caesarean had five times (OR = 5.23) higher risk of becoming obese.

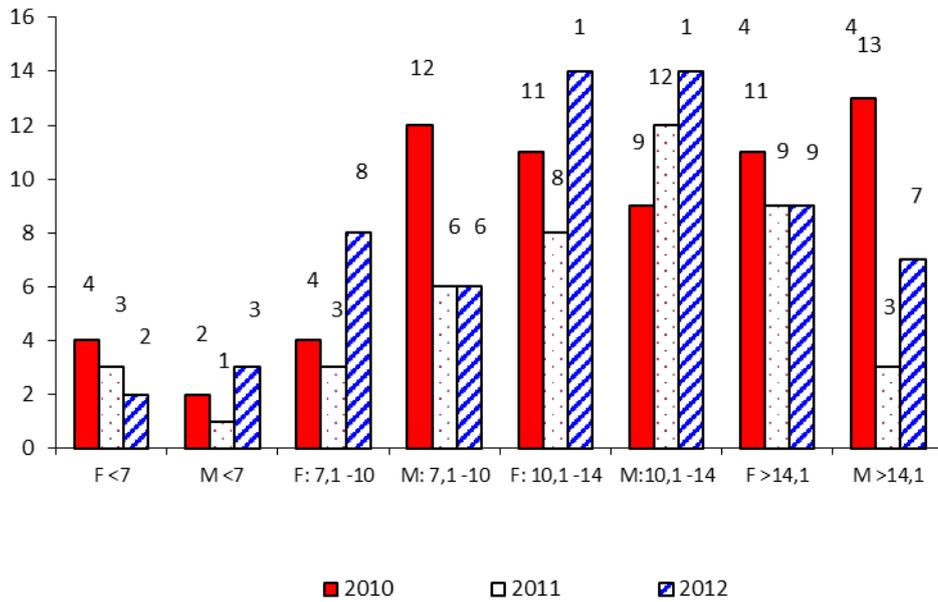


Fig.1. Incidence of overweight and obesity in the study group by age, sex and year of diagnosis.

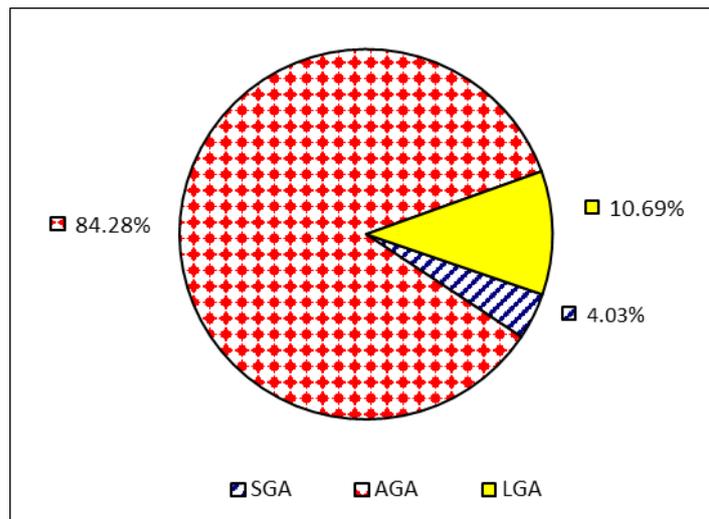


Fig.2. Study group distribution by birth weight.

Breastfeeding is known to be a protective factor, but optimal duration of breastfeeding is uncertain. Five children from the original group were excluded because the data were scarce. The children were divided by the period of breastfeeding in six groups. The first group was formed by children fed with formula or cow milk = 47 (28.11%). The second comprised those breastfed under one month = 27; the third: children breastfed between one and two months = 18; the fourth group - those breastfed for three to four months = 30; the fifth, children breastfed five to ten months = 22 (13.17%) and, the sixth group included children breastfed over ten months = 23 (13.77%). More than half of the obese children (55.08%) were shown to have been breastfed for one or two months only or fed from the beginning with formula or cow milk. The results were similar with the ones published by Mindru et al. (4). The authors found that 33% of the children were never breastfed and only 11.64% of the study group children were breastfed for five to ten months. The duration of breastfeeding remains an important risk factor. In a study by Huus et al. (15), who analyzed data from birth and later, at 5 years, it was shown that children who had been exclusively breastfed for more than 4 months were less likely to be considered obese (OR: 0.82) compared with those who were exclusively breastfed for less than 4 months. In an English birth cohort study (16) it was observed that the odds ratio of weight excess was 1.14 among children breastfed for  $\geq 6$  months compared with those who had never been breastfed. The benefits of

breastfeeding are not only represented by the high quality of maternal milk but also by the development of protective behavioral mechanisms (e.g. better self regulation in the energy intake).

There were insufficient data concerning the timing and order of introduction of solid foods to diet, but most of the parents began the diversification at four months or earlier and, mistakes like introduction of wheat products before six months of age or of sweets, in the first year of life were frequent.

### Conclusions

More than half of the evaluated children presented severe obesity (51.72%).

Prevention remains the most effective way in fighting obesity epidemic, so early recognition of the risk factors is crucial.

Positive family history of obesity is a strong predictor for child obesity.

Mode of delivery, birth weight, and breastfeeding are also involved in the development of child obesity. When evaluated independently, all the three factors seem to play less important roles.

However, informing the future parents about the advantages and disadvantages of the decisions they make within the first year of their children's life may help preventing obesity and all the medical and social complications that are coming along with it.

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