Home-based treatment of acute malnutrition in Cambodian urban poor communities

Stephen Harris and Susan Jack

Abstract

Background. *The prevalence of malnutrition in Cambodia is among the highest in Southeast Asia. Until recently, there has been a consensus that the treatment and rehabilitation of acutely severely malnourished children should take place in hospitals; however, limited local health resources often place constraints upon the inpatient management of these children.*

Objective. *This study reviews the outcomes of a community nutrition program designed to rehabilitate children under the age of 5 years with moderate or severe acute malnutrition living in a poor urban community in Phnom Penh, Cambodia.*

Methods. *Clinical records of the program participants during the period from January 1999 to November 2006 were reviewed. Attainment of recovery weight-for-height z-scores, the length of time taken to achieve this recovery, rates of weight gain, mortality rate, and rate of default were determined from the data.*

Results. *One hundred fifty-nine children aged 4 years or younger with a mean admission weight-for-height z-score of –3.3 were treated. The mean outcome weight-for-height z-score was –1.5. Eighty-seven children (55%) reached a weight-for-height z-score ≥ –1 over a mean period of 14 weeks of rehabilitation. The average rate of weight gain was 4 g/kg/day. The case fatality rate was 5.6%.*

Conclusions. *This program is an example of effective, community-based rehabilitation of children with moderate or severe acute malnutrition in an urban, Southeast Asian, non-humanitarian-relief context, through a combination of nutritional education, regular home visiting, and food support.*

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Key words: Acute malnutrition, Cambodia, home-based treatment, positive deviance

Introduction

Acute malnutrition (defined as a weight-for-length z-score < –2) affects around 10% of children under the age of 5 years worldwide [1] . Estimates of the number of children with moderate acute malnutrition (weight-for-length z-score > –3 to ≤ –2) range from 55 to 70 million globally, with up to 19 million children suffering from severe acute malnutrition (weight-for-length z-score ≤ –3 and/or nutritional edema) at any one time [1–3]. There are around 2 million children living with severe acute malnutrition at any one time in Southeast Asia [4]. The consequences of poor nutrition further illustrate its importance: malnutrition is a significant factor in over 35% of child deaths in the developing world and is the largest risk factor in any age group for the global burden of disease [4–6]. Importantly, acute malnutrition carries its own direct risk of mortality, which is closely related to severity [2].

Cambodia's mortality rate for children under 5 years of age is among the highest in Southeast Asia, 10 times the rate of neighboring Thailand, and the prevalence of malnutrition is also among the highest in the region [7, 8]. The most recent estimates of the prevalence of acute malnutrition among children under five in Cambodia using the new World Health Organization (WHO) Growth Standards (weight-for-length z-score < –2) are around 8%, or approximately 116,000 children [8–11]. Thirteen percent of infants aged 6 to 12 months are moderately or severely acutely malnourished [9, 11]. The prevalence of malnutrition has decreased over the past decade [12]; however, systematic poverty and poor child health in Cambodia continue to remain key issues. Poor feeding practices, such as early introduction of complementary feeding and unsupervised feeding of toddlers, are commonplace in Cambodia [9, 12, 13]. The predominantly rice-based diet of toddlers (in the form of rice porridge *borbor*) is not particularly

energy or nutrient dense, and in poor urban areas, snack foods such as crisps or sponge cake comprise an inappropriately large part of young children's diet [12]. The inadequate dietary intakes of energy and essential micronutrients (in particular iron, calcium, and zinc) result in widespread nutrient deficiencies: over 60% of Cambodian children under the age of 5 years are anemic, and zinc deficiency and vitamin A deficiency are endemic [9, 14]. Despite the relatively high prevalence of nutritional problems, there has been a lack of published data on the treatment of children with acute malnutrition in Southeast Asia.

This study reviews the outcomes of a community nutrition program designed to rehabilitate children with moderate or severe acute malnutrition living in urban poor communities in Mean Chey District, Phnom Penh, Cambodia. At the inception of this program in 1994, there were no facilities in Phnom Penh for the inpatient treatment of children with severe acute malnutrition (the National Pediatric Hospital in Phnom Penh only established an inpatient nutrition program in 2002), and there were none of the energy-dense therapeutic feeding options that are in widespread use today [1, 2], as ready-to-use therapeutic food (RUTF) paste only became available in Cambodia in 2007. Until fairly recently, there has been a consensus that the stabilization and rehabilitation of children with severe acute malnutrition should take place in hospitals [15, 16]. This has been the policy in Cambodia since 2002; however, controlled trials show that community- or home-based management of uncomplicated acute severe malnutrition has outcomes equal to or better than hospital care [17]. Following the joint statement by WHO, UNICEF, and the World Food Programme that advocates treating acute malnutrition in the community wherever possible [18], Cambodia is developing policies and guidelines for outpatient treatment of severe acute malnutrition without complications and moderate acute malnutrition.

Most of the recent studies on community management of acute malnutrition have been done in emergency settings [2, 19]. Ongoing community treatment in an urban poor environment outside an emergency relief context poses a different set of challenges. The urban poor face different challenges with regard to food security than do the rural poor, as access to land for cultivation and animal husbandry is often difficult and there is a greater dependence on the monetized economy in urban settings [13, 20]. The nutritional status of children living in disadvantaged urban settings is therefore acutely sensitive to changes in family income and the price of food, particularly in times of economic downturn [20, 21].

Project description

This community nutrition program was established in 1994 in the southern operational health district of Phnom Penh, one of the city's poorest areas, by expatriate nongovernmental organization medical staff working at the local district government hospital. In these squatter areas, the majority of houses were made of bamboo or makeshift materials with poor sanitation. Dwellers were generally unskilled workers, and few were accessing health services [22]. The prevalence of moderate or severe acute malnutrition among children aged under 5 years in the urban poor communities of this area was 9.4% in a 2001 community survey,* notably higher than the 5.5% prevalence for the whole city (based on the National Center for Health Statistics [NCHS]/WHO growth references)[9]. This program continues in service under the now localized nongovernmental organization, *Trotrung ning Akphiwat Sokhapheap neak Krekra* (TASK), staffed by locally trained nurses and community health workers.

Referral of children to the TASK program was made by health workers who conducted local community nutritional education programs, and also by encounters with the three nutrition clinic nurses in the course of their home visits to children already on the program. The program has two or three full-time nurses and up to 10 community nutrition workers. The nurses are responsible for assessing, enrolling, and treating eligible children at the clinics, conducting home visits, and overseeing the community nutrition activities (education, counseling, and food demonstrations) of the community nutrition workers. The admission criterion was a weight-for-height measurement of 80% or less below the median NCHS/WHO reference values [23]. Initially, because of the lack of inpatient resources for the management of severe malnutrition, only children with severe acute malnutrition and signs of serious infection or anemia, or with significant edema, were referred to a pediatric hospital (Kantha Bopha Hospital or National Pediatric Hospital). Once the inpatient management program for severe acute malnutrition was established at National Pediatric Hospital in 2002 [15, 16], all children presenting to the TASK program with severe acute malnutrition were referred there for initial assessment and management. The TASK program then provided nutritional rehabilitation support on discharge from the hospital and for those who were not admitted to hospital. Once a weight-for-height measurement of greater than 90% below the NCHS/WHO reference median was reached, the child was eligible for discharge from the program.

* Servants to Asia's Urban Poor. Community nutrition survey report. Unpublished observations. 2001.

Standard treatment on admission to the program consisted of oral broad-spectrum antibiotics (amoxicillin or cotrimoxazole), antihelminthics (pyrantel or mebendazole), vitamin A (two doses), multivitamins, and oral rehydration sachets if diarrhea was present. Iron supplements were not given during the initial phase of treatment. At times, parenteral ceftriaxone once daily was given for severe illness when a mother refused hospital admission for her child. New patients came to the outpatient clinic weekly for the first 4 weeks, then once or twice per month. The outpatient clinic was open only two mornings per week and had no diagnostic facilities and only a very limited dispensary; therefore, it would be most appropriate to consider this program as essentially domiciliary in nature [24]. Beginning at admission, mothers were given education on nutrition and health issues at every clinic attendance and also during the home visits, following key family practices determined by the hearth/positive deviance model [13, 25, 26]. Cooking demonstrations were held each clinic day, with an emphasis on teaching mothers to increase the thickness and nutritious value of the staple rice porridge by the addition of extra rice, vegetables, and sources of animal protein. Each child on the program was visited at home by one of the nurses; severely malnourished children were visited at least twice per month (or on occasions, daily if they were acutely unwell and the parents had refused hospital admission), and moderately acutely malnourished children were visited at least monthly. During these visits, the nurse checked the general health of the child, the hygiene conditions in the home, the vaccination record, and the dosages of any current medications and reviewed previous health and nutrition lessons. Food support was given to the mother each month, consisting of 10 kg of white rice, five 155-g cans of fish, and 1 L of cooking oil. For each child in the program, the mother was given one 100-g sachet per day of a locally produced nutritional mix that contained approximately 440 kcal, 28.7 g of protein, 22.6 of g fat, and 35.4 g of carbohydrates [27]. Breastfeeding was strongly encouraged, but if the mother had stopped breastfeeding and relactation was not possible, commercial milk formula powder was given if the child was under 12 months of age and soy milk powder if the child was 12 months of age or older. Transport and hospitalization costs were also reimbursed. Laboratory investigations were not routinely performed.

Methods

This was a retrospective review of de-identified clinical records from the TASK program for the period from January 1999 to November 2006. Patients who were diagnosed as HIV positive were excluded from the data analysis. The anthropometric measures were based on the NCHS/WHO reference values [23]; however, z-score values for the weight- and height-for-length measurements were recalculated with the use of the WHO Anthro program, version 2.0.3 (WHO Growth Standards 2006). Moderate acute malnutrition was defined as a weight-for-height z-score > –3 and ≤ –2, and severe acute malnutrition was defined as a weight-for-height z-score ≤ –3 or the presence of nutritional edema [16]. Rates of weight gain (g/kg/day) were evaluated [16]. Statistical analysis of the data was performed using Microsoft Excel 2003.

Results

One hundred ninety-six children were admitted to the nutrition program between January 1999 and November 2006. The clinical records of 37 children were incomplete, and therefore 159 patient records were reviewed. The demographic and nutritional characteristics of these 159 children are given in **table 1**. Seventy-three children were aged under 12 months, and 81 were female. The mean admission weight-for-height z-score was –3.3 (all the following z-scores are weight-for-height scores, unless specifically stated), and 116 patients (73%) were severely acutely malnourished. The mean admission age was 14 ± 10 months (mean ± SD), and the median birth order was third. Two patients (1%) were readmitted to the program after previously reaching the discharge criterion. Four patients received inpatient treatment in the hospital. Seventy-four percent of patients were up to date with their immunizations according to the Cambodia Ministry of Health immunization schedule. Poorer nutritional status on admission to the program was associated with age ≤ 12 months (mean z-score, –3.4; $p < .01$, Student's t-test) and male sex (mean z-score, – 3.4; $p < .01$) but was not associated with immunization status. Larger family size (more than four children) was associated with better nutritional status on admission (mean z-score, –2.9 vs. –3.4; $p < .001$).

Outcome data are given in **table 2**. Eighty-seven

TABLE 1. Demographic and nutritional characteristics of patients

Characteristic	Value
No. of patients	159
Female—no. (%)	81 (51)
Mean ± SD age—mo	14 ± 10
No. of sibling pairs	0
Readmissions—no. (%)	2 (1)
Immunized—no. (%)	117 (74)
Mean ± SD weight-for-height z-score	–3.3 ± 0.9
Severe acute malnutrition—no. (%)	116 (73)
Edema—no. (%)	23 (14)
Hospitalized—no. (%)	4 (2)

TABLE 2. Outcome data for patients[a]

Outcome	All patients (n = 159)	SAM[b] patients (n = 116)
Weight-for-height z-score	−1.5 ($p < .001$)[c]	−1.8 ($p < .001$)[c]
Reached discharge criterion—no. (%)	87 (55)	52 (45)
Mean ± SD rate of weight gain—g/kg/day	4.0 ± 4.6	3.9 ± 4.7
Mean ± SD time to recovery—wk	14 ± 13	15 ± 14
Mortality—no. (%)[d]	9 (5.6)	8 (6.8)
Defaulted—no. (%)	35 (18)	23 (20)

a. The data do not include one child who was referred to another nongovernmental organization on admission.
b. Severe acute malnutrition (SAM) is defined as a weight-for-height z-score ≤ – 3 or the presence of nutritional edema.
c. Paired *t*-test.
d. The numbers do not include two children with pre-existing epilepsy and congenital cardiac disease who died from these conditions while in the nutrition program.

children (55%) attained recovery z-scores of ≥ −1, the criterion for discharge from the program, and took a mean time of 14 ± 14 (SD) weeks to achieve this result. Twenty-five children (16%) defaulted from the program and were lost to follow-up. The case fatality rate was 5.6% for all children (9/159) and 6.9% for severely acutely malnourished children (8/116). The majority of children who died (7/9) died within 1 month of admission, and their mean z-score was −4.6 on entry. The rate of weight gain over the duration of treatment averaged 4 g/kg/day and did not differ significantly between moderately and severely acutely malnourished children.

Intention-to-treat analysis showed that nutritional improvement was not limited to those children who reached the discharge criterion. There was a significant difference between mean overall admission z-scores (−3.3) and mean overall outcome z-scores (−1.5; $p < .001$, paired *t*-test). This was also seen in the severely malnourished group of children (−3.8 vs. −1.8, $p < .001$). Children who defaulted from the program still had a mean increase over their admission z-score of 0.9 points ($p < .001$, paired *t*-test), based on their nutritional measurements at their last clinic visit.

Children who were immunized had significantly better outcomes than unimmunized children (z-score, −1.3 vs. −2.1; $p < .001$, Student's *t*-test). Children aged ≤ 12 months on admission had better outcomes than those aged > 12 months (z-score, −1.3 vs. −1.8; $p < .01$), despite having poorer initial anthropometric characteristics. There was no difference in outcome between male and female children.

Many patients remained in the program with monthly attendance at the clinic (and thus continued receipt of supplementary food) after they reached the discharge criterion. The reasons for this included observation during a course of treatment for tuberculosis, monitoring until 18 months of age to establish a definitive HIV status if a child's mother was HIV positive, or, in some cases, because the clinic staff felt nutritional relapse was likely, due to difficult socioeconomic circumstances, if they were to be discharged too promptly. The average length of stay in the program for patients successfully treated was 51 ± 32 (SD) weeks; thus, patients who reached the discharge criterion were actively followed up for an average period of 8 months. The readmission rate was 1%.

Discussion

Historically, community programs treating severe acute malnutrition have had variable results: a literature search of 33 community-based rehabilitation programs for the period from 1980 to 2005 found that only one in three programs achieved an average weight gain of more than 5 g/kg/day and a case fatality rate of less than 5% [24]. However, the criteria chosen to demonstrate effectiveness vary among programs. They include attainment of weight-for-height z-scores > −2 [17, 28–30], > −1.5 [31], > −1 [16], > −0.5 [32], and ≥ 0 [33]; rates of weight gain more than 5 g/kg/day [24]; recovery, mortality, default, and nonrecovery rates [2]; and mortality of less than 5% [24, 34].

The overall rate of weight gain among all patients on the TASK program of 4 g/kg/day compares favorably with that of other domiciliary rehabilitation programs, where rates of weight gain were 1.3 to 2.7 g/kg/day [35–38] prior to the RUTF era. It is difficult to be sure how much the locally produced nutrition mix contributed to the individual child's nutritional rehabilitation, since sharing of food rations with other family members is a recognized occurrence [17, 19]. During the 8-year study period of the TASK program, however, there were no siblings of children in the program admitted, and this is likely to represent a sustained positive "ripple effect" of enhancing nutrition in siblings due to the home visiting and nutritional and

health education given to mothers [24]. The relapse rate of only 1% and the case fatality rate of 5.6% over the 8-year period of this review suggest a durable and sustainable benefit, especially given that the majority of published information on the outcomes of community treatment of acute malnutrition is from projects of less than 12 months' duration [17, 19, 29, 30, 32, 33, 35, 37, 38].

Most of the children who were admitted to the TASK program presented relatively early in the progression of their illness, when they still had a good appetite, and therefore the necessary treatment remained technically simple, starting as it did in the rehabilitation phase [16]. One of the key determinants of successful treatment of severe acute malnutrition is the length of time to presentation [2]. Stabilization of severely malnourished children with complications, who have more significantly impaired homeostatic capacity, requires more intensive medical and nursing care [2, 16] and places greater demands on the often limited healthcare facilities in developing countries [39].

The advent of RUTF [32, 33] has dramatically improved the outcomes of severely malnourished children treated in the community, particularly in the context of humanitarian emergencies, and is now the recommended mainstay in outpatient treatment of uncomplicated acute malnutrition [38–40]. Reporting results from the treatment of 23,511 severely malnourished children with RUTF in community-based emergency treatment programs from Ethiopia, Sudan, Malawi, and Niger, Collins [19] gives recovery rates of 58.6% to 95%, with a mean of 79.4% (recovery criteria not stated), and rates of weight gain ranging from 4.5 to 6.6 g/kg/day. Although these rates of weight gain are comparable to the results from the TASK nutrition program, the higher recovery rate and shorter duration of treatment (25 to 85 days) indicate the importance of RUTF [1] and are in keeping with the benefits of RUTF over standard food therapy that were shown in a randomized, controlled trial in Malawi [17]. The development of locally produced, suitably flavored RUTF pastes should be encouraged in Cambodia*, as should the manufacture of rice-based fortified complementary foods [41].

Although the majority of published data on the use of RUTF has been from emergency humanitarian or transition settings, there is reason to believe that the use of RUTF in non-emergency contexts would also result in improved outcomes [17, 19]. The extension of this treatment option outside well-resourced research or humanitarian relief settings requires not only assessment of the effectiveness of RUTF in different contexts, such as urban poor communities and Asian countries with high malnutrition burdens, but also the consideration of indigenous systems of community mobilization, treatment provision, and health education. Our experience indicates that even without ready access to RUTF, community malnutrition programs based on the hearth model principles of nutrition rehabilitation [26] can have durable effectiveness. It is possible that further nutritional gains would be seen with the introduction of RUTF that is appropriate to a Southeast Asian context*; however, this should not detract from the existing benefits that have been achieved through the mobilization of community resources and dissemination of positive nutrition practices. We attribute a significant part of these benefits to the relationships that our nutrition nurses and community educators have developed with individual mothers and within the wider community, and agree with others that home visits are vitally important in this regard [25, 42].

There are some limitations to this analysis. The children referred to the TASK nutrition program were initially identified through a targeted selection process and therefore do not necessarily constitute a representative sample of acutely malnourished children in the community. The coverage rate of the program could not be assessed. It is possible that the positive outcomes were exaggerated because of this selection bias; however, the rates of default and mortality were similar to reported rates from much larger case series [19]. Despite attempts being made to contact the families who defaulted from the program, it is possible that the mortality rate was underestimated; however, this is likely to be a reasonably consistent problem across the reported literature. The long lengths of stay in the program, while related to both program design and the slower rates of weight gain in a pre-RUTF era, do nonetheless allow for a longer period of follow-up and, in showing a low relapse rate, are likely to counter some of the potential overestimations of benefit.

Conclusions

The successful treatment of acute malnutrition, whether in the community, feeding centers, or the hospital, is dependent not only upon a particular therapeutic energy and nutrient source, but also, to a large extent, upon the quality of the systems in place in the treatment environment and the skill and dedication of the personnel involved. Our experience over a 14-year period treating children with acute malnutrition in an urban poor environment in Cambodia is that domiciliary treatment of malnutrition is safe and effective. The treatment of childhood acute malnutrition is complementary to preventive measures in the public health, education, and economic realms, and it is to be hoped that the recent improvements in the area of

* Results from the initial demonstration of RUTF for the treatment of acute malnutrition in Cambodian children. Phnom Penh. National Nutrition Program, Cambodia and Clinton Foundation HIV/AIDS Initiative, Report, 2008

therapeutic foods and the renewed, deserved attention given to community treatment programs will continue to reap sustained benefit for individuals, families, and their communities.

Acknowledgments

Many thanks to Rosalind S. Gibson, Research Professor, Department of Human Nutrition, University of Otago, New Zealand for her detailed review, valuable comments, and suggestions on the draft manuscript. Many thanks also to Mrs. Cheang Sarim, TASK Nutrition Program Manager, and to Mrs. Hem Neang and Ms Chon Thida, TASK Nutrition Program Assistants, for their assistance during the review and also for their continued dedication in helping the poor and malnourished children of Mean Chey District, Phnom Penh.

This review was done in a voluntary capacity by Dr. Stephen Harris as part of an internship with TASK/Servants.

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