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Review Article

Child Malnutrition In Africa: Prevalence, Clinical Forms, Aetiology And Epidemiology.

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Short Title: Child Malnutrition: Current Status

Abstract

Malnutrition among children is a devastating humanitarian disaster, particularly in sub-Saharan Africa. In this region, almost half of all children never reach their fifth birthday, falling silent victims to this scourge. For example, in Guinea, a third of young people suffer irreversible developmental delays, while 9% are extremely underweight. Diseases such as marasmus and kwashiorkor, known since the nineteenth century, continue to cause damage. Worldwide, 144 million children have their development threatened, and 47 million are severely undernourished. This paradox is particularly striking given that at the same time, 38 million other children are overweight or obese. The reasons for malnutrition are numerous and interrelated (food shortages, frequent infections, poor eating habits and poverty). The consequences of malnutrition are catastrophic, as it leads to increased infant mortality, cognitive problems and lasting physical sequelae. Malnutrition is identified and characterised by measuring parameters such as weight, height, clinical examinations and biological analyses. Children who suffer from malnutrition are at increased risk of falling ill (diarrhoea, pneumonia, malaria), which in turn increases the risk of mortality. Malnutrition can be treated through the use of ready-to-use therapeutic foods. Despite slow progress, the fight against child malnutrition remains a global priority. It requires a coordinated and comprehensive approach to improve the health and well-being of all children.

Keywords : *child malnutrition, kwashiorkor, food supplement, Africa, Republic of Guinea.*

INTRODUCTION

The fight against malnutrition represents a global health priority, explicitly integrated into the United Nations Sustainable Development Goals. However, childhood malnutrition remains a predominant public health issue in low-income countries, particularly in sub-Saharan Africa (1, 2). This region concentrates a significant portion of the global burden of undernutrition (3, 4). It was highlighted in 2024 by the World Health Organisation (WHO) that malnutrition contributes to 50% of deaths in children under five years of age in low- and middle-income countries. In the Republic of Guinea, malnutrition is a major issue. According to the Demographic and Health Survey (DHS) published in 2018, it appears that 30% of children under five years of age suffer from chronic malnutrition, and 13% of them have a severe form of malnutrition. It should be noted that 9% of this population is affected by acute malnutrition (wasting). It has also been reported that 16% of children have mild underweight, and 5% of them suffer from a severe form of it (5). In this context, the Labé region presents particularly high prevalence rates of severe acute malnutrition: 13.9% according to the weight-for-age (W/A) index, 2.7% according to the weight-for-height (W/H) index, and 4.5% based on mid-upper arm circumference (5). The objective of the present review is to conduct an assessment of childhood malnutrition in Africa and its management.

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HISTORY OF MALNUTRITION

Malnutrition, as both a concept and a clinical manifestation, has distant historical antecedents. Descriptions consistent with oedematous states, diarrhoea, muscle wasting, apathy and skin alterations related to nutritional deficiency can be identified in ancient texts, including biblical writings. Medically, several forms of malnutrition exist. Marasmus, recognised as another severe form of malnutrition, constitutes a state of extreme wasting associated with a global deficiency in calories and protein. Kwashiorkor, whose first formal clinical descriptions of signs attributable to kwashiorkor were reported by Dr Fernando Hinojosa, a Mexican physician, and Léon Coindet, a French physician, published in the first issue of the "Gaceta Médica de México" under the title "Apuntes sobre una enfermedad del pueblo de la Magdalena" in 1865 (6, 7). Their observations, conducted in a Mexican village, concerned recurrent oedema in malnourished children, particularly during weaning or intercurrent illnesses. However, it was not until much later that kwashiorkor was specifically described by Cicely Delphine Williams. In 1933, while working in Africa on the Gold Coast (now Ghana), she observed weaned young children suffering symptoms such as oedema, diarrhoea, muscle wasting, apathy and skin alterations. She gave the disease its Ga name "kwashiorkor", meaning "disease of the displaced child". Kwashiorkor is a severe form of paediatric protein–energy malnutrition (7, 8). The mixed form known as "marasmic kwashiorkor" was later identified as the coexistence of the two clinical presentations (marasmus and kwashiorkor), in which the child exhibits both the oedema of kwashiorkor and the extreme wasting of marasmus. In 1926, Dr Léon Normet, a French physician, took particular interest in the effects of malnutrition and its clinical manifestations, especially in colonial territories such as Indochina. He described "Annamese bloat", a form of protein–energy malnutrition affecting young children. This condition was characterised by oedema and a distended abdomen, observed mainly in recently weaned children whose diet, centred almost exclusively on rice, was very low in protein. His work contributed to the understanding of infantile malnutrition in the early decades of the twentieth century (8-10). Today, understanding of malnutrition encompasses both macro- and micronutrient deficiencies and excesses in the lives of children under five years of age.

International awareness of the scale and consequences of malnutrition led to the creation of the Food and Agriculture Organization of the United Nations (FAO) on 16 October 1945 in Québec and the adoption of the Constitution of the World Health Organization (WHO) on 22 July 1946 in New York, which came into force on 7 April 1948. These institutions aim to promote fair and equitable health, improve nutritional status, and enhance agricultural accessibility and productivity for all in a better world. Malnutrition also found legal expression in the Universal Declaration of Human Rights (1948). Article 25 of this text stipulates that "everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food".

CURRENT GLOBAL MALNUTRITION SITUATION

Worldwide, over 144 million children under five years of age are estimated to suffer from stunting (low height for age) and 47 million from wasting (low weight for height). Concurrently, 38.3 million children are overweight or obese. Under-nutrition, whether occurring in isolation or alongside obesity, defines the "double burden of malnutrition" and is implicated in 2.7 million childhood deaths annually, representing 45% of total mortality in this age group. Each year, 6.3 million children under five die globally, nearly half of these deaths attributable to under-nutrition. Sub-Saharan Africa is among the most severely affected regions (3, 4). It is estimated that 160 million children suffer stunting on the African continent, with particularly high prevalence in West, Central and East Africa (11). Moreover, according to the 2024–2025 Global Report on Food Crises, over 36 million children across 32 countries suffer acute malnutrition, including kwashiorkor. Severe acute malnutrition without oedema (severe wasting) affects millions of African children, with around 4.5 million severely wasted children receiving treatment in 2018 according to the WHO (12-15).

In 2018, DHS data indicate that 30% of Guinean children under five years of age suffer stunting or chronic malnutrition (low height for age), 13% with severe stunting, 9% with moderate wasting (low weight for height) and 4% with severe wasting, while 16% have moderate underweight (low weight for age) and 5% severe underweight (5). Thanks to efforts and policies implemented, there has been a 9% reduction in the overall malnutrition rate, including a 4% reduction in severe acute malnutrition, according to the 2022 SMART survey (16). The Labé region in the Republic of Guinea faces a concerning situation of infant malnutrition, particularly among children aged 6 to 24 months. Despite abundant resources, malnutrition remains significant: 7.4% of children suffer acute malnutrition, characterised by rapid weight loss and general health deterioration, with 1.5% affected by severe malnutrition. Chronic malnutrition, manifesting as stunting, affects 43.3% of children, leading to physical and mental developmental issues (17, 18).

ASSESSING MALNUTRITION

Since 1995, several Malnutrition Screening Tools (MST) have been developed and implemented for early detection and classification of malnutrition forms. These techniques, often

complex and graduated, incorporate parameters beyond growth indicators alone (19, 20). Among the MSTs developed are: the Paediatric Nutritional Risk Score (PNRS), introduced in 2000 (21); the Paediatric Yorkhill Malnutrition Screening (PYMS) in 2011, comprising four stages: body mass index (BMI) below −2 standard deviations, weight-loss history, change in nutritional intake and health status over the previous week (22); and the Screening Tool for the Assessment of Malnutrition in Paediatrics (STAMP) in 2012, which assesses health status, nutritional intake and anthropometric data (23). From 2015 onwards, new tools were introduced for the general paediatric population: the Paediatric Digital Scaled Malnutrition Risk Screening Tool (PeDiSMART) and the Paediatric Nutrition Screening Tool (PNST), both evaluating health status, nutritional intake and anthropometric data (23); and the Paediatric Malnutrition Screening Tool (PMST), derived from STAMP, evaluating three main criteria: presence of a nutritionally relevant diagnosis (including overweight and obesity), changes or reduction in nutritional intake, and classification of weight and height according to percentiles or standard deviations (19, 20, 24, 25). These tools enable healthcare professionals to detect malnutrition earlier and to classify children according to the progression of nutritional complications. However, inadequate use of these tools, due to lack of proficiency, information and training of health personnel, constitutes an additional challenge in developing countries. It should be noted that the WHO relies mainly on anthropometric measures (weight, height, BMI) and the international growth reference of the National Center for Health Statistics (NCHS)/WHO (26, 27).

CAUSES OF CHILD MALNUTRITION

The aetiology of malnutrition is multifactorial; a single cause can induce multiple effects, and vice versa, an effect can influence an individual's nutritional status, leading to immediate and long-term consequences (28). The three immediate determinants of child growth—diet, health status (disease) and care practices—are closely interdependent and influenced by sociocultural, economic or climate change factors (28-30). Three types of causes of malnutrition exist: direct or immediate causes, underlying causes and fundamental or structural causes. Direct or immediate causes result from the individual immune system's response to inadequate dietary intake and/or infectious diseases (31, 32). Analysis of malnutrition determinants reveals an interlocking of factors operating at different levels. At the household and community level, three main dimensions are traditionally distinguished. First, food insecurity, characterised by limited, unstable or inadequate access to the necessary food resources. Second, child feeding and care practices, often influenced by social norms, time constraints or a lack of nutritional knowledge. Third, public health deficiencies, including restricted access to healthcare services, sanitation infrastructure, safe water and favourable environmental conditions (33, 34). At a more global level, fundamental or structural causes relate to the socio-economic and political dynamics that frame society as a whole. These include unequal distribution of resources and financial capital, which generates disparities in access and increases the vulnerability of the most fragile groups (31, 32). Thus, malnutrition cannot be apprehended solely as the result of individual behaviours or local conditions, but must be situated within a complex system where micro- and macro-structural factors interact.

CONSEQUENCES OF CHILD MALNUTRITION

Malnutrition, defined as an imbalance resulting from insufficient or excessive intake of one or more essential nutrients, causes significant detrimental consequences for both the individual and the community. This situation contributes to stunting, affecting about one-third of children under five in these contexts (2). Children under five are particularly vulnerable to the effects of malnutrition due to their specific nutritional needs, essential for their physical, intellectual and mental development (35). Malnutrition is associated with increased infant mortality, a higher risk of chronic diseases and cognitive impairments (36). Stunting has long-term effects on affected individuals, notably in terms of cognition, educational attainment, economic productivity in adulthood and reproductive health (37, 38). The main causes of stunting include maternal nutrition and foetal growth (intrauterine growth restriction) (29).

CLINICAL FORMS OF CHILD MALNUTRITION

A child's nutritional status is modulated by numerous direct and indirect factors, including care practices, food accessibility and availability, living environment, and socio-economic and cultural status (33, 39-43). Child malnutrition manifests in various forms, notably under-nutrition, micronutrient deficiencies (hidden hunger), overweight and obesity. Clinically, these states may present as wasting, stunting, pallor, the appearance of oedema and increased susceptibility to infection. Each manifestation severely impacts a child's health and development. Frequent infections—such as measles, diarrhoea, respiratory infections and malaria—can precipitate or exacerbate acute malnutrition (44, 45). The current phenotypic classification of malnutrition, based on anthropometric measurements or oedema presence, does not systematically reflect the underlying aetiology or specific nutritional deficits (1). Infant mortality is greatly increased when clinical indications of stunting and wasting occur (46, 47). Therefore, a multidisciplinary strategy that incorporates many

indicator types to present an accurate picture of nutritional status is necessary for the assessment of child malnutrition. To assess the degree and type of malnutrition, medical practitioners employ a variety of metrics rather than relying solely on one, which is essential for efficient treatment (48). Assessment of child malnutrition generally relies on three indicator types: anthropometric, biochemical and clinical. These tools are essential to determine the degree of malnutrition severity (48). Three main types are identified: severe acute malnutrition (SAM), chronic malnutrition manifesting as stunting, and underweight. Severe acute malnutrition is characterised by rapid and significant weight loss, leading to a weight-for-height index well below age-appropriate standards. Two principal clinical forms are distinguished: marasmus, defined by extreme muscle atrophy, a cachectic appearance, wrinkled skin and lethargy; the child often exhibits irritability and anorexia, and kwashiorkor, marked by bilateral oedema, hepatomegaly, cutaneous lesions (pellagroid dermatosis), depigmentation and hair fragility, as well as pronounced apathy (8, 32, 49, 50). Chronic malnutrition (stunting) manifests as a low height-for-age ratio, a consequence of chronic or recurrent under-nutrition, often multifactorial (26, 51). Finally, underweight refers to children with low weight for age, reflecting the combined effects of acute and chronic malnutrition (32, 41, 49, 52).

EPIDEMIOLOGY OF CHILD MALNUTRITION

Nutritional epidemiology aims to elucidate the distribution and determinants of nutritional pathologies within human populations, based on experimental and observational study findings (53, 54). Epidemiologists assess the impact of dietary intake on disease incidence by collecting data from large cohorts and comparing morbidity incidence between population subgroups. Statistical approaches are employed to quantify the impact of a given exposure on morbidity risk within a population (54). Randomised controlled trials are considered the gold standard methodology for establishing causal links (53). Nevertheless, other techniques are also employed for diagnosis, such as food frequency questionnaires (e.g. 24-hour recalls) and biomarker measurements, including serum proteins (albumin, transthyretin, transferrin, C-reactive protein), electrolytes and minerals (sodium, potassium, calcium, phosphorus, magnesium), micronutrients (iron as ferritin and total iron-binding capacity, zinc, selenium, vitamin A, vitamins B12, D and C), anaemia markers (haemoglobin, haematocrit, complete blood count), inflammatory parameters (C-reactive protein, erythrocyte sedimentation rate), metabolic markers (glucose, plasma lipids such as cholesterol and triglycerides), and context-specific markers (thyroid hormones, cortisol, leptin, insulin to assess energy metabolism). Each of these tools allows interpretation of epidemiological malnutrition data, which must imperatively consider the physiological and metabolic particularities of malnourished children and their increased risk of repeated infections and mortality (1, 22, 55-60).

Several pathologies play a major role in the onset or aggravation of child malnutrition. A self-perpetuating negative feedback loop results from the complicated, reciprocal interplay between infection and starvation. The main causes of this nutritional deterioration are frequent or persistent infections, including measles, respiratory ailments, diarrhea, and malaria. Numerous interconnected physiological pathways are to blame for this. First, the body uses a lot more energy when the immune system reacts to a disease, which raises the need for nutrition. At the same time, anorexia can be brought on by infection symptoms like fever and systemic inflammation, which results in a decreased intake of vital foods. This interaction frequently centers on the gastrointestinal tract; infections have the ability to directly harm the intestinal mucosa, which hinders the absorption of essential nutrients. In disorders such cystic fibrosis, inflammatory bowel disease (IBD), and enteropathies, where tissue damage or enzymatic malfunction impairs the absorption of vitamins, minerals, and macronutrients, this decreased absorption is also a basic feature. Consequently, this state of malnutrition compromises the host's immune system, making them more susceptible to subsequent infections and prolonging existing ones. This escalating relationship, where disease fuels malnutrition and malnutrition, in turn, exacerbates disease, presents a significant public health challenge. Metabolic and endocrine pathologies such as congenital hypothyroidism, diabetes or certain mitochondrial diseases also contribute. Some congenital or genetic anomalies, for example malabsorption syndromes or gastrointestinal tract malformations, also predispose to malnutrition. In addition, eating disorders, neglect or abuse contribute to this state. Finally, socio-economic and environmental factors such as poverty, food insecurity and poor hygiene conditions facilitate repeated infections and worsen malnutrition (34, 49, 61-63).

Malnourished children are particularly vulnerable to several severe infections, notably diarrhoea, acute respiratory infections such as pneumonia, malaria and measles. They may also suffer from severe opportunistic infections such as sepsis, septic shock, meningitis, as well as urinary infections and sometimes tuberculosis. HIV infection further exacerbates malnutrition by causing profound immunodepression. Malnutrition weakens the immune system, making infections more frequent, prolonged and severe. In turn, these infections increase energy demands, diminish appetite and disrupt nutrient absorption, creating a vicious cycle between malnutrition and infection that heightens morbidity and mortality in children. This phenomenon explains why over 70% of deaths in children under five are associated with the

malnutrition–infection combination. Specialised and tailored care is essential to reduce these risks and improve survival of malnourished children (1, 2, 64-66).

MANAGEMENT OF CHILD MALNUTRITION

Management is based on a systemic approach encompassing screening, triage and treatment of children, stratified by nutritional status severity. It utilises specialised nutritional preparations or ready-to-use therapeutic foods (RUTF), which are nutrient-dense pastes designed to treat severe acute malnutrition in children, composed mainly of peanut paste, powdered milk, vegetable oils, vitamins and minerals. Their ready-to-eat form facilitates outpatient use, often avoiding hospitalisation. The most commonly used preparations for managing severely malnourished children are F100 milk and RUTF supplemented with F75 (RUTF + F75) (34, 67-69). In complicated SAM cases, management within hospital settings is recommended (69-71). Children with uncomplicated severe acute malnutrition have increased energy needs to allow catch-up growth and weight recovery (67, 72, 73). Lyophilised supplements are also widely used, such as lipid-based nutrient supplements (LNS), fortified blended flours (FBF) and fibre-based supplements to improve anthropometric recovery; these are used for moderate acute malnutrition management (74, 75). In any case, use of RUTF or supplements requires dietary counselling and appropriate medical treatment. They may be administered in hospital or on an outpatient basis, depending on malnutrition severity and clinical complications (76-79). Despite the effectiveness of RUTF in treating moderate acute malnutrition, these foods are not always culturally appropriate, as their standardised ingredients may not align with local tastes, dietary habits and resources. Their uncooked form and texture may also seem unusual in cultures where foods are traditionally heated or prepared. Furthermore, standard formulations do not always account for local diets, which may limit social acceptance, children's appetite, and thus treatment efficacy. It is therefore recommended to adapt RUTF formulations by incorporating local ingredients and familiar flavours to improve acceptability, consumption and therapeutic success in different cultural contexts. This approach aims to reconcile nutritional efficacy with respect for popular food practices to optimise the fight against child malnutrition (80-82). Thus, complementary and therapeutic foods can be replaced by other legumes or cereals according to local availability, cost and acceptability, while maintaining caloric requirements. The efficacy of this protocol has been demonstrated, although limitations have been observed in some developing countries (73, 83-85).

CONCLUSION

Establishing optimal health in adulthood is intrinsically linked to adequate childhood nutrition. Malnutrition is among the most significant risk factors for child health. The fight against malnutrition is therefore a priority for many institutions, such as the United Nations Children's Fund (UNICEF), the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO). Significant advances have been made, but current progress remains far too slow and profoundly unequal, as indicated in the 2020 Global Nutrition Report (86). Numerous obstacles—such as failing agricultural systems, social inequalities, limited access to safe water and basic healthcare, climate change and armed conflicts—continue to impede progress. Although various dietary formulations for malnutrition management currently exist, their accessibility to families remains limited. It is therefore crucial to develop and evaluate the acceptability of local products for managing malnourished children. The challenges to eradicating hunger in all its forms and achieving universal food security remain immense.

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The authors declare no conflicts of interest.

Author Contributions

Pascal Sengbé Koïvogui, Natia Joseph Kouadio, Mamadou Oury Diallo, Lanan Wassy Soromou, Abdoulaye Oury Barry and Eric Ghigo conducted the bibliographic research, analysed the bibliographic data, and wrote and edited the manuscript.

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