

# Diseases resulting from nutrient excesses

Malnutrition is defined as a **nutritional disorder** due to absolute or relative **nutrient deficiencies, excesses, or imbalances**. Malnutrition can be classified in several ways:

- **Malnutrition resulting from undernourishment:** nutrient deficiencies
- **Malnutrition resulting from overnutrition:** nutrient excesses
  
- **General malnutrition:** arises from a lack or excess of energy in the diet (protein energy malnutrition, obesity).
- **Specific malnutrition:** arises from a deficiency or excess of individual nutrients.
  
- **Primary (exogenous) malnutrition:** insufficient or excessive nutrient intake. Primary malnutrition affects millions of people worldwide.
- **Secondary (endogenous) malnutrition** results from nutrient absorption disorders, nutrient utilization disorders (enzyme defects), and the use of certain drugs that can alter nutrient metabolism. Secondary malnutrition is infrequent compared to some primary malnutrition. Environmental factors (xenobiotics, smoking) may also contribute to malnutrition.

*The International Classification of Diseases<sup>[1]</sup> classifies diseases resulting from nutrient excesses mostly into the group "Endocrine, nutritional and metabolic diseases". Within this group, obesity and other hyperalimentation (e.g., excess vitamin A and D) (E65-68) are included.*

## Malnutrition resulting from overnutrition

**Obesity** is a manifestation of general malnutrition when there is excessive energy intake. Obesity is a "disease of civilization" and is the **most common metabolic disease** today. It is characterized by **increased fat deposition in the body**.

Excessive intake of certain vitamins, minerals, or trace elements can lead to specific malnutrition resulting from overnutrition. This is mostly associated with excessive supplement use and only rarely it is associated with excessive intake of food (e.g., A hypervitaminosis after consumption of polar bear liver, fluorosis as a result of consuming excessively fluorinated drinking water).

### Definition of the degree and types of obesity

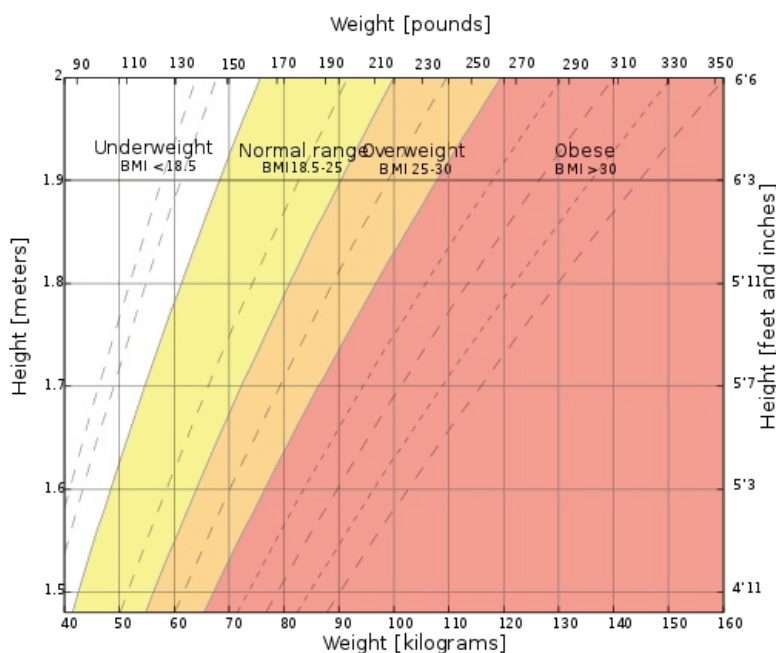
The physiological **body fat percentage** (by weight) is **28-30% in women** and **23-25% in men**. Body mass index, or **BMI**, is most commonly used to define the degree of excessive weight. The following formula is used to calculate BMI.

$$\text{BMI} = \text{weight (kg)} / \text{height (m)}^2$$

Based on BMI, one can distinguish between the different stages of **excessive weight**.

- 20.0–24.9 – normal body weight
- 25.0–29.9 – overweight
- 30.0–39.9 – obese
- 40.0 and more – morbidly obese

The type of obesity is also defined by the **distribution of adipose tissue** in the body. One can distinguish the so-called **android type**, which is characterized by excessive fat storage on the abdomen (apple shape). This type occurs mainly in men and is associated with a greater risk of health complications. **Gynoid type** obesity with the placement of fat on the buttocks and thighs (pear shape), which is found mainly in women, is associated with a lower risk of health complications: it is not associated with a higher risk of cardiovascular and metabolic complications. The distribution of body fat can also be assessed by the **WHR** (waist to hip ratio) **index**. This index is obtained by dividing the waist circumference by the hip circumference. This ratio should not exceed **0.8 for women** and **1.0 for men**.



BMI Graph

## Prevalence of obesity

The **prevalence** of obesity has **risen dramatically** in recent years, both in the developed and developing countries. In developing countries, it is associated mainly with economic development and the adoption of the Western lifestyle in terms of the diet, development of individual modes of transport, and spending time on television. It has been shown that there is a positive correlation between gross domestic product (GDP) and the prevalence of obesity. The distribution of obesity among the population is also characteristic. In developed countries, especially in North America and Europe, obesity is associated with populations with lower access to education and socioeconomic status. It is more common in rural areas. In contrast, in developing countries, obesity is mostly restricted to more economically prosperous populations and is more common among urban dwellers. In Japan and China, there is a relatively low prevalence of obesity. In **Europe**, the prevalence of obesity is **10-20% for men** and **10-25% for women**.

## Pathogenesis of obesity

**Excessive energy intake, low physical activity**, and a number of exogenous and endogenous factors (genetic and metabolic disorders) play a role in the **pathogenesis** of obesity. There are a number of mechanisms in the body to maintain a stable body weight. However, these mechanisms protect people more effectively against energy deficits and weight loss than against energy excesses and weight gain. This is probably because humans have historically experienced food shortages more often than food surpluses during human evolution. Therefore, mainly individuals with energy-storing strategies survived. They then passed on their genes to their descendants, who now, in times of energy excess, have to deal with being overweight. Of all nutrient, **excessive intake of fat** plays the most important role in the pathogenesis of obesity. They have a relatively **high energy value** (per gram) and are **less satiating** than other macronutrients. Obese individuals are not able to adequately burn fat during its excessive supply and the body responds by **storing fat**. These individuals prefer fattier foods mainly for its sensory properties - fullness and texture. Excessive carbohydrate intake does not play a major role because carbohydrate storage is limited. However, consuming carbohydrates in combination with fats (especially in fatty sweets) is risky. Proteins do not play a major role in the pathogenesis of obesity. The lack of food diversity and poor eating habits are lead to excess fat storage and paradoxically, at the same time, some specific **nutrient deficiencies**.

## Health risks associated with obesity

Obesity is now considered one of the **primary health risks** in developed countries. It is associated with a **number of complications** and **diseases**, which are summarized in the following section:

- hypertension
- angina pectoris
- myocardial infarction
- stroke
- lower limb varices and deep vein thrombosis
- diabetes mellitus
- sleep apnea
- lipoprotein metabolism disorders
- hyperuricemia
- changes in fibrinolytic activity
- degenerative diseases of the joints and spine (coxarthrosis, gonarthrosis)
- higher risk of some tumors
- cholelithiasis a cholecystitis
- edema
- worse wound healing
- more frequent injuries and hernias
- depression, anxiety
- low self-esteem, motivational disorders, self-blame
- social exclusion and discrimination
- and more...

## Treatment of obesity

Therapy should be initiated if a BMI greater than 30 is found. The goal of treatment is to reduce weight and maintain the lowered weight. Treatment methods vary depending on the patient's condition. They include dietary treatment, physical activity, cognitive-behavioral treatment and psychotherapeutic support, as well as pharmacological, and surgical treatment. The prevention of obesity is very important, especially through knowledge of the nutritional value of food, the correct composition of the diet, and the principles of a healthy lifestyle, and their application from childhood.

 *For more information see Obesity Treatment Principles.*

## References

### Related articles

- Diseases resulting from nutrient deficiencies

## Citations

1. Světová zdravotnická organizace. . *Mezinárodní klasifikace nemocí a přidružených zdravotních problémů 10. revize* [online] . 2. edition. Geneva : WHO, 2004. Available from <<https://old.uzis.cz/cz/mkn/index.html>>. ISBN 9241546492.

## Literature

- BENCKO, Vladimír, et al. *Hygiena : Učební texty k seminářům s praktickým cvičením*. 2. edition. Prague : Karolinum, 1998. ISBN 80-7184-551-5.
- HAINER, Vojtěch – KUNEŠOVÁ, Marie. *Obezita : Etiopatogeneze, diagnostika, terapie*. 1. edition. Prague : Galén, 1997. ISBN 80-85824-67-1.