

ASSESSMENT OF THE PRESCHOOL AND SCHOOL OBESE AND OVERWEIGHT CHILDREN

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Abstract

In the last decades, obesity became one of the most frequent nutritional diseases in the world, resembling a pandemic and being considered the 21st century disease. Obesity is characterized by an excess in weight, which represents more than 20% of the ideal weight and it occurs due to an increased food intake in the people with a particular constitutional predisposition. BMI is an indirect measure of body fatness. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry.

Keywords: obesity, evaluation, BMI, child

Introduction

In the last decades, obesity became one of the most frequent nutritional diseases in the world, resembling a pandemic and being considered the 21st century disease. Obesity is a plurifactorial disease, its occurrence supposing multiple interactions among genetic, social, behavioral, metabolic, cellular and molecular factors that lead to changes of the energetic balance [1]. The specialty literature defines obesity as an excess of body fat or adipose tissue quantity as compared to the “lean” tissue mass (National Research Council, Diet and Health, 1989). Obesity is characterized by an excess in weight, which represents more than 20% of the ideal weight and it occurs due to an increased food intake in the people with a particular constitutional predisposition. [2]

According to a study carried out in 79 countries, World Health Organization (WHO) estimates that there are 250 million obese people in the world, among which approximately 22 million are children aged less than 5 years. The study stresses upon the fact that 50% of the obese children will become obese adults. [3] The IOTF (International Obesity Taskforce) Report showed that 1 in 10 children is overweight, leading to a total of 155 million, among which 30 to 45 million are regarded as obese. [4] NCHS/ WHO Source: National Nutrition Surveillance Programme, 1993-2002. Bucharest, "Alfred Ruseanu" Institute for Mother and Child Care, shows a prevalence of overweight in the children aged 0-4 years of 6.4% in girls and 5.5 % in boys. [5] A study carried out between 2005 and 2006 in children aged 11 to 15 years (published in a report of The International Association for the Study of Obesity, London, 2009), showed that, in Romania, the overweight prevalence is 14.7% in girls and 8.7% in boys, the highest prevalence being registered in Malta (31% in boys and 28% in girls) and the lowest in Lithuania (10.3% in boys and 4.7% in girls).

Most researchers stress upon the idea that obesity which occurs in childhood and maintained when adult is more difficult to treat than the obesity occurred when an adult. Children obesity in the 21st century inevitably leads to a decrease of life expectancy. [6]

ASSESSMENT OF OBESITY IN CHILDREN
The assessment of obesity in children implies several stages (fig. 1).

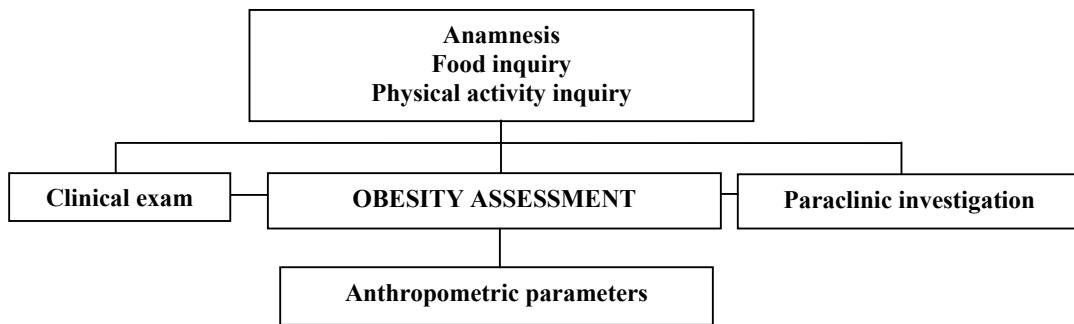


Fig. 1 Assessment of obesity in children.

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1. ANAMNESIS

- Obesity onset age: more frequent in the first year of life, between 5 and 6 years of age and during adolescence;
- Food inquiry: an excess in food intake, particularly in sweets and fats, fast-food; the meal program is not observed;
- Physical activity inquiry: sedentarism, performed physical activity, sports, time spent in front of the computer and TV;
- Trigger factors: infectious episodes, drugs, psychological factors, overfeeding;
- Events which had a serious psychological impact and which can represent the moment of hyperphagia; family conflicts, parents divorce, accidents).

Identifying the obesity risk children:

- Relation weight at birth – obesity,
- Pre- and postnatal development, age stages development,
- Overfeeding when infant,
- Obesity onset age,
- Relation between food intake/physical activity and obesity; food intake – physical activity.

2. CLINICAL FINDINGS

Infant obesity, in both sexes, develops, as a rule, a uniform clinical picture, characterized by troncular fat deposits, partly avoiding the face and extremities. The distribution of the adipose panicle is generalized and symmetric and it varies according to sex and age. In preschool children it is diffuse, leading to uniform, harmonious obesities while in school children, the weight excess is associated with a distribution of the weight at the level of the abdominal wall, hips, thighs, buttocks, the pectoral region and the subscapular area. The height of children is normal or even increased as compared to the age average. At pre-puberty age, one can notice that obese children are taller as compared to children with normal weight and same age, the height of the obese being over percentile 97, until puberty. [1]

Fighting against obesity starts ever since childhood; in girls, the early obesity leads to a stop of the growth cartilages, reducing the height, while obese boys will have a deficitary sexual development. One can notice whitish, sometimes reddish, stretch marks on the abdomen flanks, on hips and thighs, and facial erythrosis. Because of the excessive adipose tissue deposits, the cutaneous folds are getting more and more profound, leading to friction, hyper-sweating – the teguments have a drier aspect and the acne is more frequently met.

Morphology of genital organs. Because of the adipose deposits in the lower abdominal and pubian regions, the genital organs are almost hidden. In boys, the pubian and perineal fat makes the penis to be engrossed in it, the scrotum flat and the testicles difficult to palpate; a false adiposogenital diagnosis (Babinski-Frohlich), genital infantilism, and adiposity in the mammal region (thorax-abdominal adiposity) lead to the appearance of gynecomastia which can produce complexes.

Psychological problems: inferiority complex and rejection from the same age children, frustration, depression;

sometimes poor results at school, antisocial behavior, sedentarism, normal intellectual development.

There occurs a low tolerance in effort: tiredness, dyspnea, polipnea, tachycardia which lead to avoiding effort and consecutively to decreasing the energy consumption and aggravating obesity.

The overcharge of the osteoarticular apparatus has several consequences: genu valgum, flat foot, edema of the lower limbs in orthostatism, articular pains, gonarthrosis, femoral head aseptic necrosis, hyperlordosis.

Unspecific symptomatology: cephaea, asthenia, flatulence, bloating, period dysfunctions, constipation, normal or increased BP values.

OBESEITY PHENOTYPES

- **Androgynous type (upper troncular, abdominal, central, upper, “apple” type)** – the distribution of the fat is mainly in the abdominal region; it is frequently associated with the increase of the visceral and intra-abdominal tissue deposits, and it correlates with high morbidity and mortality due to cardio-vascular diseases, especially in boys.
- **Ginoid type (pelvis, lower, peripheral, “pear” type)**, distribution of the adipose tissue mainly on buttocks and thighs, especially in girls.
- **VAT (visceral adipose tissue)** can be noticed by means of imagistic techniques (ECHO, CT, MRI): particular cardiovascular and diabetes risk, frequently associated with insulin resistance and hyperinsulinism

1. ANTHROPOMETRIC MEASUREMENTS

The normal growth is defined as the progression in weight and height in accordance with the established standards for age, sex and the genetic potential of the individual. The growth process is monitored by comparing the weight and the height of the child with the standard references offered by the growth maps (*nomograms*). These maps are a set of curves which indicate the normal progression of an anthropometric parameter according to age and sex. The location on that map of an anthropometric parameter registered for a certain subject indicates where that parameter is situated, as compared to the reference population of the same age and sex. By mapping the different measurements, a child with a normal growth groups the values, which were registered on the occasion of different assessments, between two curves of the map, marking his/her own growth band [7]. The growth maps are more useful than the anthropometric indicators, since they report the evolution of the child's growth to the average values for the age group (percentile 50) and they allow the calculus of the anthropometric indicators when one does not know the weight or the height at birth. Harmonious growth and development mean that the values of different measurements of the child at a certain age will be found approximately on the same curve, percentile.

Nomograms (CDC 2000) for the 0-36 months and 2-20 years categories of age [8]:

- **Weight for age/ sex**
- **Height for age/ sex** – the deficit in height means a slow development of the skeleton and it is due to a

- chronic cause which acted in time; the recovery is going to be a long one
- **Weight for length/ sex** – the deficit in weight for a certain length reflects an acute cause of the nutritional state which can be easily recovered
 - **Up to the age of 2 years: Ponderal Index = Weight present / Weight_{ideal}**
The ideal weight is assessed by means of some nomograms (which have a regional specificity or are calculated according to some formulas).
 - **BMI for age/ sex** – after 2 years of age.
BMI is an anthropometric index of weight and height that is defined as body weight in kilograms divided by height in square meters; and calculated with EXCEL BMI Calculator English Version – www.cdc.gov/healthyweight/BMI.
 - **BMI = Weight (kg) / Height (m)²**
The growth charts show the weight status categories used with children and teens (underweight, healthy weight, overweight, and obese).
 - Underweight:** BMI < percentile 5/ sex/ age
 - Health weight:** 5 ≤ BMI < 85 percentile /sex/ age
 - Overweight:** 85 ≤ BMI < percentile 95/ sex/ age
 - Obese:** BMI ≥ percentile 95 (+2DS) / sex/ age
 - BMI is an indirect measure of body fat. Recent research has shown that the age when the "adiposity" rebound occurs may be a critical period in childhood for the development of obesity as an adult. An early "adiposity" rebound, occurring before ages 4-6, is associated with obesity in adulthood.
 - BMI is a reliable indicator of body fatness for most children and teens. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy X-ray absorptiometry (DXA). BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems.
 - After BMI is calculated for children and teens, the BMI number is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children. The IOTF Report recommended using age and gender specific BMI cut-off points which equate to an adult BMI of 25 and 30. This approach defines overweight as the childhood equivalent of having a BMI of 25 or above (age and gender adjusted) and obese as the childhood equivalent of having a BMI of 30 and above (age and gender adjusted) [4].
 - The best definition of obesity in children is given by the content of the body fat mass calculated through bioelectric impedance. Up to 16 years, the child is considered obese if the fat mass is more than 20% of the reference value for age and sex, while for the age of plus 16 years, the diagnosis implies a fat mass more than 25% of the weight in boys and more than 32% in girls.
 - Classification according to the excess weight:**
- Overweight: increased values, more than 10-20 % W_{ideal}
- Light obesity: increased values, between 20 and 30 % W_{ideal}
- Medium obesity: increased values, between 30 and 50 % W_{ideal}
- Severe obesity: increased values, more than 50 % W_{ideal}
- Other parameters which can only be obtained through imagistic methods (ECHO, CT, MRI):
- Total Body Fat Mass – **TFM**;
 - Body Fat – **BF**;
 - Visceral Adipose Tissue – **VAT**.
- Abdominal ECHO:** measurement of the thickness of the intra-abdominal adipose tissue layer by determining the fat located between the anterior abdominal muscles and the aorta.
- An accurate estimation of the adipose tissue quantity with **OMNIRON BF 302**.
 - There is a correlation among BMI, TFM, the thickness of the tricipital skinfold, the level of insulin, and BP
 - Thickness of the tricipital cutaneous skinfold > percentile 95 for age/sex
 - Waist circumference has attracted much recent attention as an indicator of fatness and health risks in children and adults.
 - **Metabolic profile:** glucidic (glucose tolerance test, glycemia); lipidic (cholesterol, HDL, LDL, TG, lipemia).
 - **Enzymatic:** serum leptin (the serum levels are influenced by the food intake, the glycemia level, the adipose tissue mass, sleep-watch rhythm and they vary according to age, sex)
 - **Complementary tests**
- ### OBESITY CLASSIFICATION
- I. **Primary obesity (ordinary, idiopathic, essential)** 95-98%
1. **familial:** (with an abusive feeding behavior, sedentarism or both)
 2. **non-familial:** it occurs in several family generations, the onset is at the infancy age, children are normally developed from the psychic point of view, adiposity is located in the ½ lower part of the trunk and at the level of the lower limbs (cylindrical aspect).
- **Ordinary type:** the onset is between 4 and 6 years, but the specific aspect is to be noticed at puberty, familial feature (70% have at least one obese parent)
 - **"Cushing"** type: 2%, onset usually at 5 or 6 years of age, "full moon" face, thick, "bull-like" neck, fat in the ½ upper part of the trunk, hyperpigmentation.
 - **Familial plethoric obesity:** 5%, onset when an infant, rather tall, well-developed muscular mass, excessive fat prevails in the ½ lower part of the trunk and at the level of the lower limbs.
- II. **Secondary obesity (symptomatic, endogenous, unknown cause)** 10 %
1. **endocrine:** Cushing syndrome, insulinoma, polycystic ovary Stein-Leventhal syndrome), hypothyroidism

2. **hypothalamic:** central obesity of tumor cause, inflammatory, post-traumatic, vascular obesity, Babinski-Frohlich syndrome

3. **deposit diseases:** glycogenosis type I, Mauriac syndrome

4. **genetic diseases:**

- pleiotropic obesity syndrome (obesity "symptom")
- with dominant autosomal transmission: acardioplasia, Albright hereditary osteodystrophy, Prader-Willi syndrome
- with recessive transmission: Bardet-Biedl syndrome
- with X linked transmission: Turner syndrome
- monogenic obesity – congenital deficit of leptin
- polygenic obesity – over 90% of the obesity cases are polygenic

5. **diseases with particular deposits of adipose tissue:** paralipodystrophy, lipomatosis

6. **drugs:** treatment with HIN or corticoids.

7. **lack of physical activity:** in the severe motor defects due to infantile cerebral paralyses, invalidant sequels of poliomyelitis, myopathy.

Conclusions

A child up to 16 years of age is considered obese if the body fat is more than 20% of the reference value for age and sex. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry. The best definition of obesity in children is given by the body fat content which is measured through bioelectric impedance. Excessive food intake obviously represents the main exogenous factor with a role in the obesity genesis and perpetuation. The prevention of obesity is a public health issue which imposes a careful supervision of the children with a tendency in gaining weight.

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