

# Effect of Malted Sorghum Based Porridge Supplementation on the Anthropometric & Biochemical Changes of Infants & Young Children with Moderate Acute Malnutrition

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# Introduction

- ▶ Moderate acute malnutrition (MAM) among infants & young children (IYC) mainly occurs as result of inadequate food intake (WHO, 2012)
- ▶ In low & middle income countries, MAM affects 10% of U5 children (Lazzerini et. al 2013)
  - MAM is estimated at 14m in Africa (Hayashi et.al, 2017)
  - Anaemia affects 85 million U5 children in Africa (WHO, 2015)
- ▶ IYC with MAM, seldom achieve their full potential
  - of physical, intellectual, or cognitive development (Cichon et.al, 2016)

# Introduction...

- ▶ Commercial & local foods have been used to treat IYC with MAM
  - However, no definitive consensus on the most effective protocol to treat IYC with MAM has been agreed
- ▶ Fortified food (FF) supplementation results in recovery of malnourished children ([Lazzerini et al., 2013](#))
  - Some studies: no significant effect on nutritional status reported after supplementation with FF

# Background

- ▶ Sorghum peanut blend supplementation showed potential to reverse MAM among children aged 6–59 months ([Ochola et al., 2014](#))
  - anti-nutrients were not reduced
- ▶ The effectiveness of malted sorghum based porridge (MSBP) compared with fortified corn soy blend (CSB+) in the treatment of IYC with MAM had not been demonstrated in Uganda
- ▶ This study investigated the effect of a MSBP combined with nutrition education on anthropometric & biochemical changes of IYC with MAM

# Objective

- ❖ Compare the effect of MSBP & CSB+ in combination with nutrition education on weight, length, & haemoglobin level changes of IYC with MAM.

# Study design

- ▶ A double blind cluster randomized control trial (cRCT) study design was conducted with 220 IYC with MAM
- ▶ 24 parishes (that formed clusters) were conveniently selected from 35 parishes of 4 randomly sampled sub-counties in Arua district
- ▶ **Sample size**
  - A sample size of 220 children with MAM

# Inclusion & exclusion criteria

## Included

- ▶ IYC aged 6 to 18 months with MAM (-2 to -3 z-scores) with mother's consent

## Excluded

- ▶ IYC receiving a supplementary feeding program

# Randomisation

- 12 clusters with 110 of IYC with MAM were randomly allocated to control or treatment group



## Treatment (12)

- ▶ MSBP & nutrition education
- ▶ Home foods & breast milk

## Control (12)

- CSB+ & nutrition education
- Home foods & breast milk

# Intervention

## Dosage

- Daily dose of 150g of either MSBP or CSB+ was fed to IYC for ninety days
- Weekly nutrition education was given to mothers of IYC with MAM
  - Village Teams checked twice the feeding of MSBP & CSB+

# Measurements

- Weekly weight & length measurements of IYC were conducted
- Haemoglobin level was determined only at baseline and end of study

# Data analysis

## Inferential statistics

- ◆ Comparisons between **changes & differences** in the mean weight, length & blood haemoglobin levels in the treatment & control groups were done
  - using **chi-square & paired t-tests**
  - Significance was at  $P < 0.05$

# Results

**Table 1: Mean anthropometric & biochemical difference between treatment & control groups at end line**

Anthropometric & biochemical measures (n=204)	Mean (SD)		P-value
	Treatment	Control	
Weight (kg)	7.966(0.866)	7.776(0.934)	0.133
Length (cm)	72.093(4.273)	71.728(.135)	0.536
Weight-for-age z-scores	-1.939(0.690)	-2.214(0.817)	0.010
Length-for-age z-scores	-2.282(1.038)	-2.521(1.057)	0.104
Length-for-weight z-scores	-1.068(0.755)	-1.276(0.846)	0.064
Haemoglobin level (g/dl)	10.145(1.425)	10.463(1.445)	0.115

The mean weight-for-age z-score in the treatment group was significantly (P=0.01) higher than that in the control group at end of the study.

# Results

Table 2: Absolute mean anthropometric & biochemical differences between treatment & control group at baseline

Anthropometric and biochemical measures	Groups		P-value
	Treatment (104) Mean (SD)	Control (100) Mean (SD)	
Weight (kg)	7.12(0.08)	7.01(0.09)	0.345
Length (cm)	69.43(0.42)	69.14(0.45)	0.640
Weight for age z-scores	-2.289(0.621)	-2.506(0.649)	<b>0.016</b>
Length for age z-scores	-2.098(0.993)	-2.327(1.053)	0.111
Length for weight z-scores	-2.192(0.830)	-2.403(0.756)	<b>0.315</b>
Haemoglobin level (g/dl)	9.71(0.15)	9.62(0.16)	0.890

Anthropometric measures regarding stunting, wasting, hemoglobin level in the treatment group compared to control did not significantly differ except for underweight.

**Table 3: Relative mean anthropometric & biochemical gain between treatment & control group at end line**

Anthropometric and biochemical measures	Relative mean gain* (SD)		P-value
	Treatment (n=104)	Control (n=100)	
Weight gain (g/kg)	1.342 (0.731)	1.254 (0.862)	0.433
Length gain (µm/cm)	4.299 (1.828)	4.212 (1.985)	0.744
Weight-for-age z-scores gain	0.148(0.021)	0.115(0.02)	0.310
Length-for-age z-scores gain	0.078(0.102)	-0.152(0.070)	0.556
Length-for-weight z-scores gain	0.350(0.060)	-0.952(1.105)	0.232
Haemoglobin level gain (mg/dl per g/dl)	0.634 (1.706)	1.149 (1.783)	<b>0.036</b>

\*Relative mean gain = end line - baseline mean values / baseline mean values & by 90 days.

**Table 4: Difference of mean anthropometric and biochemical gain for IYC at end line**

Anthropometric and biochemical measures	Difference of mean gain* (SD)		P-value
	Treatment	Control	
Weight gain (kg)	0.988(0.417)	1.086(0.454)	0.433
Length gain (cm)	2.992(0.107)	2.941(0.111)	0.744
Haemoglobin level gain (g/dl)	0.483(0.135)	1.170(0.127)	0.010



\*Mean gain = end line – baseline means values.

✓The change in mean haemoglobin levels was smaller (P=0.01) in the treatment group when compared to that of the control group.

Table 5: Anthropometric and biochemical indicators of IYC with MAM between treatment and control group at the end line

Parameter	Treatment n (%)	Control n (%)	P-value
<b>Mean weight gain</b>			
• $\geq 1.5$ grams/kg/day	39(37.5)	35(35.0)	0.710
• $<1.5$ grams/kg/day	65(62.5)	65(65.0)	
<b>Mean weight gain</b>			
• $\geq 10\%$	63(60.6)	51(51.0)	0.168
• $<10\%$	41(39.4)	49(49.0)	
<b>Weight-for-length z-scores</b>			
• $>-2$ z-score	94(90.4)	81(81.0)	0.055
• $\leq -2$ z-score	10(9.6)	19(19.0)	
<b>Weight-for-age z-scores</b>			
• $>-2$ z-score	59(56.7)	44(44.0)	0.069
• $\leq -2$ z-score	45(43.3)	56(56.0)	
<b>Length-for-age z-scores</b>			
• $>-2$ z-score	36(34.6)	33(33.0)	0.807
• $\leq -2$ z-score	68(65.4)	67(67.0)	
<b>Haemoglobin level</b>			
• $>10.5$ g/dl	47(45.2)	58(58.0)	0.067
• $\leq 10.5$ g/dl	57(54.8)	42(42.0)	

➡ The proportion of IYC who recovered from MAM was higher in the treatment group compared to those in the control group, and the difference was not statistically significant (P=0.055).

# Discussion

## Weight gain

- ▶ This study failed to reject the null hypothesis that MSBP equally induces weight gain as CSB+

Possibly:

- ▶ Appropriate feeding practices and
  - ✓ Improved bioavailability of energy & nutrient density of either MSBP or CSB+ fed to IYC

# Discussion

## Haemoglobin level

- ▶ Increase in haemoglobin level among IYC in the treatment group could have been due to the active enzymatic malt effect in the MSBP
  - Improved bioavailability of iron in the MSBP

# Discussion

## Haemoglobin level

- ▶ The haemoglobin level gain of IYC in control compared to treatment group at end line did not create difference in weight gain.
  - In the management of anaemic IYC with MAM it would be optional to fortify malted foods
  - Children recover from MAM while still anaemic

# Discussion

## Recovery rates

- ▶ The recovery rate of either porridges was above the recommended sphere standard of  $\geq 75\%$ .
  - The use malted porridge, household foods, breast milk and nutrition education provides an evidence base approach to treat IYC with MAM.
- ▶ A weight gain of a third a kilogram per month or more of IYC fed on MSBP was sufficient to yield satisfactory recovery rate.

# Study Limitation

- ▶ Consumption of either MSBP or CSB+ at household level was not monitored
  - However, traditional values associated with supplementation dose could not have affected the outcome of this study

# Conclusion

- ▶ Supplementation of malted porridge to IYC with MAM results in comparable anthropometric & haemoglobin level gains and a satisfactorily high recovery rate
- ▶ Therefore, MSBP could be considered as an alternative to CSB+ in the management of breastfed IYC with MAM.