

# Assessment of General Nutrition Status

## *Study Guide:*

### **With respect to skills:**

Level 1 = should have confidence in performing the task and can recognize normal signs;

Level 2 = should have performed the task;

Level 3 = should have observed the task performed in real life or on video.

### **With respect to knowledge:**

Level 1 = should understand the subject matter and can apply it to practice;

Level 2 = should have a sound understanding of the subject matter;

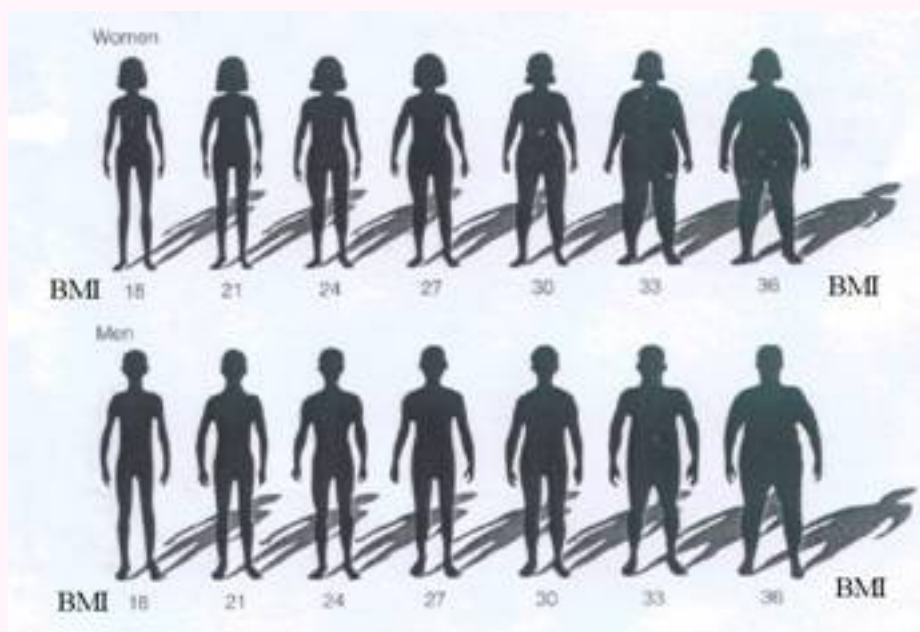
Level 3 = should be aware of the importance of the subject matter.

Level of Achievement	1	2	3
• Inspection: recognition of emaciation, underweight (slender, thin), normal, overweight (plumb, fat, obese), morbid obesity	•	-	-
• Body weight & height	•	-	-
• Body Mass Index (BMI)	•	-	-
• Skin fold measurement	-	-	•
• Waist Circumference	•	-	-
• Waist-Hip-Ratio (WHR)	-	•	-
• Mid-arm Circumference, Mid-Arm-Muscle Circumference	-	-	•
• Bioelectric impedance	-	-	•

**N.B.** Year 1 & 2 students are expected to recognize normal findings only, although abnormal findings are also included for students in their senior years.

## Inspection

- A visual assessment of the patient's general appearance can provide a relatively accurate assessment of his general nutrition status. According to the Canadian Dietetic Association, the silhouette (body shape) of women and men are related to their Body Mass Index or BMI (see below) as shown in the accompanying picture:



- With practice it is not difficult to classify an individual as emaciated, slender (thin), normal, plump (overweight), or obese.
- Emaciation is a condition in which weight loss is extreme and is accompanied by skeletal muscle wasting. As a consequence, the affected individual's cheeks are sunken and bony landmarks of his maxilla, major joints, ribs, scapulae, and pelvis are unusually prominent.
- Morbid obesity is a condition in which an individual weighs two or more times his ideal weight.

## Exercise

- You will be shown slides of several individuals. Put each one of them into the rightful category according to body shape: emaciated, slender (thin), normal, plumb (overweight), obese.

## Anthropometry

- Anthropometry is a technique of body weight and size measurement developed by anthropologists. To make anthropometrics measurements is simple, safe, inexpensive, and can be applied clinically at the bedside. Physicians commonly use the following items marked by an asterisk (\*) as indices of general nutrition status and students should know them well. Items that are not marked are seldom-used in general clinical examination. However, they are popular among some nutrition experts, gymnasium instructors, and health conscious patients. Students should familiarize themselves with these unmarked items so that they can communicate with their patients competently.

### Body weight and height\*

- Body weight, particularly in relation to height, is commonly used as an indicator of general nutrition status. Underweight can be due to inadequate food intake, poor absorption or utilization, or unbalanced and excessive usage of energy by the body (as when the thyroid gland is overactive in hyperthyroidism). In the absence of disease, excess body weight usually reflects obesity (an increase in the amount of fat tissue) from excessive food intake, except in body builders who have a high muscle mass. More than 5% change in body weight, particularly recent and sudden in onset (e.g., over the last month), indicates either change in dietary intake or underlying illness.

- To measure the weight and height of a patient during routine examination is important both for their immediate value and for future reference. In the doctor's office or in the outpatient clinic, the weight of a patient should be obtained with him wearing only normal indoor clothing and without shoes. In an inpatient hospital setting, a patient should be weighed in hospital pajama or gown, again without shoes. To measure height, a patient should be standing upright, arms resting by his side, and without shoes.

- To determine whether a patient's weight is normal, one can go to tables of ideal weight in relation to height and gender. Different version of these tables exists. Some of these tables will take into account the person's frame or body build (small, medium, or large). However, body frame (body build) cannot be measured and must be derived visually.

### Exercise

- Measure the weight and height of your fellow student using the scale and yardstick provided.

### Body Mass Index (BMI)\*

- The BMI of a person is the number obtained by dividing his weight (in kilograms) by the square of his height (in meters):

$$\text{BMI} = \frac{\text{[Weight in kilograms]}}{\text{[Height in meters]}^2}$$

- In adult Asians, a person is considered underweight if his BMI is <18.5 kg/m<sup>2</sup>; he is considered normal if his BMI is 18.5 to 22.9 kg/m<sup>2</sup>; he is considered overweight if his BMI is > 23 kg/m<sup>2</sup>; he is considered obese if his BMI is > 25 kg/m<sup>2</sup>.

- There is a positive relationship between BMI and risks of cardiovascular, cerebrovascular, and metabolic (diabetes mellitus & hyperlipidemia) diseases; these risks rise appreciably when the BMI is above 23 kg/m<sup>2</sup> (see “Waist Circumference” and “Waist-Hip-Ratio”).

## **Exercise**

- Use the weight and height you have obtained from your fellow student to calculate the BMI.

## **Skin fold measurement**

- An increase in weight in relation to height does not always mean fatness or obesity if the increase in weight is due to muscle mass as in body-builders. Degree of fatness (adiposity) correlates better with the increased risks of diseases. Skin fold thickness is often used to measure this adiposity.
- Measurement of skin fold thickness requires special calipers. Various areas of the body have been suggested as suitable for measuring skin fold thickness, including back of the arm over the triceps, below the scapulae at the back, and at the supra-iliac region of the anterior abdominal wall.
- Skin fold thickness represents peripheral fatness or adiposity. In recent years attention is focused more on abdominal (also called central or visceral) adiposity (see “Waist Circumference” and “Waist-Hip-Ratio” below).

## Waist Circumference (WC) \*

• Adipose tissue (fat) distributed centrally within the abdomen and among the viscera is also a predictor of cardiovascular, cerebrovascular, and metabolic (diabetes & hyperlipidemia) diseases. Among adult Asians, a waist circumference > 90 cm in men and > 80 cm in women increase further the risk of these diseases associated with an increase in BMI (see Table to the right):

Waist Circumference < 90 cm (men) < 80 cm (women)	Risk	Waist Circumference ≥ 90 cm (men) ≥ 80 cm (women)
BMI		BMI
≥ 30	Very severely increased	≥ 30
25 – 29.9	Severely increased	25 – 29.9
23 – 24.9	Moderately increased	23 – 24.9
18.5 – 22.9	Mildly increased	18.5 – 22.9
< 18.5	Average	< 18.5
	Low	

## Exercise

- Measure the waist circumference of your fellow student according to the method recommended by the World Health Organization:
  1. The subject should be lightly dressed; measurement should not be made through thick or bulky clothing;
  2. Position the subject upright with feet 25 – 30 cm apart and weight evenly distributed;
  3. Sit yourself by the subject comfortable on a chair;
  4. Fit a tape measure snugly around the abdominal girth without compressing soft tissue and measure the waist circumference to the nearest 0.1 cm in a horizontal plane midway between the inferior costal margin and the iliac crest.
  5. Use the BMI and WC of your fellow student to determine his risk for cardiovascular, cerebrovascular, and metabolic (diabetes & hyperlipidemia) disease.

## Waist-Hip Ratio (WHR)

- The Waist-Hip Ratio of a person is obtained by dividing his “Waist circumference” by his “Hip circumference”:

$$\text{WHR} = \frac{\text{Waist circumference (cm)}}{\text{Hip circumference (cm)}}$$

- Hip circumference can be measured around the pelvis at the point of maximal protrusion of the buttocks.
- WHR is considered to be a ratio between fat stored centrally inside the abdomen (waist circumference) and fat stored peripherally (hip circumference). A WHR > 1.0 in European men or 0.85 in European women is associated with increased risk of ischemic heart disease, stroke, and diabetes. These limits have not been determined for Chinese.

## Mid-Arm Circumference (MAC) and Mid-Arm Muscle Circumference

- The Mid-Arm Circumference (MAC) is the circumference of the non-dominant arm midway between the shoulder and the elbow. Assuming the mid-arm muscle mass is a cylinder surrounded by a circumferential layer of skin fold, the Mid-Arm Muscle Circumference can be calculated as follows: (There is no need to memorize the formula; just understand the principle.)

$$\text{MAMC} = \text{MAC} - (\pi \times \text{skin fold thickness})$$

- Mid-Arm Muscle Circumference is considered an index of muscle mass and caloric adequacy. Malnutrition can cause muscle wasting and a decrease in muscle circumference. The calculation of Mid-Arm Muscle Circumference is based on the erroneous assumptions that the muscles are completely round and that bone mass is negligible. Although it may be of interest to nutrition experts, it is not popular among primary care physicians.

## Other Measurements

### Bioelectrical impedance

- Bioelectrical impedance measures the body's electrical impedance (resistance) to a small electric current. This impedance measurement can be analyzed to provide an estimate of the adiposity (amount of fat tissue in the body) of a person.
- Wrong interpretation of adiposity through measurement of bioelectrical impedance can result due to the presence of fluid in the limbs (edema), fluid in the abdominal cavity (ascites), a full urinary bladder, or excessive sweating.
- There is doubt whether bioelectrical impedance measurement offers any advantage over BMI, WC, or WHR measurement. Its need of specialized equipment is another disadvantage.