

# Domiciliary treatment of Severe Acute Malnutrition

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**Background** Severe acute malnutrition (SAM) is rampant in the children of hilly and inaccessible tribal region of Nandurbar, Maharashtra in India. It is estimated that nearly 5% of the children under five years have SAM.

**Objectives** To assess the therapeutic efficacy of 3 types of nutrition protocols administered largely at home in SAM children from Nandurbar, Maharashtra.

**Methodology** This study is a part of a larger three arm open label trial using 3 therapeutic feeds i.e. C-RUTF (Centrally produced ready to use therapeutic food), L-RUTF (locally prepared ready to use therapeutic food) and ARF (locally prepared amylase rich food) in children of SAM who attended the health facility and completed the treatment protocols for 8 weeks (All 'per protocol patients') and were between 1 to 3 years of age. The larger study included children aged 6 months to 59 months who were given same therapeutic feeding protocol.

**Findings** A total of 450 SAM babies between 12-36 months. attended the outpatient therapeutic program during the period of July 2014 to December 2015 and completed the given protocol of therapeutic feeding program. 242(53.7%) were males and 208(46.2%) females. Out of these, 150 received C-RUTF, 150 received L-RUTF and 150 received ARF. Out of C-RUTF group 83(55.3%) recovered, in L-RUTF 70 (46.7%) recovered and from ARF group 69(46.0%) recovered. The difference was statistically significant.(p=0.03) Total recovery rate was 49.3% in comparison to another under publication study by our group on 3418 children aged 6 months to 59 months, where recovery was 36.8%. Average weight gain per day was  $3.54 \pm 2.36$  g/kg/day,  $2.61 \pm 2.12$  g/kg/day,  $2.60 \pm 1.50$  g/kg/day in the 3 arms respectively.

**Conclusion** This study proves that domiciliary treatment with 3 types of therapeutic feeds gives recovery rate of 49.3%, there by meaning that SAM Children without complications can be treated at home with visit to health facility once a week. Of all the therapeutic feeding protocols C-RUTF had best recovery rates (55.3%) compared to others, the difference being statistically significant. Average weight gain per kg per day in C-RUTF group was 35.8 % higher than the other 2 groups.

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## Introduction

Malnutrition remains the biggest threat to child survival, growth and development. Severe acute malnutrition is a major public Health issue in India<sup>1</sup>. As per NFHS 4 (National Family Health Survey-4, 2015-2016), 29.3% children under five are stunted, 30.7% are underweight, 24.9% are wasted and 9.5% are severely wasted. This severe acute malnutrition puts children at 9 times higher risk of death and needs immediate treatment.

Severe acute malnutrition is defined as mid upper arm circumference (MUAC) <115mm or weight for height Z score (WHZ) <-3 of the median weight for height on WHO growth charts for babies from 6 months to 5 years.

WHO and UNICEF recommend that children with medically, complicated SAM or SAM with bilateral pitting edema (Nutritional), should be treated as in-patients in a health facility, while children with uncomplicated SAM should be treated at home. Public Health dept. of the State of Maharashtra has undertaken three levels of management of SAM. The first level is VDC (Village Child Development Center) where uncomplicated SAM are being treated with amylase rich flour .

The second level is child treatment center (CTC) located at rural hospital wherein children without appetite are admitted and treated. The third level is NRC (Nutrition Rehabilitation Center) where children with SAM and medical complications are admitted.

The present study was undertaken in the community of Nandurbar District of Maharashtra where it is estimated that the 0-6 year population as per ICDS 2013 is 173756, out of which there may be around 7819 children with SAM (considering 4.5% prevalence as per NFHS-3). These children with SAM were given three kinds of therapeutic foods and the recovery rates were observed.

## Material and methods

This study is a subset of larger study of SAM children between 6 to 59 months of age, who were given 3 types of therapeutic foods. The children belonged to hilly, inaccessible tribal district of Maharashtra. 6 administrative blocks (Dhadgaon, Akkalkuwa, Taloda, Shahada, Nawapur & Nandurbar) were selected and randomized by cluster method involving three blocks. It was not possible to randomise individual child at every sub center where the anganwadi worker gave therapeutic food as it was logistically impractical. Children attending health facility were screened by taking their mid-upper-arm-circumference or their weight and height during monthly growth monitoring session. Children with MUAC <115mm or wt for ht <-3 SD were categorized as SAM.

Those who had no appetite, bilateral pitting edema (Nutritional) or medical complications suggestive of pneumonia , diarrhoea or any other were referred to CTC or NRC. Remaining children formed the study group and were managed on domiciliary treatment for SAM. Parental consent for participation was taken in local language.

They were give 3 types of feeds. Each randomized group received C-RUTF (Compact,India),L-RUTF made with powdered ground nuts vegetate oil , milk powder, sugar and micronutrients & ARF- amylase rich flour consisting of germinated dried & powdered grains-wheat & moong (green gram) , vegetable oil , milk and sugar . ARF was prepared like a fresh porridge by Anganwadi worker. The children were given the food to eat on the day of the visit and given weekly C-RUTF,L-RUTF or ARF as the case may be.

They were counselled and weighed every week. MUAC was taken. At the end of 8 weeks, MUAC, wt. for ht were taken & recovery was assessed. Those whose MUAC was more than 125mm or wt/for ht greater than - 2 SD were categorized as recovered. Those admitted by the criterion of MUAC were considered as recovered by MUAC and those admitted by wt./ht were considered

recovered by wt/ht. Only those children who completed 8 weeks of treatment (per protocol) and who were in the age group of 1 to 3 years were analysed further.

The larger study was approved by the ethics committee of Haffkine Institute, Mumbai and the trial was registered under clinical trial registry of India with identifier CTR/2014/09/004958. Data safety monitoring board and community advisory board were constituted and were informed periodically about adverse events if any.

Data were recorded on case record forms and then computerised entries were made for each patient.

## Findings

**Table 1.** Composition of therapeutic feeds

	ARF	L-RUTF	C-RUTF
Amylase rich flour (g/100 g)	29	na	na
Peanut paste (g/100 g)	na	20	30
Sugar (g/100 g)	24	28	29
Milk powder (g/100 g)	24	30	20
Vegetable oil (g/100 g)	19	20	18
Sesame seeds (g/100 g)	5	na	na
Other	na	1.6	2.5
Energy (kcal/100 g)	420	513	550

Caloric density of C-RUTF is higher than the other two feeds.

**Table 2.** Baseline characteristics of the children

	ARF		L-RUTF		C-RUTF		All	
	n	%	n	%	n	%	n	%
Girls	76	50.7	63	42	83	55.3	222	48.2
Boys	74	49.3	87	58	67	44.7	228	51.8
Total	150	100	150	100	150	100	450	100
MUAC < 115 mm	54	36	67	44.7	75	50	196	43.6
WHZ < -3	96	64	83	55.3	75	50	254	56.4
Total	150	100	150	100	150	100	450	100

50% of children in C-RUTF group had MUAC less than 115mm., while the L-RUTF group had 44.7% and ARF group had 36% children. 50% of children in C-RUTF group had WHZ less than -3 SD, while the L-RUTF group had 55.3% and ARF group had 64% of children.

total of 450 children of SAM were available for study.

## Discussion

Community management of SAM using domiciliary treatment has been a debated issue and the methodology is being evolved. Children with SAM often have good appetite and no medical complications. In fact it has been observed that 85-90% children belong to this category and hence may not need hospitalization as per UNICEF/WHO criteria. However, they need close supervision and monitoring as one episode of an illness like diarrhoea or measles and these children may lose appetite, develop edema or medical complications. Therefore a carefully supervised domiciliary treatment may be tried for SAM babies in the community.

In our present paper we have tried 3 therapeutic foods on SAM Children. The first therapeutic food is the ARF, a meal that is prepared, cooked and served hot in the Anganwadi or VCDC or any Health facility or given to the mother as 'Take home ration' along with counselling and instructions on how to feed the baby. This food contains 420 cal per 100 gms, is coarse, large in amount to consume but is as per cultural taste. It was found that out of 150 babies, 69 (46.0 %) recovered at the end of 8 weeks. The second food is L-RUTF which is prepared and ground in Anganwadi using same ingredients as RUTF & gives 513 cal per 100 gms. It is

calorie dense but coarse & voluminous food. It was found that out of 150 babies who were given L-RUTF 70 (46.7 %) recovered at the end of 8 weeks.

The third food is centrally prepared RUTF (Compact, India) which is fine, pasty with particle density around 200 microns & gives 550 cal per 100 gms. Being available in sachets, it was found easy to administer, store and was palatable. Out of 150 children on C - RUTF 83 (55.3 %) recovered at

**Table 3.**  
**Program outcomes among children**

	ARF		L-RUTF		C-RUTF		All		P value
	n	%	n	%	n	%	n	%	
<b>At Exit</b>									
Recovered	69	46	70	46.7	83	55.3	222	49.3	0.03
(MUAC $\geq$ 125 / WHZ $\geq$ -2) <sup>1</sup>									
Non recovered	81	54	80	53.3	67	44.7	228	50.7	
(MUAC < 125 / WHZ < -2) <sup>2</sup>									
Total	150	100	150	100	150	100	450	100	

1 MUAC  $\geq$  125 mm for children admitted on the basis of MUAC < 115 mm; WHZ  $\geq$  -2 for children admitted on the basis of WHZ < -3

2 MUAC < 125 mm for children admitted on the basis of MUAC < 115 mm; WHZ < -2 for children admitted on the basis of WHZ < -3

Recovery rates were 55.3% in C-RUTF group, 46% in ARF group and 46.7% in L-RUTF group. The difference is statistically significant

the end of 8 weeks. This difference in the three groups is statistically significant ( $P < 0.05$ ).

This is probably the first study which clearly demonstrates the superiority of C-RUTF over locally prepared RUTF (L-RUTF) and also hot cooked ARF. It is particularly effective in SAM children between 1 and 3 years compared to another study of ours wherein recovery rates were 40%, 31.3% & 26.3% in C-RUTF, L-RUTF & ARF groups respectively in children between 6 months to 5 years.

It is reasonable to imagine that infants between 6 months to 1 year found these feeds difficult to eat & hence recovery rates were not as good.

Average wt. gain per day was also the highest in C-RUTF group  $3.54 \pm 2.36$ g/kg/day as compared to L-RUTF  $2.61 \pm 2.12$ g/kg/day & ARF  $2.60 \pm 1.50$  g/kg/day.

The reasons for C-RUTF giving better results compared to the other two could be multifold. Firstly it is finely pasted food & thus may be easily digestible and absorbable through the thin atrophic gut lining of SAM babies due to environmental enteric enteropathy. It is calorie dense and therefore small amount is required to eat for a baby with small stomach capacity. L-RUTF has bigger particle size, larger volume hence may be difficult to be absorbed by the gut and difficult to consume due to small stomach capacity. ARF though palpable is again voluminous & not so calorie dense. In addition storage, transport and ease of administration was found to be the best with C-RUTF that was available in sachets. Chances of contamination are also nonexistent in C-RUTF but significant in the other two foods.

There are a few studies in India which have compared commercial RUTF with hot cooked meals like Khichri (rice & green gram gruel) which gave good weight gain but numbers of observations were small.

When RUTF is given along with other diet as is the case in our study, the factor of taste & palatability becomes less important. Studies from Africa (Nigeria,

Congo, Malawi & Ethiopia) clearly show the benefit of commercial RUTF.

This paper therefore highlights the issues of community management of severe acute malnutrition and proves the superiority of C-RUTF over the other foods (L-RUTF & ARF) in 1 to 3 Years old SAM children from tribal blocks of Nundurbar, Maharashtra, India.

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### Data sharing

The data is property of the Govt and can be shared with anyone on request after permission from the Govt. of Maharashtra and uploaded at appropriate place.

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