RESEARCH REPORT

REHABILITATION OF CHILDREN WITH SEVERE ACUTE MALNUTRITION WITH READY-TO-USE THERAPEUTIC FOOD COMPARED TO F100 AT CLAIRWOOD, HOSPITAL, KWAZULU-NATAL

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1. INTRODUCTION

Malnutrition is a major risk factor contributing to the high burden of disease and mortality in young children (Black *et al*., 2008). In South Africa 3.6% of children are severely malnourished with a WHZ below the -3SD (UNICEF, 2007).

The Health Systems Trust 2011 Report on severe malnutrition incidences by districts showed that KwaZulu-Natal (KZN) had the highest SAM rates. This report also indicated that eThekwini district had 6.9 per 1000 incidences which exceeded both the national (4.8 per 1000) and metro averages for 2010/2011 (Health Systems Trust: district health barometer, 2011).

In 2007 the WHO, the World Food Programme, the United Nations Systems Standing Committee on Nutrition and the United Nations Children's Fund (UNICEF) issued a joint statement introducing Ready-to-Use Therapeutic Food (RUTF) for the treatment of SAM in uncomplicated cases and at community level (WHO, 2007). RUTF is similar to F100 in nutrient composition, but has a low water activity that inhibits microbial growth (Briend, 2001). Results from studies in other parts of Africa suggests that RUTF may be a more optimal choice than F100 in promoting weight gain in a supervised setting. (Diop *et al*., 2003; Ciliberto *et al*., 2005). RUTFs are accessible to all health facilities in South Africa, on the RT9 government contract. However, in South Africa no studies were available on the recovery rate of children with SAM treated with RUTFs.

2. AIM

The aim of this study was to compare the recovery of clinically stable severe acute malnourished children, between the age of 12 and 60 months, treated with either F100 or RUTF as main the nutrition supplement.

The objectives were to determine the rate of weight gain; timeframe to recovery; changes in height and mid-upper arm circumference (MUAC); morbidity and mortality; and retention in the programme.

3. METHODS

A randomised clinically controlled trial was conducted among clinically stable children between the age of 12 and 60 months referred to Clairwood hospital for malnutrition rehabilitation between August 2012 and September 2013. A total of 35 participants were included in the study. Children with WHZ z-score <-3SD, who were clinically stable, and who ate well (good appetite) were included in this study. Children with WHZ z-score above -3SD, poor appetite, poor response to stimuli and had oedema were excluded from this study.

Parents or legal guardians of all children who qualified according to the inclusion criteria were approached for informed consent and invited to allow the children to participate.

Children were stratified according to age and gender and subsequently randomly assigned with randomisation tables to either the RUTF or F100 group.

Ethical approval for the study was obtained from the Research Ethics Committee (REC) – Human, Nelson Mandela Metropolitan University (**H12-RTI-HIV-005**). Approval for the research at Clairwood hospital was obtained from the Chief Executive Officer (CEO) of Clairwood hospital, and the Department of Health KwaZulu-Natal Research Committee (Addendum A). Informed consent was obtained from the participants' legal guardian in the mother language before commencement of the study.

The supplements provided in this study were used as part of management of SAM at Clairwood hospital prior to the research. The referring hospitals used the same treatment in the management of these children before being referred to Clairwood hospital for rehabilitation.

The monitoring sheet was developed by the researcher and tested during pilot study which revealed no problems with the monitoring sheet.

Data was collated on an Excel spreadsheet and analysed by means of the Statistica software package. Data was categorised according to the two treatment groups and compared. Frequencies and percentages were used to summarise the categorical data. Means and standard deviations were used to summarise quantitative variables. Comparison of means was done using the Mann-Whitney U test to determine statistical significance ($p<0.05$).

The original planned sample size of 60 participants was reduced to 35 as a result of the limitations delineated below. One of the limitations was feeding because children were fed by either nurses or mothers or caregivers, and that would impact on the amounts of RUTF and F100 taken by each child recorded by the nurse. There was no full observation or plate wasting done by the researcher to confirm the total amounts of RUTF or F100 eaten by each child. Children were not forced to eat RUTF or F100 and therefore children who refused to eat these supplements were given an alternative and they were not included in the study. This decreased the number of children participating in this study by 7 children.

The number of referrals from the surrounding hospitals to Clairwood hospital for nutrition rehabilitation impacted on the total number of participants. Most hospitals in Ethekwini district started managing SAM children at their hospitals. The children were managed from admission until discharge to the follow-up phase without referring to Clairwood hospital for rehabilitation.

4. FINDINGS

Of the total number of children (n=35) that participated in the study; one defaulted after two weeks and was not included in the final data analysis; 56% were male and 44% were female. The ages ranged from 12 to 60 months, with the majority (56%) of the children between 12 and 18 months. The mean age was 22.32 months (SD = 12.48), with the median age 18 months. No significant differences could be demonstrated between the groups in terms of age and gender.

A large percentage of children that participated in the study were HIV-infected, 76% in the F100 group and 70% in the RUTF group. Out of 34 children, 11.8% and 17.6% in the RUTF and F100 groups respectively, had Tuberculosis (TB). Only one child had Foetal Alcohol Syndrome (FAS). Less than 12% of children from both groups had no underlying disease.

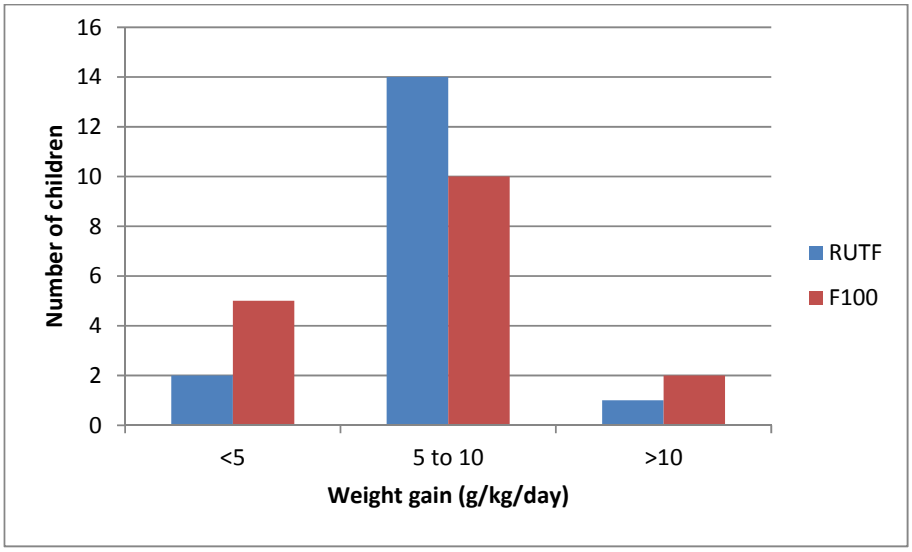
Symptoms during rehabilitation incuded fever and/or cough (2 children in the RUTF group and 4 children in the F100 group), diarrhoea (one from the RUTF group and one from the RUTF group) and vomiting (4 children in the RUTF group and 4 children in the F100 group).

From the 34 children that participated in the study, only one child died as a result of diarrhoea and HIV complications. The child was in the F100 group. The child was noted and excluded from the final data analysis.

Rate of weight gain

For the purpose of the study poor growth velocity referred to < 5g/kg/day; moderate growth referred to 5 to 10g/kg/day and good growth referred to > 10g/kg/day (Ashworth *et al*, 2003). The mean growth velocity was 7.77 g/kg/day (SD=2.72) in the RUTF group and 6.11 g/kg/day (SD = 4.87) in the F100 group. There was no significant difference between groups (p =0.46). Both groups therefore experienced moderate growth velocity. Both supplements had similar results in terms of growh velocity.

Table 1 Weight gain distribution between groups



*poor (<5 g/kg/d); moderate (5-10 g/kg/d); good (>10 g/kg/d)

Time-frame to recovery

Recovery as outcome measure for the purpose of this study referred to a WHZ score ≥-1.

47% of children in the RUTF group recovered within 3 weeks (21 days), while only 23.5% of children in the F100 group recovered within 3 weeks (Table 2; Figure 2). Only 11.8% never reached the target weight in the RUTF compared to 35.3% in the F100 group. A total of 88.2% of children recovered in the RUTF group after the 6 week intervention period and 64.7% in the F100 group (Table 3).

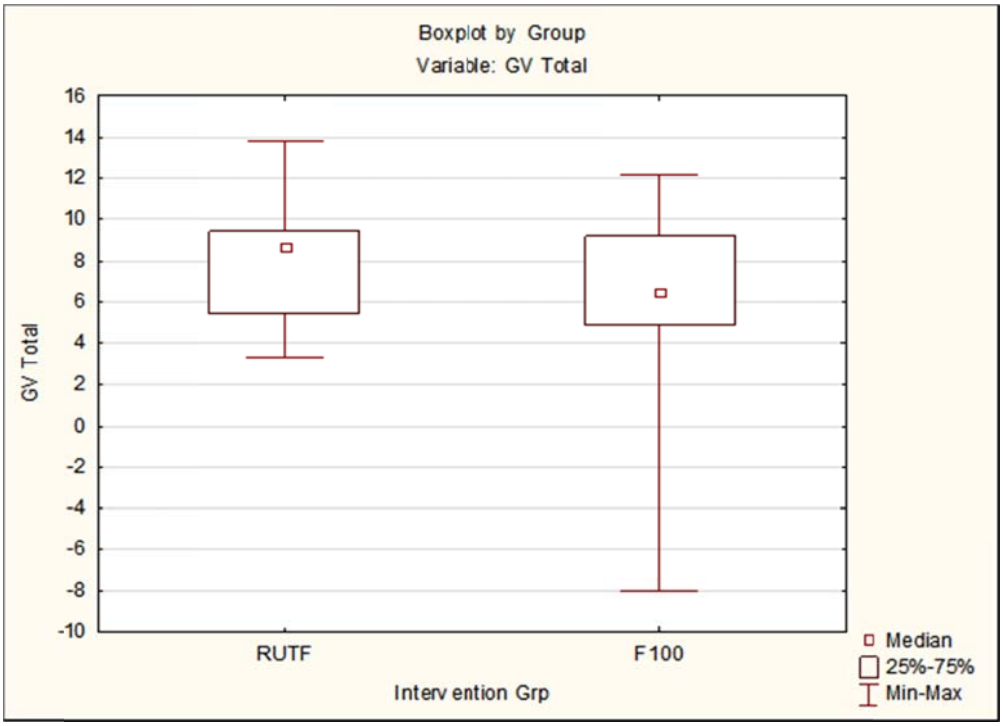


Figure 1 Growth velocity between groups

Table 2 Recovery rates (reached WHZ >-1) between RUTF and F100 group

WHZ ≥ -1	**RUTF**		**F100**	
	n	**%**	**n**	**%**
Week2	1	5.8	1	5.8
Week3	7	41.2	3	17.7
Week4	4	23.5	3	17.7
week6	3	17.7	4	23.5
Never recovered to target weight	2	11.8	6	35.3
Total	17	100	17	100

Table 3 Overall recovery in the RUTF group and F100 group

WHZ ≥ -1	RUTF n	RUTF %	F100 n	F100 %
Reached target weight	15	88.2	11	64.7
Never reached target weight	2	11.8	6	35.3
Total	17	100	17	100

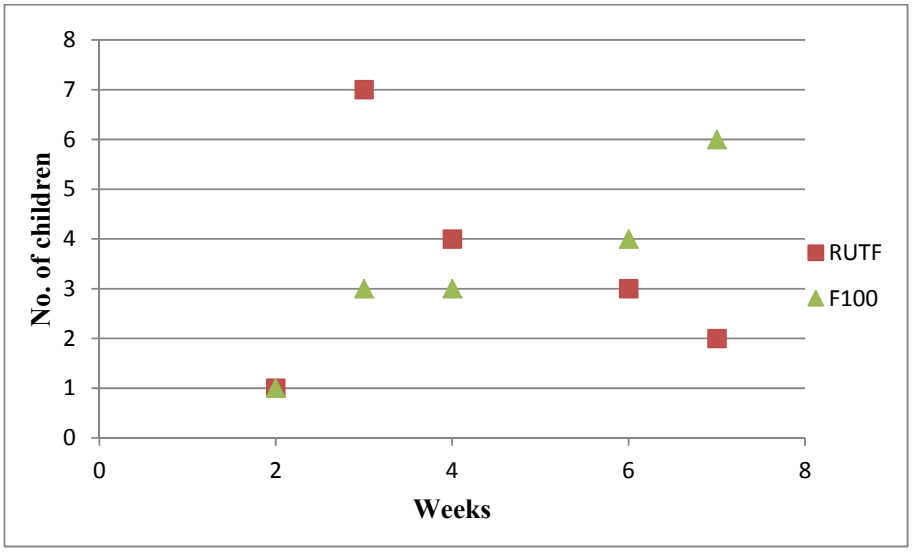


Figure 2 Time to reach WHZ score ≥-1

Other anthropometry

Out of the 34 children participating in the study, no changes in height were observed within both the RUTF and F100 groups in the six week period.

A total 31 children had the MUAC of >11.5 cm after 6 weeks of rehabilitation with RUTF and F100. Only 1 child from the RUTF group and only 2 children from the F100 group did not reach the MUAC of >11.5cm after 6 weeks of intervention. Further statistical analysis will be performed by the researchers.

5. SUMMARY

Although Dramowski *et al*. (2011) reported a high prevalence of HIV-infected children admitted to Chris Baragwanath Hospital's general paediatric wards between 1 October 2007 and December 2007 with 29.5% of admissions were HIV infected, HIV prevalence in Clairwood hospital among SAM cases in this study were much higher, corresponding to the high HIV-prevalence of 40% in KZN (UNGASS, 2012).

The only death in this study was due to HIV complications and diarrhoea. HIV/AIDS and diarrhoeal infections have been associated with an increased risk of mortality in children with SAM receiving treatment in inpatient units (Heikens *et al*., 2008). As most of the children, apart from one recovered from SAM, and clinical symptoms were controlled, this study strongly suggests that it is possible to control morbidity and mortality in a clinically controlled environment in clinically stable children with SAM.

In this study the results suggest that RUTF promotes weight gain that is at least as good as F100 during rehabilitation phase of the management of SAM. A mean weight gain velocity of 7.7 g/kg/day was observed in the RUTF group with 6.11 g/kg/day in the RUTF group. A review by Teferi *et al*. (2010) on treatment outcomes of children with SAM admitted to therapeutic feeding centres in Southern Region of Ethiopia showed an average rate of weight gain of 8-12 g/kg/day in children with SAM treated with F100. Results from the study at Clairwood Hospital indicated that an acceptable weight gain of more than 5 g/kg/day was achieved on both supplements.

However, this study has shown that children on RUTF were able to achieve higher rates of recovery than children on F100 during the 6 week period of rehabilitation. Recovery was achieved in the third week of intervention with RUTF in almost half of the sample which compared to WHO standards where children with SAM that are fed with high-energy foods should be able to reach their target weight for discharge after 2-4 weeks (WHO, 1999).

The duration of hospital stay at Clairwood hospital for children with SAM is about 8 weeks or longer, and prolonged hospital can be costly. The results of this study suggest that children with SAM may be fully rehabilitated within three weeks of using RUTF, and this will result in a shorter hospital stay and associated cost savings. The cost per patient per day at Clairwood hospital was R965.50 in the second quarter of 2013.

If the hospital stay can be reduced by two weeks and a total cost saving of more than R 13 000 per patient can be achieved.

In conclusion, RUTF resulted in higher rates of recovery and can be used efficiently in rehabilitating children with SAM in a supervised facility setting. RUTF is energy dense, convenient and safe to use, and it does not require preparation, unlike F100. The shortened in-patient stay will benefit the hospital by reducing costs in rehabilitating SAM children. A follow-up study should be done with a larger sample, in order to establish if there is any further significant differences between groups.

6. RECOMMENDATIONS

Based on the findings, the researcher recommends that RUTF can be used in rehabilitating children with SAM, if acceptable to the children. Children will be able to achieve weight gain that is at least as good as with F100 but results suggest that a faster recovery may be possible.

The provision of F100 should be maintained for those children who do not prefer RUTF despite the latter's advantages.

One of the limitations of study was that the researcher was unable to reach the anticipated number of participants due to the fact that there were children who refused to eat either RUTF or F100 and lower intake of children with SAM due to surrounding hospitals altering their treatment protocols.

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ADDENDUM A

health
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Reference : **HRKM113/12**
Enquiries : **Mrs G Khumalo**
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16 August 2012

Dear Ms A Y Nomvete

Subject: Approval of a Research Proposal

1. The research proposal titled **'Rehabilitation of children with severe acute malnutrition with ready-to-use therapeutic food compared to F100 at Clairwood Hospital, KwaZulu-Natal' was** reviewed by the KwaZulu-Natal Department of Health.

   The proposal is hereby approved for research to be undertaken at **Clairwood Hospital.**

2. You are requested to take note of the following:
   a. Make the necessary arrangement with the identified facility before commencing with your research project.
   b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.

3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mrs G Khumalo.

Yours Sincerely

Dr S.M. Zungu
HOD: KZN Department of Health

Date: 19/8/2012