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Review Article

Severe Acute Malnutrition and Its Consequences Among Malnourished Children

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Abstract

Severe Acute Malnutrition is the most serious form of childhood malnutrition, as a major public health problem associated with very high rates of morbidity and mortality. It is one of the key drivers of child mortality in the developing countries. SAM is one of the main reasons for children's hospital admission and is one of the key drivers of child mortality in the developing countries. SAM among children has adverse outcome it has serious physiological consequences, including reductive adaptation, marked immunosuppression, and concurrent infection such as diarrhea and pneumonia. It can lead to increased risk of dying by 12-folds. In addition, other long-term consequences are increased risk for stunting, possible later overweight and non-communicable diseases, and impaired cognitive development. It is linked to reduced learning ability and school performance.

Keywords: Severe acute malnutrition; Consequences of SAM; Morbidity; Mortality.

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Introduction

Severe Acute Malnutrition (SAM) is the most serious form of childhood malnutrition, as a major public health problem that is associated with very high rates of morbidity and mortality and threatens the lives of millions of children yearly around the world [1-3]. SAM is one of the main reasons for children's hospital admission [4]. and is one of the key drivers of child mortality in the developing countries [5]. According to United Nations Children's Fund (UNICEF) report in 2015, indicated that SAM was considered a major cause of death in children less than five years of age [6].

Children with SAM are up to nine times more likely to dying than well-nourished children [7-9]. SAM develops when the child is not

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getting enough energy or protein and other nutrients from the food to meet his nutritional needs [10]. SAM results from sudden reductions in food intake or diet quality and is often combined with pathological causes and is associated with loss of body fat and wasting of skeletal muscle, develops as a result of recent rapid weight loss or a failure to gain weight [11-13].

Definition of SAM

SAM in children 6-59 months of age defined as a weight for height/length <–3 Z-score of the WHO growth standard, and/or MUAC of less than 115 mm, or the presence of bilateral pitting oedema (nutritional oedema) [6,14,15].

Magnitude of the problem

Morbidity

SAM remains one of the most common causes of morbidity among children in developing countries [16]. Globally, SAM has been reduced by only 11% over the past 20 years [17]. But the burden of SAM is increase in the areas affected by conflicts. Geographically, 70-80% of the world's malnourished children live in developing countries. Yemen has the third highest rates of undernutrition in the world after India and Bangladesh; affecting more than half of all CU5 [18,19].

The number of children affected by SAM changes throughout the year, The total number of current cases will increase by the number of new cases and will decrease by the number of children that either recover or die [6]. According to the latest UNICEF, WHO and World Bank (WB) joint acute malnutrition estimates of 2020, 47 million CU5 worldwide. It is highly prevalent in South Asia (25.2 million) and Sub-Saharan Africa (12.7 million). Over 14.3 million of them affected by SAM, of these, 10.5 million were found in Southern Asia, 3.5 million in Sub-Saharan Africa countries, .1 million in Latin America and Caribbean and .05 million in Oceania. Around 75% of all severely malnourished children live in lower-middle income countries. Southern Asia and Sub-Saharan Africa bear the greatest share of SAM children [20]. In developing countries, 2% of children suffer from SAM [21].

Mortality

Despite several advances towards MDG4 to reduce childhood mortality [22], undernutrition remains among the leading causes of child mortality across the world. It is a significant contributing factor in approximately half of the deaths seen annually in CU5 worldwide [3].

In Asia and Oceania, acute malnutrition is putting nearly one in ten CU5 at increased risk of death [23]. Annually, 3.1 million of all deaths among CU5 are associated with acute malnutrition. SAM is known to directly cause 4.4% of child deaths in the absence of effective treatment [24,20]. Each year approximately 2.3 million deaths among children between aged 6-59 months in developing countries are associated with acute malnutrition [25].

SAM contributes to 1.7 million child deaths per year in Sub-Saharan Africa [26]. Study conducted to comparison of indicators in a multi-country pooled analysis in the Democratic Republic of the Congo (DRC), Senegal and Nepal, demonstrated that SAM children with an 8 times higher hazard of

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dying compared to non-malnourished children [27].

Consequences of SAM

The consequences of SAM among infants and children can be short or long-term adverse outcome as the following.

Short-term consequences

1. Increase risk of death: SAM is one of the important comorbidities leading to deaths. [28,20]. It has a direct effect on child mortality [29]. In most developing countries, case fatality rates (CFRs) in hospitals treating SAM remain at 20–30% [30,11] pointed out that degree of acute malnutrition is positively correlated with an increase in the risk of death. SAM makes children more strongly susceptible to risk of death. Children with SAM are 11.6 times more likely to dying than well-nourished children [8,9].
2. Increase of morbidity: SAM has serious physiological consequences such as immunosuppression and concurrent infection [11]. It weakens the immune system, putting children at higher risk of more severe, frequent and prolonged bouts of illness [31], which lead to increase energy requirements and often reduce appetite and nutrient absorption [32,33,29]. Lenters et al. [11], pointed out to that the relationship between acute malnutrition and infection is often described as a vicious cycle or bidirectional that begins with infections and progresses to undernourishment. Several potential mechanisms of immune dysfunction exist in individuals with malnutrition. Skin, respiratory and gastrointestinal mucosal barrier integrity are often impaired in children with SAM, and the effects of this impairment are compounded by chronic subclinical enteric dysfunction in close association with alterations to gut microbiota [34].

Long-term consequences

Malnourished children without access to an adequate diet during the first 1,000 days of age suffer irreversible long-term consequences such as the following [6,14]:

1. Increase risk of stunting: Early nutritional deficits are linked to long-term impairment in growth and health. SAM during the early of life causes stunting in adulthood. According to study conducted in East Asia and the Pacific by UNICEF (2015b), indicated to the acute malnutrition was linked to increase risk of stunting.
2. Impaired cognitive development: SAM especially in the critical period from birth to five years impairs physical and cognitive development, particularly in settings where its common [36].
3. Reduce school performance and work capacity: Malnourished children in the future are less likely to achieve their full potential in terms of education and economic productivity, and they earn less income than well-nourished peers [7]. The WHO (2009) indicates to that there is evidence that

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adults who were malnourished in early childhood have impaired intellectual performance and reduced capacity for physical work. Briend and Berkley [37], found the poorer school performance of children treated for SAM compared with the control groups is a serious concern as long-term health status of children recovering from severe acute malnutrition.

4. Increase risk of low birth weight: Low birth weight is significantly associated with SAM, WHO indicated if women were malnourished in her childhood, their reproductive capacity is affected, their infants may have lower birth weight, and they have more complicated deliveries.
5. Increase risk of chronic diseases: SAM leading to increased risk of developing chronic diseases in adulthood such as cardiovascular disease, stroke, diabetes and obesity [38,35,13].

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