# OBESITY, INSULIN RESISTANCE AND THE METABOLIC SYNDROME

## OBESITY

Obesity is a medical condition in which excess body fat accumulates to the extent that it may have a negative effect on health. Obesity is defined in terms of the body mass index (BMI), calculated by dividing a person's weight by the square of the person's height: BMI = weight (kg)/ height2 (m2).

Table 1: Classification of weight categories and obesity

| BMI | WEIGHT CATEGORY |
|---|---|
| < 18.5 | Underweight |
| 18.5–24.9 | Healthy weight |
| 25.0–29.9 | Overweight |
| 30.0–34.9 | Obesity class I |
| 35.0–39.9 | Obesity class II |
| ≥ 40 kg/m2 | Obesity class III |

Although there are a few rare medical conditions that can cause weight gain, the main reasons are high-energy diets and physical inactivity. After the onset of obesity, the first demonstrable complications are impairment of glucose tolerance and increased insulin resistance. This is followed by an abnormal lipogram (increased triglycerides and decreased HDL cholesterol) and high blood pressure. Obesity therefore increases the risk of heart disease, stroke, type 2 diabetes, gall stones, osteoarthritis, obstructive sleep apnoea, infertility and certain types of cancer.

Some of the more common disorders associated with obesity include a deficiency in thyroid hormone (hypothyroidism) and polycystic ovarian syndrome (PCOS). There are also some rare causes of secondary obesity like excessive production or intake of cortisol (hypercortisolism), hypothalamic injury or disorders and genetic mutations. Your doctor can determine if you need to be evaluated for secondary obesity based on your medical history and a clinical examination.

According to the World Health Organization (WHO), global obesity is an epidemic, and they estimate that in 2014, more than 1.9 billion adults (age 18 or older) worldwide were overweight and 600 million adults (representing 13 percent of the world's adult population) were obese.

In 2005 the American Academy of Paediatrics called obesity "the paediatric epidemic of the new millennium". Overweight and obese children are being increasingly diagnosed with high blood pressure, elevated cholesterol, and type 2 diabetes mellitus — conditions once seen almost exclusively in adults. In addition, overweight children experience more broken bones and problems with joints than normal-weight children. The long-term consequence of obesity in young people is of great concern because obese children are at high risk of becoming obese adults. Experts on longevity have concluded that today's American youth might "live less healthy and possibly even shorter lives than their parents" if the rising prevalence of obesity is left unchecked.

Factors which might protect against weight gain and obesity include regular physical exercise, high dietary fibre intake, low glycaemic-index foods, home and school environments that support healthy food choices for children and breastfeeding.

(Please refer to our information leaflet, "Lipids – Separating fats from fiction" for guidance on healthy food choices that can also lower cholesterol levels.)

## INSULIN RESISTANCE

Insulin is secreted by the pancreas and regulates blood sugar levels. Insulin resistance means that the body becomes resistant to the action of insulin and that higher than normal insulin levels are necessary to keep blood sugar levels normal. Insulin resistance is the first step towards the development of type 2 diabetes.

Causes of insulin resistance include obesity, especially abdominal obesity (the most common cause), following a high-carbohydrate, high-calorie or high-sugar diet, inactive lifestyle, chronic stress, some medications (such as steroids), hypercortisolism, polycystic ovarian syndrome and other hereditary factors.

Symptoms of insulin resistance include tiredness, hunger and difficulty concentrating.

Consequences of insulin resistance include increased abdominal obesity, hypertension, high cholesterol, the metabolic syndrome, type 2 diabetes, and polycystic ovarian syndrome.

## THE METABOLIC SYNDROME

The metabolic syndrome is not a disease but a group of characteristics or risk factors that commonly appear together, often linked to insulin resistance. These characteristics include obesity, high blood pressure, elevated blood sugar levels and high triglycerides (fat-like substances in the blood).

The diagnosis of the Metabolic Syndrome is made in the presence of central OBESITY (waist circumference ≥ 80 cm in females and ≥ 94 cm in males) PLUS any two of the following criteria (according to the International Diabetes Federation 2006 definition):

- Fasting triglyceride (TG) ≥ 1.7 mmol/L or on treatment for elevated TG;
- HDL-cholesterol < 1.3 mmol/L or being on treatment for low HDL;
- Hypertension (HT) (blood pressure ≥ 130/85) or being on treatment for HT;
- Fasting plasma glucose ≥ 5.6 mmol/L or previously diagnosed type 2 diabetes.

Although the above waist circumference cut-offs have been established in a European population, similar values have been proposed for persons from other ethnic groups, including Asian-Indian, Chinese, and Sub-Saharan Africans. A person with the metabolic syndrome has a higher risk to develop type 2 diabetes and heart disease. The more components of the metabolic syndrome that are evident, the higher is the cardiovascular mortality rate.

Laboratory tests for diagnosis include a fasting blood sugar, glucose tolerance test, lipogram [includes total cholesterol, LDL-cholesterol ("bad" cholesterol), HDL-cholesterol ("good" cholesterol), triglycerides] and uric acid.

## TREATMENT

Lifestyle change is the most important and includes weight loss - through a combination of a low carbohydrate, high fibre and ketogenic diet; and moderate physical exercise for 30–45 minutes 3–5 times a week, ideally every day (e.g. gardening, housework, walking, cycling, swimming, etc.). Medication is also available to help with weight loss, and in patients with morbid obesity, weight loss surgery may be considered.