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AN OVERVIEW OF PREVENTION MALNUTRITION IN CHILDREN; NURSING POINT OF VIEW

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Abstract:

Malnutrition is defined as both undernutrition and overnutrition. Undernutrition is caused by a lack of food and recurring viral illnesses. Undernutrition is measured using many signs such as underweight wasting, stunting, and vitamin and mineral deficiencies. Under weight is the most commonly used indicator to monitor undernutrition. Narrative review was conducted through electrical databases; PubMed and Embase for relevant studies that were published up to beginning of 2022 in English language. Malnutrition is intimately tied to societal socioeconomic problems, which are frequently entrenched in poverty. Malnutrition and poverty fuel a downward spiral fueled by an increasing disease load, delayed growth, and limited ability to work. Maternal malnutrition, a lack of exclusive breast-feeding, inadequate complementary feeding habits, and a high burden of infectious illnesses are the primary risk factors for early childhood malnutrition.

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INTRODUCTION:

Malnutrition is a frequent and prevalent condition characterized by a lack of energy, protein, or micronutrients [1]. Malnutrition is one of the leading causes of death in children under the age of five, as well as one of the most common reasons of decline in children's health and life, resulting in impaired learnability, inefficiency, and inability to acquire skills [2]. Malnutrition is responsible for the deaths of over half of all children under the age of five in Asia and Africa. Inadequate nutrition raises the risk of death from common diseases, increases the number and severity of infections, and may result in a delayed recovery [3,4].

Acute malnutrition is a nutritional shortage caused by insufficient protein or calorie consumption. Jelliffe coined the term "protein calorie malnutrition" in 1959, which has since been superseded by "acute malnutrition." Protein energy malnutrition was defined by Olsen et al. [5] as dietary deficiency in children in underdeveloped nations. However, all phrases allude to pediatric undernutrition as a nutritional state in which a lack of energy, protein, and other nutrients causes observable detrimental effects on tissue and body functioning, as well as a clinical consequence of growth deviation [6]. Pediatric malnutrition is defined as "an imbalance between nutrient requirement and intake, resulting in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes," according to the American Society of Parenteral and Enteral Nutrition (ASPEN) [7]. Malnutrition is either induced by illness (one or more diseases or injuries directly cause nutritional imbalance) or by environmental/behavioral variables associated with inadequate nutrient intake and/or delivery [7]. Primary acute malnutrition in children is caused by insufficient food supply due to socioeconomic, political, and environmental causes, and it is most common in low- and middle-income nations [8]. Household food insecurity, poverty, poor nutrition of pregnant women, intrauterine growth restriction, low birth weight, poor breastfeeding and inadequate supplemental feeding, frequent infectious infections, poor water quality, hygiene, and other factors are to blame. As a result, the cause of primary acute malnutrition is primarily social rather than biological, but it is also complex. Poor water quality, sanitation, and hygiene practices, for example, are increasingly thought to be the cause of "environmental enteropathy," a condition that contributes to acute malnutrition in children [9,10]. Despite considerable gains and improvements in child health, malnutrition remains one of the most significant public health concerns of the twenty-first century, particularly in developing nations [11]. It jeopardizes the survival, growth, and development of children and women, as well as nations' power and potential [12]. It is responsible for over one-third of all deaths in children under the age of five worldwide [13].

DISCUSSION:

Undernourished children have a higher risk of illness and mortality than well-nourished children. As the degree of underweight, stunting, and wasting grows, so does the chance of death. Stunting is a symptom of chronic malnutrition and an important predictor of child development [14]. It has been related to poor cognitive development in childhood and adolescence, fewer school years, reduced production, and smaller adult stature. Wasting is a symptom of both acute and severe malnutrition [14,15]. Repeated exposure to pathogens in the environment promotes small intestine bacterial colonization, which results in the formation of inflammatory cells in the small intestinal mucosa, destruction to the intestinal villi, and, as a result, nutrient malabsorption, resulting in malnutrition [16].

Secondary acute malnutrition is typically caused by abnormal nutrient loss, increased energy expenditure, or decreased food intake, and occurs frequently as a result of underlying, mostly chronic, diseases such as cystic fibrosis, chronic renal failure, chronic liver diseases, childhood malignancies, congenital heart disease, and neuromuscular diseases [8,9].

Although there is disagreement on nomenclature and definitions, there is agreement that acute malnutrition should be diagnosed only through anthropometrics (Table 1) [10].

Table 1: New terms used for childhood malnutrition (adapted from Koletzko, B. et al. (eds), 2015) [10].

Term	Definition
Moderate acute malnutrition	Mid-upper-arm circumference greater or equal to 115 mm and less than 125 mm Weight-for-height Z score < −2 but > −3
Severe acute malnutrition	Mid-upper-arm circumference < 115 mm Weight-for-height Z score < −3

Term	Definition
	Bilateral pitting edema Marasmic kwashiorkor
Global acute malnutrition	The sum of the prevalence of severe acute malnutrition plus moderate acute malnutrition at a population level

In studies using various methods of assessing malnutrition, the prevalence of acute malnutrition among hospitalized children in developed countries ranged from 6 to 51% [17,18,19]. Using Waterlow's criteria, Pawellek et al. [20] found that 24.1% of pediatric patients in a tertiary hospital in Germany were malnourished, with 17.9% mild, 4.4% moderate, and 1.7% severely malnourished. Malnutrition prevalence varied according to underlying medical condition, ranging from 40% in the case of neurologic diseases to 34.5% in the case of infectious disease, 33.3% in the case of cystic fibrosis, 28.6% in the case of cardiovascular disease, 27.3% in the case of oncology patients, and 23.6% in the case of gastrointestinal diseases [20]. Malnutrition was most common in patients with multiple illnesses (43.8%). Despite discrepancies in malnutrition measures, many studies show a considerable prevalence of malnutrition even in the wealthy world [16].

Inadequate calorie intake causes a variety of physiologic responses, such as growth limitation, fat, muscle, and visceral mass loss, a lower basal metabolic rate, and a lower total energy expenditure [8,9]. Acute starvation causes biochemical alterations that involve metabolic, hormonal, and glucoregulatory processes. Thyroid hormones, insulin, and growth hormone are the key hormones affected (GH). Reduced levels of tri-iodothyroxine (T3), insulin, insulin-like growth factor-1 (IGF-1) and increased levels of GH and cortisol are among the changes [4]. Glucose levels are frequently low at first due to glycogen depletion. Rapid gluconeogenesis occurs in the early phase, resulting in skeletal muscle atrophy due to the utilization of amino acids, pyruvate, and lactate. The protein conservation phase follows, with fat mobilization leading to lipolysis and ketogenesis [21,22]. The decreased activity of the glycoside-sensitive energy-dependent sodium pump to increased permeability of cell membranes in kwashiorkor can explain major electrolyte alterations such as salt retention and intracellular potassium depletion [23].

Acute starvation impairs various organ systems [21]. Atrophy of the thymus, lymph nodes, and tonsils impairs cellular immunity. There is a decrease in CD4 with normal CD8-T cells, a lack of delayed hypersensitivity, decreased phagocytosis, and a decrease in secretory immunoglobulin A. As a result, the susceptibility to invasive infections (urinary tract infections, gastrointestinal infections, septicemia, and so on) increases [22,23].

Malabsorption is caused by villous atrophy, which leads in the loss of disaccharidases, crypt hypoplasia, and increased intestinal permeability. Bacterial overgrowth and pancreatic atrophy, leading in fat malabsorption, are very prevalent; fatty infiltrationn of the liver is also common [8]. Drug metabolism may be slowed due to reduced plasma albumin and glycoprotein fractions responsible for drug binding [24]. Cardiac myofibrils thin as contractility declines. Cardiac output decreases in direct proportion to weight loss. In severe situations, bradycardia and hypotension are also common [8,22]. Arrhythmias are predisposed by the combination of bradycardia, decreased cardiac contractility, and electrolyte abnormalities. Reduced thoracic muscle mass, a lower metabolic rate, and electrolyte imbalances (hypokalemia and hypophosphatemia) can all lead to decreased minute ventilation and a poor ventilatory response to hypoxia [22,25].

Acute starvation has been linked to a decrease in the number of neurons, synapses, dendritic arborizations, and myelinations, all of which result in a smaller brain [26]. The cerebral cortex has been shrunk, and brain growth has been halted. Malnutrition has been linked to delays in global function, motor function, and memory [27].

Marasmus:

The term "marasmus" is derived from the Greek word "marasmus," which means "wasting or withering." Marasmus is the most common acute malnutrition syndrome [8]. It is the result of insufficient energy intake over a period of months to years. It is characterized by wasting of body tissues, notably muscles and subcutaneous fat, and is frequently the result of severe limits in energy intake. Children under the age of five are the most usually affected due to their increased caloric needs and susceptibility to infections [19]. These kids appear malnourished, feeble, and lethargic, with bradycardia, hypotension, and hypothermia. Their skin is xerotic, wrinkled, and loose due to subcutaneous fat loss, but they do not

have any identifiable dermatosis [8]. Muscle wasting frequently begins in the axilla and groin (grade I), then progresses to the thighs and buttocks (grade II), chest and belly (grade III), and lastly the facial muscles (grade IV), which are physiologically less active. The loss of buccal fat pads gives youngsters an elderly appearance in severe cases. Children that are severely affected are frequently indifferent, yet they become agitated and difficult to soothe [8].

Kwashiorkor:

The term "kwashiorkor" is derived from the Kwa language of Ghana and translates to "weaning sickness" [21]. Cicely D. Williams coined the phrase in 1933. Kwashiorkor is hypothesized to be caused by a lack of protein but a rather normal calorie intake. It was originally observed in youngsters on maize diets (dubbed "sugar babies" since their diet is often low in protein but high in carbohydrate) [19,24,27]. Kwashiorkor is common in underdeveloped nations, primarily affecting older newborns and young children. It is more common in places of famine or restricted food supply, and especially in nations where the diet consists primarily of corn, rice, and beans [26]. Kwashiorkor represents a maladaptive response to starvation. Edema is the distinctive feature of kwashiorkor, which does not exist in marasmus [27], and it is typically caused by a combination of low serum albumin, elevated cortisol, and a failure to activate the antidiuretic hormone. It usually begins with pedal edema (grade I), then progresses to face edema (grade II), paraspinal and chest edema (grade III), and finally to ascitis (grade IV). Aside from edema, clinical characteristics include dermatoses, hypopigmented hair, a swollen abdomen, and hepatomegaly. Hair is frequently dry, sparse, brittle, and depigmented, with a reddish yellow appearance. Cutaneous signs are typical and increase over days, beginning with dry atrophic skin with confluent patches of hyperkeratosis and hyperpigmentation, then splitting when stretched, culminating in erosions and underlying erythematous skin [8,27]. Shiny, varnished-looking skin (64%), dark erythematous pigmented macules (48%), xerotic crazy paving skin (28%), residual hypopigmentation (18%), and hyperpigmentation and erythema (11%) are among the skin alterations seen in children with kwashiorkor. [8,27].

It is critical to identify the underlying condition in the management of secondary acute malnutrition through history collection, physical, and laboratory testing [9]. For preterm and low-birth-weight infants, exclusive nursing for the first six months, together with iron supplementation, is sufficient. If aggressive enteral feeding is administered, they are at danger of necrotizing enterocolitis. In mild inflammatory bowel disease or disease remission, a regular diet can be recommended. Some patients with inflammatory bowel disease benefit from commercially manufactured liquid formulations [28]. In advanced chronic liver disease, protein restriction may be required to prevent hyperammonemia. A combination of fats and carbs, with very little protein, should be employed. Another hallmark of chronic liver illness is decreased bile salt output into the small intestine, which can result in fat and fat-soluble vitamin malabsorption. Because they do not require bile salts for absorption, medium-chain triglycerides can be used as a source of dietary fat. Water-soluble vitamins (A, D, E, and K) should be utilized instead of fat-soluble vitamins. Children with chronic renal illness may benefit from high-energy, high-quality protein at amounts that do not induce or worsen uremia [9]. Children with congenital heart disease require adequate calories and protein without raising fluid volume excessively. Due to weariness, dyspnea, and recurrent lung infections, they have lowered their food consumption. Heart failure and greater breathing attempts cause a hypermetabolic state, which raises the demand for additional nutrients [9]. Cachexia is common in children with cancer, chemotherapy, radiation, surgery, and infections, and is caused by tumor necrosis factor- and tumor metabolites. The diet must be altered to meet the increased caloric requirements. In the case of poor tolerance to high amounts of enteral feeds, parenteral nutrition can be employed to enhance nutrition [28].

CONCLUSION:

The area of child nutrition is critical, yet several associated issues are not being prioritized by policymakers as they should be. Issues such as a shortage of certain micronutrients, which is common in youngsters, necessitate more stringent policy. Priority should be given to the precise formulation and implementation of breastfeeding programs, supplementary nutrition and therapeutic supplementation for children, and fortification and supplementation for mothers. The parameters for addressing mild acute malnutrition are primarily concerned with targeted supplementary feeding. A targeted supplementary feeding program's major goal is to prevent moderately malnourished people from becoming severely malnourished and to rehabilitate them. These programs often give a food supplement to the general ration for moderately malnourished people, pregnant and nursing mothers, and other vulnerable people. Finally, acute malnutrition is a nutritional shortage caused by insufficient energy or

protein consumption, with varying clinical manifestation. In order to identify children with acute malnutrition, a clinical examination, meticulous measurement of growth status, and reference to conventional growth charts are required.

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