

## WEIGHT IS NOT EVERYTHING



### Global obesity epidemic?

The condition of obesity is the **result of complex interactions between genetic and environmental factors**. The diagnosis is based on the body mass index (BMI) defined as the weight of the individual divided by the square of the height ( $\text{kg}/\text{m}^2$ ).

The World Health Organization (WHO) in 2016 estimated that 39% of adults in the world are overweight (**1.9 billion people** with BMI between 20 and 25  $\text{kg}/\text{m}^2$ ) while 13% are obese (**650 million people** with BMI greater than 30  $\text{kg}/\text{m}^2$ ).

**GLOBESITY is the term used to describe this global obesity epidemic.**

Furthermore, if we consider that a pregnant woman, if in a situation of overweight or obesity, can define the **metabolic programming and the behavior that the unborn child** will have towards food, we can easily realize the dimensions of GLOBESITY in the years to come.

In 2019, the WHO estimated that **38 million children** under the age of 5 are obese.

### Beyond the body mass index (BMI)

Using only the body mass index, we can divide the population into three large groups \*: people of normal weight (BMI between 18.5 and 24.9 kg / m<sup>2</sup>), people who are overweight (BMI between 25 and 29.9 kg / m<sup>2</sup>) and obesity (BMI equal to or greater than 30 kg / m<sup>2</sup>). However, this index of measurement of fat mass, coined 150 years ago, does not take into account the **real state of health** and does not accurately define the degree of risk factor for the individual.

In fact, **NOT ALL OBESE PEOPLE** have the **SAME CARIOVASCULAR AND METABOLIC RISK FACTOR** and, conversely, **NOT ALL NORMALLY WEIGHT PEOPLE** have a **HEALTHY METABOLIC PROFILE AND ABSENCE OF RISK FACTORS**.



## TOFI: thin outside fat inside (metabolically obese normal weight individual)

Considering the combination of two factors, **weight and metabolic health**, can help define a further classification of the adult population, based on health status and cardiovascular and metabolic risk factor. This way, it is possible to identify a category of **metabolically dysfunctional normal weight people**.

The so-called **TOFI** (Thin Outside Fat Inside) are phenotypically indistinguishable from metabolically healthy lean people who, however, show early signs of the characteristic features of the metabolic syndrome such as **hyperinsulinemia, fatty liver, dyslipidemia**. These conditions are clinically associated with an abnormal distribution of fat mass, which is encountered mainly in the intra-abdominal region (**visceral adipose tissue**) and in metabolic organs (**ectopic adipose tissue**: hepatic steatosis is the most notable example).

The methodology of choice for the diagnostic investigation and for the follow-up of the TOFI patient would be that of magnetic resonance, to analyze and quantify the volume of visceral and ectopic adipose tissue present. Due to the high cost, it is understandable that these people are difficult to diagnose and often go clinically unnoticed given their young age and / or, precisely, the visible absence of excess body mass. Often this works against prevention against the onset of severe metabolic complications.

However, physical inactivity, poor cardiovascular fitness (for example by measuring VO<sub>2</sub>max) and an unbalanced diet can guide the Specialist towards identifying and treating the metabolic state of the individual. Unlike a metabolically obese individual with similar alterations in metabolic parameters, these people can be the subject of **primary prevention** interventions based on **personalized dietary balance**, with particular attention to the types of fats and their role in tissue inflammation processes, and on increased physical activity.

## FOTI: fat outside thin inside (obese individual metabolically healthy)

Similarly, a subgroup of the population defined as obese according to the body mass index (BMI equal to or greater than 30kg / m<sup>2</sup>), can be classified as metabolically healthy because it lacks all (or most of) classic metabolic characteristics related to the syndrome. metabolic, such as:

- insulin resistance
- hyperglycemia
- hypertension
- hypertriglyceridemia
- hypercholesterolemia

Also in this case, the amount of visceral adipose tissue is the factor most related to the degree of insulin resistance and metabolic overload of other metabolic organs, such as liver, pancreas and muscle.

In fact, a Japanese study was able to classify a group of **sumo wrestlers** as metabolically healthy given the normal amounts of visceral fat, despite the very high daily caloric intake.

In general, we must not think that this is the condition of optimal health, since the possibility that the metabolically healthy state is transitory and that, over time, becomes pathological is not excluded.

Rather, it indicates the need to investigate the state of health of the phenotypically obese individual, **discerning people based on their metabolic state** and, in the case of FOTI, aligning towards a therapeutic goal aimed at preventing the transition to the individual. metabolically dysfunctional obese, even before the definition of aggressive and rapid weight loss strategies.

## The body and its physiological functioning

With these brief assertion, it is easy to understand that the crucial issue is not exclusively body weight, but the **correct functioning of the metabolic system**, primarily the adipose tissue, but also the other organs involved in energy homeostasis.

As long as the **adipocyte cell is healthy**, that is, it performs its function of accumulating energy reserves and participates in the coordination of the body's energy metabolism together with the liver, pancreas, muscle, kidney, brain, according to the genetic programming defined at the time of cell differentiation, it has a **protective effect** against metabolic dysfunctions which, over the years, lead to the diagnosis of diabetes or metabolic syndrome.

It is certainly important to be aware of the body distribution of adipose tissue, since

physiologically it has different impact on metabolism. However, the **primary goal must be the intervention on organ function**, going to act, through the introduction of changes in the person's lifestyle (diet, physical activity, sleep quality, stress management ...), on the restoration of **metabolic health at the cellular level**.

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**Bibliography:**

[1] <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

[2] Matsuzawa Y. (1997) Diabetes Metab Rev 13: 3-13.

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**To know more:**

*Numerous reviews address the ongoing debate about the absence of a common consensus on the definition of "Metabolically Healthy Obese". We mention some recent ones:*

- Smith GI (2019) J Clin Invest. 129(10): 3978-3989.
- Brandão I (2020) Metabolites 10(2): 48

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**Article by the editorial team of Lipinutragen**

*The information given must in no way replace the direct relationship between health professional and patient.*

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