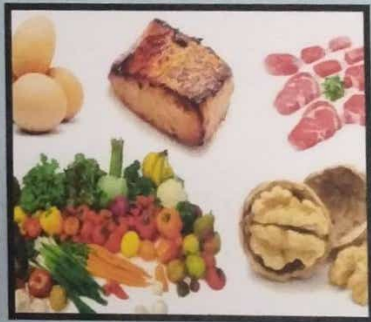
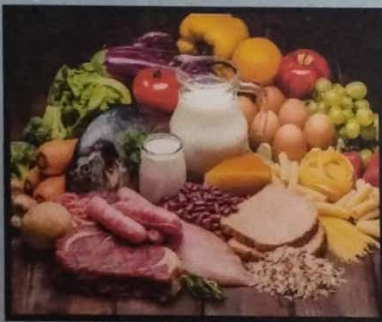




Nutrition and Human Health



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Nutrition and Human Health

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Nutritional Assessment Tools

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Introduction

The **ABCD** for nutritional assessment is as follows:

- A. Anthropometry nutritional assessment method
- B. Biochemical/biophysical nutritional assessment method
- C. Clinical nutritional assessment method
- D. Dietary nutritional assessment method

A. Anthropometry Nutritional Assessment Method

The word anthropometry is made from two words

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where, anthro means 'human' and metry means 'measurement'. Therefore, anthropometry is the assessment of the various components of the human body. Various methods are used in the anthropometric measurements, which are as follows:

1. Change in Weight %

Formulae:

$$\frac{(\text{Present weight} - \text{Previous weight})}{\text{Present weight}} \times 100$$

Note: Patient's counselling is required in the following cases:

1. BMI <18.5kg/m², Weight loss of >10% in the last 3-6 months
2. BMI <20kg/m², weight loss >5% in the last 3-6 months.

Source: (NICE, 2006)

2. Body Mass Index (BMI)

Formulae:

$$\text{BMI (kg/m}^2\text{)} = \text{weight (kg)} / \text{height}^2 \text{ (m}^2\text{)}$$

Note: If BMI of patient is:

1. <18.5kg/m²= underweight
2. 18.5-25kg/m², =Normal BMI
3. >25kg/m² = overweight

Source: (WHO, 2016)

3. Mid Upper Arm Circumference (MUAC)

It is used when a person's actual weight is not reflected due to medical conditions like malnutrition, oedema, ascites, etc.

Procedure: By placing MUAC tape on the upper arm of the child, the circumference of the mid-point of the upper arm is measured. By doing this fat free mass

(FFM) and fat mass (FM) are calculated.

Note: Patient's guardian required counseling in the following cases:

If MUAC is:

>23.5cm = Healthy BMI - low risk of malnutrition.

<23.5cm = BMI <20kg/m² – malnourished child.

Source: (BAPEN, 2011)

4. Skin Fold Thickness

Skin fold calipers are used for measuring thickness of skin at 4 different sites that is suprailliac, subscapular, biceps and triceps of arms. Before using skin fold calipers, ensure calipers should be calibrated. The mean result will be recorded after taking three consecutive readings of the measurement.

5. Mid-arm Muscle Circumference (MAMC)

It is a computation of body's fat free mass. It is estimated by taking the values of both MUAC and TSF.

Formulae:

$$\text{MAMC (cm)} = \text{MUAC (cm)} - 3.14 \times \text{TSF (cm)}$$

B. Biochemical/Biophysical Nutritional Assessment Method

Biochemical tests are used to the levels of chemical substances present in the human blood. These are done to the functions of body organs such as the sugar level, urea level, etc. These blood tests are done synchronically with a clinical examination, any medication and previous medical history.

Following are the Common Biochemical Tests

1. **Haemoglobin (Hb):** Assessment of iron status among women and men.

Normal range: Women = (12.0 -15.5) g/dl

Men = (13.5- 17.5) g/dl

2. **Albumin (Alb):** A low level of albumin is a sign of inflammation or infection in the human body.

Normal range: 35 - 50 g/L (3.5 - 5.0 g/dL)

3. **Calcium and Phosphate:** These levels are used as a baseline when there is a disturbance in body fluids and electrolytes resulting from hormonal and metabolic changes causing serious clinical complications. These may occur in malnourished patients who were on artificial refeeding both enterally or parenterally.

Modified range: Ca: 2.0-2.6 mmol/l

Phosphate: 0.7-1.4 mmol/l

4. **Sodium (Na):** A raised sodium level may indicate dehydration, an indicator to hydration status of kidney function.

Normal range: 135-145 mmol/L

5. **Magnesium:** When there is an extreme loss of gastro intestinal fluid, magnesium levels are likely to drop down.

Normal range: 0.7-1.0 mmol/l

6. **Vitamin- D:** Normal Range: 400 IU (10 microgram)

7. **Vitamin-E:** Normal Range :7.5-10 mg alpha tocopherol

8. **Vitamin-K:** Normal Range: 55 micrograms

C. Clinical Nutritional Assessment Method

Clinical assessment is done to quantify the nutritional status of the person by assessing the nutritional deficiencies at specific places on the human body.

Clinical Symptoms

1. **Heart Attack:** Pain, feeling of congestion in the bottom of the chest for more than a minute, difficulty in breathing, nausea and cold sweat.
2. **Urinary Bladder:** Bloody urine, leaking urine, painful urination, frequent urination, uncontrolled bladder, wetting of the bed at night.
3. **Skin Problems:** Skin moles, skin lesions, thick and red skin with patches.
4. **GIT Problems:** Constipation, bleeding in rectum, blood in the stool, black or dark stools, changes in the bowel habits, unable to control bowel movement, diarrhea, heartburn, acid reflux, passing of blood during vomiting.
5. **Lung Problems:** Blood while coughing, shortness of breath, difficulty in breathing, bronchitis pneumonia.
6. **Eating Disorders:** Extreme thirst, dehydration, excessive hunger, losing weight, binging, vomiting, starvation, excessive use of laxatives or diet pills.

D. Dietary Nutritional Assessment Method

It includes following parameters:

1. **24-hour Dietary Recall:** It is a Subjective measure using open-ended questionnaires administered by a nutritionist/dietician.
2. **Duplicate Diet Approach:** Collection of duplicate diet sample and direct analysis by a nutritionist/dietician.
3. **Food Consumption Record:** Objective by a nutritionist/dietician at the household level.
4. **Dietary Record:** Subjective measure using open-ended, self-administered questionnaires by a nutritionist/dietician.

5. **Dietary History:** Using open- and close-ended questionnaires prepared by a nutritionist/dietician dietary recall can be taken.

6. **Food Frequency Questionnaire:** These are pre-defined questionnaires made by a nutritionist/dietician.

7. **Energy Requirements:** To determine the total daily calorie needs, multiply BMR by the appropriate activity factor, as follows:

- Sedentary worker = (BMR x 1.2)
- Lightly active worker (Engage in sports or physical activity 1-3 days in a week) = (BMR x 1.375)
- Moderately active worker (Engage in sports or physical activity 3-5 days in a week) = (BMR x 1.55)
- Very active worker (Engage in sports or physical activity 6-7 days in a week) = (BMR x 1.725)
- A worker engages in very hard exercise or sports & other physical activity = (BMR x 1.9)

Basal Metabolic Rate (BMR): It is based on the Mifflin - St Jeor equation. It differs for men and women:

BMR (men) = (10 * weight / 1kg + 6.25 * height / 1cm - 5 * age / 1 year + 5) kcal / day

BMR (women) = (10 * weight / 1kg + 6.25 * height / 1cm - 5 * age / 1 year - 161) kcal / day

The result will be the TDEE - Total Daily Energy Expenditure. It is the daily calorie intake recommended for maintaining the current weight.

8. **Fluid Intake:** Fluid intake varies with age, gender, climate and medical conditions.

Normal range: >60 years = (30ml/kg body weight)

<60 years = (35ml/kg body weight)

Source: (Todorovic and Micklewright, 2011)

9. Fiber Intake: In India daily intake of Dietary fiber varies among different socio-economic groups from 15 to 41 g/day. It is seen that the fiber intake is lower in women (15-30 g/day) and much lesser in tribal population (15-19 g/day). People consume wheat- or millet-based dietary fibers more than rice-based dietary fibers.

10. Dietary Assessment: It is the assessment of the daily calorie consumption and the quality of food eaten by a patient. Daily follow up will be helpful in understanding the patterns of eating disorders/ styles, portion sizes, type of cooking method and types of food and fluids taken.

Conclusion

Anthropometric, biochemical, clinical and dietary assessment are the basic tools for assessing nutritional status of any malnourished person. These tools are economical, easy to use and can be done anywhere easily.

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