Semester 2 (Practical)

Obesity management

UNIT 2: CALCULATION OF B.M.R.

Aim: To Calculate BMR and waist hip ratio of ten students

Basal metabolic rate (BMR) is the total number of calories that the body needs to perform basic, life-sustaining functions. These basal functions include circulation, breathing, cell production, nutrient processing, protein synthesis, and ion transport. The basal metabolic rate can be calculated using a mathematical formula.

Step 1: Calculate BMR by using The Harris-Benedict formula

- **BMR (metric) for men** = (10 × weight in kg) + (6.25 × height in cm) - (5 × age in years) + 5
- **BMR (metric)** for women = (10 × weight in kg) + (6.25 × height in cm) - (5 × age in years) – 161

Step 2: Determine Total Calorie Intake

Once the BMR is estimated using the Harris-Benedict formula, the next step is to include the number of calories you burn during daily activities based on the lifestyle:

- **Sedentary.** If you get minimal or no exercise, multiply the BMR by 1.2.
- **Lightly active.** If you exercise lightly one to three days a week, multiply the BMR by 1.375.
- **Moderately active.** If you exercise moderately three to five days a week, multiply the BMR by 1.55.

- **Very active.** If you engage in hard exercise six to seven days a week, multiply the BMR by 1.725.
- **Extra active.** If you engage in very hard exercise six to seven days a week or have a physical job, multiply the BMR by 1.9.

The final number is approximately how many calories you need on a daily basis to maintain the weight.

Step 3: Reference Chart

Daily calorie needs based on activity level:

Activity Level	**Calorie**
Sedentary: little or no exercise	1926
Exercise 1-3 times/week	2207
Exercise 4-5 times/week	2351
Daily exercise or intense exercise 3-4 times/week	2488
Intense exercise 6-7 times/week	2769
Very intense exercise daily, or physical job	3050

Exercise: 15-30 minutes of elevated heart rate activity.

Intense exercise: 45-120 minutes of elevated heart rate activity.

Very intense exercise: 2+ hours of elevated heart rate activity.

Please Note: Recording of observations for ten students (BMR) is to be done till step 1. Step 2 and 3 are required for Viva purpose only but has to be written in file**.**

UNIT 2: CALCULATION OF WAIST HIP RATIO

The Waist-to-hip Ratio (WHR) looks at the proportion of fat stored on the body around the waist and hip. It is a simple but useful measure of fat distribution. It is an easy, inexpensive, and accurate way to calculate body fat. The Waist Hip Ratio is calculated by dividing the waist measurement by the hip measurement, since the hips are the widest part of the buttocks.

The formula is:

WHR= waist circumference / hip circumference.

Having an apple shape (carrying extra weight around the stomach) is riskier for the health than having a pear shape (carrying extra weight around the hips or thighs). This is because body shape and health risks are linked. If you have more weight around the waist you have a greater risk of lifestyle related diseases such as heart disease, diabetes and pre- mature deaths than those with weight around their hips. Ideally, women should have a waist-to-hip ratio of 0.8 or less, whereas men should have a waist-to-hip ratio of 0.95 or less.

Measurement Procedure

- Stand up straight and breathe out. Use a non-stretchable tape measure to check the distance around the smallest part of the waist, just above the belly button. This is the waist circumference.
- Then measure the distance around the largest part of the hips — the widest part of the buttocks. This is the hip circumference.
- Calculate the WHR by dividing the waist circumference by the hip circumference.

Posture of the subjects during the measurement

For both measurements, the subject should stand with feet close together, arms at the side and body weight evenly distributed, and should wear little clothing. The subject should be relaxed, and the measurements should be taken at the end of a normal expiration. Each measurement should be repeated twice; if the measurements are within 1 cm of one another, the average should be calculated. If the difference between the two measurements exceeds 1 cm, the two measurements should be repeated.

Waist-to-hip ratio chart

In both men and women, a WHR of 1.0 or higher increases the risk for heart disease and other conditions that are linked to being overweight.

Health risk	Women	Men
Low	0.80 or lower	0.95 or lower
Moderate	0.81–0.85	0.96–1.0
High	0.86 or higher	1.0 or higher

UNIT 3: Measurement of body composition for Calculating body fat and lean body mass

Aim: Measurement of body composition for Calculating body fat and lean body mass

Introduction

The body is mainly composed of three main components: fat, lean body mass (muscle, bone, and organs), and water. Body composition is the proportion of fat and non-fat mass in the body. A healthy body composition is one that includes a lower percentage of body fat and a higher percentage of non-fat mass, which includes muscle, bones, and organs.

The body stores the fat from the food we eat and gets deposited to be used for energy, insulation, and protection. Everyone needs some fat to live and function. When too much body fat accumulates, however, it can lead to obesity and obesity-related diseases, like type 2 diabetes and heart disease.

Methodology

The different methods that can be used to identify the body fat percentage are as follows:

- Skinfold Callipers
- . Body Circumference/Girth Measurements

1. Skinfold Callipers

Skinfold calliper measure the thickness of the subcutaneous fat, the fat underneath the skin. Measurement are taken at either 3 or 7 different sites on the body. The specific sites used vary in men and women. For women, the triceps, area above the hip bone and either the

thigh or abdomen are used for the 3-site measurement. For men, the 3 sites are the chest, abdomen and thigh, or the chest, triceps and area beneath the scapula.

Advantages: Skinfold callipers are very affordable, and measurements can be taken quickly. They can be used at home but are also portable.

Disadvantages:

- The method requires practice and basic anatomy knowledge. Also, some people don't enjoy getting their fat pinched.
- The skill of the person performing the skinfolds can vary, impacting the accuracy. Measurement errors can range from 3.5–5% body fat.

Skinfold Measurement score

		Excellent
Normal	Male	60-80
	Female	70-90
Athletic	Male	40-60
	Female	50-70

2. Body Circumference/Girth Measurements

Body shape varies from person to person, and the shape of the body provides information about the body fat. Measuring the circumference of certain body parts is a simple method of

body fat estimation. For example, for men, the circumferences of the neck, triceps and waist are used in this equation. For women, the circumference of the hips is also included.

Procedure to measure body circumference:

- **<u>Waist Circumference</u>**

1. Stand and place a tape measure around your middle, just above your hipbones.
2. Make sure tape is horizontal around the waist.
3. Keep the tape snug around the waist, but not compressing the skin.
4. Measure your waist just after you breathe out.
5. Record the reading.

As a general risk factor there are girth measurements that are used as a guideline to show an increased risk of heart disease.

- Waist girth greater than 102 cm (men) and greater than 88 cm (women).
- Waist to hip ratio greater than 0.95 (men) and greater than 0.86 (women).

- **Neck Measurement**

Measure the circumference of the neck by placing a measuring tape directly on the skin just below the larynx -- also known as the Adam's apple -- and extend the tape horizontally all the way around the neck. For accuracy, your shoulders need to be relaxed, not hunched, while measuring. Round your neck measurement to the nearest half inch and write down the reading.

- **Hip Measurement**

The hip measurement is taken around your hips, passing over the fullest part of the buttocks, and rounded down to the nearest half inch.

In the same way, other girth measurements are done.

Calculation

To calculate body fat percentage, add your waist and hip measurements, and then subtract the neck measurement to determine your circumference value. For example, if your waist is 30, your hips are 36, and your neck is 13, your circumference value would be 53.

Advantages: This method is easy and affordable. A flexible measuring tape and calculator are all you need. These tools can be used at home and are portable.

Disadvantages:

- Body circumference equations may not be accurate for all people due to differences in body shape and fat distribution.
- The error rate can be as low as 2.5–4.5% body fat, but it can also be much higher.

LEAN BODY MASS

Lean body mass is what the body would weight if you didn't have any body fat; that means it counts all the organs, bones, muscles, blood and skin, and everything else which is not fat but has mass.

Methodology

To calculate lean body mass, you must first identify your overall body fat percentage and then,

1. Measure the body weight.
2. Multiply the body weight by the fat percentage.
3. Subtract the result from the body weight.

Calculate your LBM using your height and weight.

1. Men: **Lean body mass** = (0.32810 × W) + (0.33929 × H) − 29.5336.
2. Women: **Lean body mass** = (0.29569 × W) + (0.41813 × H) − 43.2933.