HOSPITAL MANAGEMENT OF PROTEIN ENERGY MALNUTRITION, SUDAN EXPERIENCE

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ABSTRACT

Objectives: To describe the protocol of management of severe protein energy malnutrition (PEM) and the treatment outcome of inpatient children using Gezira Formula and to compare it with the similar WHO protocol for the same purpose.

Methods: All children less than five years of age admitted to Academy Charity Teaching Hospital (ACTH) with protein energy malnutrition were included in dietary management using Gezira Formula. Initial management with half strength formula was initiated until signs of improvement occur and thereafter maintained in full strength formula until recovery. The constituents of the two formulae were compared to WHO formula F75 & F100 as well as the outcome of treatment.

Results: The total number of children studied was 396, representing 6.1% of the total number of children admitted to ACTH during the study period. The peak range of age at presentation was 6-24 months. Seven percent of children had marasmic-kwashiorkor, 13% had kwashiorkor, 48% had marasmus and 32% were under weight. The outcome of treatment was 72.5% improved, 10.4% died and 17.2% escaped from the ward before criteria for discharge was fulfilled. The management outcome was comparable with international standards suggested by WHO. Conclusion: Gezira Formula is comparable to WHO formula for inpatient treatment of PEM, it is simple, cheap, easily understood by hospital staff and ingredients are available.

Keywords: PEM, Gezira formula, WHO F75, WHO F100, orphans

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ملخص:

مرض سوء التغذية من الأمراض الشائعة في السودان حيث بلغت نسبة الدخول للمستشفي 6.1 %.

إقترحت هيئة الصحة العالمية بروتوكولاً علاجياً لهذا المرض بغرض إنقاص نسبة الوفيات .

أجريت هذه الدراسة في 396 طفلاً دون الخامسة من العمر في أحد المستشفيات في الخرطوم مستعملة صيغة بروتوكول الجزيرة لعلاج أمراض سوء التغذية.

قارنت الدراسة بين نسبة الوفاه ،نسبة الشفاء ،مدة المعالجة ومعدل زيادة الوزن اليومي في كل من صيغة الجزيرة العلاجية و المعيار العالمي لهيئة الصحة العالمية لمعالجة أمراض سوء التغذية كما قارنت الدراسة أيضاً بين مكونات الصيغتين .

أشارت الدراسة أن 72.5% من الأطفال تم شفاؤهم بصيغة الجزيرة ووفاة 10.5% وهروب 17.2% من العلاج لظروف عائلاتهم.

أشارت الدراسة أيضاً أن نتائج المعالجة بوصفة الجزيرة تشابه ما قررته هيئة الصحة العالمية والمعايير العالمية لمعالجة أمراض سوء التغذية ووصفة الجزيرة بسيطة و سهلة وقليلة التكلفة و مكوناتها متوفره محلياً.

INTRODUCTION

About 11 million children aged 0-4 die worldwide every year and 99% are in the developing world. Protein Energy Malnutrition (PEM) is associated with more than 60% of these deaths [1]. Poor hospital care of severely malnourished children contributes to case fatality rates as high as 50% [2, 3]. Different hospitals in Sudan use different guidelines for management of severe malnutrition. WHO has developed guidelines to improve the quality of hospital care for malnourished children. [4-5] Implementation of these guidelines is one of the goals of the WHO strategy of Integrated Management of Childhood Illnesses (IMCI).

Joint research in PEM between the departments of Paediatrics in Gezira University, Sudan, and D sseldorf University [6, 7, and 8] resulted in introduction of a dietary formula for management of inpatient cases of severe PEM, which was subsequently called Gezira Formula ([6]).

The Nutrition unit in the Paediatric Department of the Faculty of Medicine, Academy of Medical Science & Technology, Khartoum, Sudan is implementing the above formula for inpatient treatment of severely malnourished children since May, 2000.

The objective is to describe the protocol of management and the outcome of treatment using Gezira Formula and to compare it to WHO protocol of management for inpatient treatment of children with severe malnutrition ([2, 9]).

MATERIAL & METHODS

The study was conducted in the Academy Charity Teaching Hospital (ACTH) in Khartoum. The study period was from May 2000 to March 2005. The study population was under five children with PEM living in suburb areas of Khartoum.

Criteria for admission were:

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1. All children with oedematous malnutrition by welcome classification.
2. Non-edematous malnourished children.
3. Age under 5 years. Exclusion criteria:

1. Children more than 5 years
2. Children with:

- Advanced heart disease
- Severe congenital abnormalities
- Renal or other organ failure

All children were managed in PEM ward and milk formula was prepared in a separate milk kitchen attached to PEM ward.

On admission, detailed history and physical examination were recorded. Anthropometric measurements chosen were weight & height for age, weight for height and mid-upper-arm circumference (MUAC). Oedema degree was recorded, investigations were started and follow up was registered in a monitoring sheet Fig. (1)

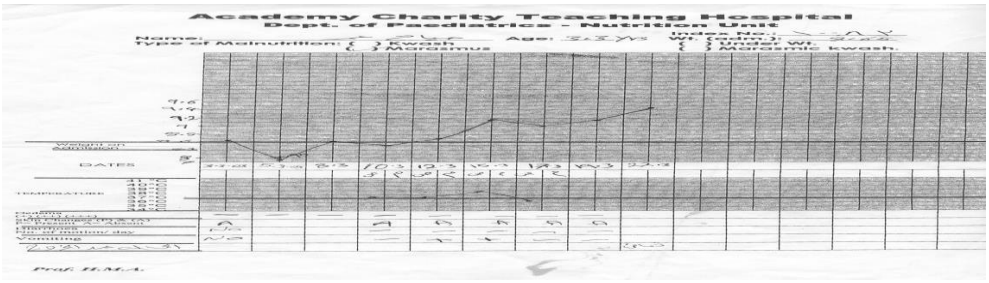

Fig. (1): Monitoring sheet in use in PEM ward

International Guidelines for Infant Formula Preparation were implemented [8]. Two full-time Nutrition Guiders were responsible for formula preparation and distribution. The formula was distributed twice per day at 7 - 8 am and 3 - 4 pm. six feeds per day were distributed. Nasogastric tube was used for feeding. The daily amount of formula needed was prescribed in the treatment sheet of each patient. The mean weight between actual and expected weight was used for calculation of the daily amount of the formula needed. The formula was prepared in two concentrations: Initial formula equivalent to WHO formula (F75) [9], and maintenance formula equivalent to WHO formula (F100). The initial formula consisted of:

50 g of skimmed milk.
45 g of vegetable oil (sesame oil).
40 g of sugar (sucrose).
Make up to 1000 ml by boiled water.

This initial formula provides:

70 Cal /100 mls
1.1g protein/100 mls
The dose used was 100 ml/kg/day

To every patient 4mmol/kg/day potassium chloride and 0.5 mmol/kg/day magnesium chloride were added. .

The initial formula was used until signs of improvement occured. This meant loss of weight in edematous PEM or improvement in temperament and/or weight gain in non-edematous PEM.

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This phase was called the initial phase. If the child was not showing the above signs of improvement, he was shifted to maintenance formula within 7 days from the start of therapy whether he showed improvement or not.

All children were given oral Amoxicillin 15 mg / k / dose 8 hourly by nasogastric tube. All children were given Metronidazole 15 mg /k eight hourly in the first day and half this dose for further 4 days.

Children were kept warm by blankets until they showed marked improvement in weight. Dehydration was treated by Resomal solution, which was prepared from universal ORS being dissolved in two liters of water. Twenty mmol of Potassium chloride (Kcl) and 50 grams of glucose were added.

All children were given two doses of Vitamin A 50000 units for children < 6 months, 100000 units for children up to two years old and 200000 units for children more than two years based on a previous experience [8]. All children were given one daily dose of multivitamin syrup. Children were then monitored in a special sheet (see figure 1) by temperature, degree of oedema, number of diarrhea motions, presence or absence of vomiting, presence of exophthalmia and weight every other day. Improved children during the first week of management were shifted to maintenance formula, which is equivalent to WHO, F100 maintenance formula. The maintenance Formula consisted of:

90 g of skimmed milk.
80 g of vegetable oil (sesame oil).
60 g of sugar (sucrose).
Make up to 1000 ml by boiled water.

It Provides:

130 Cal/100mls
3.1 g protein/100 mls

The dose used was 100 ml/kg/day.

Potassium & Magnesium were added as in the initial formula.

Table (1) Ingredients of WHO and Gezira Formulae

Source	WHO	Gezira	WHO	Gezira
Formula Name	F 75 75Cal/1oo 0.9G Protein	Initial Formula	F 100 Formula 100Cal/100ml 3.5G protein	Maintenance Formula 130 Cal/100ml 3G protein
Ingredient	Grams	Grams	Grams	Grams
Dried skimmed milk	25G	50 G	80G	90G

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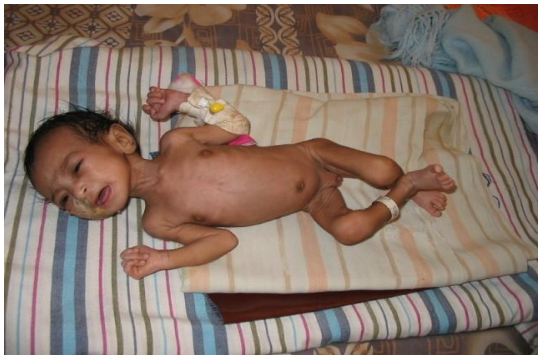
Sugar	70G	40G	50G	80G
Cereal flour	35G	-	-	-
Vegetable oil	27G	45	60G	60G
Mineral Mix	20ml	K4mmol /Kg Mg 0.5mmol/Kg	20 ml	K4mmol/Kg Mg 0.5mmol/Kg
Vitamin mix Water to	140ml 1000	Multivitamin. Syrup	140ml 1000	Multivitamin . Syrup

RESULTS

The number of children studied was 396, representing 6.1% of the total number of children admitted to the paediatric wards of the ACTH hospital during the study period. Males were 56% and females were 44%.

Eighty five percent of children were between 6 24 months of age (Fig5). Twenty five percent of these children were under 6 months of age as the ACTH hospital is extending service to Mygoma Orphanage Centre in Khartoum (see figs. 3 &4). The specific type Of pem on admission is shown in table2.



Figs 3

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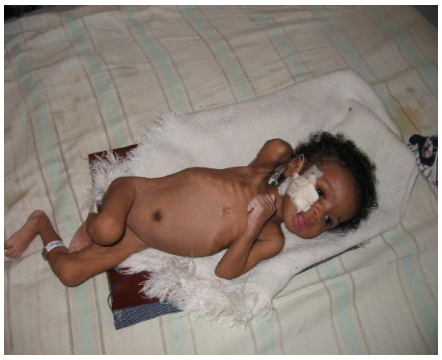

Figs 4

Figs 3 and 4: babies 3 and 4 months old respectively from Mygoma Orphanage

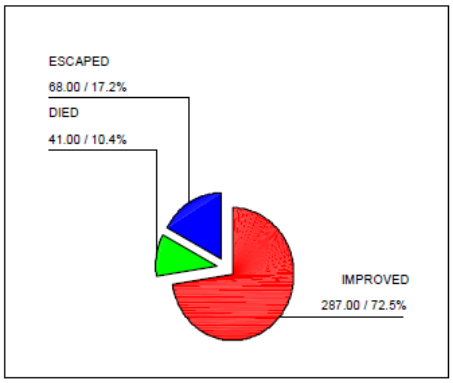

Fig (6) shows the outcome of treatment,

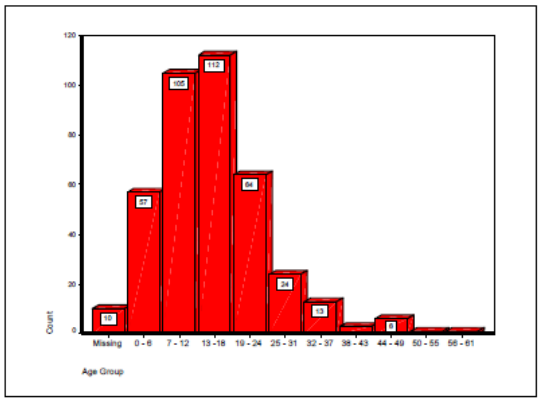

Fig (5) Shows age groups at presentation

Table 2: Distribution of cases by type of PEM at diagnosis

Type of PEM on admission	No	%
Marasmic-kwaskiokor	29	7
Kwashiorkor	47	13
Marasmus	187	48
Underweight	127	32

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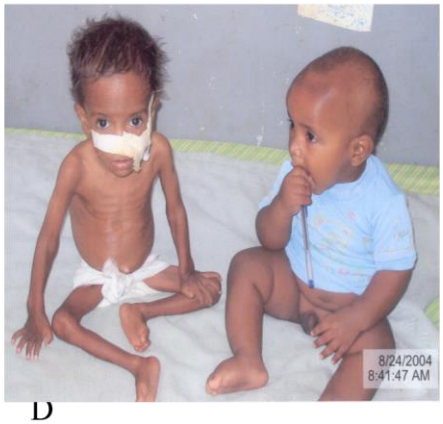
Fig 7: Milk kitchen used for formula preparation.

A

B

C



D

Fig (7 C) both mother and child were Tuberculous. Six% of children were positive for HIV/AIDS. The child affected. on the left was positive and 3years old, his brother was not affected and 8 month old.

Fig (7 D) 1 % of children were

Figure 6 shows the outcome of management using Gezira Formula where 72.5% of children recovered. They were discharged when their weight for height reached 80 85% of the expected normal by NCHS chart. 17.2% escaped from the ward before achieving expected improvement and 10.4% died.

The mortality rate of neonates and infants from Mygoma Orphanage Centre reached 17.5% (N= 101).

Table 3: compares the management outcome of Gezira formula with the International standards suggested by WHO.

Sphere key indicator	International standard	Study result
Proportion of children died	<10%	10.4%
Proportion of children recovered	>75%	72.5%
Length of stay (days)	30 - 40	18

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Minimum mean rate of weight gain (gm/person/day)	>8g	Mean :17.1 gm/person/day

Fig 8 (a&b) and 9 (a&b) show children before and after management with Gezira Formula.

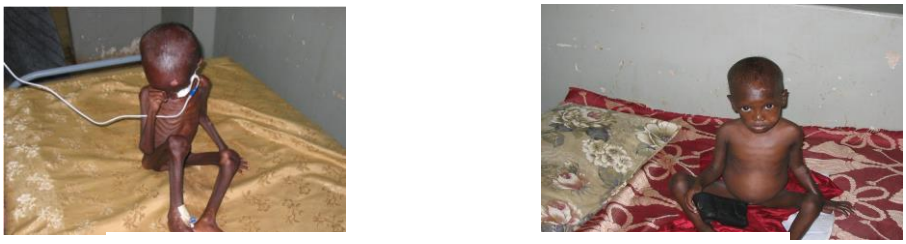

Fig 8: (a) before and (b) 20 days after management

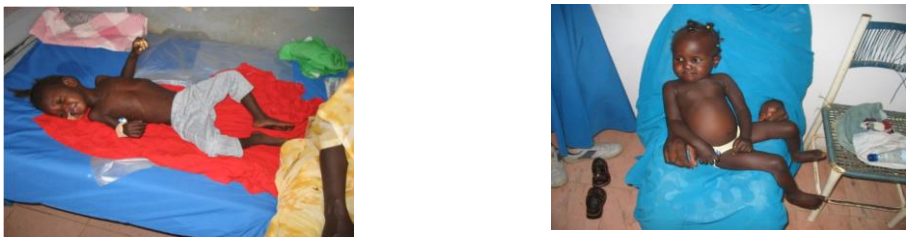

Fig 9: (a) before and (b) 18 days after management

DISCUSSION

The guidelines used to manage PEM in this study are in good agreement with the guidelines distributed by WHO [2]. There is no major difference between the calorie & protein content of the two formulae as well as the amount to be given per day. Hence the Gezira formula can be regarded as good adaptation to the WHO formula in Sudan. The cereal flour used in WHO formula was not an ingredient in Gezira formula because mixtures containing sorghum flour were noticed to change smell in hot weather.

The vitamins and minerals mix suggested by WHO is in fact not available in Sudan, and may need money, time & effort to be available at remote rural level and their preparation requires the presence of a dietician. Use of imported ready-to-use powdered products, which are common in emergency relief operations, seems unsustainable in most poor countries. The multivitamin syrups available as cheap tender items in health centers and rural hospitals were found sufficient to treat signs of vitamin B deficiency.

WHO recommended one dose of vitamin A on admission but a previous experience [6] with Vitamin A supplementation in Sudanese children showed that the majority of children were admitted with serum retinol bellow 20ug% and with two Vitamin A doses about 60-70% of them their serum retinol became above 40ug% which is regarded as a safe level.

WHO recommendation to shift from initial formula (F75) to maintenance formula (F100) within 7 days from the start of dietary therapy was found useful as the long initial phase was found to increase mortality ([2]).

The mortality rate in this study was considered high (10.4%) when compared to the international standard (<10%). This can be explained by the fact that 25.5% (n= 101)

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were children less than 4 months old. None of them was breast fed, being from an orphanage centre. The mortality rate among these infants was 17.8%. Lack of breast-feeding was known to contribute significantly to infant mortality rate ([16, 17, and 18]).

Significant geographical differences probably do exist for patients with severe PEM as a result of the multifactorial and environmental etiology of the disease. As an example tocopherols and total lipids estimation in Sudanese children documented that, the ratio of tocopherols / total lipids was 0.8, which was well above the ratio of 0.6 recommended by WHO ([7]). This is because the staple oil in Sudan is vegetable oil which is available and cheap. The cooking habit of putting more oil in vegetable and meat mixtures in common use may well be contributing to the normal lipid status in Sudanese malnourished children ([8]). This may not be true in other parts of the world [13].

Seventeen percent of parents escaped with their children from the ward. Looking closely into this group, it was found that the larger number of other children at home the higher the escape rate of mothers. For this reason and during health education sessions in the ward mothers must be told to continue the formula at home. Twelve percent of escaped children were readmitted within 3-5 weeks after escapewith even more severe degrees of PEM.

PEM is a disease of high morbidity and mortality and its management needs a lot of time, effort, dedication, and can not replace regular community surveys for early case finding and early management. More over a cheap available food is needed for home management of mild degrees of PEM.

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