



Diagnosis of Acute Malnutrition ▼

Research Project

OptiDiag Project

Biomedical Investigations for Optimized Diagnosis and Monitoring of Severe Acute Malnutrition

Elucidating the heterogeneous diagnosis of SAM by current anthropometric criteria and moving beyond

▶ Duration

3 years, from January 2015

▶ Area

Multi-country, with at least two investigation sites, one in Africa one in Asia

▶ Objectives

- To generate new evidence on pathophysiological process, nutritional needs and risks associated with the two highly heterogeneous anthropometric criteria currently used to identify SAM and monitor recovery in children.
- To ultimately improve the diagnosis of SAM and the monitoring of treatment outcomes, through the optimization of anthropometric tools (possible adjustments in cut-offs, age or height ranges), and through the addition of novel tools for the assessment of emerging biomarkers of impaired metabolism and vulnerability, with better specificity and sensitivity for predicting long-term outcomes and mortality risk.

▶ Consortium

- Lead: ACF-France
- International partners: ACF-International, AgroParisTech University, Institute of Tropical Medicine of Antwerp, Duke University Medical Center
- National academic and institutional partners to be found

▶ **Estimated Budget for prospective studies in two settings:** 600 000 euros

▶ CONTEXT

Acute malnutrition is the consequence of a rapid deterioration of nutritional status, due to an imbalance between the required and the actually available amount of one or more nutrients. It is characterized by either severe wasting of fat and muscle called marasmus or emaciation, or by the presence of bilateral oedema called kwashiorkor, or a combination of both (kwashiorkor-marasmus).

Two independent anthropometric criteria are today recommended by the international community and widely used in practice for acute malnutrition diagnosis:

- **weight-for-height z-score (WHZ)** (WHZ<-3 is identified as SAM);
- **mid-upper arm circumference (MUAC)** (<115mm is identified as SAM).

However, there is a huge discrepancy between these two criteria: they do not usually identify the same children as suffering from acute malnutrition and display different levels of gravity of the nutritional situation in the population. WHO originally estimated a maximum 40% overlap between the two indicators. There are in fact huge variations across contexts, and extreme discrepancies are frequently reported. Most of the time, caseloads defined by WHZ are much larger than by MUAC, but the contrary may happen as well.

The discrepancy in diagnosis raises important technical and programmatic questions, whose urgency is triggered by the fact that **MUAC is more and more used in practice as the only admission criteria for medico-nutritional rehabilitation programs.**

First, it raises the question of possible diagnostic errors. If the discrepancy is caused by the lack of sensitivity of one of the diagnostic criteria, programs using only this criterion will *miss out true cases* and have decreased coverage of the real needs. On the other hand, if the discrepancy is caused by the low specificity of these criteria, many *children not in need of nutritional treatment will be included* in the programs, causing waste of resources.

Second, diagnosis heterogeneity raises the question of possible heterogeneity in needs. Children identified by different criteria may require different treatments. For instance, lower anthropometric response to treatment has already been observed in younger and stunted female children, three characteristics which are independently associated with MUAC diagnosis. Also, a recent meta-analysis of follow-up datasets evidenced a dramatic increase in mortality risk in children combining low WHZ and stunting (MUAC was not factored in).

Answering these questions will contribute to evidence-based policies and practices for the identification of individuals who can benefit most from the standard treatment. Further adaptations of the treatment for highly vulnerable children are also at stake.

It is thus crucial to increase knowledge about:

- 1) The reality and diversity of the needs associated with different types of anthropometric deficits;
- 2) The adequacy of current medico-nutritional programs to meet the needs of these different types of patients, restoring healthy growth over time and reducing risk of mortality.

▶ GENERAL OBJECTIVE

To generate new evidence on pathophysiological process, nutritional needs and risks associated with different types of anthropometric deficits in children under 5, in order to optimize the diagnosis and treatment of SAM.

▶ SPECIFIC OBJECTIVES

- To compare nutritional status, metabolism, pathophysiological process and risks in different types of SAM anthropometric diagnosis, with or without concomitant stunting (growth retardation).
- To analyze the extent to which current SAM treatment is promoting recovery and healthy growth in different categories of children.
- To evaluate the relevance of current discharge criteria used in nutrition programs and their association with metabolic recovery, in different age groups and among those who are stunted.
- To test novel rapid tests of emerging biomarkers predicting long-term outcomes and mortality risk in the field.

▶ METHODOLOGY

A wide range of supplementary information related to nutritional status, body composition, metabolic and immune status, including emerging biomarkers of metabolic deprivation and vulnerability, will be collected besides anthropometry during prospective observational studies. They will be collected with minimum level of invasiveness, compatible with field work requirements in the humanitarian context.

Phase 1: Cross-sectional surveys.

Phase 2: Prospective cohort studies involving SAM children between 6 months and 5 years old.

Children admitted as SAM at the nutrition centers will be enrolled into the cohort. The follow up duration will be at least three months.

▶ EXPECTED OUTCOMES

- Confirmation of current hypotheses related to:
 - a) possible misdiagnosis of SAM made by MUAC or WHZ criteria,
 - b) varying degree of severity and need for admission to treatment of the different types of diagnosis,
 - c) underlying heterogeneity of the pathophysiology.
- Generation of new algorithms for the assessment and classification of malnourished children, based on the combined use of emerging biomarkers and anthropometric measures, or on the modification of anthropometric criteria.
- Generation of new treatment paradigms based on the predictive value of biomarkers in combination with traditional anthropometric measures. This will enable us to assess the power of current treatment regimens to promote long-term weight gain and growth and will allow us to tailor treatment to the physiological needs of the child.



► Contacts

- ◆ **ACF-France:**
Dr. Benjamin Guesdon, Nutrition and Health Research Coordinator,
bguesdon@actioncontrelafaim.org
- ◆ **Institute of Tropical Medicine of Antwerp :**
Pr. Dr. Patrick Kolsteren, Head of Child Nutrition and Health Unit, Institute of Tropical Medicine of Antwerp, Belgium,
PKolsteren@itg.be
- ◆ **AgroParisTech University:**
Pr. Dr. Jean-François Huneau, Department of life Science & Health, Division of Human Nutrition,
jean_francois.huneau@agroparistech.fr
- ◆ **Duke University Medical Center:**
Pr. Dr. Michael Freemark, Chief, Division of Pediatric Endocrinology and Diabetes, Vice Chair for Pediatric Research,
michael.freemark@duke.edu

