

# Assessment of nutritional status

We determine the nutritional status of both individuals and population groups, e.g. infants, pregnant women, seniors, people with increased physical exertion, etc. Nutritional status significantly affects the health of an individual, so it should be monitored at least to some extent by all clinicians. Special attention is paid to it by nutritional and obesitological counseling centers. Assessment of the nutritional status of population groups is used in various studies. Assessment of nutritional status includes anamnesis, clinical examination, laboratory examination and assessment of consumption (food composition, energy and nutrient intake).

## Medical history

- **FH** (family history): nutritional status may be influenced by genetic predisposition.
- **PH** (personal history): the nutritional status can be affected by the patient's illness (e.g. disorders of the endocrine system) or certain medications.
- **NH** (nutritional history): we find out changes in body weight recently, common eating habits, food allergies, alcohol consumption, changes in appetite and amount of food recently, difficulties with eating and psychosocial problems (e.g. eating for the elderly); it is also important to find out the level of physical activity.

## Clinical examination

We determine the body type (sedentary, athletic) and nutritional status (cachexia, asthenia, normal state, overweight, obesity). We perform the following somatometric examinations:

- BMI,
- body fat percentage
- body fat distribution
- circumference of non-dominant arm

### BMI

It is calculated as the ratio of weight in kilograms and height in  $m^2$ . The disadvantage is that the BMI method cannot differentiate the amount of body fat and muscle mass, so the result can be significantly distorted.

classification	BMI ( $kg/m^2$ )	health risk
malnourished	< 18,5	increased
normal values	18,5–24,9	minimal
overweight < 27	< 27	low
overweight > 27	> 27	slightly elevated
obesity of the 1st degree	30,0–34,9	high
obesity of the 2nd degree	35,0–39,9	high
obesity of the 3rd degree	$\geq 40,0$	very high

### BMI Prime

BMI Prime is obtained by simply modifying the BMI calculation. BMI Prime is the ratio of a person's BMI to the upper limit of normal weight BMI (defined as 25). Because it is the ratio of two BMI values, BMI Prime is a unitless quantity (no units assigned). Persons with a BMI Prime of less than 0.74 are malnourished; people with a weight between 0.74 and 1.00 have an optimal weight; and people with more than 1.00 are overweight. BMI Prime is useful in medicine because it tells how an individual differs from the upper weight limit. For example, a person with a BMI of 34 has a BMI Prime of  $34/25 = 1.36$ , and is 36% above their upper weight limit. In Southeast Asia and southern China, BMI Prime is calculated with an upper BMI limit of 23 instead of 25. However, BMI Prime allows comparisons between populations that have different upper BMI limits.<sup>[1]</sup>

## Body fat percentage

- The classic method for determining the percentage of body fat is **caliper**: measuring the thickness of the skin eyelashes using a caliper at specified places on the body. The measured values are added up and the resulting percentage of body fat is subtracted from the tables. There are tables for measurements in 10, 5, 3 and 2 places - according to the required accuracy. Places to measure 10 skin folds: on the face, under the chin, under the collarbone, above the elbow (triceps), above the shoulder blade, on the abdomen, under the breasts, above the spine, above the knee, below the knee. The accuracy of the calibration depends to a large extent on the correct collection of the skinfold.
- Measurement using **bioelectrical impedance** is very widespread today. The device measures the body's

resistance to the passage of a low-intensity, high-frequency electric current. The method is based on the different electrical conductivity of fat and other body tissues. The disadvantage is that it affects the body's hydration - it cannot be used in patients with swelling and when there is increased water loss - for example, during short-term weight loss.

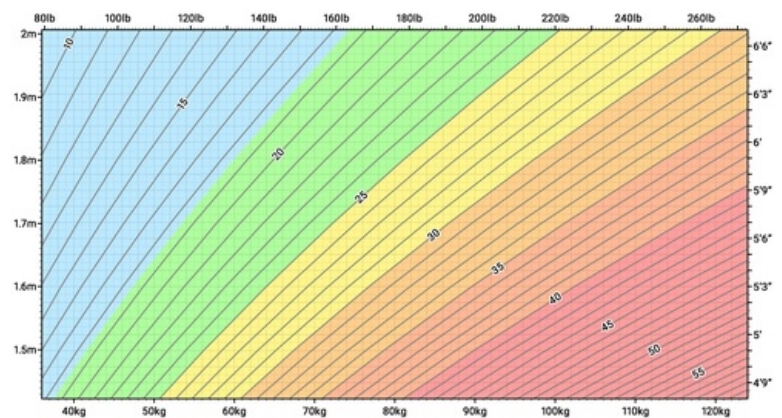
- Other methods are underwater weighing and magnetic resonance imaging.

Opinions on the upper limit of the physiological proportion of fat in the human body differ according to individual sources. According to the EU standard, it is <20% for men and <24% for women. The minimum is 3-5% for men, 10-12% for women.

## Body fat distribution

We determine the distribution of body fat by measuring the waist circumference and comparing the determined values with reference values. This figure serves as an indicator of the risk of developing metabolic and cardiovascular complications of obesity. A larger waist circumference indicates the deposition of fat around the organs of the abdominal cavity, the so-called "male" type of obesity. It represents a greater relative risk for the individual than the "female" type, which consists in the accumulation of fat in the area of the hips and thighs.

	increased risk	high risk
<b>men</b>	> 94 cm	> 102 cm
<b>women</b>	> 80 cm	> 88 cm



BMI chart

## Circumference of the non-dominant arm

It is used as an indicative examination of muscle loss (<19.5 cm in men and <15.5 cm in women).

## Laboratory examination

In connection with the assessment of the nutritional status, it is possible to carry out a whole range of laboratory examinations. They are chosen according to the purpose of the examination.

### Examples

- blood – blood count, hemoglobin, triglycerides, cholesterol, plasma proteins, vitamins, minerals;
- urine – N, urea, some minerals, vitamins;
- feces - metabolites;
- energy output – is determined by the method of direct calorimetry (the amount of heat released by the organism per unit of time) or by the method of indirect calorimetry (the amount of oxygen consumed per unit of time).

## Consumption rating

In order to assess food composition, nutrient intake and energy, we must first obtain data on food consumption from the person being assessed. Methods used:

- frequency of food intake (questionnaire in which an estimate of how often the examined person eats a certain food is indicated);
- 24-hour recall (in the evening, the whole day's food intake from the first meal is recorded);
- continuous record - diary (the food just eaten and its quantity are continuously recorded - the most accurate).

Evaluation of records can be qualitative (representation of food types) or quantitative (calculation of energy and nutrient intake and comparison with daily recommended doses). The recommended daily doses of energy and nutrients are primarily intended for the assessment of the consumption of population groups, only possibly of individuals - the need of individuals is variable. The usual definition of recommended intake: the amount of a nutrient in a population that will cover the needs of nearly all healthy individuals in a given population group.

## Links

- BMI Calculator, BMI Intervals and more information (<https://kingscalculator.com/en/fitness-calculators/bmi-calculator>)
- Body fat calculator, formulas and more information (<https://kingscalculator.com/en/fitness-calculators/body-fat-calculator>)
- ws: Hodnocení výživového stavu



Device for measuring body fat % using bioelectrical impedance

## Reference

1. GADZIK, James. 'How much should I weigh?' Quetelet's equation, upper weight limits, and BMI prime. *Connecticut Medicine*. 2006, y. 70, p. 81-8, ISSN 0010-6178. PMID: 16768059 (<http://www.ncbi.nlm.nih.gov/pubmed/16768059>).

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