

# Obesity (Pediatrics)

**Obesity** is the most common metabolic disease that affects not only adults, but also children to an increasing extent. In the Czech Republic in 2000, obesity was found in 6% of boys and 5.6% of girls aged 7–11 years. The incidence of obesity increases in the population by 10-40% every 10 years. The incidence of obesity in children has almost tripled in the last 10-25 years. Most obese children remain obese into adulthood<sup>[1]</sup>

## Diagnosis

- We use BMI (body mass index): **weight (kg) / height (m) <sup>2</sup> (kg/m <sup>2</sup> )**,
- assessment of BMI alone, as is done in adults, cannot be used in children, as BMI changes significantly with age,
- to assess children's weight, we **use the BMI percentile chart according to Bláha and Vígnerová**:
  - 90–97 BMI percentile represents overweight,
  - A BMI above the 97th percentile represents obesity,
  - the degree of obesity can also be determined from the chart. <sup>[1]</sup>

Other methods:

- measurement of subcutaneous fat with calipers at defined points - values change with the age of the child,
- waist circumference (in the horizontal plane in the middle of the distance between the crest of the hip bone and the last rib) - to assess the amount of abdominal fat <sup>[2]</sup>
- hip circumference (at the point of the highest arching of the buttocks),
- bioelectrical impedance (BIA) - measures the composition of the body based on the determination of its resistance during the passage of a current of low intensity and high frequency, it may not be completely accurate, especially in obese people,
- dual X-ray absorptiometry (DXA) - more reliable, available in specialized centers, so far more for research purposes or to assess body composition in severely obese patients. <sup>[3]</sup>

## The underlying causes of obesity

- The **congenital predisposition to obesity** is conditioned by the interaction of about 250 genes known today with perinatal factors, which include maternal obesity, prenatal overfeeding of the fetus, higher birth weight of the fetus, but also malnutrition of the fetus at a certain stage of development<sup>[1]</sup>
  - a breastfed child is less often at risk of obesity than a formula-fed child.
- **External factors** : consumption of foods with a higher energy value, a sedentary lifestyle and recently greatly limited more intense physical activity of children,
  - little interest of schools and especially families in the organization of children's free time,
  - increased intake of foods with a high energy value, a high glycemic index and a high content of saturated fatty acids or hydrogenated unsaturated fatty acids.<sup>[1]</sup>
- **Genetic causes** - receptors for leptin, genetic factors influencing the thermogenic effect of food, ...,
  - obesity is part of genetically determined syndromes ( Prader-Willi syndrome , Laurenc-Moon-Biedl syndrome, etc.) and endocrinopathies ( hypothyroidism , hypercorticalism ([https://www.wikiskripta.eu/index.php?curid=12155#:~:text=endocrinopathies%20\(%20hypothyroidism%20%2C-,hypercorticalism,-%2C%20...\),](https://www.wikiskripta.eu/index.php?curid=12155#:~:text=endocrinopathies%20(%20hypothyroidism%20%2C-,hypercorticalism,-%2C%20...),)), ...).
- Importance of leptin :
  - regulates appetite, energy expenditure,
  - it is related to the rate of maturity and the reproductive system,
  - it is produced by adipocytes ,
  - leptin level is a determining factor for the onset of puberty ,
  - the leptin gene is on the 7th chromosome, leptin receptors on the 1st chromosome,
  - receptors - there are many of them - long form (Ob-Rb) in the hypothalamus, in short forms (Ob-Ra, Rc, Rd, Re) in various tissues of the body,
  - in the CNS, leptin stimulates the production of neuropeptide Y , which affects food intake and reduces thermogenesis ,
  - leptin level cycles (lowest at night), depends on BMI,
  - in the prepubertal and pubertal period, leptin resistance occurs, thereby creating energy reserves for rapid growth during puberty.

## Adverse consequences of obesity

- A significant risk factor for premature atherosclerosis and coronary disease <sup>[4]</sup>
- hypertension , disorder of lipid metabolism - dyslipidemia , chronic inflammation, increased blood coagulation, endothelial dysfunction and hyperinsulinemia <sup>[1]</sup>
- insulin resistance with the development of type 2 diabetes mellitus <sup>[4]</sup>
- orthopedic problems - increased stress on the skeleton, during growth there are changes especially in the

- spine (kyphosis, scoliosis), in the DK (genua and coxa vara), flat feet, later arthrosis occurs,
- vascular system – varicose veins DK,
- gallstones and hepatic steatosis ,
- eating disorders : anorexia nervosa and bulimia nervosa ,
- sleep apnea, shortness of breath ,
- polycystic ovary syndrome , precocious puberty , hypogonadism in boys<sup>[1]</sup>
- an extreme case of obesity leads to the formation of Pickwick syndrome with respiratory and cardiac insufficiency,
- due to extreme obesity, hypoventilation occurs and this suppresses the CNS - extreme sleepiness,
- psychological problems – depression, ridicule, alienation from peers,
- metabolic changes:
  - lipid metabolism - high CHOL, TAG - this can lead to early AT changes,
  - carbohydrate metabolism – insulin resistance and glc intolerance, associated with acanthosis nigricans in skin folds. <sup>[2]</sup>

## Examination procedure of a child with obesity

- Family history, personal history,
- growth chart assessment, eating habits at school and in the family,
- physical examination, anthropometric parameters, blood pressure,
- exclusion of a secondary cause of obesity:
  - basic serum biochemistry, uric acid, lipidogram (total cholesterol, HDL, LDL and triglycerides);
  - hormones: FT4 and TSH to rule out hypothyroidism, insulin and C peptide to rule out diabetes;
  - if hypercorticism is suspected: 24-hour urine collection to determine free cortisol and dexamethasone suppression test. <sup>[4]</sup>

## Obesity therapy

Treatment of obesity is very difficult and often unsuccessful. Treatment should be started as soon as possible, certainly before adolescence. Dietary measures, physical activity, psychotherapeutic procedures, possibly spa stays. Pharmacological treatment is quite exceptional in childhood (for malignant obesity with organ complications in adolescents) and should be indicated by a pediatric obesitologist. A fundamental condition is to achieve a change in the amount of energy consumption and output. Weight loss should not exceed 0.5-2 kg per month. The goal is to approach the 75th percentile on the BMI developmental age curve. <sup>[4]</sup>

The first step is the education of parents, e.g. in the form of printed materials on the healthy nutrition of children of individual age categories. The next step is a gradual change in the behavior and diet of the child and the whole family. <sup>[4]</sup>

## Energy intake and diet

Determining the necessary energy in childhood is very complicated, because its amount depends on the age of the child and on other influences, such as growth or physical activity. With increasing age, the energy requirement per kg of the child's weight decreases.

- Regular diet and fluid intake.
- Food portions should be appropriate for the child's age.
- It is advisable to eat with the whole family and without television.
- It is important to limit the consumption of sugary drinks, the best source of fluids is water.
- Vegetables and fruits should be in the menu five times a day.

Recommended energy content of individual nutrients: 55% carbohydrates (complex carbohydrates with a high fiber content and low glycemic index), 30% fats (monounsaturated and polyunsaturated fatty acids), 15-20% proteins. <sup>[4]</sup>

## Increase in energy expenditure

Increasing energy expenditure can be achieved more easily in children than in adults. A sports activity of at least 1 hour a day is suitable (cycling, swimming, skating).

Increasing energy output alone without reducing energy supply has only a small effect. <sup>[4]</sup>

## Links

### Related Articles

- Obesity

**External links [ edit | edit source ]**

- [www.vyzivadeti.cz](https://vyzivadeti.cz) (<https://vyzivadeti.cz/>)
- SZÚ - percentile graphs (<http://www.szu.cz/publikace/data/6-celostatni-antropologicky-vyzkum>)

## Citation

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2. BENEŠ, Jiří. *Study materials* [online]. ©2007. [feeling. 2010]. < <http://jirben.wz.cz> >. HRODEK, O and J VAVŘINEC, et al. *Pediatrics*. 1st edition. Prague: Galén, 2002. 767 pp. ISBN 80-7262-178-5 .
3. BRAUNER, R and V HAINER. Obesity - diagnosis and treatment in practice. *Medicine for practice* [online] . 2010, year 7, vol. 1, pp. 19-22, also available from < <http://solen.cz/pdfs/med/2010/01/05.pdf> >.
4. URBANOVÁ, Z. Can we influence childhood obesity?. *Pediatrics for Practice* [online] . 2008, year 9, vol. 4, pp. 236-239, also available from < <http://solen.cz/pdfs/ped/2008/04/06.pdf> >.