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The Causes and Effects of Malnutrition in Children

Malnutrition remains a pressing global health problem, impacting millions of people across diverse regions and demographics. It is defined as a condition that occurs when a person receives either too little or too much nutrition. This can lead to a variety of health problems, including deficiencies in essential nutrients or an excess of certain nutrients, both of which negatively affect overall health. Malnutrition is classified into two main forms: undernutrition (such as stunting, wasting, and micronutrient deficiencies) and overnutrition (such as diet-related noncommunicable diseases and obesity). Undernutrition is characterized by inadequate intake or absorption of essential nutrients, leading to stunted growth, wasting (acute weight loss), micronutrient deficiencies (such as vitamin and iron deficiencies), and impaired immune function. On the other hand, overnutrition occurs when there is excessive caloric intake, commonly resulting in overweight and obesity, which increase the risk of chronic diseases, including cancer, diabetes, and cardiovascular disease.

Heather Morgan is widely credited with the statement, “Every time you eat or drink, you are either feeding disease or fighting it.” This highlights how the foods and drinks people consume, along with factors such as rest and stress management, impact health. Proper nutrition helps prevent disease, while a poor diet increases the risk. Children are especially vulnerable to malnutrition due to their developing immune systems, which make them more susceptible to illness. Malnutrition in children is a global concern.

This highlights the importance of understanding the effects, causes, and treatments of malnutrition.

Table 1: Forms of malnutrition

Types of malnutrition	**Undernutrition**	**Micronutrient-related malnutrition**	**Overweight and obesity**	**Diet-related malnutrition**
Definition	Undernutrition refers to a situation where an individual does not meet their daily required nutrient intake that shows in various forms.	Micronutrient-related malnutrition occurs due to lack of essential vitamins and minerals.	Overweight is a condition where the body mass index in between 25 and 29, obesity is a condition where a person's body mass index exceeds 30.	A condition occurs due to an insufficient, instable, or extreme intake of nourishments, resulting in either shortages or overindulgences that has many disadvantages disturbing well-being
Example	There are numerous forms of malnutrition: • Wasting • Stunting • underweight	Deficiencies in: • Vitamin A • Iodine • Iron	Overweight: a person who is 175 cm and weighs 86 kg. Obesity: person who is 83 cm and weighs 113 kg.	• Chronic diseases • Cancer • Cardiovascular illnesses • Diabetes

Source: ("Malnutrition").

This table explains the various aspects of malnutrition. First, it presents the forms of malnutrition, including undernutrition, micronutrient-related malnutrition, overweight and obesity, and diet-related malnutrition. Second, it provides definitions that explain each form and describe its condition. Third, it offers examples for each form of malnutrition to support the previous explanations.

Undernutrition

"Malnutrition" observes that there are numerous forms of malnourishment. To start with, there are four major subcomponents. First, wasting is defined as low weight for height. It indicates current and rapid weight loss and occurs when an individual does not have sufficient access to food and/or is experiencing a contagious disease. For example, diarrhoea can result in weight loss. Children are at a high risk of death if they are moderately or severely wasted; however, this condition is treatable. Second, low height for age is defined as stunting. It is a significant consequence of recurrent or chronic undernutrition. It is commonly associated with deprived socioeconomic conditions, poor maternal health and nutrition, repeated illness, and/or improper feeding and care of infants and young children during the early stages of life. Stunting can prevent children from achieving their full cognitive and physical potential. Third, low weight for age is recognized as underweight. A child who is underweight may be wasted, stunted, or both ("Malnutrition").

Micronutrient-related Malnutrition

"Malnutrition" states that micronutrient-related malnutrition is considered the second form. Vitamins and minerals are examples of micronutrients. Micronutrient-related malnutrition is often referred to as a deficiency in the intake of essential vitamins and minerals. Micronutrients enable infants to produce hormones, enzymes, and other critical substances necessary for proper growth and development. Iron, iodine, and vitamin A are among the most important micronutrients in terms of global health. Deficiencies in these nutrients pose a major threat to the health and development of populations worldwide, particularly pregnant women and children in low- and middle-income countries ("Malnutrition").

Overweight and Obesity

Overweight and obesity, which are forms of malnutrition, result from poor diet, lack of physical activity, genetic factors, and certain medical conditions. When a person's weight is excessive relative to his or her height, this condition is classified as overweight or obesity. Health can be negatively affected by abnormal or excessive fat accumulation. BMI (Body Mass Index) is an imperfect measure of nutritional status; however, it is widely used to classify overweight and obesity. It is defined as a person's weight in kilograms divided by the square of his or her height in meters (kg/m^2). BMI thresholds for overweight and obesity vary by age among children and adolescents.

Overweight and obesity result from an imbalance between energy consumed and energy expended. Individuals increasingly consume energy-dense foods and beverages while engaging in lower levels of physical activity ("Malnutrition"). Furthermore, these factors contribute to chronic diseases and weakened immune function. They may also lead to diabetes and cardiovascular diseases, which are considered long-term health risks. Obesity, which has risen to 13% globally, impairs immune responses and increases susceptibility to infections. Individuals with obesity are at higher risk for respiratory, skin, and surgical-site infections (Morales et al. 3–5).

Diet-related Malnutrition

Diet-related noncommunicable diseases (NCDs), also known as chronic diseases, are a group of conditions that are not primarily caused by infections but result from long-term factors and often require ongoing treatment. Cardiovascular diseases, such as heart attacks, often associated with high blood pressure, and certain types of cancer are included among diet-related noncommunicable diseases. Diets high in trans and

saturated fats, sugar-sweetened beverages, and low-fiber foods contribute to the development of noncommunicable diseases.

In general, older adults aged 65 and above and children under seven years old with medical conditions such as chronic kidney disease or cancer are at higher risk of complications. This increased vulnerability is partly due to weakened immune systems, which make them more susceptible to illness ("World Health Organization"). On the other hand, many NCDs can be prevented by reducing tobacco use, maintaining a healthy diet, and increasing physical activity ("Malnutrition").

Scope of the Problem

According to Evans, "Malnutrition remains a pressing global health issue, affecting millions of people across various demographics and regions" (1). "Malnutrition" highlights that one or more forms of malnutrition affect every country in the world. Combating malnutrition in all its forms remains one of the greatest global health challenges. Women, adolescents, children, and infants are at particular risk. Women generally have less muscle mass than men and require approximately 25% less energy. However, both females and males require similar amounts of essential nutrients. This explains why women must consume smaller quantities of highly nutritious food, which may increase their risk of malnutrition.

Adolescents experience significant changes in body composition, weight, and height during growth, resulting in increased nutritional requirements. "Malnutrition" explains that during the first few years of life, proper nutrition and feeding play a crucial role in supporting mental and physical development. Improving nutrition early in life, including the 1,000 days from pregnancy to a child's second birthday, ensures the best possible start in life and contributes to long-term health benefits.

In 2022, 390 million children and adolescents aged 5 to 19 were overweight, including 160 million classified as obese and 190 million experiencing thinness. Additionally, 37 million children under the age of five experienced overweight or obesity, while approximately 149 million suffered from stunting. Undernutrition is associated with approximately 50% of deaths among children under five.

The risks of malnutrition are closely linked to poverty. Different forms of malnutrition disproportionately affect individuals living in poverty. Undernourishment increases healthcare costs, reduces productivity, and slows economic growth, thereby contributing to a cycle of persistent poverty and poor health ("Malnutrition").

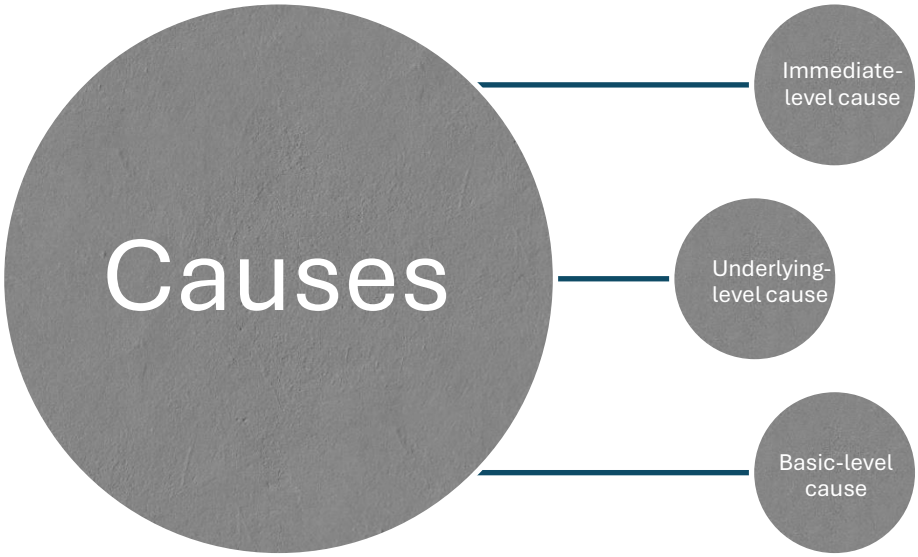
Size of the Problem

Saunders and Smith highlight that undernourishment is a common, undertreated, and underrecognized issue affecting both patients and healthcare institutions (624). It is both a cause and a consequence of illness. Individuals with a body mass index (BMI) below 20 kg/m² who are classified as underweight constitute approximately 5% of the population. Other patients become unable to meet their metabolic demands in the short or long term as a result of a critical event (e.g., small bowel infarction). The prevalence of malnutrition is at least doubled among older adults and individuals with chronic diseases and tripled among those living in institutional care (Saunders and Smith 624).

Reports of extensive undernourishment in UK hospitals over the past 15 years indicate prevalence rates ranging from 13% to 40% (Saunders and Smith 624). During hospital admission, many patients experience further deterioration in their nutritional status. A large study conducted by the British Association of Parenteral and Enteral Nutrition (BAPEN) in 2008 found that 28% of inpatients were at risk of undernourishment. The prevalence was higher in specific subpopulations. For example, 34% of all admissions

and 52% of those admitted from home care. Folate deficiency has been reported in 29% of the independent elderly population and 35% of those in institutional care, where specific micronutrient deficiencies are common, particularly among older adults (Saunders and Smith 624). Therefore, it is critical to reduce these rates as much as possible, given the profound negative impact this issue has on both individuals and society.

Causes



Source: Authors

The causes of undernourishment can be categorized into three levels: immediate-level, underlying-level, and basic-level causes. Immediate-level causes refer to the direct and often visible factors that lead to the condition. Underlying-level causes, on the other hand, are deeper and less visible factors that contribute to the development of the condition over time. Lastly, basic-level causes are the fundamental, root-level determinants, such as environmental or genetic influences, that play a major role in shaping an individual's overall health. Each level of causation offers a different

perspective on the disease state, ranging from immediate triggers to deeper, long-term structural influences (Ersado 4–8).

Immediate-level Causes

According to Ersado, "the causes of malnutrition can be grouped into immediate-level causes, underlying-level causes, and basic-level causes" (4). UNICEF's framework explains these causes across different levels. Immediate causes result from an imbalance between the nutrients required and the amount absorbed. Malnutrition is often associated with disease (Ersado 4, 6). Daily consumption of food and nutrients is undoubtedly the single most dominant factor in disease-related malnutrition. It may occur due to a reduced awareness of hunger, resulting from variations in insulin, glucocorticoids, cytokines, and insulin-like growth factors.

The issue may be worsened in hospital patients due to the failure to provide regular, nutritious meals in environments where patients lack protection during routine clinical procedures and are not offered assistance with feeding when needed (Saunders and Smith 624). Certain diseases are considered immediate causes. Anorexia, an eating disorder that results in severe weight loss, is characterized by a body weight significantly below healthy standards. Another example is dementia, in which individuals may forget to eat due to cognitive decline. Individuals who experience difficulty eating due to dysphagia, dental pain, or oral lesions are also at risk (Ersado 6).

Additionally, malnutrition is common among cancer patients and is caused by a combination of inadequate dietary intake and metabolic changes associated with chemotherapy. Malabsorption is a risk factor for weight loss and undernourishment in patients with intestinal failure or those undergoing gastrointestinal surgery. Patients

may experience uncontrolled or specific nutrient losses in conditions such as enterocutaneous fistulae and burns. Due to increased losses or altered requirements, their nutritional needs differ from those of healthy individuals.

In many disease states, energy expenditure is lower than in normal health conditions, as confirmed by clinical evidence. The hypermetabolism associated with illness is often offset by reduced physical activity. Studies of intensive care patients indicate that caloric expenditure is frequently below 2,000 kcal per day. Patients with major trauma, head injuries, or burns are exceptions, as they may experience elevated energy expenditure, although typically for a limited period (Saunders and Smith 624).

The risk of malnutrition in preterm infants is higher than in full-term infants. Major risk factors in children include congenital heart disease, childhood cancer, and other chronic conditions. Additional contributing factors include eating disorders and behavioral or psychological conditions that result in food avoidance (Ersado 9).

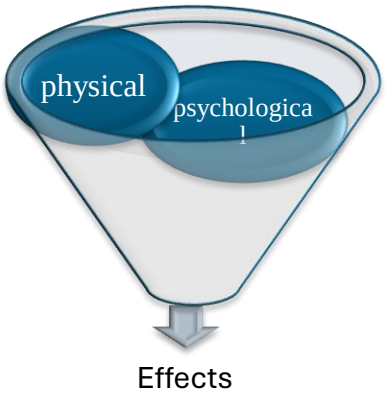
Underlying-level Causes

Ersado notes that the underlying level is the second category in UNICEF's framework. Conflict, inadequate education, and poverty are among the fundamental factors associated with this level. The primary factors contributing to undernutrition at the household level include nutritional insecurity and food deprivation, particularly among displaced populations. Furthermore, undernutrition occurs when individuals lack access to adequate quantities of safe, affordable, and nutritious food. It may also result from low income. In addition, a poor social and caregiving environment contributes to inadequate infant feeding practices, insufficient home care for ill children, and poor health-seeking behaviors (Ersado 7–8).

Basic-level Causes

Ersado explains that the third category consists of the basic causes of malnutrition. There are three essential components of basic causes: human resources, economic resources, and organizational resources. First, human resources represent a basic-level cause resulting from human behaviors and conditions, such as poverty, in which individuals struggle with limited financial means and restricted access to nutritious food. A significant determinant of malnutrition is a lack of information; when individuals do not possess adequate knowledge about health, nutritional requirements, and how to maintain long-term well-being or prevent chronic diseases. Second, economic resources refer to challenges such as economic instability, political insecurity, and war. Political and economic institutions, which form the structure of governance, play a critical role. Political institutions regulate the relationship between governments and individuals through laws and policies that protect citizens' rights. In contrast, economic institutions oversee the organization of production, processing, distribution, consumption, and disposal of goods. War, defined as an armed conflict between countries or opposing groups within a country, significantly contributes to malnutrition. During war, populations often experience hunger, thirst, and shortages of essential resources, which may lead to famine and severe health consequences. Third, organizational resources include both formal and informal institutions, extended family systems, and childcare services. The formal institutional system includes political, economic, and civic structures, whereas informal institutions include traditional community frameworks such as local markets, social networks, and cultural norms that regulate access to resources and help mitigate risks such as disasters and undernourishment. Neglected children, orphans, and those living in institutional care are among the most vulnerable to undernourishment (Ersado 8–9).

Effects



Source: Authors

Malnutrition has numerous effects on the recovery and function of every organ system. It significantly impacts both the physical and psychological health of children. Physically, malnutrition affects muscle function due to the depletion of muscle and fat stores, including loss of organ mass resulting from weight loss, which is usually an evident sign of undernourishment. Even before visible muscle loss occurs, muscle function declines, indicating that nutrient deficiencies impair physiological function; however, nutritional support can improve muscle performance (Saunders and Smith 624). For instance, in undernourished individuals, a reduction in cardiac muscle mass is observed. The resulting decline in cardiac output similarly affects renal function by reducing glomerular filtration rate and renal perfusion. The respiratory system is also affected, with weakened respiratory muscles, structural changes in lung tissue, and reduced respiratory capacity (Saunders and Smith 624). Malnutrition further compromises digestive health by disrupting pancreatic function and increasing gut permeability. It may also alter gut microbiota, thereby weakening antibacterial defenses (Allen and Saunders 463).

On the other hand, malnutrition compromises the immune system, increasing susceptibility to upper respiratory and other common infections. It also leads to delayed wound healing, particularly in perioperative patients. Proteins and vitamin A are essential for immune function; deficiencies impair antibody production, immune cell activity, and wound healing. Amino acids are also crucial for optimal immune responses; deficiencies in key amino acids such as arginine, tryptophan, and lysine impair immune function and increase the risk of infection (Morales et al. 6).

Malnutrition also suppresses endocrine function by lowering thyroid and reproductive hormone levels, thereby impairing reproductive health and potentially causing amenorrhea. It frequently affects cancer patients, worsening their condition and hindering treatment, while cancer therapies further reduce nutrient intake. As Santarpia states, “The prevalence of malnutrition among cancer patients has been estimated to range between 15% and 80%” (27). Additionally, some patients experience deficiencies in electrolytes such as magnesium and phosphate, leading to dangerous metabolic shifts during refeeding (Allen and Saunders 464).

Furthermore, beyond these physical effects, malnutrition also impacts psychological outcomes, including depression, anxiety, and apathy. Malnourished individuals, especially children, may experience significant psychological consequences. Deficiencies in essential nutrients such as omega-3 fatty acids and iron contribute to impaired problem-solving abilities and poor memory. These cognitive deficits may lead to social isolation and poor academic performance. Changes in physical appearance may also result in social withdrawal, further affecting mental health. Moreover,

malnourished children are at risk of developing long-term disorders, including mood imbalances, due to disruptions in neurotransmitter function (Allen and Saunders 464).

Treatments

There are many effective treatments for malnutrition that provide significant benefits. The appropriate treatment depends on the degree of undernourishment and the underlying cause. Diagnosing malnutrition is critical and should include proper documentation, a comprehensive management plan, and inclusion in discharge summaries (Allen and Saunders 466).

First, a nutritionist may provide guidance on dietary changes that can help address deficiencies. They may also develop a customized diet plan to ensure adequate nutrient intake, emphasizing a balanced and healthy diet, fortified foods enriched with additional nutrients, and, when necessary, nutritional supplements ("Malnutrition Treatment"). Most individuals who are unable to meet their nutritional needs, particularly those with swallowing difficulties, require alternative methods of nutritional support, such as feeding tubes. This may involve inserting a tube through the nose into the stomach. In some cases, nutrients are delivered directly into the bloodstream through intravenous feeding ("Malnutrition Treatment"). Care and support services may also include promoting healthy eating in accordance with dietary guidelines, as well as providing food assistance, such as referrals to food banks for local support ("Malnutrition" 3). Local authorities may offer additional services, including "meals on wheels" or in-home food support.

Spreading awareness plays a crucial role in treatment and prevention by promoting healthy eating habits, breastfeeding practices, and the importance of micronutrient

supplementation. Additionally, increasing access to a variety of nutritious foods through sustainable agriculture, food fortification, and social protection programs is essential. Addressing malnutrition is vital because it increases healthcare costs, reduces productivity, and slows economic growth, thereby perpetuating a cycle of poverty and poor health ("Malnutrition").

Guided by the Food and Agriculture Organization of the United Nations and the World Health Organization, the UN Decade of Action on Nutrition emphasizes the need for policies focused on six key areas. These include: (1) building environmentally sustainable and resilient food systems that support healthy diets; (2) providing social support and nutrition education for children; (3) adapting health systems to meet nutritional needs; (4) ensuring universal access to essential nutrition services; (5) aligning investment and trade policies to improve nutrition; and (6) creating safe and supportive environments for nutrition while strengthening global nutrition governance and accountability ("Malnutrition").

Table 2: Patients characteristics with feeding tubes.

Variable	N	%
- Gender		
Female	17	48.6
Male	18	51.4
-Age range		
18-40	4	11.4
41-64	8	22.9
65-74	8	22.9
Over 75	15	42.8

-Type of feeding tube		
Polyurethane	29	82.9
Levin tube	6	17.1
-Tube size		
8F	21	5.6
10F	31	8.3
12F	276	74.2
14F	23	6.2
16F	16	4.3
Other	5	1.3

(Fernando et. al 308).

One of the treatments for malnutrition is the use of feeding tubes. This study indicates that feeding tubes are more commonly used in females than in males. They are most frequently used among individuals over the age of 75, primarily because many in this age group experience swallowing difficulties. There are two main types of feeding tubes: the polyurethane tube and the Levin tube. The polyurethane tube is more commonly used because it is considered safer. Feeding tubes are available in various sizes, with 12F being the most commonly used size.

Conclusion

In the final analysis, malnutrition is defined as an imbalance in nutrient intake that leads to the weakening of the body. The body begins to show symptoms of malnutrition when it does not receive sufficient essential nutrients to meet its needs; a condition that often results from a poor diet. It is a complex issue that remains prevalent globally, with widespread consequences for public health. Malnutrition affects millions of people

worldwide, particularly a large number of children. No single factor can be identified as the sole cause of undernourishment. The risk of malnutrition is especially high during the early years of a child's life if proper feeding and adequate nourishment are not provided.

Treating malnutrition requires coordinated efforts across multiple sectors, from agriculture and healthcare to education and policy, to build sustainable food systems, ensure equitable access to nutritious food, and equip individuals and communities with the necessary knowledge and resources. Therefore, raising awareness about the causes, consequences, and treatments of malnutrition is essential. Future research is needed to explore this issue in greater depth, particularly among younger generations, to better understand and address its underlying determinants.

As undernourishment among children continues to pose a significant challenge, strengthening knowledge and evidence-based interventions may serve as a critical step in combating this global health crisis. Moreover, ensuring global access to essential nutritional interventions and aligning health systems to meet nutritional needs are vital. Additionally, improving and promoting nutrition governance and accountability across regions is necessary. Thus, nutrition-related education should be made accessible to all individuals.

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