

1 Introduction

This chapter introduces malnutrition, acceptability and feeding behaviour and leads to the thesis objectives.

Malnutrition in young children is one of the leading underlying causes of childhood morbidity and mortality in low-income countries. Nearly half of all deaths in children less than five years-old are due to malnutrition, leading to about three million child deaths annually (1). For children surviving malnutrition, the consequences on the physical and mental development may be long-term and affect school performance, income potential and thereby productivity and economic development on a larger scale (2). As an example, an estimated 11% of Gross National Product in Africa and Asia, is lost due to poor nutrition (3). Prevention and treatment of malnutrition are therefore key to reduce morbidity and mortality in young children as well as to reduce poverty, and is part of the new sustainable development goals set out by the United Nations (4).

Malnutrition encompasses both over-nutrition and undernutrition. For the purpose of this thesis malnutrition will be used interchangeably with undernutrition. Undernutrition refers to both chronic and acute malnutrition as well as micro-nutrient deficiencies. *Chronic malnutrition*, also referred to as stunting, results from insufficient intake or absorption of essential nutrients over a protracted period, while *acute malnutrition* results from sudden reductions in food intake or diet quality, as previously mentioned, and is often associated with morbidity, especially infectious diseases. Acute malnutrition is often also referred to as wasting. *Micronutrient deficiencies* can impact health, development and productivity during the lifecycle. It is often referred to as “the hidden hunger”, as there are not always visible signs present (5). All three conditions can co-exist in the same person.

Although chronic malnutrition is more common than acute malnutrition, the latter is associated with higher risk of dying (6). Acute malnutrition is categorized as severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) according to the severity of the condition. The mortality risk increases with the severity of acute malnutrition; compared to well-nourished children, children with SAM have a twelve time higher risk of dying, while children with MAM have a three time higher risk of dying (6). The prevalence of wasting in children less than five years of age is 8 % globally, out of which 3 % have severe wasting (3), which translates to 33 million and 19 million children, respectively (1). This makes acute malnutrition a significant public health concern (1), the vast majority of children affected reside in low and middle income countries (2).

Different prevention and treatment strategies have been developed throughout the years to address the problem of acute malnutrition. For years, the treatment strategy recommended by the World Health Organization (WHO) was to treat all cases of SAM with therapeutic milk in hospital settings or special therapeutic feeding centres. This approach is resource demanding and requires skilled staff (7) and has often been accompanied by high case fatality rates (8). In the late 1990's, a new type of product, the so-called ready-to-use therapeutic foods (RUTFs) was successfully introduced for the treatment of SAM (7, 9, 10). RUTF was introduced as part of a community-based therapeutic care-approach, now often referred to as Community Based Management of Acute Malnutrition (CMAM), where children with complicated SAM, such as lack of appetite and medical complications are still treated in hospital settings with specially designed therapeutic milk (11, 12), but children with uncomplicated SAM are treated at home with RUTF. This way of managing SAM has been recommended by the World Health Organization since 2007 and seeks to offer a more community conscious alternative, that recognises the important role of the family (13).

Similar globally agreed-upon treatment and prevention guidelines do not exist for the management of MAM, despite the fact that management of MAM is key in preventing deterioration into SAM. In 2012, WHO published a technical note on proposed nutrient composition for supplementary foods for children with MAM, but called for more research before being able to provide more detailed guidelines.

The lack of consensus in the management of MAM is due to unanswered questions and inconsistent findings in relation to the effectiveness of MAM programs (14, 15, 16). However, there is a growing interest towards finding effective approaches to treat MAM based on the CMAM approach (12), among those, an increased focus on the development of supplementary foods for young children with MAM (17). Currently, supplementary foods are either provided in the form of fortified blended flours (FBF) such as corn-soy blends (CSB) with different formulations evolving in recent years (18) or as lipid-based nutrient supplements (LNS) which have emerged from the RUTF. These foods developed for the treatment of MAM are also known as ready-to-use supplementary foods (RUSF) and vary by ingredients and micronutrient composition (19). But there is no consensus on which product to use or on the nutritional composition of the products and WHO recommends further research comparing different approaches to managing MAM, taking local context into consideration(15).

With the aim of contributing to this evidence base, we carried out a large randomized controlled trial assessing the effectiveness of different formulations of supplementary foods for the treatment of MAM based on a variety of biological and functional outcomes. The key factors assessed were the quality of soy flour and the quantity of milk.

An optimal nutritional composition alone is however not enough for successful interventions. Several studies have shown suboptimal consumption of the nutritional treatment provided, which may impair adequate nutrient intake and limit catch-up growth among recipients (20, 21, 22). Acceptability of the foods provided to treat MAM, such as the sensory appreciation and the perceived benefits and/or undesirable effects of the foods as well as ease of use and degree of sharing is therefore also key. Furthermore, since MAM is treated within the communities, feeding behaviours in terms of how, when and where the supplements are fed and who is feeding them, also play an important role in the successful outcome of nutritional interventions. Information on these aspects is therefore crucial when it comes to the understanding of the effectiveness of supplementary foods for the treatment of MAM.

1.1 Objectives of Ph.D. thesis

The objective of this thesis was to contribute to the evidence base related to the management of children with MAM by evaluating the acceptability of different formulations of supplementary foods for the treatment of MAM and explore feeding behaviours related to home-based treatment to identify barriers and facilitators for the effective provision of nutritional supplementation.

Specific objectives include:

- To evaluate in a pilot study, the acceptability of new formulations of supplementary foods designed for the TreatFOOD trial among healthy children and identify potential barriers for treatment. (Paper I)
- To evaluate the acceptability of the new formulations of supplementary foods with different quantity of milk and different quality of soy among children with MAM. (Paper II)
- To explore and compare feeding behaviours related to supplementary feeding with CSB and LNS and to identify behaviours that could influence the effect of such foods. (Paper III)