Assessment of Obesity

- **Body Composition Overview**
  - Before considering assessment, look at body composition:
    - a. The active mass (muscle, liver, heart etc.)
    - b. The fatty mass (fat)
    - c. The extracellular fluid (blood, lymph, etc.)
    - d. The connective tissue (skin, bones, connective tissue)
  - The state of obesity is characterized by an increase in the fatty mass at the expense of the other parts of the body.
  - The water content of the body is never increased in case of obesity.
  - Although obesity can easily be identified at first sight, a precise assessment requires measurements and reference standards.

- **Body Weight as a Criterion**
  - Body weight, though not an accurate measure of excess fat, is a widely used index.
  - In epidemiological studies, it is conventional to accept + 2 SD (standard deviations) from the median weight for height as a cut-off point for overweight and + 3 SD for obesity.

- **(1) Body Mass Index (Quetelet's index)**
  - Body mass index (BMI) is a simple index of weight-for-height commonly used to classify underweight, overweight, and obesity in adults.
  - It is defined as weight in kilograms divided by the square of the height in metres (kg/m^2).
  - **Example:** 70 kg and 1.75 m height: $BMI = 70 / 1.75^2 = 22.9$.
  - Obesity is classified as a BMI ≥ 30.0.
  - The classification is based primarily on the association between BMI and mortality.

Classification	BMI	Risk of comorbidities
Underweight	< 18.50	Low (but risk of other clinical problems increased)
Normal range	18.50–24.99	Average
Overweight	≥ 25.00	
Pre-obese	25.00–29.99	Increased
Obese class I	30.00–34.99	Moderate
Obese class II	35.00–39.99	Severe
Obese class III	≥ 40.00	Very severe

- **(2) Ponderal Index**
  - Formula: $\text{Height (cm)} / \sqrt[3]{\text{Body weight (kg)}}$

- **(3) Brocca Index**
  - Formula: $\text{Height (cm)} - 100$
  - **Example:** If height is 160 cm, ideal weight is $(160 - 100) = 60 \text{ kg}$.

- **(4) Lorentz's Formula**
  - Formula: $\text{Ht (cm)} - 100 - [\text{Ht (cm)} - 150 / 2 \text{ (women) or } 4 \text{ (men)}]$

- **(5) Corpulence Index**
  - Formula: $\text{Actual weight} / \text{Desirable weight}$
  - This should not exceed 1.2.

- **Waist Circumference and Waist:Hip Ratio (WHR)**
  - **Waist Circumference:** Measured at the midpoint between the lower border of the rib cage and the iliac crest.
  - It is an approximate index of intra-abdominal fat mass and total body fat.
  - Increased risk of metabolic complications:
    - Men: $\ge 102 \text{ cm}$
    - Women: $\ge 88 \text{ cm}$
  - **Waist:Hip Ratio (WHR):** A high WHR indicates abdominal fat accumulation.
    - High risk for Men: > 1.0
    - High risk for Women: > 0.85