Malnutrition

Learning objectives

- To define malnutrition and know its causes
- To assess malnutrition by using the indicators and anthropometric measures
- To know the wellcome classification of malnutrition
- To be able to know the clinical manifestation of Marasmus and Kwashiorkor.
- To understand the basics of treatment of severe malnutrition

Definition

Malnutrition is a general term for the medical condition caused by an improper or insufficient diet.

It most often refers to undernutrition resulting from inadequate consumption, poor absorption, or excessive loss of nutrients, but the term can also include overnutrition, resulting from overeating or excessive intake of specific nutrients.

Undernutrition (malnutrition): structural and functional changes due to inadequate intake of nutrients and energy sources. Deficiency of a single nutrient is an example of undernutrition, e.g. iron and iodin.

Causes

Primary Malnutrition: resulting from inadequate food intake

Secondary Malnutrition: resulting from increased nutrient needs, decreased nutrient absorption, and/or increased nutrient losses.

Although both 1 ° & 2 ° malnutrition occur in developing as well as developed countries, 1 ° malnutrition accounts for the major percentage of malnourished children in developing countries, whereas 2 ° malnutrition accounts for a higher percentage in developed countries.

Causes of 1 ° Malnutrition

Accounts for the vast majority of cases:

- **Nutrition**: Inadequate food intake due to;
  - insufficient or inappropriate food supplies
  - early cessation of breastfeeding
  - cultural and religious food customs (in some areas)
Causes of 2° Malnutrition

Children with chronic illness are at risk for nutritional problems for several reasons, including the following:

- Anorexia, which leads to inadequate food intake.
- Increased inflammatory burden and increased metabolic demands can increase caloric need.
- Any chronic illness that involves the liver or small bowel affects nutrition adversely by impairing digestive and absorptive functions. Like:
  - Cystic fibrosis
  - Chronic renal failure
  - Childhood malignancies
  - Congenital heart disease
  - Neuromuscular diseases
  - Chronic inflammatory bowel diseases

Protein-Energy Malnutrition

PEM, whether primary or secondary, is a spectrum ranging from mild undernutrition resulting in some decrease in length and/or weight for age through severe forms of undernutrition resulting in more marked deficits in weight and length for age as well as wasting (i.e., a low weight for length).

The distinction between the 2 forms of PEM is based on the presence (Kwashiorkor) or absence (Marasmus) of edema.

Marasmus involves inadequate intake of protein and calories, whereas a child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake.

(Anthropometric measurements)

Malnutrition is assessed by a combination of clinical features and anthropometry (body measurements). The indicators used are:

1. Wasting:
   - Weight for height,
   - Mid upper arm circumference (MUAC),
   - Body mass index (BMI)
2. Stunting: height for age

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Underweight
Measurements that fall below 2 standard deviations under the normal weight for age.

Stunting
Measurements that fall below 2 standard deviations below height for age.

Wasting
Measurements that fall below 2 standard deviations below weight for height.

Diagnosis
Acute: Wasting: low weight for height
Chronic: Stunted: low height for age

Classifications of childhood malnutrition

Wellcome Classification

Definition:
Marasmus: Weight less than 60% of expected weight - no oedema.
Kwashiorkor: Weight between 60-80% of expected weight + oedema

Kwashiorkor

“The one who is displaced” reflecting the development of the condition in the older child who has been weaned from the breast once a new sibling is born.

The essential feature is deficiency of protein with relatively adequate energy intake.

1. Failure of growth:
2. Oedema: pitting, bilateral including lower extremities. May be localized or extensive, including eyelids. It may mislead an observer into thinking that the child is plump and well.
3. Muscle and fat: the muscles are wasted. This is particularly noticeable around the chest and the upper arm; the wasting of the legs and around the hips is frequently concealed by oedema. Subcutaneous fat is often plentiful in children whose diets have provided sufficient energy but little protein.
4. Mental changes:: the child is apathetic and miserable.
5. Hair: becomes fine, straight and often sparse. Children with long straight black hair may show a pale band across the hair, corresponding to an earlier episode of kwashiorkor, the ‘flag sign’. The extent of these changes in the hair is an indication of the duration rather than the severity of the disease.
6. **Skin:** pigmentation, desquamation and ulceration. A severe case may look like an extensive burn. The legs, buttocks and perineum are most frequently involved, but any region may be affected.

7. **Mucous membranes:** angular stomatitis, cheilosis and a smooth tongue are commonly seen, as is ulceration around the anus.

8. **Liver:** this may be enlarged.

9. **Gastrointestinal system:** anorexia is usually present and sometimes vomiting. There is nearly always diarrhea, with the passage of stools containing undigested food. The diarrhea may be due to impaired secretion of digestive enzymes, to intestinal mucosal atrophy or to an intestinal infection.

10. **Anaemia**

11. **Associated vitamine deficiencies:** vit. A, thiamine, niacine, folate, vitamin k

**Signs of Kwashiorkor:**

1. Oedema of the legs and arms and face
2. Moon face
3. Moderately low weight
4. Misery and apathy
5. Poor appetite
6. Pale, thin, peeling skin
7. Pale spare hair with weak roots
8. Enlarge liver

**Nutritional marasmus**

Due to a severe and prolonged restriction of all food, i.e. energy sources and other nutrients in addition to protein.

The two constant features of marasmus are:

1. Retardation of growth and reduction of weight which is much more marked than that of height
2. Wasting of muscles & loss of subcutaneous fat started from the abdominal wall then the buttocks then from the buccal pad of fat which gave the infant a wizened, old appearance.

Appetite is usually preserved or even enhanced and the liver is usually normal, with no fatty infiltration.

Episodes of hypothermia and fasting hypoglycaemia are common

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Nutritional marasmus; Features

- Emaciated: thin, flaccid skin (the ‘little old man’ appearance), fat and muscle tissue grossly reduced, prominence spine and ribs
- Behaviour: alert and irritable
- Electrolyte imbalance, dehydration
- Infection,
- Normal hair
- There are no biochemical or haematological changes diagnostic of the condition

Signs of marasmus:

1. Extremely low weight (Weight for age < 60% expected)
2. Extreme wasting
3. An ‘old person’s face’
4. Pot belly: the child’s abdomen protruded, because the muscles of the abdominal wall are wasted and weak
5. Irritability
6. Hunger
7. No edema

Evaluation

Practical nutritional assessment

- Complete history, including a detailed dietary history
- Growth measurements, including weight and length/height; head circumference in children younger than 3 years
- Complete physical examination

Laboratory investigations are generally unhelpful

- Tests that may be useful in the assessment of PEM and management of complications:
  - laboratory studies evaluating protein status
  - hematological studies
  - Blood glucose
  - GUE & culture
  - Stool exam & culture
  - CXR

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MANAGEMENT

Successful management of malnutrition should mean complete catch-up followed by sustained normal growth, health and development.

Treatment of severe malnutrition

Monitoring of:
1. Weight
2. Height
3. Oedema
4. Vomiting
5. Diarrhea
6. Temperature
7. Heart rate
8. Respiratory rate

Phases of treatment

Management of severe malnutrition is best divided into three phases.

Initial Phase (days 1-7) involves resuscitation, treatment of infection and correction of disordered metabolism.

The principal tasks are:

1. To treat or prevent hypoglycemia and hypothermia;
2. To treat or prevent dehydration and restore electrolyte balance;
3. To treat septic shock, if present;
4. To start to feed the child;
5. To treat infection;
6. To identify and treat any other problems, including vitamin deficiency, severe anemia and heart failure

- The quantity given in the initial phase is delicate: if too little is given, malnutrition will continue. Overfeeding (too large quantities of food, too high osmotic value of the food) and overhydration (IV fluids, oral rehydration fluids) increases the risk of congestive heart failure. Early signs are increased respiratory rate, increased heart rate, and lung sounds.
- Give the food frequently and in small amounts (e.g. 8 times over 24 hrs) throughout the day and night.
- At each feed the food should be offered by mouth, after which the remainder is given by NG tube.
- Severely malnourished patients do not tolerate the usual amounts of dietary protein, fat, and sodium, and require a diet low in these component (dietary protein, fat, and sodium) and in osmolality, but high in carbohydrate. Special food items are therefore used.
Rehabilitation Phase

The child is supposed to have entered the rehabilitation phase when his or her appetite has returned.

Usually within a week, the second or Rehabilitation Phase (weeks 2-6) is heralded by the following criteria:

- Eating well
- Mental status has improved; smiles, responds to stimuli, interested in surroundings
- Normal temperature (36.5-37.5°C)
- No vomiting or diarrhea
- No oedema
- Gaining weight: > 5g/kg of body weight per day for 3 successive days

The principal tasks are:

- To encourage the child to eat as much as possible
- To re-initiate and/or encourage breastfeeding as necessary
- To stimulate emotional and physical development; and
- To prepare the mother to continue to look after the child after discharge

At this stage, the formula feed is changed to one that provides more energy (up to 150kcal/kg/24hr) and protein (4g/kg/24hr) for growth.

The child’s dietary intake increases steadily, the frequency of feeding is reduced and weight gain is rapid, up to 20 times normal, on average 10 g/kg/day.

The child’s mother must be taught of nutrition and food preparation and hygiene.

Follow-Up Phase

When the child has reached –1 SD weight-for-length or height, he or she is ready for home and the final Follow-Up Phase (weeks 7-26) commences.

Ideally, the child is visited at increasing intervals for up to 3 years to ensure that recurrence of malnutrition is prevented
Treatment of Malnutrition: Summary

1. Treat/prevent hypoglycaemia
2. Treat/prevent hypothermia
3. Treat/prevent dehydration
4. Correct electrolyte imbalance
5. Treat/prevent infection
6. Correct micronutrient deficiencies
7. Initiate refeeding
8. Facilitate catch-up growth
9. Provide sensory stimulation and emotional support
10. Prepare for follow-up after recovery

Complication

- Severe kwashiorkor and marasmus has a mortality of around 20% even in a well equipped hospital.
- Most deaths occur in the first 10 days
- The usual cause of death is intercurrent infections and severe malnutrition, including potassium deficiency.
- Availability of medical care is another factor influencing prognosis.

Prognosis

Children who have chronic malnutrition, especially those with intrauterine growth retardation and with onset at an early age, do not achieve their full growth potential or regain cognitive deficits.

Over half of childhood mortality in developing countries is either directly or indirectly secondary to malnutrition.

THANKS