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Primary and Moderate Acute Malnutrition and Rehabilitation Measures in Children Under the Age of Five: Clinical Effects and Treatment

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ABSTRACT

Child undernourishment brought on by inadequate protein and calorie intake is a severe public health concern. Particularly in light of research on mild acute malnutrition, the role and relative importance of food protein's importance. Micronutrient deficits have an impact on performance, development, and general health over the course of a person's life. An abrupt decrease in food intake or diet quality causes acute malnutrition, which is frequently linked to pathogenic reasons. Acute malnutrition causes changes in metabolic, hormonal, and glucoregulatory functions that can be treated with nutrition-specific therapies (such as parent counseling, ensuring family food security, etc.). In most cases, children with primary acute malnutrition may be treated at home. Inpatient treatment is advised when acute malnutrition is particularly severe and its repercussions are present. In order to manage secondary acute malnutrition, the underlying cause must be treated.

Key Words : Acute Malnutrition, Rehabilitation, Treatment, Primary Malnutrition, Moderate Acute Malnutrition

INTRODUCTION

Under-five-year-old malnutrition is a significant global public health concern. The two main types into which it may be separated are

– Acute malnutrition
– Chronic malnutrition

The two types of acute malnutrition that are further divided are severe acute malnutrition (SAM) and moderate acute malnutrition (MAM). We'll focus on mild acute malnutrition and available treatments for children under five in this answer. Weight-for-height measurements in children with MAM are between -2 and -3 standard deviations below the median of the World Health Organisation (WHO) growth criteria (also known as wasting). They lack the potentially fatal consequences observed in SAM, though.

Primary and moderate acute malnutrition are serious health conditions that affect children under the age of five. Let's explore each of them, including their causes, symptoms, and impacts:

Primary Acute Malnutrition: Primary acute malnutrition, commonly referred to as severe acute malnutrition (SAM), is characterised by a significant nutritional shortage in a child's diet that results into a quick loss of weight and stunted development. It is a potentially fatal disorder that needs immediate medical intervention.

Etiology: The main causes of primary acute malnutrition in children under five are inadequate food intake, poor dietary diversity, lack of access to nutritious food, infections, and environmental factors that contribute to a weakened immune system.

Symptoms: Children with primary acute malnutrition

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may exhibit the following symptoms:

– Severe wasting (very low weight for height/ length)
– Visible ribs and bones
– Swollen belly (edema)
– Fatigue and weakness
– Loss of appetite
– Irritability and apathy

Moderate acute malnutrition (MAM) is less severe than primary acute malnutrition but still poses significant health risks. Children with MAM may have stunted growth and are more susceptible to infections.

Etiology: The causes of moderate acute malnutrition are similar to those of primary acute malnutrition and often stem from insufficient nutrient intake and poor feeding practices.

Symptoms: Children with moderate acute malnutrition may show the following symptoms:

– Moderate wasting (low weight for height/length)
– Slower growth rate
– Visible bones but less severe than in primary acute malnutrition
– Delayed milestones

Treatment and Prevention: Treatment for both primary and moderate acute malnutrition typically involves therapeutic feeding, which includes a diet rich in essential nutrients. In severe cases, hospitalization and specialized therapeutic feeding programs may be necessary. Preventive strategies include encouraging exclusive breast feeding during the first six months of infancy, expanding access to nutritional meals, improving maternal nutrition, and educating people on optimal feeding techniques. In conclusion, primary and moderate acute malnutrition are critical health concerns affecting children under five.

Epidemiology:

Acute malnutrition, which affects kids under the age of five and causes intellectual or cognitive damage, is the root cause of one-third of all pediatric fatalities. 101 million or 16% of children worldwide are underweight, according to the weight-for-age Z score 2. The goal set by the World Health Assembly to reduce and sustain the prevalence at under 5% by 2025 has not been met in terms of acute and severe malnutrition among children under the age of five.

Prevalence: Malnutrition includes both undernutrition (inadequate nutrient intake) and over nutrition (excessive nutrient intake). Stunting is characterised by low height for age, wasting is characterised by low weight for height, and underweight is characterised by low weight for age. Obesity and overweight are both symptoms of overeating**.**

Age and Gender: All ages are susceptible to malnutrition, but the first 1,000 days of life (from conception to the child's second birthday) are particularly vulnerable

Geographic Variation: Prevalence and types of malnutrition can vary significantly between different regions and countries. Factors such as poverty, access to healthcare, food security, and cultural practices influence malnutrition patterns in various populations.

Malnutrition and Disease Burden : Malnutrition can also exacerbate the impact of infectious diseases, leading to increased morbidity and mortality.

Overall, the epidemiology of malnutrition highlights the importance of a multi-sectoral approach to address its various forms. Effective interventions require collaboration between governments, health care systems, non-governmental organizations, and communities to tackle the underlying causes of malnutrition and improve overall nutritional status worldwide.

Pathophysiology:

A variety of organ systems are impacted by acute malnutrition. Cellular immunity is impacted by lymph node, thymus, and tonsil atrophy. Normal CD8-T cells show a decline in immunoglobulin secretion

A, diminished cluster of differentiation (CD), poor phagocytosis, and lack of delayed hypersensitivity. It is well known that acute hunger reduces the quantity of neurons, synapses, dendritic arborizations, and myelinations, all of which result in a shrinkage of the brain. As the cerebral cortex ages, brain development slows.

When the body does not get enough of the nutrients it needs for healthy growth, development, and functioning, malnutrition can occur. It can result from various factors, including insufficient food intake, poor food choices, improper digestion and absorption of nutrients, and underlying medical conditions. The pathophysiology of malnutrition involves complexinter actions between physiological, biochemical, and metabolic processes. Here's an overview of the key aspects of the pathophysiology:

Inadequate Nutrient Intake: Malnutrition often

starts with insufficient food intake, which can be due to poverty, food insecurity, restricted access to food, or cultural and social factors that limit food consumption.

Imbalance of Macronutrients and Micronutrients : Deficiencies or imbalances in macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals) can contribute to malnutrition. These nutrients are crucial for many body processes, including metabolism, generating energy, and tissue repair.

Impaired Digestion and Absorption: Some individuals may have issues with their digestive system that prevent proper breakdown of food and absorption of nutrients. For example, conditions affecting the intestines like celiac disease, Crohn's disease, and chronic diarrhea can lead to malabsorption of nutrients.

Nutritional Rehabilitation: Treating malnutrition involves a careful and gradual approach to providing proper nutrition, as rapid refeeding can lead to complications like refeeding syndrome.

It's crucial to remember that malnutrition can appear in a variety of ways, including undernutrition (lack of sufficient nutrients), overnutrition (over consumption of some nutrients, which causes obesity and related health issues), and micronutrient deficiencies (lack of necessary vitamins and minerals). These kinds each have their own distinct pathophysiology and potential health hazards.

Clinical Syndromes:

Among the illnesses connected to acute malnutrition include kwashiorkor, marasmus, and intermediate stages of marasmic kwashiorkor. Clinical indicators are utilised to tell them apart; the fundamental distinction between kwashiorkor and marasmus is that the former has edoema while the latter does not.

Marasmus:

The name "marasmus" is derived from the Greek word "marasmus," which meant to wither or waste. The most prevalent manifestation of acute malnutrition is marasmus. It develops after months or years of low energy intake .It is distinguished by the wasting of body tissues, particularly muscles and subcutaneous fat, and often happens as a result of severe energy intake restrictions. In response to acute food and energy shortage, hunger is the body's physiologically adapted response. Due to their greater calorie needs and increased illness vulnerability, children under the age of five are most commonly affected. These young toddlers suffer bradycardia, hypotension, and hypothermia, and they seem underweight, weak, and listless. Brain injury may become persistent beyond the age of three to four years.

Kwashiorkor:

The phrase Kwashiorkor, which means "the sickness of the weaning," originates from the Kwa language of Ghana. The phrase was originally used in 1933 by Cicely D. Williams. Kwashiorkor is believed to be brought on by a low protein intake but an average calorie intake. Children that consume a lot of maize are known as "sugar babies" because their diets are frequently low in protein but high in carbs. Common in developing countries, kwashiorkor typically affects older babies and early toddlers. It mainly happens in famine-stricken or food-scarce regions, especially in nations where maize, rice, and beans are the staples of the diet. Kwashiorkor is a prime example of a starvation-related aberrant reaction.

Marasmic Kwashiorkor:

When a child has marasmic kwashiorkor, they are also suffering from severe wasting brought on by marasmus and edoema brought on by kwashiorkor. If not treated soon and effectively, this set of symptoms can suggest a very serious case of malnutrition and carry a significant risk of death.

Marasmic Kwashiorkor is typically brought on by in adequate intake of vital nutrients including protein and calories, improper breast-feeding techniques, limited access to nutrient-rich food, and unhygienic living conditions. Additionally, infectious infections can make children who already have malnutrition worse.

Analysis:

A thorough dietary history, physical examination, anthropometric measurements (such as weight, length, and head circumference in younger children) using appropriate reference standards, like the WHO standard growth charts, and fundamental laboratory indices, if possible, are all components of an adequate nutritional assessment. Additionally helpful measurements for figuring out body composition are the skin fold thickness and mid-upper arm circumference (MUAC). The mid-upper arm circumference (MUAC) and measurements of skin fold thickness are two more helpful measurements for figuring out body composition.

If malnutrition is present, accurate weight and height

measurement (length in children is 85 cm or unable of standing) charting is essential. Clinical examination without anthropometric data represented on growth charts has been demonstrated to be incredibly inaccurate. Preterm newborns up to two years of age must have their real ("chronological") age subtracted in order to arrive at the "corrected" age for charting on growth charts. Children under the age of two should have their head circumference regularly measured and plotted. When predicting nutritional status and brain development in school-age children, head circumference is a reliable indicator of intelligence and academic achievement The skinfold of the child's triceps alone might be a useful screening method. In contrast, its accuracy may be questioned in children who have severe muscle wasting. Infants and young children should be measured laying down or supine, while children above the age of two should be measured for height while standing.

Laboratory tests are essential in deciding the best course of treatment for secondary malnutrition and can be used to diagnose primary acute malnutrition. It is essential to pay close attention to signs of macronutrient (protein) storage and micronutrient (vitamin or mineral) shortages since nutritional status is an independent predictor of outcome in sick children.

Based on demographic the children, different anthropometric measurements may or may not be valid. Therefore, the assessment of nutritional status should be based on measurements taken by a skilled individual in conjunction with other clinical factors. Measurements are necessary to determine the best rate of development while a patient is unwell.

Treatment:

Plans for treating acute malnutrition are based on the nature, aetiology, and severity of the malnutrition.

Primary acute malnutrition:

The most effective course of action is to treat primary mild acute malnutrition at home, which entails parent counselling with a focus on maintaining breast-feeding and providing appropriate supplemental feeding (nutrition-specific therapy). The optimum daily calorie intake for these children should be 25 kcal/kg more than that of their healthy classmates, and they should consume foods produced from animals that are rich in micronutrients like vitamin A, iron, and zinc.

Children with severe acute malnutrition can easily be kept in the community with ready-to-use therapeutic food (peanut paste, milk powder, vegetable oil, and a mineral and vitamin mix as per WHO criteria). In hospitals, ready-to-eat therapeutic food can be used to treat children who have had trouble getting well but have an appetite. Children with severe acute malnutrition syndrome, such as severe diarrhoea, hypoglycemia, hypothermia, pneumonia, urinary tract infections, sepsis, etc., must be hospitalised until they can get home care. During the stabilisation stage of treatment for complications, the following ailments need to be managed:

- Treating hypoglycemia with oral or intravenous glucose is the initial step if a kid is listless, unconscious, or convulsing.
- Treating and preventing hypothermia;
- Treating shock.
- If the child is healthy, treating and preventing dehydration is best accomplished by giving 5 mL/kg of body weight of the specialised rehydration solution for malnutrition, ReSoMal, or Ampicillin at 50 mg/kg given intravenously every six hours for two days, oral amoxicillin at 15 mg/kg given eight hours a day for five days, and genamicin at 7.5 mg/kg given intravenously once a day for seven days.
- A third-generation cephalosporin (ceftriaxone at 50–75 mg/kg i.v. or i.m. once daily) may be begun together with gentamicin if the child's clinical state has not improved by 48 hours or has gone worse after 24 hours.

Table 1 : Feeding of children with severe acute

Days	Frequency	Volume/kg Per Feed, mL	Volume/kg Per Day, mL
1-2	2-hourly	11	130
3-5	3-hourly	16	130
6-7	4-hourly	22	130

Sources : Koletzko *et al.* (eds): Pediatric Nutrition in Practice. World Rev Nutr Diet. Basel, Karger, 2015, vol 113, pp 139-146

Secondary Acute Malnutrition:

Malnutrition that lies between severe acute malnutrition (SAM) and general undernutrition is referred to as secondary acute malnutrition, also known as moderate acute malnutrition (MAM). It is characterized by a moderate deficiency in dietary energy and nutrients, leading to impaired growth and development in children and adverse health outcomes in both children and adults.

Causes of Secondary Acute Malnutrition:

Inadequate diet: Secondary acute malnutrition often results from a lack of access to adiverse and nutritious diet, which is essential for main training good health and preventing malnutrition.

***Poor feeding practices*:** Improper feeding practices, especially during the early years of life, can contribute to malnutrition. This includes inadequate breastfeeding, inappropriate introduction of complementary foods, and poor feeding frequency and quantity.

Socioeconomic factors: Secondary acute malnutrition can be exacerbated by poverty, food insecurity, a lack of access to healthcare, and unsanitary and unhygienic living circumstances.

Environmental factors: Natural disasters, conflicts, and other emergencies can disrupt food production and distribution, leading to malnutrition among affected populations.

Symptoms of Secondary Acute Malnutrition:

- Slowed growth and development in children
- Weight loss or failure to gain weight
- Loss of muscle mass
- Fatigue and weakness
- Increased susceptibility to infections
- Poor wound healing
- Changes in skin and hair quality
- Irritability and changes in behavior

Treatment and Prevention:

Treatment for secondary acute malnutrition typically involves providing supplementary feeding with nutrient-rich foods and addressing any underlying medical conditions. Health workers and nutrition programs may use Ready-to- Use Supplementary Foods (RUSF) or other specialized food products to help address nutrient deficiencies and promote weight gain.

Prevention strategies include improving access to a diverse and nutritious diet, promoting exclusive breastfeeding during the first six months of life, and educating communities about proper nutrition and hygiene practices.

Management of Acute Malnutrition in Humanitarian Emergencies:

Acute malnutrition is a severe condition that requires immediate attention, especially in humanitarian crises where vulnerable populations are at a higher risk of food insecurity and in adequate nutrition. Managing acute malnutrition in such situations involves a comprehensive and multi-sectoral approach. Here are some key components of acute malnutrition management in Screening and Identification Establishing a system to identify and screen individuals, particularly children under five years of age and pregnant or lactating women, for acute malnutrition is crucial. Various anthropometric measurements, such as mid-upper arm circumference (MUAC) and weight-for-height/length, are commonly used for screening.

Stabilization Centers and Therapeutic Feeding: Setting up stabilization centers or clinics where severely malnourished individuals can receive specialized medical care, therapeutic feeding, and essential medical treatment is essential.

Community-Based Management: To reach people who cannot readily access medical facilities, community-based management of acute malnutrition (CMAM) programmes must be put in place.

Infant and Young Child Feeding: Ensuring proper infant and young child feeding practices are crucial to prevent and treat acute malnutrition.

Monitoring and Surveillance: Establishing a robust monitoring and surveillance system to track malnutrition rates and response effectiveness is crucial for adjusting interventions as needed.

Collaboration and Coordination: Effective acute malnutrition management requires coordination among various stakeholders, including governments, NGOs, and local communities, to ensure a coherent and integrated response.

Micronutrient Supplementation: Providing vitamin and mineral supplements, such as Vitamin A, iron, and zinc, can help address micronutrient deficiencies associated with malnutrition and enhance overall health. Water, Sanitation, and Hygiene (WASH) Improving access to clean water, sanitation facilities, and promoting good hygiene practices is essential to prevent waterborne diseases and reduce the risk of malnutrition. Overall, managing acute malnutrition in humanitarian crises requires a comprehensive and well- coordinated approach that addresses not only the immediate nutritional needs but also the underlying causes of malnutrition in affected communities.

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