

**NUTRITIONAL
DEFICIENCY
DISORDERS**

DEFINITION OF MALNUTRITION

- Malnutrition has been defined as a “pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients.”
- It comprises four forms- undernutrition, overnutrition, imbalance and specific deficiency.

ECOLOGY OF MALNUTRITION

- Infections and disease conditions
- Poor socio economic status
- Cultural influences
- Inadequate health and other services

ASSESSMENT OF NUTRITIONAL PROBLEMS

- Assessment of dietary intake by detailed history of dietary patterns, specific food consumed and its amount, quality and adequacy in relation of nutrient value.
- Anthropometric examination of child including weight, length/height, mid-upper arm circumference, skin fold thickness are valuable indicators of nutritional status.
- Clinical examination of the child with thorough head to foot examination to assess deficiency signs and associated problems.
- Assessment of associated problems like TB, malabsorption syndrome, any infections or infestations should be made to find out the probable cause of nutritional deficiency.

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ASSESSMENT OF NUTRITIONAL PROBLEMS

- Laboratory investigations including
 - Routine examination of stool, urine, blood
 - X-ray
 - Estimation of hemoglobin
 - Serum proteins
 - Enzymes
 - Blood levels of nutrients like vitamins, iron, amino acid etc.
- Assessment of ecological factors morbidity and mortality patterns in the community help to detect the nutritional status of the particular community.

PROTEIN ENERGY MALNUTRITION

DEFINITION

- Protein energy malnutrition can be defined as a group of clinical conditions that may result from varying degree of protein deficiency and energy (calorie) inadequacy.

INCIDENCE

- About 1-2 percent in preschool children in India.

ETIOLOGY

- Inadequate intake of food (food gap), both in quantity and quality
- Infections especially ARI, diarrhoea, measles, worm infestations- increase in requirements of calories, proteins and other nutrients, while decreasing their absorption and utilization.
- Poor socio economic status
- Cultural influences
- Inadequate health and other services

CLASSIFICATION OF PEM

- Classifications are done based on achievement of expected weight or height according to given age.
- There are several classifications of PEM as-
 - Syndromal classification
 - Gomez classification
 - Welcome or International classification
 - Classification by Indian Academy of Pediatrics (IAP)
 - Jellife classification
 - Mc Laren classification
 - Waterlow classification
 - Arnold classification
 - WHO classification
 - Gopalan classification etc

Contd...

CLASSIFICATION OF PEM

Syndromal classification:

- Kwashiorkor
- Nutritional Marasmus
- Prekwashiorkor
- Nutritional dwarfing

Classification by Indian Academy of Pediatrics (IAP)

When the child is having weight more than 80% of expected weight for age, considered as normal. The grade of malnutrition is described as follows:

- Grade-I- between 71-80% of expected weight for the age.
- Grade-II- between 61-70% of expected weight for that age.
- Grade-III- between 51-60% of expected weight for that age.
- Grade-IV- 50% or less weight expected weight for that age.

Incase of demonstrable edema in the child, the letter 'K' is placed in front of the evaluated grade.

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CLASSIFICATION OF PEM

Gomez classification

- According to this classification, PEM is graded with reference to the weight for age as percentage of the expected weight (Harvard Standard).
- It is an international classification that takes a weight of more than 90% of expected for that age (50th percentile) as normal.
- The grade of malnutrition is as follows:
- **Grade-I-** weight between 75-90% of expected for the age.
- **Grade-II-** weight between 61-75% of expected for the age.
- **Grade-III-** weight less than or equal to 60% of expected for the age.

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CLASSIFICATION OF PEM

WHO classification

WHO recommends 3 terms i.e., stunting, under weight and wasting, for assessing the magnitude of malnutrition in under five children.

- **Stunting** is defined as a child below 2 standard deviation (SD) score from the median height for age of NCHS reference population (-3SD for severe stunting)
- **Under weight** is defined as a child below 2 SD from the median weight for age of NCHS reference population (-3SD for under weight)
- **Wasting** is defined as a child below 2 SD from the median weight for height of NCHS reference population (-3SD for severe wasting)
- National Center for Health Statistics (NCHS), USA, is the most popular international standards (WHO, 1993).

CLINICAL FEATURES OF PEM

KWASHIORKOR

- Kwashiorkor was first described by Dr. Cicely Williams in 1933, according to local name for the disease in Ghana.
- The term was said to mean “red boy” due to characteristic pigmentary changes.
- The presenting features can be divided into 2 groups, i.e., essential and non-essential features.

Essential features of Kwashiorkor:

- ❖ Marked growth retardation with low weight and low height gain.
- ❖ Muscle wasting with retention of some subcutaneous fat.
- ❖ Psychomotor changes characterized by mental apathy with listless, inertness, lack of interest about the surrounding, lethargy, dullness and loss of appetite.
- ❖ Pitting edema, especially over the pretibial region, due to hypoalbuminemia, and increased capillary permeability with damaged cell membrane.

CLINICAL FEATURES OF PEM

KWASHIORKOR

Non-Essential features of Kwashiorkor:

1. Hair changes

- light colored hair or reddish brown color hair which becomes thin, dry, coarse, silky with easy pluckability.
- Affected child may have alopecia with alternate band of light and dark color hair as 'flag sign' which indicates period of inadequate, adequate and inadequate nutrition over a prolonged period.

2. Skin changes

- Erythema and hyperpigmented and skin patches but later found as desquamated and hypopigmented patch with the appearance like old paint flaking off the surface of the wood (flaky-paint dermatosis)
- Crazy pavement dermatosis, Mosaic dermatosis, Reticular pigmentation, Pyodermas, Scabies, Indolent sores and ulcers over exposed parts or limbs.

3. Superadded infections

- Repeated infections of GI tract with diarrhoea, vomiting, anorexia and dehydration
- Respiratory infections (ARI, TB)
- Skin infections and septicemia

Kwashiorkor child



CLINICAL FEATURES OF PEM

NUTRITIONAL MARASMUS

- Child looks like old person with wizened and shrivelled face due to loss of buccal pad of fat.
- Child is irritable, hungry and craves for food, but in alter stages may become miserable, apathetic and refusal to take anything orally.
- Clinical features are subdivided into essential and non-essential features.

Essential features of marasmus

1. Marked growth retardation with less than 60% of expected weight for age an subnormal height/length.
2. Gross wasting of muscle and subcutaneous tissue.
3. Marked stunting and absence of edema.

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CLINICAL FEATURES OF PEM

NUTRITIONAL MARASMUS

Non-Essential features of marasmus

1. Hair changes usually not present or may be hypopigmented.
2. Skin looks dry, scaly with prominent loose folds and having mid-upper arm circumference.
3. Superadded infections are common. Skin infections and diarrhea with vomiting and abdominal distention usually occur.
4. Liver usually shrunk and child has craving for food and hunger.
5. Psychomotor changes usually present with irritability, apathy and miserable appearance.
6. Features of mineral deficiencies (anemia) and vitamin deficiencies are usually found.
7. Grading of nutritional marasmus:
 - Grade-I- loss of fat from axilla
 - Grade-II- loss of fat from abdominal wall and gluteal region
 - Grade-III- loss of fat from chest, back
 - Grade-IV- loss of buccal pad of fat

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Marasmus child



CLINICAL FEATURES OF PEM

MARASMIC KWASHIORKOR

- It is a condition where the child is manifested with both the features of marasmus and kwashiorkor.
- The presence of edema is essential for the diagnosis and other features of kwashiorkor may or may not be present.

PREKWASHIORKOR

- It is a condition where the child is having features of kwashiorkor without edema.

NUTRITIONAL DWARFING

- It is a condition when the child is having significant low weight or height for the age without any overt features of kwashiorkor or marasmus. It is usually seen when the PEM continue over a number of years.

MANAGEMENT OF PEM

- ◉ Domiciliary treatment
- ◉ Management in nutritional rehabilitation center (NRC)
- ◉ Management at hospital

COMPLICATIONS OF PEM

Acute complications-

- Systemic or local infections
- Severe dehydration
- Shock
- Dyselectrolytemia
- Hypoglycemia
- Hypothermia
- CCF
- Bleeding disorders
- Hepatic dysfunction
- Sudden infant death syndrome (SIDS)
- Convulsions

Long-term complications-

- ❖ Cachexia
- ❖ Growth retardation
- ❖ Mental subnormality
- ❖ Visual and learning disabilities

PROGNOSIS OF PEM

- Prognosis depends upon good hospital and domiciliary care.
- Acute complications may lead to poor prognosis and fatal outcome

PREVENTIVE MANAGEMENT OF PEM

Health promotion

- Improvement of pre-pregnant state, pregnant mother and lactating women towards healthy mother for healthy child.
- Promotion of exclusive breastfeeding upto 4 to 6 months of age to prepare firm base of child health and promotes nutritional status.
- Appropriate weaning practices and necessary nutritional supplementations.
- Improvement of family dietary habit with locally available, low cost food items for balanced diets.
- Nutrition education and nutrition counseling to promote correct feeding practices, food habits, food hygiene, safe water, environmental sanitation, and to eliminate misconceptions regarding food and feedings.
- Improvement of home economics, earnings, income generating activities, adequate dietary budget and diet planning for family members.
- Birth spacing and regulating family size.

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PREVENTIVE MANAGEMENT OF PEM

Health promotion

- Promotion of educational status.
- Especially women literacy to improve the family health.
- Provision of nutritional supplementation from ICDS centers and schools (Mid-day meal).
- Maintenance of healthy family environment, congenial for physical, social and psychological development of children.

Specific protection

- Provision of balanced diet with adequate proteins and energy for all children according to age.
- Immunization against vaccine preventable diseases.
- Promotion and maintenance of hygienic measures (handwashing, food hygiene).
- Food fortification to enrich the food items.

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PREVENTIVE MANAGEMENT OF PEM

Early diagnosis and treatment

- Periodic health check up of all children for health supervision and maintenance of 'growth chart.'
- Detection of growth failure as early as possible.
- Early diagnosis and management of infections, worm infestations and common childhood illnesses (ARI, diarrhea, measles, malaria).
- Promotion of early rehydration therapy in the child having diarrhea, without restriction of feeding.
- Implementation of supplementary feeding programs and services.

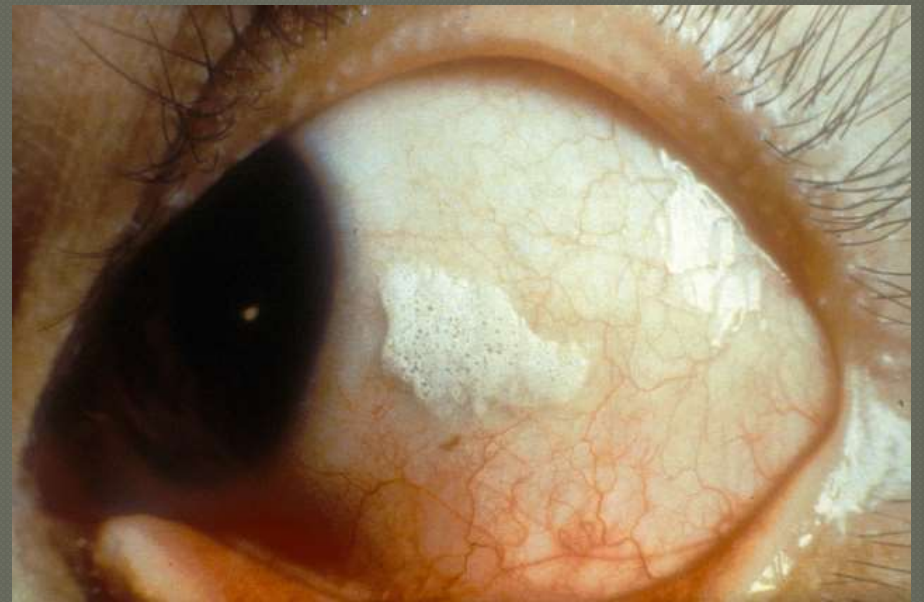
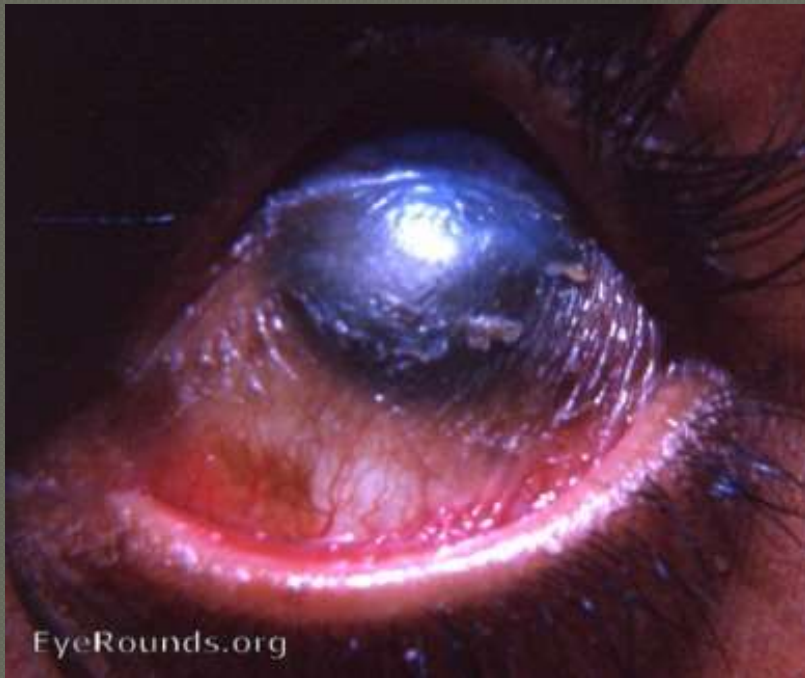
Rehabilitation

- Nutritional rehabilitation services
- Hospital management of advanced PEM cases
- Follow-up care.

NURSING RESPONSIBILITIES FOR THE MANAGEMENT OF PEM

- Assessment of nutritional status of children.
- Assisting in diagnostic investigations
- Maintenance of growth chart by regular health check-up
- Participating in hospital management in complications and life threatening situations
- Implementing nutritional rehabilitation activities.
- Encouraging parents for home care and follow-up at regular interval.
- Nutrition education, demonstration and counseling
- Promoting, preventing measures for individual, family and community to overcome the problem PEM.
- Cooperating with other team members
- Maintaining records and reports related to nutritional assessment
- Assisting in implementation of national nutritional assessment for prevention of malnutrition
- Participating in nutritional research project

Xerophthalmia bitots spots



Keratomalacia

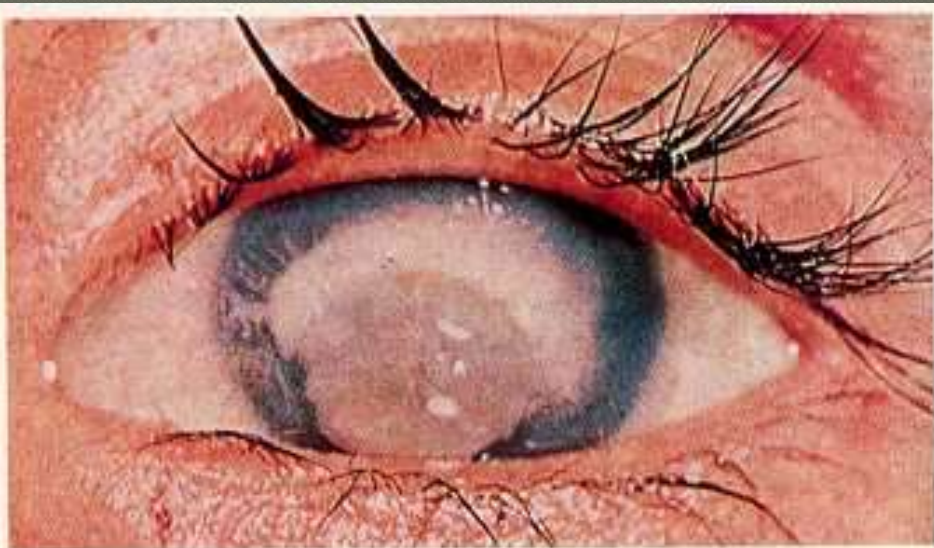


Fig. 3 Keratomalacia in a young child.

Rachitic rosary



widening of wrists



Beri-beri

THIAMINE DEFICIENCY (Beriberi)

DRY BERIBERI

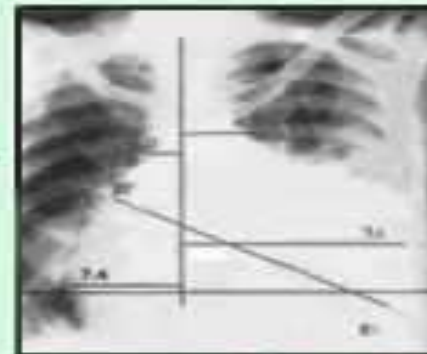
Common early manifestations



Dyspnea, orthopnea



WET BERIBERI



Wernicke's Syndrome

Ophthalmoplegia
→ Confusion
→ Coma
→ Death



cheilosis



Corneal
vascularization

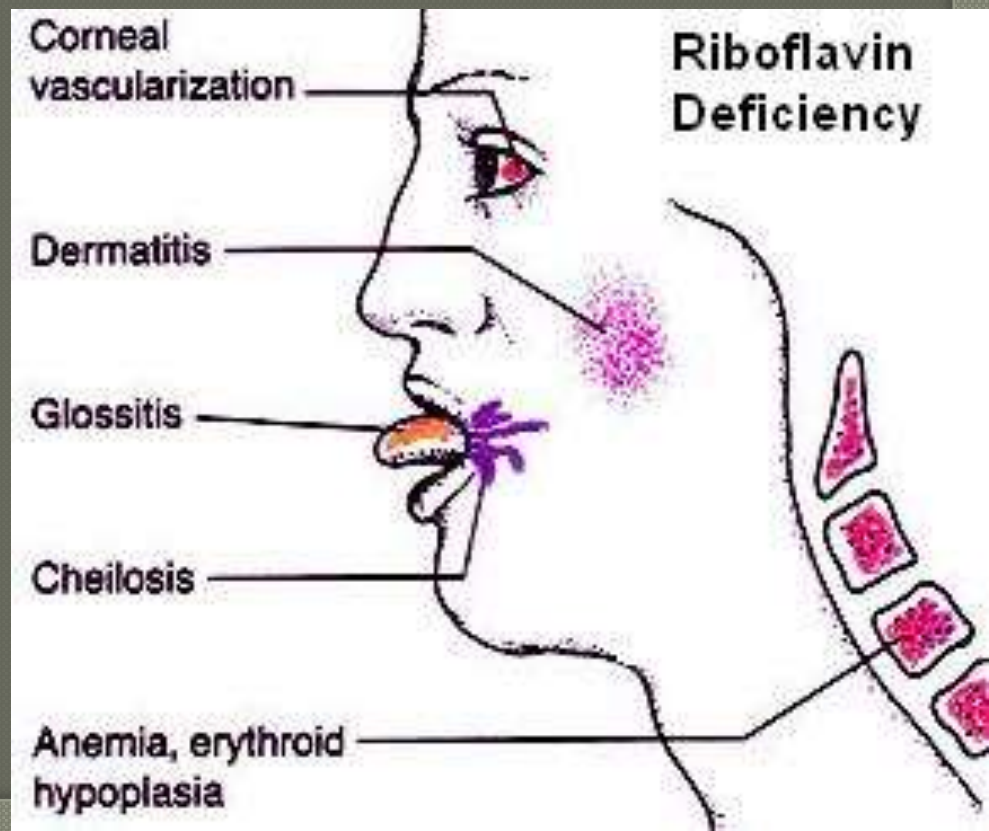
Dermatitis

Glossitis

Cheilosis

Anemia, erythroid
hypoplasia

Riboflavin
Deficiency



pellagra



Scurvy



Fluorosis

