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# Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries (Review)

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#### [Intervention Review]

# Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries

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#### **ABSTRACT**

## **Background**

Moderate acute malnutrition, also called moderate wasting, affects around 10% of children under five years of age in low- and middle-income countries. There are different approaches to addressing malnutrition with prepared foods in these settings; for example, providing lipid-based nutrient supplements or blended foods, either a full daily dose or in a low dose as a complement to the usual diet. There is no definitive consensus on the most effective way to treat children with moderate acute malnutrition.

#### **Objectives**

To evaluate the safety and effectiveness of different types of specially formulated foods for children with moderate acute malnutrition in low- and middle-income countries, and to assess whether foods complying or not complying with specific nutritional compositions, such as the WHO technical specifications, are safe and effective.

# **Search methods**

In October 2012, we searched CENTRAL, MEDLINE, LILACS, CINAHL, BIBLIOMAP, POPLINE, ZETOC, ICTRP, mRCT, and ClinicalTrials.gov. In August 2012, we searched Embase. We also searched the reference lists of relevant papers and contacted nutrition-related organisations and researchers in this field.

## **Selection criteria**

We planned to included any relevant randomised controlled trials (RCTs), controlled clinical trials (CCTs), controlled before-and-after studies (CBAs), and interrupted time series (ITS) that evaluated specially formulated foods for the treatment of moderate acute malnutrition in children aged between six months and five years in low- and middle-income countries.

#### **Data collection and analysis**

Two authors assessed trial eligibility and risk of bias, and extracted and analysed the data. We summarised dichotomous outcomes using risk ratios (RR) and continuous outcomes using mean differences (MD) with 95% confidence intervals (CI). Where appropriate, we combined data in meta-analyses using the random-effects model and assessed heterogeneity. The quality of evidence was assessed using GRADE methods.



#### **Main results**

Eight randomised controlled trials, enrolling 10,037 children, met our inclusion criteria. Seven of the trials were conducted in Africa. In general, the included studies were at a low risk of bias. There may have been a risk of performance bias as trial participants were aware which intervention group they were in, but we did not consider this likely to have biased the outcome measurement. We were unable to assess the risk of reporting bias in half of the trials and two trials were at high risk of attrition bias.

Any specially formulated food versus standard care - the provision of food increased the recovery rate by 29% (RR 1.29, 95% CI 1.20 to 1.38; 2152 children, two trials; moderate quality evidence), decreased the number dropping out by 70% (RR 0.30, 95% CI 0.22 to 0.39; 1974 children, one trial; moderate quality evidence), and improved weight-for-height (MD 0.20 z-score, 95% CI 0.03 to 0.37; 1546 children, two trials; moderate quality evidence). The reduction in mortality did not reach statistical significance (RR 0.44; 95% CI 0.14 to 1.36; 1974 children, one trial; low quality evidence).

Lipid-based nutrient supplements versus any blended foods (dry food mixtures, without high lipid content), at full doses - there was no significant difference in mortality (RR 0.93, 95% CI 0.54 to 1.62; 6367 children, five trials; moderate quality evidence), progression to severe malnutrition (RR 0.88, 95% CI 0.72 to 1.07; 4537 children, three trials; high quality evidence), or the number of dropouts from the nutritional programme (RR 1.14, 95% CI 0.62 to 2.11; 5107 children, four trials; moderate quality evidence). However, lipid-based nutrient supplements significantly increased the number of children recovered (RR 1.10, 95% CI 1.04 to 1.16; 6367 children, five trials; moderate quality evidence), and decreased the number of non-recovering children (RR 0.53, 95% CI 0.40 to 0.69; 4537 children, three trials; high quality evidence). LNS also improved weight gain, weight-for-height, and mid-upper arm circumference, although for these outcomes, the improvement was modest (moderate quality evidence). One trial observed more children with vomiting in the lipid-based nutrient supplements group compared to those receiving blended food (RR 1.43, 95% CI 1.11 to 1.85; 2712 children, one trial; low quality evidence).

Foods at complementary doses - no firm conclusion could be drawn on the comparisons between LNS at complementary dose and blended foods at complementary or full dose (low quality evidence).

Lipid-based nutrient supplements versus specific types of blended foods - a recently developed enriched blended food (CSB++) resulted in similar outcomes to LNS (4758 children, three trials; moderate to high quality evidence).

Different types of blended foods - in one trial, CSB++ did not show any significant benefit over locally made blended food, for example, Misola, in number who recovered, number who died, or weight gain (moderate to high quality evidence).

Improved adequacy of home diet - no study evaluated the impact of improving adequacy of local diet, such as local foods prepared at home according to a given recipe or of home processing of local foods (soaking, germination, malting, fermentation) in order to increase their nutritional content.

#### **Authors' conclusions**

In conclusion, there is moderate to high quality evidence that both lipid-based nutrient supplements and blended foods are effective in treating children with MAM. Although lipid-based nutrient supplements (LNS) led to a clinically significant benefit in the number of children recovered in comparison with blended foods, LNS did not reduce mortality, the risk of default or progression to SAM. It also induced more vomiting. Blended foods such as CSB++ may be equally effective and cheaper than LNS. Most of the research so far has focused on industrialised foods, and on short-term outcomes of MAM. There are no studies evaluating interventions to improve the quality of the home diet, an approach that should be evaluated in settings where food is available, and nutritional education and habits are the main determinants of malnutrition. There are no studies from Asia, where moderate acute malnutrition is most prevalent.

#### PLAIN LANGUAGE SUMMARY

# Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries

Moderate acute malnutrition (MAM) affects around 10% of children under five years of age in low- and middle-income countries. Different food strategies have been used for the nutritional recovery of children with MAM, such as lipid-based nutrient supplements or blended foods, which can be provided in full dose or in a low dose as a complement to the usual diet. However, there is no definitive consensus on the most effective way to treat children with MAM.

We searched eight electronic databases and three trials registers (in October 2012 for all except Embase, which was searched in August 2012). We also searched the reference lists of relevant papers and contacted nutrition-related organisations and researchers in this field.

We found eight relevant randomised controlled trials, enrolling 10,037 children under five years of age. All but one study was conducted in Africa.

The risk of bias in the studies was generally low, though two studies had a high dropout rate. The participants were aware which intervention group they were in and this may have influenced their behaviour but we thought it unlikely it would have influenced the results since the outcomes measured were objective ones. For four of the studies, we were unable to assess if the study authors reported all the outcomes they intended to measure.



When any type of specially formulated food was compared to standard care (medical care and counselling without foods), the children treated with foods had a higher chance of recovering from moderate malnutrition (two studies), greater improvement in nutritional status (two studies), and a lower number of dropouts (one study). A reduction in mortality was not shown.

When lipid-based nutrient supplements (which are food with high energy density and high lipid content) at full dose were compared to blended foods at full dose (which are dry food mixtures without high lipid content), there was no difference between these two types of foods in terms of number of deaths (five studies), children progressing to severe acute malnutrition (three studies), and children dropping out (four studies). However, lipid-based nutrient supplements increased the number recovered by 10% (five studies), decreased the number of children non-recovering (three studies), and slightly improved the nutritional status among the recovered. One study observed more children vomiting when given lipid-based nutrient supplements compared to blended foods, but this was not reported by the other studies. No other side effects were reported.

Few studies evaluated foods at complementary dosage (i.e. foods given in low quantity, just to complement the diet and not to fully substitute it), and no conclusion could be drawn from these studies.

When specific foods were compared to each other, a type of corn-soy blended food called CSB++ compared to lipid-based nutrient supplements resulted in similar outcomes, while results of another blended food (CSB pre-mix) versus lipid-based nutrient supplements were unclear. In one study, CSB++ did not show any significant benefit over locally-made blended foods, for example, Misola.

No study evaluated the impact of improving adequacy of local diet, such as local foods prepared at home according to a given recipe or of home processing of local foods (soaking, germination, malting, fermentation) in order to increase their nutritional content.

In conclusion, there is moderate to high quality evidence that both lipid-based nutrient supplements and blended foods are effective in treating children with moderate acute malnutrition. Although lipid-based nutrient supplements (LNS) led to a clinically significant benefit in the number of children recovered in comparison with blended foods, LNS did not reduce mortality, the risk of default or progression to SAM. It also induced more vomiting. Blended foods such as CSB++ may be equally effective and cheaper than LNS. There are no studies evaluating special recipes to improve the adequacy of the usual home diet, an approach that should be evaluated in settings where food is available, and nutritional education and habits are the main determinants of malnutrition. There are no studies from Asia, where moderate acute malnutrition is most prevalent.