Brief communication

Treatment outcome of children with severe acute malnutrition admitted to therapeutic feeding centers in Southern Region of Ethiopia

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Abstract

Background: Inadequate intake of carbohydrates, proteins, vitamins and minerals is one of the causes for malnutrition. It often affects young children and contributes to more than 60% of deaths in children in developing countries. One in four of malnourished children receiving traditional treatment die during or soon after treatment. The study aimed to assess the treatment outcome of children treated in therapeutic feeding centers (TFC) in southern Ethiopia.

Methods: A retrospective review of reports submitted by the TFCs was done during 2003-2004. Data was collected from the monthly reports using standardized formats. The variables included age, treatment centers, type of malnutrition and treatment outcome which were analyzed using descriptive statistics.

Results: Of 11,335 cases of malnutrition, 47% (5447) had severe wasting and 53% (6103) had edematous malnutrition. Of the total, 87% (11,191) were cured while 3.6% (468) had died. The average length of stay was 25 and 21 days with an average weight gain of 14 and 13.4 g/kg/d for children with severe wasting and edematous malnutrition, respectively. With increasing age, the death rate decreased and cure rate increased ($p < 0.05$ for both).

Discussion: Our results show that the new management approach implemented in the TFC improved the treatment outcome of malnourished children compared to the minimum international standard set for management of severe acute malnutrition which is cure rate of at least 75% and death rate less than 10%, average length of stay of less than 30 days and average weight gain of 8g/kg/day. [*Ethiop. J. Health Dev.* 2010;24(3):234-238]

Introduction

Inadequate intake of carbohydrates, protein, vitamins and mineral supply to the cells of the body to satisfy the physiological requirements is one of the causes for malnutrition (1-3). The immediate causes of malnutrition and child death are mutually reinforcing conditions of inadequate dietary intake and infectious disease; the underlying causes are household food insecurity, inadequate health service and absence of healthy environment. The basic causes include formal and informal institutions: political, economic and ideological structure and system. Malnutrition can affect all age groups, but is more frequent among infants and young children (4-6 years); it is linked to increased risk of death in children, and reduces the learning ability, school performance and retention rate. Malnutrition contributes to 50 - 60% of deaths in children for which infection is the underlying cause (7-12).

In developing countries, two percent of children (about 13 million children) suffer from severe acute malnutrition (13). In India, 2.8% of children under five are severely wasted (7). In 2003, the United Nations children's Fund (UNICEF) estimated sixty thousand children to be severely malnourished in Ethiopia (14). In children younger than five years of age, according to the Ethiopian Demographic and Health Survey (EDHS) report, 47% were stunted, 11% wasted, 2% severely wasted 38% underweight (below -2SD) and 16% severely underweight (below -3SD) (15).

In the Southern Nations, Nationalities and Peoples' Region (SNNPR), 52% of children were stunted, 6.5% wasted and 34.7 % underweight (15-17). Similarly, according to a house hold survey in 2003 by Essential Services for Health in Ethiopia (ESHE)/USAID, among children from 12 - 24 months, 48% were stunted, 42% were underweight, 11% had moderate to severe malnutrition and 2% severe malnutrition (18).

The traditional method used to treat severe malnutrition in hospitals in Ethiopia involves administering ''kwash'' and ''marasmic'' milk (locally prepared by mixing cow's whole milk, oil, raw egg, sugar, iron and potassium chloride). Under traditional treatment approach deaths as high as 20-40% were reported from developing countries (7-19).

Michael Golden and his colleagues came up with the free radical theory of edematous malnutrition (kwashiorkor) which stated that it results from excessive toxic products resulting in the generation of sufficient reactive oxidative free radicals (which should normally be balanced by similar rate of their consumption by antioxidants) to exceed the host's antioxidant capacity (the capacity to consume reactive oxidative free radicals). In short, edematous malnutrition occurs due to the imbalance

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between production of free radicals and their safe disposal. They described wasting as a result un-replaced pathological loss of nutrients or infection and recommended to manage children with severe malnutrition using therapeutic products, formula milk (F75 and F100) which contain essential nutrients (minerals, vitamins, proteins, energy) and used drugs to treat infections (Ampicillin, Vitamin A, Mebendazol and Folic acid) in TFC (19-21). The aim of this cross sectional study was to describe the treatment outcome of malnourished individuals admitted to TFC. This study reports the treatment outcome of children with severe acute malnutrition using the therapeutic products and drugs in southern Ethiopia in 2003-2004.

Methods

Study area and population

SNNPR is the third largest and populous region with a population of 15 million people. The health service coverage was 50% in 2005 with family planning coverage of 47%, antenatal care coverage of 60% and 18% delivery by skilled birth attendants. DPT3 and measles immunization coverage was 90% and 83.4%, respectively. The major causes of death in children were diarrhea, pneumonia and malaria (unpublished report, SNNPR Health Bureau). Uncontrolled population growth and limited household food reserves were compounded by shortage of rain that exacerbated the living condition of the vulnerable communities and resulted in a widespread famine (22). In response, the Regional Health Bureau (RHB) in collaboration with partners established 25 TFC's near health facilities for treatment of severe malnutrition by health professionals: pediatricians, general practitioners, health officers and nurses using the standard and uniform protocol (21).

Data collection and admission criteria

Prior to the data collection, health workers involved in the TFC were trained using standard guideline used in the country. Repeated measurements were conducted which was observed and checked by the supervisors. In addition, the data collection was regularly supervised and checked by trained supervisors and higher professionals including pediatricians who checked the measurements and compared it to the standard to decide on admission, treatment and discharge.

Children in the affected area were screened for signs of malnutrition after community mobilization and health education session conducted by community health workers. Weight, height and mid upper arm circumference (MUAC) were measured using weighing scales and measuring tapes and compared with the standard for the age group. First, weight and height (W/H) were measured and compared with the percentage of the median; if the W/H was < 70% of the median (NCHS/WHO 1999), it is a criterion for admission. Second, MUAC was measured for children from six months to five years; if the MUAC was found to be less than 11cm, it is a criterion for admission. Third, pedal edema was checked in children by pressing the foot for three minutes; children with bilateral pedal edema were admitted. Lastly, body mass index (BMI) was used in adults as admission criteria if the BMI is less than 16.

Management of severe malnutrition

Children in affected areas were screened for signs of severe acute malnutrition and diagnosed based on anthropometric measurement and examination of the feeted for bilateral pitting edema. Children who fulfill the criteria for admission were admitted to the TFC. On admission, malnourished patients were assessed for hydration status, anemia and signs of infections. They were given oral dose of Vitamin A, Mebendazol, and Fansidar® (sulfadoxine and pyrimethamine) in malaria endemic areas, folic acid and a course of Amoxicillin for five days. Oral rehydration salt (Resomal, DANature Foods, Denmark) was used for treating dehydrated cases and drugs like Gentamicin, Chloramphenicol or Quinine were used based on the causes of the infections (21).

Treatment of severe malnutrition was divided into three phases; the first phase (phase I), transition phase and phase II. In phase I, health workers resuscitated patients, treated for infections, restored electrolyte balance, and prevented hypoglycemia and hypothermia on indication. F75 milk (formula 75 that contains 75 kilocalories in 100 milliliters, minerals and proteins) was used during phase I treatment; malnourished cases who responded on treatment by return of appetite, beginning of loss of edema and no intravenous line or nasogastric tubes were transferred to transition phase to receive F100 (formula 100 that contains 100 kilocalories in 100 milliliters). No additional feeding was given and to prepare the cases to phase II treatment. Phase I and transition phase usually took two to seven days and the quantity of F100 given is equal to the quantity of F75 given in phase I. A transition phase was introduced for in-patients because a sudden increase in the amounts of diet, before physiological function is restored can lead to electrolyte disequilibrium and prepares the cases for the next treatment phase. Afterwards, cases were transferred to phase II after they gained good appetite (finish 90% of F100 prescribed for transition phase) clear edema. In phase II treatment, F100 was used as much as the children could take and additional diet is recommended until they achieved a normal weight for height, 85% and above of the standard. Children who attained at least 85% of the standard weight for height were discharged with an appointment for regular follow up in the health facilities.

Admission criteria for less than six months infants were the same except that infants too weak to suck. Those who were weak were admitted too but MUAC was not used. They were treated with supplementary suckling technique and there were no separate phases of treatment. The criteria for discharge were weight gain on breast milk alone and no medical complications (21, 23). A malnourished patient that achieved normal weight for height, at least 85 % of the standard and discharged was

reported cured while a malnourished patient who died of any cause during treatment was recorded as death. All information about the patients and treatment details were recorded on standardized formats. This study is done based on the data obtained from monthly reports sent to the RHB from April 2003 to March 2004.

Data analysis

The number of discharges, average weight gain in gram per kilogram per day (g/kg/d) and average length of stay in days (d) were recorded. The cure and death rates were calculated as the number of malnourished children cured or died of the total admitted expressed in percentage. Average weight gain and average length of stay were calculated for recovered patients as the total individual patient weight gain or the number of days for each recovered patient over the number of recovered patients, respectively. EPI-Info (CDC, Atlanta) was used for data entry and analysis. Descriptive statistics (proportions and means) and chi-square was used in the analysis. P-value < 0.05 was considered significant. The permission to use the data was obtained from RHB.

Results

A total of 13,843 patients with severe malnutrition were admitted to 25 TFCs in five zones and one special woreda. Of these, 12,827 patients were newly evaluated while 1,016 were on treatment during the evaluation. Of the 12, 827 patients, 70% (8,979) were children younger than five years (Table 1 & 3). Of the 11,550 (83%) patients for which nutritional status was documented, 47% (5,447) had severe wasting and 53% (6,103) had edematous malnutrition. The average length of stay in the TFCs was 25 days for patients with severe wasting and 21 days for patients with edematous malnutrition. Of 13,843 patients admitted to the TFCs, 11,191 (87%) were cured, 468 (3.6%) died during treatment, 1,168 (9.1%) were defaulters (left the TFCs before completing treatment) and non respondents (did not respond to treatment after 40 days on treatment).The average weight gain was 14g/kg/day for patients with severe wasting and 13.4g/kg/day for patients with edematous malnutrition (Table 1). The average cure and death rate was 87% and 3.6%, respectively. Cure rate as high as 92% was reported from Kambata Tambaro and Wolaita (Table 2). The lowest cure rate (39%) and highest death rate (13.7%) was reported from Butajira and Yirgalem, respectively (data not shown). The cure rate increased and death rate decreased with age (Table 3).

Table 1: **Distribution of average length of stay and weight gain of children admitted with severe malnutrition in Therapeutic Feeding Centers, Southern Ethiopia, 2003 - 2004**

Nº	Feeding Center	Average length of stay in days and weight gain in g/kg/day					
		Severe wasting			Edematous malnutrition		
		Nº of cases	length of stay	Weight gain	Nº of cases	length of stay	Weight gain
1	Yetebone	201	28	17	171	22	18
2	Bushlo	152	20	12.6	203	21	12.1
3	Leku	278	28	11.5	325	22	11.9
4	Derara	129	26	14.4	108	22	12
5	Yirgalem Hosp.	333	30	10	278	23	13.5
6	Morocho	300	27	13.8	271	24	13.3
7	Malgano	187	17	16.8	85	18	15.3
8	Aroresa	76	27	14.5	179	25	14.9
9	Tulla	255	29	12.6	237	22	13.1
10	Dore Bafano	135	26	14.4	256	18	14
11	Yirba	415	39	13.2	410	27	10.8
12	Balela	236	29	12	135	26	11.3
13	Sodo Zuria	70	33	11.6	105	24	11.4
14	Gununo	211	23	14.8	201	21	11.9
15	Areka	204	26	14.4	296	24	14
16	Bombay	280	23	15	130	21	14.9
17	Dolla	221	24	15	171	22	14.4
18	Bodditi	745	21	12	849	17	10.5
19	Buge	398	16	12.4	487	13	9.7
20	Karat	230	29	13.7	341	25	13.4
21	Modulla	164	15	19	202	19	16.8
22	Kedida Gamela	227	17	18	663	14	17.9
	Region	**5447**	**25**	**14**	**6103**	**21**	**14.3**

Table 2: **Treatment outcomes of children with severe malnutrition admitted to the therapeutic feeding centers in the southern Ethiopia, 2003 - 2004**

Zone/special woreda	Admission	Cured N (%)	Died N (%)
Silti	95	59 (82%)	1 (1.4%)
Gurage	595	414 (75%)	23 (4.1%)
Sidama	6,011	4539 (84%)	172 (3.2%)
Wolaita	5,056	4540 (92%)	208 (4.2%)
Karat	696	492 (86%)	46 (8.0%)
Kembata Tembaro	1,390	1,147 (92%)	18 (1.4%)
Total	13,843*	11,191 (87%)	468 (3.6%)

*The denominator is 12,827 whose treatment outcome was known, 1,016 were still on treatment, during evaluation

Table 3: **The age distribution of treatment outcome of children admitted with severe malnutrition in therapeutic feeding centers, Southern Ethiopia, 2003 - 2004**

Age	Admission	Cured*		Death*	
		N	%	N	%
< 6 months	168	134	79.8%	9	6.6%
6 - 59 months	8485	7815	92%	352	4.2%
5 - 10 years	2867	2609	91%	81	2.9%
11 - 17 years	375	248	66%	11	2.9%
> 18 years	468	387	82%	14	4%

*There was significant difference in cure rate (x^2 = 336.5, p-value=0.0001) and death rate (x^2 = 13.9, p-value=0.008) by age

Discussion

The introduction of the new protocol for management of severe acute malnutrition has saved the lives of many children and adults by achieving high cure rate and reducing death rate in southern Ethiopia. Relatively high death rates were reported from Yirgalem and Butajira hospitals due to the fact that these centers were referral units for the Sidama and Gurage zones, respectively. Moreover those places where severely complicated malnourished were admitted. In some TFCs the cure rate was higher mainly because of the type of cases admitted: age distribution, fewer secondary complications, the type of health workers involved in the treatment and regular supportive supervision. The death rate could be higher in infants under six months of age because of depressed immunity (24), increased risk of infection and suffer from insufficient feeding practices.

Our review shows that the treatment of severe malnutrition with formula milks (containing low protein, other micronutrients) and some drugs had significantly improved recovery and decreased the death rate. The treatment outcome in our setting was much better than the standard set in the guideline set for management of severe acute malnutrition (cure rate of >75%, average length of stay less than 30 days and average weight gain of 8 - 12 g/kg/d) (21). There was no much difference in average length of stay and weight gain among patients with severe wasting and edematous malnutrition. The treatment outcome in Ethiopian settings was better than reports of 20 centers from 13 African countries (cure rate of 73%, death rate of 11.7%, varying length of stay from 28 - 35 days and weight gain of more than 10g/kg/d) using the new protocol (19). In Jamaica, cure rate of 92.4% and death rate of 7%, total length of stay 33 days and weight gain of 14.2g/kg/d was reported using similar milk products for treatment of acute severe malnutrition (19). In addition to the new treatment protocol, the prompt response to the nutritional problems in the southern region could explain our better treatment outcome.

In this study, the proportion of cases with severe wasting and edematous malnutrition (39%) was lower than reports from studies conducted in African countries (61%). This could be due to the difference in the causes of malnutrition in various parts of the world. Similar to reports from various parts of Africa, the majority of admissions in our TFCs were between 6 - 59 months due to higher risk factors for malnutrition (9, 19). This could possibly be prevented by providing nutrition education to the parents about sufficient breast feeding and complementary feeding after 6 months of age; and by proper management of childhood illness that makes children susceptible for malnutrition (11, 25, 26).

The first limitation of this study was that the health professionals who treated patients were of different educational background (pediatricians, general practitioners, health officers and nurses) and those who did the measurements had also of different levels of knowledge and experience (ranging from trained community members to health workers). Cognizant of the fact that these affect the quality of the reports, standard training, regular supervision, the standardized measurement procedures and simple formats could have improved the quality of the reporting and recording in the treatment centers. Secondly, using aggregate data that did not specify sex limits gender and individual patient level the interpretation and analysis defiantly affects.

The new management protocol needs to be integrated the health service delivery and expanded to treat malnourished children improve the nutritional status and reduce related mortality. This could be improved if supported by nutrition education and supplementary feeding to prevent recurrence of malnutrition after treatment. The significance of this study is high for the current community therapeutic care (CTC) for malnourished children. First, TFC manages severe malnourished children that cannot be managed or referred from CTC because of medical complications and refers them back after they completed phase I. This referral is done at best transition phase treatment to help malnourished children under six months of age as they cannot be treated in CTC (14, 27). Second, due to the fact that health extension workers and community health agents participated in establishing and managing cases in TFCs their experience helps them to adopt, participate, in CTC, identify, and refer severe complicated cases easily.

In conclusion, this study confirms that the new protocol for management of severe malnutrition can be used to save lives of many children with high cure rate and minimum death rate compared to traditional treatment.

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