ORIGINAL RESEARCH

Submitted: 23.01.2023; Accepted: 14.02.2023; Published online: 25.02.2023

Protein Energy Malnutrition – an Overview

Florence Nightingale K. A.[1], Sathiyalatha Sarathi[2], V. Hemavathy[3], Jenifar Monisha A.[4], Pandian B.[5]

[1] Department of Child Health Nursing, Panimalar College of Nursing, Chennai, Tamilnadu, India.

[2]Department of obstetrics and Gynaecological Nursing, Sree Balaji College of Nursing, (BIHER), Chennai, Tamilnadu, India.

[3]Department of Mental Health Nursing, Sree Balaji College of Nursing, BIHER, Chennai, Tamilnadu, India.

[4]Department of Obstetrics and Gynaecological Nursing, Panimalar College of Nursing, Chennai, Tamilnadu, India.

[5]Department of Medical surgical Nursing, Panimalar College of Nursing, Chennai, Tamilnadu, India.

E-mail
nightingaleflorence17@gmail.com
sathiyalathas@gmail.com
jenifermonisha.a@gmail.com
pandianbalu87@gmail.com

ABSTRACT

Protein-energy malnutrition or PEM is the condition of lack of energy due to the deficiency of all the macronutrients and many micronutrients. It can occur suddenly or gradually. It can be graded as mild, moderate or severe. In developing countries, it affects children who are not provided with calories and proteins.

KEYWORDS

Protein energy malnutrition, Kwashiorkor, Marasmus, Calories, Classification of PEM

Imprint

Florence Nightingale K. A., Sathiyalatha Sarathi, V. Hemavathy, Jenifar Monisha A., Pandian B. Protein Energy Malnutrition – an Overview. Cardiometry; Issue No. 26; February 2023; p. 585-588; DOI: 10.18137/cardiometry.2023.26.585588; Available from: http://www.cardiometry.net/issues/no26-february-2023/protein-energy

INTRODUCTION:

PEM is also referred to as protein-calorie malnutrition. It develops in children whose consumption of protein and energy (measured by calories) is insufficient to satisfy their nutritional needs. While pure protein deficiency can occur when a person's diet provides enough energy but lacks an adequate amount of protein, in most cases deficiency will exist in both total calorie and protein intake. PEM may also occur in children with illnesses that leave them unable to absorb vital nutrients or convert them to the energy essential for healthy tissue formation and organ function.

DEFINITION:

Protein-energy **malnutrition** (PEM) is a potentially fatal body-depletion disorder. It is the leading cause of death in children in developing countries.

TYPES WITH SYMPTOMS:

Primary PEM results from a diet that lacks sufficient sources of protein. Secondary PEM is more common in the United States, where it usually occurs as a complication of **AIDS, cancer,** chronic kidney failure, inflammatory bowel disease, and other illnesses that impair the body's ability to absorb or use nutrients or to compensate for nutrient losses.

Kwashiorkor, also called wet protein-energy malnutrition, is a form of PEM characterized primarily by protein deficiency. This condition usually appears at about the age of 12 months when breast-feeding is discontinued, but it can develop at any time during a child's formative years. It causes fluid retention (edema); dry, peeling skin; and hair discoloration.

Marasmus, a PEM disorder, is caused by total calorie/energy depletion rather than primarily protein calorie/energy depletion. Marasmus is characterized by stunted growth and wasting of muscle and tissue. Marasmus usually develops between the ages of six months and one year in children who have been weaned from breast milk or who suffer from weakening conditions such as chronic **diarrhea.**

ETIOLOGY:

Etiology of Protein-energy malnutrition (PEM)

- Inadequate medical facilities.
- poverty and, ignorance illiteracy.
- Maternal malnutrition.
- Poor hygiene, sanitation water supply.

- Occult infectious diseases.
- Early weaning from breast.
- Late weaning.
- High birth rate.
- Low birth weight.

DIAGNOSIS:

When the physician suspects PEM, A thorough physical examination is performed, and these areas assessed:

- eating habits and weight changes
- body-fat composition and muscle strength
- gastrointestinal symptoms
- presence of underlying illness
- developmental delays and loss of acquired milestones in children
- nutritional status

Doctors further quantify a patient's nutritional status by:

- comparing height and weight to standardized norms
- calculating body mass index (BMI)
- measuring skinfold thickness or the circumference of the upper arm

CLASSIFICATION:

The three different classification schemes of protein-energy malnutrition are described below

(i) Gomez classification

Terminology	Meaning
Underweight	Underweight for one's age (Weight for age)
Stunted	Too short for one's age (Height for age)
Wasted	Dangerously thin (Weight for height)
Micronutrient malnutrition	Deficient in vitamins and minerals (Hidden Hunger)

Grading

Grade of PEM	Weight for age (%)	General considerations and formula
Normal	90-100	• Normal reference child is the 50th centile of the Boston standard • Weight for age (%) = (Weight of the child / Weight of the normal child of same age) X100
Mild malnutrition, Grade I	75-89	
Moderate malnutrition, Grade II	60-74	
Severe malnutrition, Grade III	Less than 60	

(ii) Waterlow's classification

Feature	Basic definition
Stunting	Drop in height for age (< 90%)
Wasting	Drop in weight for height (<80%)
Under weight	Drop in Weight for Age (<80%)

Grading

Grade of PEM	Stunting (low height for age)	Wasting (low weight for height)
Normal	95	90
Mild malnutrition	87.5-95	80-90
Moderate malnutrition	80-87.5	70-80
Severe malnutrition	Less than 80	Less than 70

(iii) Welcome's classification

Weight for age	With edema	Without edema	General considerations
60-80%	Kwashiorkor	Undernutrition	• Weight for age +/- oedema • Reference standard (50th percentile)
<60%	Marasmic kwashiorkor	Marasmus	

NUTRITIONAL REQUIREMENT:

Energy: The child should be given 150-200Kcal/Kg of existing body weight /day. The children less than 2 years 200Kcal/Kg body weight and for older children's 150-175 Kcal/Kg body weight should be given. It is very important to provide enough calories or protein will be utilized for energy purposes not for building tissues.

Protein: For the existing weight five grams of protein/Kg body weight /day should be given. The calories derived from protein should be 10% of the total calculated calories per day if the main source is animal protein.

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Fats: Forty percent of total calories are from fats which is permitted by children, unsaturated fats worsen diarrhea.

Electrolytes: Potassium chloride (2.4g) and magnesium chloride(0.5g) should be added daily to the diet for a period of 2 weeks.

Vitamins: If vitamin A deficiency is present, oral administration of a single dose of 50, 000 IU of fat-sol-

uble vitamin A should be given immediately, followed by 500 units daily. So, The deficiency symptoms disappear in about 2 weeks.

Low-cost recipes for children recovering from PEM

- Ragi, green gram, jaggery: Puttu
- Ragi, Bengal gram, wheat: Puttu
- Bengal gram, milk, jaggery: payasam.
- Rice, Bengal gram: porridge
- Red gram, spinach: dal
- Wheat Rava, green gram dhal: vegetable Upma.
- Malted wheat, green gram, and groundnut powder (chapati, gruel, or laddu with jaggery).
- Rice, green gram dhal: Pongal/kichadi.
- Idly with sugar.

Suggested diet during convalescence:

- Increasing the quantity of existing foods(like idlis, rice, chapatis)
- Increasing the number of meals to satisfy calorie and protein requirements.
- In Addition to oil and ghee 1-2tsp to increase calories without increasing bulk.
- Consumption of sugar can be increased to increase the calories in the diet.
- The child can also be given cereal and pulse mixture.
- If the patient can afford milk, egg and skim milk can be included in the diet

TREATMENT:

Treatment strategy can be divided into the following 3 stages

- Solving the life-threatening condition.
- Replace nutritional status without disrupting homeostasis.
- Ensuring nutritional rehabilitation.

Treatment is designed to provide adequate **nutrition,** restore normal body composition, and cure the condition that caused the deficiency. Tube feeding or intravenous feeding is used to supply nutrients to patients who cannot or will not eat protein-rich foods.

In patients with severe PEM, the first stage of treatment consists of correcting fluid and electrolyte imbalances, treating infection with **antibiotics** that do not affect protein synthesis, and addressing related medical problems. The second phase involves replenishing essential nutrients slowly to prevent taxing the patient's weakened system with more food than it can handle. Physical therapy may benefit patients whose muscles have deteriorated significantly

PREVENTION:

Breastfeeding a baby for at least six months is considered the best way to prevent early-childhood malnutrition. Talking to a doctor before putting a child on any kind of diet, such as vegan, vegetarian, or low-carbohydrate, can help assure that the child gets the full supply of nutrients that he or she needs.

Every child being admitted to a hospital should be screened for the presence of illnesses and conditions that could lead to PEM. The nutritional status of patients at higher-than-average risk should be more thoroughly assessed and periodically re-evaluated during extended hospital stays.

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