BODY MASS INDEX
Bmi

A value used to quantify the amount of body mass of an individual.

⚠️ Risk factor ♂️ Male & Female

About Body mass index

Body mass index (BMI) is a mathematic calculation that provides a measure for assessing the health risks associated with body weight. It is defined as the body weight divided by the square of the body height, and is universally expressed in units of kg/m², resulting from weight in kilograms and height in metres (Pic. 1).

Numerous research studies confirm that body size below and particularly above a defined range increases the risk for health problems. Commonly accepted BMI ranges are underweight: under 18.5 kg/m², normal weight: 18.5 to 25, overweight: 25 to 30, obese: over 30. Each category is associated with specific related conditions and prognosis:

- A healthy BMI is 18.5 to 24.9. This reflects a ratio between weight and height that presents no greater than the typical risks of health problems.
- A BMI below 18.5 reflects an increased risk of health problems associated with being underweight (Pic. 2).
- A BMI from 25 to 29.9 reflects body weight that is 10-15% above what is healthy and double the risk for hypertension (high blood pressure).
- A BMI over 30 reflects body weight that is 20% or more above healthy weight and 2-6 times the risk for cardiovascular (affecting the heart and blood vessels) disease of any kind.
- A BMI over 35 reflects nearly certain health problems related to obesity, most of which are cardiovascular such as hypertension, hypercholesterolemia (high blood cholesterol), coronary artery disease, and heart failure.

BMI is not accurate for certain people—athletes with high muscle mass, pregnant women, people under age 18, and the very elderly. However, the correlation between BMI and cardiac health is strong.

Symptoms

BMI is determined by the individual’s height and body weight. Therefore, and individual with a higher BMI has more body mass in relation to his height than a person with a lower BMI. Each category of BMI then typically presents with associated conditions and symptoms. Whereas people considered underweight (with BMI lower than 18) commonly suffer from fragile bones, hypotension (low blood pressure) and anaemia, people considered overweight or obese (BMI over 25 and 30, respectively) have an increased risk of hypertension (high blood pressure), diabetes, atherosclerosis, arthrosis (damage to the joints), stroke, and heart attack (Pic. 3).

However, BMI is only one of numerous health indicators. People with BMIs in the “healthy weight” range can still have hypertension, coronary artery disease, and other cardiovascular conditions. Conversely, people with BMIs in ranges associated with increased risk for heart disease can have no symptoms of cardiovascular disease.

Associated diseases

Obesity

In Western countries, people are considered obese when their body mass index (BMI) exceeds 30 kg/m². Obesity increases the likelihood of various diseases, such as heart disease, diabetes and cancer, sleep apnea, along with other illnesses such as joint problems or high blood pressure. There are several factors contributing towards obesity and interaction between these factors is very complex. Obesity is most commonly caused by a
combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications, or psychiatric illness.

Underweight

Underweight is characterized by unhealthy low body weight. Underweight refers to people with BMI under 18.5 or weight 15% - 20% below normal in relevance to age and height group. A person may be underweight due to genetics, metabolism, drug use, lack of food, or illness. Underweight might be secondary to malnutrition or symptomatic of an underlying disease. Unexplained weight loss may require professional medical diagnosis.

Complications

High BMI

- coronary artery disease
- stroke
- diabetes
- hypertension
- sleep apnea
- artheros
- gout
- certain tumours
- menstrual irregularities

Low BMI

- anaemia
- osteoporosis (abnormally fragile bones)
- hypotension

Risk factors

High BMI

- family history of obesity
- excessive food intake
- lack of physical activity
- endocrine disorders
- genetic disorders
- medications

Low BMI

- insufficient food intake
- chronic illness
- genetic susceptibility
- tumours
- endocrine disorders
- drug use
- eating disorders

Prevention

High BMI/Overweight

A large number of people undergo some form of treatment to attempt to reduce their weight. The generally recommended treatment for being overweight is a modified or controlled diet in conjunction with increased exercise. For those who are obese rather than overweight, more intensive therapies such as drugs or surgery are sometimes used. Studies suggest that reducing calorie intake by itself (dieting) may have short-term effects but does not lead to long-term weight loss, and can often result in gaining back all of the lost weight and more in the longer term. For this reason, it is generally recommended that weight-loss diets not be attempted on their own but instead in combination with increased exercise and long-term planning and weight management.

Low BMI/Underweight

In order to avoid or treat being underweight, an overall lifestyle change is necessary. A combination of improved diet, exercise, and appetite stimulants are helpful. Exercise helps to keep bones strong and maintain muscle tone, it can also stimulate appetite. Diet should include nutrient rich food and calorie dense snacks; it should be
a diet rich in fruits, vegetables, proteins and fats from plant sources. The major focus should be increased intake of healthy calories.

### How it can affect fertility

Obesity, which is roughly defined as a body mass index (BMI) of more than 30 kg/m², has been reported to be negatively associated with the reproductive capacity of both women and men.

**High BMI/Obesity**

Most obese women are not infertile; however, obesity and its negative impact upon fecundity and fertility are well documented. Obese women are three times more likely to suffer from infertility than women with a normal body mass index (BMI). Furthermore, obesity as such disturbs menstrual cycle and ovulation. A large questionnaire study demonstrated that menstrual cycle irregularity and anovulation were correlated with being overweight or obese. Obese women had a rate of menstrual disturbance 3.1 times that of women with normal weight. In addition, studies have reported that women with obesity have decreased pregnancy and increased miscarriage rate. Also, impaired fertility has been demonstrated even in obese women with normal menstrual cycle. Obesity is also common in women with polycystic ovary syndrome (PCOS), which is associated also with menstrual irregularities, hyperandrogenism (elevated levels of male sex hormones) and infertility.

Concerning men, it has been found that high BMI decreases sperm quality such as sperm count, concentration, and semen volume rather than sperm motility (overall or progressive). Being overweight decreases the quality of total sperm count and semen volume, obesity decreases the quality of total sperm count, sperm concentration, and semen volume, while changes of sperm motility do not show significant statistical difference. As sperm quality and spermatogenesis are vital for male fertility, these results demonstrate the detrimental effect of overweight and obesity on male fertility.

**Low BMI/Underweight**

For women, being underweight and having extremely low amounts of body fat are associated with ovarian dysfunction and infertility. Underweight women (BMI < 19 kg/m²) have a four-fold longer time to pregnancy than women with a normal BMI. Specifically, underweight women required an average of 29 months to conceive as compared to 6.8 months in women with a normal weight profile.

Indeed, as for the initiation of menses, a minimum of fat mass is necessary, for maintaining ovulatory function, and therefore, fertility. Conditions of energy deficit, such as eating disorders (ED), malnutrition and strenuous physical activity, are associated with subfecundity and infertility.

Men who are underweight are also at risk of infertility. Men who are underweight tend to have lower sperm concentrations than those who are at a normal BMI. As the majority of the available literature focuses on the impact of obesity, more research is needed into the effects that being underweight may have on male fertility.

### Prognosis

**High BMI/Overweight and obesity**

The effect of obesity on life expectancy and future health is complex. While there is clear association of obesity with an increased lifetime risk of many chronic, so-called civilizational diseases such as hypertension, coronary artery disease, stroke, and diabetes, patients with higher BMI have a better outcomes and survival rates in the case of some serious diseases such as pneumonia or certain tumours. However, it is well-documented that in the general population, obesity is correlated with a shorter life expectancy and worse quality of life in older age.

While most obese people are fertile, being overweight or obese is associated with several conditions and health complications that have a negative effect on fertility.

**Low BMI/Underweight**
The prognosis of underweight patients depends on the underlying cause, but low body weight is generally associated with poorer outcomes of any other disease. Underweight individuals are at increased risk of dying, mainly due to external causes of death. This prompts at screening and counselling this risk group for modifiable risk factors for external causes of death, e.g. frailty or alcohol or drug abuse. Furthermore, among underweight individuals, smokers may be regarded as a vulnerable population. An overall improvement in diet, exercise and lifestyle is needed to achieve a healthy body weight and sufficiently decrease the risks of complications.

Being underweight has a detrimental effect on fertility of both males and females, as their reproductive functions decline together with the depletion of metabolic reserves, body fat and energy. Severe body mass loss, and subsequently severely low BMI, can cause infertility, which, however, can be reversed by gaining weight back.

![A table graphically showing BMI values for different conditions of body weight.](image1)

**Sources**

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