

# The Effectiveness of Locally-Prepared, Home-Made Food in the Outpatient Management of Children with Moderate, Severe and Acute Malnutrition

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## **ABSTRACT:**

### **BACKGROUND:**

Severe acute malnutrition (SAM) affects nearly 20 million preschool-age children. Malnutrition is a risk factor in approximately one third of deaths in children who are under 5 years of age worldwide. Outpatient treatment of uncomplicated (SAM) is increasingly provided, using ready-to-use therapeutic foods (RUTF) & home-based management with locally homemade food.

### **OBJECTIVE:**

To evaluate the effectiveness of Iraqi locally-prepared, home-made food in outpatient management of moderate and SAM in children aged 6-59mo, and to assess foods complying with specific nutritional compositions of standard ready-to-use therapeutic foods (RUTF), recommended by WHO.

### **PATIENTS AND METHODS:**

This is a Hospital-based cross sectional study was conducted at Fatema Al-Zahraa Hospital for Maternity and Children in Baghdad from 1<sup>st</sup> Jan 2018 to 31<sup>st</sup> Dec 2018 in an attempt to assess the use of locally-prepared, home-made food prepared high energy-dense food in outpatient management of moderate acute malnutrition (MAM) and SAM in form of four recipes which were designed in nutrition research institute, MOH. This is done by following the weight and length or height of (76) patients with MAM or SAM every two weeks depending on WHO growth standards; Weight-for-Length (W/L) or weight-for-height (W/H) Reference Card.

### **RESULTS:**

The total number of patients who completed the study were 76; 31 (41%) males and 45 (59%) females. The most common age group was 6 -12 months 51 (67.1% ) with a relatively MAM predominance 43(56.6%) patients, over SAM 33(43.4%) patients. The recovery rate was 66 patients (86.8%) while 10 patients (13.6%) were referred to inpatient treatment. The wt. gain was > 5 g/kg/d in 34 (51.5%) patients and <5 g/kg/d in 32 (48.5%) patients with mean (5.2±1.37) which is consistent with WHO recommendations. The mean duration of treatment was (5.93 ± 2.63) weeks.

### **CONCLUSION:**

A locally homemade prepared food is highly relevant and it is good alternative and might be used as substituent for imported RUTF in outpatient management of acute malnutrition.

**KEYWORDS:** Severe acute malnutrition, ready to use therapeutic food, locally homemade prepared food.

## **INTRODUCTION:**

Childhood undernutrition is a major global health problem, contributing to childhood morbidity, mortality, impaired intellectual development, suboptimal adult work capacity, and increased risk of diseases in adulthood<sup>1</sup>. Severe acute malnutrition affects nearly 20 million preschool-age children, mostly from the World Health Organization (WHO) African Region and South-East Asia Region.

Malnutrition is a significant factor in approximately one third of the nearly 8 million deaths in children who are under 5 years of age worldwide<sup>2</sup>.

SAM is defined as weight-for-height/ or length < -3 Z-score of the median of the WHO growth standards, or clinical signs of bilateral edema of nutritional origin; while MAM is defined as weight-for-height/ or length <-2 to >-3 SD)<sup>3</sup>.

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In Iraq, the percentage of moderately or severely underweight is (2.9%) in 2018<sup>4</sup> in children under 5 years, while in other Arab countries, the rate of wasting in 2018 e.g. Yemen (16.3%) Sudan (16.3%), Somalia (13.2%), Egypt (9.5%) and Syrian Arab Republic (7.2%)<sup>5</sup>.

Young children are particularly susceptible to malnutrition if complementary foods are of low nutrient density and have low bioavailability of micronutrients or if they are introduced too early or too late, or are contaminated<sup>6</sup>.

Today's community-based model represents a historic shift away from exclusive inpatient care, wherein the majority of children with SAM presenting without clinical complications and sufficient appetite benefit from outpatient care. Outpatient care, including either weekly or biweekly clinical follow-up at a health facility, was made possible in part by the development of RUTFs<sup>7</sup>.

### PATIENTS AND METHODS:

A cross-sectional study was carried out among children aged 6-59 months referred to nutritional rehabilitation ward in the hospital from 1<sup>st</sup> Jan 2018 to 31<sup>st</sup> Dec 2018.

The commonly used anthropometric indices in the study are WHO growth standards; W/L or W/H Reference Cards to identify SAM (<-3 SD) & MAM (<-2to >-3 SD). Length was measured for children < 2 y of age and height measured for children > 2 y of age according to WHO recommendations<sup>8</sup>. Weight was measured using an electronic scale. Length or height was measured using a standard wooden length board provided by UNICEF.

**Inclusion criteria:** All patients aged 6-59 months old with weight for length or weight for height WHO reference Cards, <-2 SD with no complications and a good appetite.

**Exclusion Criteria:** Children known to have chronic illness, including cardiac disease, congenital abnormalities, cerebral palsy, or cancer were excluded from the study.

The appetite test recommended by the WHO was done by asking the mother to sit quietly for as long as it takes (usually 15 minutes up to one hour) and assessing the patient according to following observations in table (1).

Table( I): appetite Test<sup>9</sup>.

Appetite	Observation	Action
Good	Child takes the RUTF eagerly	Outpatient Therapeutic Programme (OTP)
Poor	Child takes RUTF with persistent encouragement	Child may continue in (OTP) but must be observed carefully for any weight loss or clinical deterioration
Refused	Child refuses RUTF even after persistent encouragement	Transfer to inpatient care

Calculation of number of recipes to be given to the patient was done according to the body weight to provide 175 kcal/kg body weight/day as recommended by WHO and the mother was advised to be cautious to feed her child the required number and to add Combined Minerals & Vitamins (CMV) to the recipe when it is warm, not hot to get benefit of micronutrients, in addition to give multivitamin syrup, twice daily & folic acid tab (1 mg) once daily.

Four recipes of locally homemade food were created and designed in nutrition research institute\ MOH in an attempt to be more palatable than standard RUTF and to meet the need of nutritional rehabilitation wards during stock out periods of standard RUTF. The macronutrient contents of these recipes were nearly equal to that of standard RUTF,

while the micronutrient contents were supplied by adding half scope of Combined Minerals & Vitamins (CMV) to consumed recipes per day which is equal to that added to F100.

F75: is the "starter" formula used during initial management of malnutrition while F-100 is used as a "catch-up" formula to rebuild wasted tissues. F-100 contains more calories and protein than F75. CMV: was used to provide the necessary vitamins and minerals necessary for patients with acute malnutrition. **RUTF:** high energy, fortified ready-to-eat food suitable for treatment of SAM, should be soft or crushable, palatable and easy for children to eat without any preparation. At least half of the proteins contained in the product should come from milk products<sup>8</sup>.

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The constituents of these four recipes which are created and designed in nutrition research institute, MOH are as follows:

### Recipe I

Cocked Full-fat cheese	(60 gm) 4 triangle pieces	} Carbohydrates (43.2%) Fats (47%) Proteins (10.4%)	} Total calories (536) kcal Total size (125 ml)
White bread	(60 gm) Half loaf		
Jam	(60 gm) 3 spoon cup		
Oil	(20 gm) 4 spoon cup		

### Recipe II

Full-fat milk (powder)	Half cup	} Carbohydrates (45.5%) Fats (46.2%) Proteins (10.2%)	} Total calories (545) kcal Total size (295 ml)
Cooked Rice	One Cup		
Oil	(20 ml) 4 spoon cup		
Sugar or Molasses	(20 gm) 4 spoon cup		

### Recipe III

Full-fat Milk	One Cup	} Carbohydrates (44.5%) Fats (44.3%) Proteins (9.5%)	} Total calories (467) kcal Total size (235 ml)
Flour or Starch	2.5 table spoon		
Sugar	5 spoon cup		
Oil	3 spoon cup		

### Recipe IV

Egg	one	} Carbohydrates (34.8%) Fats (45.8%) Proteins (11.8%)	} Total calories (471) Total size 210 ml
Flour	(30gm) 2.5 table spoon		
Full-fat Milk (powder)	(60 gm) 1/4 Cup		
Oil	(20 ml) 4 spoon cup		
Molasses	(20 ml) 4 spoon cup		

The follow-up was done every two weeks, weight. and height. or length were measured then compare with previous reading & calculate the Wt. gain according to the following equation:

$$W2 - W1 = \text{----- kg} \quad \text{----- kg} \times 1000 = \text{grams gained}$$

$$\text{Weight gain in grams} \div W1 = \text{g/kg/2wk} \div (14) = \text{g/kg/day}$$

A response is determined according to WHO guideline:

- Good weight gain: 10 g/kg/day or more.
- Moderate weight gain: 5 up to 10 g/kg/day
- Poor weight gain: Less than 5 g/kg/day<sup>8</sup>

Recovery was considered when the patient reached a target wt. (-1 SD) W/L or W/H, WHO reference Cards.

Analysis of data was done by SPSS. Independent sample t test was used to measure the means difference. Ethics approval was received from Ministry of Health (MOH), & nutrition research institute. Consent was obtained from all the caregivers or parents of the participating children before recruitment into the study.

### RESULTS:

The total No. of malnourished patients who were examined were 91, however, 15 patients were lost to follow-up and were excluded from the analysis, so the patients who completed the study were 76; 31 (40.8%) males and 45 (59.2%) females. A relatively higher percentage of studied patients were moderately malnourished 43 (56.6%), while 33 (43.4%) were diagnosed with SAM.

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The highest percentage of patients were the age group 6 -12 months 51 (67.1%) patients. Bottle feeding was mostly observed in 46 patients (60.5%) vs. breast feeding 12 patients (15.8%). Start of complementary Feeding was mostly after the age of 6 months in 70 patients (92.1%). Ranking of patient among other family members was 3<sup>rd</sup> or 4<sup>th</sup> in 44 (57.9%). Previous admissions to hospital were twice or three times in 48 (63.2%) patients, the cause of admission was mostly acute gastroenteritis in 54 patients (71.1%), SAM in 13 (17.1%) and bronchopneumonia in 9 (11.8%) as shown in (Table II).

Regarding mothers' criteria and housing, most of patients were mostly cared by mother in 60 patients (78.9%), more than 25 years old in 39 mothers (51.3%), mostly illiterate and primary school graduation 61(80.3%) and the majority as housewives 73 (96.1%) .The monthly income in most families was < 500000 IQ Dinars in 59 (77.6%). Drinking-water source was filtered water in the majority of families 63(82.9%). Regarding the state of housing, the majority of families 56 (73.7%) owned their homes but with less than 3 rooms per house in 65 (85.5%) and sharing with other families in 63(82.9%) as shown in (Table II) .The most distinct area of distribution was Al-Saader City 57 (62.6%).

**Table II. The distribution of study group according to some socio- demographic characteristics**

Variable	Frequency	Percent (%)
Gender	Male	40.8
	Female	59.2
Age in months	6 – <12 months	67.1
	12 – <24 months	18.4
	> 24	14.5
Mother's age in years	< 25	48.7
	≥ 25	51.3
Mother's educational level	Illiterate, Primary school	80.3
	Secondary school	14.5
	University or higher	5.3
Father's educational level	Illiterate, Primary school	65.8
	Secondary	30.3
	University or higher	3.9
Monthly salary in IQD	< 500000	77.6
	≥ 500000	22.4
Baby's rank	1 <sup>st</sup> or 2 <sup>nd</sup>	17.1
	3 <sup>rd</sup> or 4 <sup>th</sup>	57.9
	5 <sup>th</sup> or more	25
Drinking water source	Tab	1.3
	Filter	82.9
	Mineral	15.8
House owning	Owned	73.7
	Rent	26.3
Housing status	Shared with others	82.9
	Separated	17.1
Rooms per house	< 3	85.5
	≥ 3	14.5

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**Table (III) Feeding and nutritional state of studied patients**

Feeding	Breast feeding	12	15.8
	Bottle feeding	46	60.5
	Mixed	5	6.6
	Weaned	13	17.1
Start of Feeding	< 6 months	6	7.9
	≥ 6 months	70	92.1
Severity of malnutrition	MAM	43	56.6
	SAM	33	43.4
Care by	Mother	60	78.9
	No mother	15	9.7
Previous admission	1	13	17.1
	2 or 3	48	63.2
	4	5	6.6
Cause of admission	A.G.E* <sup>1</sup>	54	71.1
	SAM	13	17.1
	BN* <sup>2</sup>	9	11.8

\*<sup>1</sup> A.G.E acute gastroenteritis

\*<sup>2</sup> BN bronchopneumonia

Table (IV) shows the relation between mean wt. gain and different variables of the study.

**Table IV. The distribution of study group according to weight gain and some socio-demographic factors**

Variable		Mean ± SD	P value
Gender	Male	5.30 ± 1.33	0.538 <sup>(NS)</sup>
	Female	5.09 ± 1.43	
Maternal education	Mother	5.03±0.08	0.02 <sup>(S)</sup>
Monthly salary in IQD	< 500000	5.17 ± 1.39	0.03 <sup>(S)</sup>
	≥ 500000	5.29 ± 1.33	
House owning	Owned	5.17 ± 1.52	0.758 <sup>(NS)</sup>
	Rent	5.28 ± 0.88	
Housing status	Shared with others	5.22 ± 1.56	0.02 <sup>(S)</sup>
	Separated	5.14 ± 0.65	
Rooms per house	< 3	5.05 ± 1.04	<0.02 <sup>(S)</sup>
	≥ 3	5.36 ± 1.75	

(S) significant.

(NS) not significant.

Independent sample t test used to measure the means difference.

The recovery rate was (86.8%) 66 patients, while (13.6%) 10 patients were referred to inpatient management Due to weight gain failure or the development of complications e.g., acute gastro- enteritis and bronchopneumonia. The mean wt. & length or height of patients on admission was (6.74±1.8),(72.05±9.3) respectively .

The mean target wt. was (7.88±1.85).The wt. gain was > 5 g/kg/d in 34(51.5%) patients and <5 g/kg/d in 32(48.5%) patients with mean (5.2+1.37) which is consistent with WHO recommendations as shown in Table (V).The mean duration of treatment was (5.93±2.63) weeks.

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Table V: (Patients' sequels at the end of study)

Outcome	No. and %	Wt. gain
Recovery	66 (86.8%)	<5 g/kg/d 32(48.5%)
		> 5 g/kg/d 34(51.5%)
Inpatient management	10 (13.6%)	

### DISCUSSION:

The use of RUTF is greatly increasing in Asia, where the lower acceptability of peanuts has led some experts to advocate for non-peanut products on acceptability grounds (Nnakwe N<sup>10</sup>, Weber JM et al<sup>11</sup>, Dube B et al<sup>12</sup>). Assessment of efficacy and effectiveness of locally made RUTFs, using commercially produced RUTFs as the comparison is recommended by the (WHO)<sup>6</sup>.

The results revealed a relatively higher rates of MAM (56.6%) as compared to the malnutrition reported in Al-Basra province by Fahed F.S et al study<sup>13</sup> with SAM being the most frequently recorded diagnosis at a rate of (72.4%). Abdulla study<sup>14</sup> in Baghdad shows 5.28% of children were below -2SD. Mahmood study<sup>15</sup> revealed that the prevalence of underweight was only (26.3 %) also Sand et al study<sup>16</sup> showed that SAM(47.6%) was more than MAM (31.4%).

There was higher rate of bottle feeding (60.5%) vs. breastfeeding (15.8%). The drinking water source in most families (82.9%) was filtered water. This is in contrast to Sanne et al study<sup>17</sup> (47.1%) and Oakley et al study<sup>18</sup> (58%). This fact reflects improper way of sterilization, furthermore unhealthy way of filtration & storage of water, leading to the conclusion that poor breastfeeding may be associated with malnutrition.

There was a significant statistical relation between malnutrition, and low parental education especially of the mother in the study; illiteracy & primary school graduation of mother was 80.03% (p value =0.02). The same conclusion was reached by Abdulla study<sup>14</sup>; father (64.3%), mother (79.7%) and Sand et al<sup>16</sup> (81.9%). Our finding of the household income (monthly salary in IQD < 500000 in (77.6%), with p value (0.03) which is considered relatively low income was associated significantly with malnutrition among children, is also in line with other studies; Abdulla<sup>14</sup> Sand et al<sup>16</sup>, Fuch<sup>19</sup> which revealed more obvious malnutrition in families where monthly household income was low.

Overcrowding and malnutrition also showed a statistically significant association. Most families still sharing with others in same house in (82.9%) with (p value = 0.02) and < 3 rooms per house in (85.5%) with p value =0.02). Moreover, 44 patients (57.9%) have 3<sup>rd</sup> or 4<sup>th</sup> ranking in their families; and, this was consistent with Abdulla et al study<sup>14</sup>.

The higher percentage of patients 30 (45.5%) spent 5-8 weeks until they reached the target wt. This is inconsistent with WHO manual of management of SAM<sup>8</sup> which suggests a six-week period to catch up growth. The same conclusion was reached in the study by Sanne et al<sup>17</sup> (56 days) but longer duration of treatment in Nita et al study<sup>20</sup> (7.12 weeks) and Oakley et al<sup>18</sup> (8 weeks).

The recovery rate in our study was (86.8%), this was consistent with Bahwere P. et al<sup>21</sup> (78.5%), and Oakley et al<sup>18</sup> (81%) in contrast to Nita et al<sup>20</sup> (42.8%) study.

We have no imported RUTF in our hospital to be used as a comparison, so we depend on the fact that an average increase in body weight of 4 g/kg/day was the minimum desired gain based on WHO recommendations<sup>22</sup>. The estimated weight gain in the study was 5.2 ±1.37 SD g/kg/d; this is interpreted as moderate response according to WHO recommendations. This is in agreement with Bahwere P. et al<sup>21</sup> (6.3 ± 4.1 g/kg/day), and ~4-5 g/kg/day in James P.T et al<sup>23</sup>, and Harris S et al<sup>24</sup> study. In contrast to Sanne et al,<sup>17</sup> Oakley et al<sup>18</sup>, and Nita B. et al<sup>20</sup> studies in which the weight gain was < 4 g/kg/day. Some studies show mean weight gain ~9.5 g/kg/day for in home-based treatment Burza et al<sup>25</sup> and Thurkur G. et al study<sup>26</sup>

Despite the fact that mothers were strongly encouraged to come for follow-up visits, patients were lost to follow up were 15 (16.5%) and were excluded from the study. This drop-out rate is considered high in comparison to Oakley et al study<sup>18</sup> (3%), the reasons behind this may be that the mothers were not always able to get

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permission from their husbands to leave home, or they lacked understanding of that their child suffered from acute malnutrition and its consequences.

### CONCLUSION:

A locally homemade prepared food is highly relevant and it is good alternative and might be used as substituent for imported RUTF in outpatient management of acute malnutrition.

### RECOMMENDATIONS

Awareness about malnutrition should be promoted among pediatricians and medical staff in health centers and hospitals as this issue is neglected.

Further researches are needed for evaluation as the sample size was small and our results are in need to compare with imported RUTF as soon as it becomes available.

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