

Review article

Community-based Management of Micronutrient deficiency in Malnourished Children in Ghana

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Abstract:

The relationship between undernutrition and ill health is complex. It is complicated by growth retardation, impaired mental development, and significant morbidity from malaria, diarrhoeal diseases, pneumonia etc. and mortality. Several micronutrients are required for adequate growth and development especially in young children. They also account for three of the four most important forms of malnutrition worldwide. This review attempts to evaluate the community-based management of malnutrition in developing countries while comparing it to the in-patient management of malnourished children. Parameters evaluated include cost, coverage, choice, nosocomial infection acquisition and effect on productivity. The community-based management of severe malnutrition has many benefits that should be harnessed by healthcare givers so as to reduce the burden of malnutrition in low resource settings.

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Introduction:

Nutrition plays a major role in maintaining health. The relationship between undernutrition and ill health is complex because ill health often results in undernutrition and undernutrition increases susceptibility and severity of childhood disease e.g. malaria, diarrhoea, pneumonia and measles¹⁻³.

Morbidity complicated by undernutrition in children has attendant grave consequences including growth retardation, impaired mental development and mortality that result from diminished ability of all systems of the body to perform properly. Hence undernutrition is considered to be the underlying cause of more than 50% (approximately 3.5million) of all childhood deaths in the world³⁻⁴.

Several micronutrients are required for adequate growth among children. However, it has been unclear as to which nutrient deficiencies contribute most often to growth faltering in populations at risk for poor nutrition and poor growth because there are often no reliable biochemical indices for marginal micronutrient status. Three of the four most important forms of malnutrition worldwide are micronutrient deficiencies - iron deficiency anaemia (IDA), vitamin A deficiency (VAD), and iodine deficiency

disorders (IDD). Recently, zinc deficiency became a global health problem¹. Micronutrient deficiencies however overlap with PEM and both are often present in a malnourished child⁵.

Since most research from sub Saharan (including Ghana) extensively focus on PEM⁶, this work therefore attempts to redirect the spotlight to three (out of the four) micronutrient deficiencies of public health importance in Ghana and their effects on child health. Finally, special emphasis would be made on the community based management of (micronutrient) malnutrition (CMAM).

Overview

The spectrum of Malnutrition

Malnutrition can be defined as a condition that results from eating a diet in which certain nutrients (and / or calories) are in a wrong proportion – either they are lacking (undernutrition), in excess (overnutrition)⁷. This review would focus on undernutrition. Undernutrition has been a major public health concern and has been described as the greatest single treat to public health especially in developing countries. However, there has been an up-surge in cases of overnutrition even among lower socio-economic

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populations^{1,7}.

The forms of undernutrition include protein energy malnutrition; which includes marasmus and kwashiorkor (characterized by wasting and stunting) and micronutrient deficiencies mainly iron, iodine, zinc and vitamin deficiency. Of the vitamin deficiencies, emphasis is placed on vitamin A in Ghana (like most other countries)⁷.

Causes of Malnutrition^{1,4}

The nutritional status of an individual is often the result of many related factors including food intake, quantity and quality of the food, physical health. The complex interaction between the risk factors for childhood undernutrition is described in the diagram below.

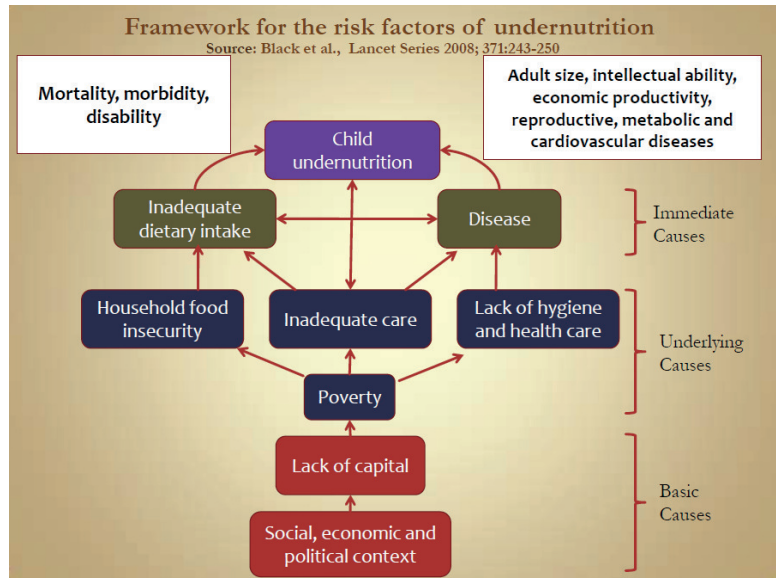


Fig 1: Framework for the risk factors of undernutrition (adapted from Caulfield et al, 2008)

Grades of Malnutrition

Malnutrition is graded based on severity as mild, moderate and severe. These grades are determined by anthropometric, biochemical and clinical tests⁷. A summary on the grades of malnutrition is shown in the table below.

Fig 2: A table showing the grades of malnutrition based on anthropometric measurements that estimate severity. WFH: weight for height, HFA: height for age, WFA: weight for age, MUAC: mid-upper arm circumference.

Burden of malnutrition

Of all children under the age of 5 years (U5) in developing countries, about 39% are underweight, 38% stunted and 9% are wasted. These values are similar to what is obtained in sub-saharan Africa where 80% of malnourished children live. In Ghana alone, 54% of all deaths beyond infancy were associated with PEM and about 36% of children under 5years were stunted. The greatest burden of malnutrition is observed in the Northern, central, Upper East and Western regions. It follows a linear relationship with socioeconomic inequality largely due to poverty⁴⁻⁸.

Apart from socioeconomic inequality, the burden of malnutrition is thought to be influenced by healthcare facilities,

increase in age of the child, male sex and long duration of breastfeeding (which reflects lack of resources to provide adequately for the nutritional needs of the child), short birth intervals with presence of 2 or more children under 5years in the household and younger age of mothers among other factors⁶.

Ghana has had a sustained economic growth in recent years. However, this favorable situation has not been equally translated into every sector of the economy. The health and nutrition status of children are lagging behind despite steady improvement of the nutritional situation of the country. The paradigm

severity	Mild malnutrition	Moderate malnutrition	Severe malnutrition
oedema	No	No	Yes
WFH	80 to 89% (-1 to -2SD)	70 to 79% (-2 to -3SD)	<70%(<-3SD) (Severe wasting)
HFA	90 to 94% (-1 to -2SD)	85 to 89% (-2 to -3SD)	<85 (-3SD) (Severe stunting)
WFA		60 to 80% (-2 to -3SD)	<60 (-3SD) (Severe stunting)
ACFA/L			<-3SD
MUAC	12.5-13.5cm	12.0-12.5cm	11.5-12.0cm

shift in the health policy of 2006 aimed at improving the wealth of Ghana through health. This saw the prevalence of stunting among children under the age of five declined from 29.4 percent to 22.4 percent, and that of underweight declined from 21.8 percent to 17.8 percent between 2003 and 2006. Though we have not reached our target, we are gradually winning the fight⁹.

Micronutrient Deficiency

Between 1933 and about 1965 the main focus was on severe protein malnutrition which was very common in rural Africa because of high starch diet. However further research showed that protein might not be the limiting nutrient. They discovered that birthweight response was proportional to the amount of energy consumed by the pregnant woman not protein diet alone; hence the name protein-energy malnutrition.

Improvement of breastfeeding practices, maternal and child malnutrition (including supplementary feeding programs), received much attention from UNICEF in the 70's in order to tackle PEM but little was done specifically in the area of micronutrient deficiencies. Nevertheless it was well-known that anemia was widespread, iodine deficiency caused endemic goiter and vitamin A was the leading cause of preventable blindness.

In 1977 the conclusion of a prestigious group of nutritionists and economists was that "on a worldwide basis inadequate intake of energy because of inadequate intake of food appears to rank ahead of all other types of malnutrition". However, they also agreed that "when the total of intake of food and thus energy is low, the intake of many (micro) nutrients is low as well" (National Academy of Sciences, 1977). This perspective led to the Nutrition Collaborative

Research Support Program (Nutrition CRSP, funded by USAID). Subsequently different countries drew up protocols to manage micronutrient deficiencies¹⁰.

Ghana has a good track record in implementing its programs and strategies, including nutrition interventions. The government, in close partnership with development partners (DPs), has implemented a number of priority interventions on micronutrient deficiency⁹.

Iron deficiency is the most common micronutrient deficiency in humans today as it affects over 2 million people worldwide. In Ghana as much as 76% of under 5 (U5) are anemic. Consequences include poor cognitive and motor development and behavioral problems, in addition to susceptibility to infections including malaria^{1,3,9}.

Approximately 1.5 billion people are at risk of preventable IDD worldwide. In Ghana, it is estimated that 120,000 children born each year are at risk of intellectual impairment because of iodine deficiency^{1,11}. On the basis of a baseline survey conducted in 1994, it was found out that IDD was serious in 33% of the 110 surveyed districts. This survey was revisited in 2001 and higher values (51%) were reported¹¹. Ignorance of the general population regarding the importance and sources of iodine to the body could have contributed to the high burden of IDDs. To improve consumption of iodized salt; which has been the most widespread, long-term and effective preventive measure against IDDs the Universal Salt Iodization (USI) programme was launched in Ghana in 1995. The national target of 90% has however not been met⁹.

Vitamin A plays an essential role in eye health. It

Results

Table1: Table explaining the benefits of put-patient management of Severe acute malnutrition

Factor	In-patient care	Out-patient care
Cost	Higher, about 4 times the cost of community based care	Cheaper
Coverage	Less coverage, stationary nutritional centres at designated points	Higher coverage, management is in close proximity to community members
Choice in resource-limited areas	Less favoured, because of strain on personnel and material resources	Preferred, seems to be more effective
Nosocomial infection	Higher rate of infection	Lesser
Effect on production	Long term: counter productive	Mothers can still go about their economic activities

causes night blindness that consequently leads to blindness (from associated corneal ulceration) if left untreated. Vitamin A deficiency contributes to anemia by immobilizing iron in the reticuloendothelial system, reducing hemopoiesis and increasing susceptibility to infections. Ghana has a policy on vitamin A supplementation which is implemented bi-annually with national coverage of about 97%. However, marginal Vitamin A deficiency is estimated to affect 26.1% of Ghanaian children, killing over 9,000 each year^{1,9}.

Materials And Methods

This was a quick review of literature done with the aid of search engines like google scholar and reference databases like PUBMED. Articles pertaining to community based management of malnutrition in developing countries were evaluated.

In-patient and out-patient management of malnourished children are thus described in the results section.

Discussion

The Community-based Management of (severe) Acute Malnutrition (CMAM) Programme was introduced in Ghana in June 2007. It was piloted in 2008 at two sites; Ashiedu Keteke Sub-Municipal in Greater Accra region and Agona West Municipal in the Central region. It was previously run as community based therapeutic care (CTC) before 2011.

Components of CMAM in Ghana include: community outreach involving mobilization, case finding, referral and follow-up, outpatient care (OPC) of children with SAM without complications inpatient care (IPC) of children with SAM with complications and other Programmes for the management of moderate malnutrition e.g. Supplementary Feeding.

The outpatient management of severe malnutrition is based on the age of the child (6 months – 59 months), absence of complications e.g. hypoglycemia, con-

vulsion, skin infections etc, child is clinically well and alert, edema limited to the mid shin (+ / ++) and passing the appetite test. Otherwise the child is managed on in-patient basis.

The children are fed on lipid-based ready to use therapeutic feeds (RUTF, plumpy nuts) which contains mineral and vitamin mix (CVM) for associated micronutrient deficiency among other things. They are usually given weekly supplies^{7,8}.

As observed in our results, the benefits of this community approach are numerous. In a Malawian study CMAM cost about \$42 per disability-adjusted life year (DALY) against \$493 for in-patient care¹². Similar observation was made in a Bangladesh study¹³.

The deliberate decentralization of care as observed in CMAM tremendously improved mortality associated with malnutrition from 29% to 18% in another study¹⁴. Better geographical coverage was observed in the same study.

It has also reduced the need to house severely malnourished children for at least 30 days in nutritional centers - which could at times be very far from where their families are hence neglecting other children in the family in order for mothers to focus of the ill child³. Mother's means of livelihood is thus being preserved.

In conclusion, the CMAM has proved to be extremely important in tackling malnutrition. Despite the existing data documenting the efficacy of the program, it catches inadequate attention. The inclusion and exclusion criteria also need to be revised to suite a rural African community typically characterized by paucity of health staff and proximity to referral centers, so that patient who need in-patient care can get access to them.

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