

## **Efficacy of a therapeutic feeding centre evaluated during hospitalization and a follow-up period, Tahoua, Niger, 1987–1988**

BERNARD PÉCOUL, CATHERINE SOUTIF\*, MARCEL HOUNKPEVI\*\* & MONIQUE DUCOS\*

*Epicentre, Paris, \*Médecins Sans Frontières, Paris, France, and \*\*Department of Paediatrics, Tahoua Hospital, Niger, West Africa*

(Received 3 December 1990)

**Summary** Between 1 February 1987 and 31 May 1988 an evaluation of a nutritional rehabilitation centre in Tahoua, Niger was conducted. Among the 381 children admitted to the centre, 61 (16%) had kwashiorkor and 347 (91.3%) were aged between 6 and 29 months. Recovery and death rates were 46.2% and 14.4%, respectively. The median duration of stay until recovery was 21 days. Sixty-two per cent of deaths occurred during the 1st week of hospitalization. Three risk factors for death were identified by the study: patients with kwashiorkor with a weight/height (W/H) less than  $-3$  SD, those with marasmus with a W/H less than  $-5$  SD, and those dehydrated with marasmus. Among children included in the follow-up study after leaving the centre, the risk of dying during the follow-up period among children who absconded was 7.1 times higher than the risk observed among children who recovered. Among the children who recovered, no relapse was observed 3–18 months after they left the centre. This investigation indicates the importance of intensive therapeutic feeding centres in areas with a high prevalence of malnutrition.

### **Introduction**

Protein-energy malnutrition (PEM) is a major public health problem in the developing world.<sup>1</sup> Radical changes in social and economic conditions will be required to eliminate the basic causes, and preventive measures at all levels should be a priority. At the same time, however, health care systems have to deal with children now suffering from severe PEM who continue to be brought to hospitals in many areas. Most literature implies that nutrition rehabilitation in hospital is “a waste of time and money”.<sup>2–4</sup>

In May and June 1988, at the request of the Ministry of Health in Niger and of Médecins Sans Frontières, we carried out an evaluation of a rehabilitation centre in a rural district in Tahoua, Niger. The study was conducted after a period of famine. Earlier cross-sectional surveys indicated a prevalence of moderate PEM (defined as a weight for height (W/H) less than  $-2$  SD) of 12%.<sup>5</sup> The prevalence of severe PEM (W/H less than  $-3$  SD or a presence of oedema) was 2%.

Two studies were undertaken. The first study investigated mortality, recovery and drop-out rates and their risk factors within the rehabilitation centre; the second study looked at mortality rates and nutritional status during a long term follow-up of children previously registered at the feeding centre.

TABLE I. Outcome among malnourished children included in the study, Tahoua, Niger (February 1987–May 1988)

Group who recovered	Group who were discharged	Group who absconded	Group who died
Loss of oedema, no infection. W/H more than $-2$ SD	Discharge with medical approval. Loss of oedema, no infection, weight gain and clinical improvement (recovery of appetite and activity). W/H between $-2$ SD and $-3$ SD.	Left the centre without medical authorization.	Died during hospitalization.

### Background information

Tahoua Hospital is the only hospital in Tahoua district located in the sub-sahelian area of Niger. The hospital services a population of around 1 200 000 people within a radius of more than 100 km. Owing to transportation difficulties, only 25% of the population can readily be referred to the hospital.

The nutrition rehabilitation centre of Tahoua is a special building inside the hospital with a patient capacity of 20 beds. A simple routine nutrition programme had been devised which could be managed by limited staff (one nurse and one auxiliary) and supervised by a physician. The emphasis was on active participation of mothers and other caretakers in feeding, cooking, and other educational activities.

Dietary treatment consisted of milk powder/oil/sugar mixtures of 1 kcal/ml, 100–150 ml/kg in five or six feeds daily. As soon as the child accepted the mixture, feeding with meals prepared from locally available foods was started. Standardized protocols were used for treating children with kwashiorkor or diarrhoea. Medical management consisted of measles vaccination, mebendazole (200 mg stat) treatment and a single high dose of vitamin A on admission (100 000 IU for children less than 1 year, 200 000 IU for other children), daily mineral

(potassium 3 mg/day; magnesium 1.5 mg/day) and vitamin supplements (vitamin C 250 mg/day; iron 2 g/day; folic acid 0.25 mg/day), a weekly prophylactic dose of chloroquine (10 mg/kg) and antibiotic treatment if infection was diagnosed. Unfortunately, no information on tuberculosis was available.

### Materials and methods

#### Study 1

We included in the study all children aged 6–59 months with severe marasmus (defined as a W/H less than  $-3$  SD without oedema—NCHS reference) or with kwashiorkor (presence of oedema) admitted to Tahoua Hospital between 1 February 1987 and 31 May 1988. Children were measured using a locally made height rod with measurements to the nearest 0.5 centimetre. Weight was estimated using a Salter scale (readings were made to the nearest 100 g). Data recorded in individual nutrition charts included: demographic information (age, sex, address), date of admission and discharge, clinical signs and symptoms assessed by a physician, dietary and medical treatment and the outcome of hospitalization. The first study was a retrospective cohort using children's hospital records. For each child, the study period corresponded to the length of stay in the centre. Four outcomes were defined (Table I).

TABLE II. Distribution of cases of severe PEM by outcome and duration of stay (1 February 1987–31 May 1988, Tahoua, Niger)

Groups (status)	Outcome	Duration of stay		
	Number (%) of children	Range (days)	Mean (days)	Median (days)
Recovered	176 (46.2)	6–70	23.2	21
Discharged	55 (14.4)	5–46	17.2	14
Absconded	95 (25.0)	1–46	13.2	11
Died	55 (14.4)	1–33	7.6	6
Total	381 (100)	1–70	17.6	14

### Study 2

The second study was a prospective cohort study. All children included in the first study during 1987 were visited at home at least 3 months after they had left the feeding centre. Exposure data collected included outcome categories (recovered, discharged, absconded) obtained from the first study (Table I). In this second study, outcome information included survival data and causes of death assessed by interview and nutritional status measured as previously described.

In addition, a questionnaire was used to interview the mothers about nutrition practices and their attitudes to prevention, particularly the use of oral rehydration.

In both studies, for each outcome, rates were calculated according to the demographic data, entrance nutritional status and clinical status. Rates of outcome among the exposure groups were compared using relative risk with a confidence interval of 95% (Taylor Series Confidence Limits). Survival data analysis was used to compare the mortality rate during the follow-up period. Fisher's exact tests or Anova tests were used when needed.

## Results

### Study 1

A total of 381 children were admitted to the therapeutic feeding centre between 1 February 1987 and 31 May 1988. The average number of admissions per month was

23.8 with a decrease of activity during the rainy season. Fifty-two per cent of the children came from villages located more than 30 km from the hospital.

Of the 381 children included in the study, 347 (81%) belonged to the age group 6–29 months and 216 (56.7%) were aged 6–17 months. Among the 381 children admitted, 61 (16%) had kwashiorkor and among those with marasmus 135 (42%) had a W/H less than  $-4$  SD.

The main diagnoses observed at the time of registration were diarrhoea (71.3%), acute respiratory infection (49.7%) and dehydration (22.2%). Ninety per cent (343) of the children had received antibiotic treatment after a clinical check-up by a physician.

The duration of stay in hospital is described in Table II. The mean duration of stay until recovery was 23.3 days with a difference of almost 1 week between those with kwashiorkor (28.7 days) and those with marasmus (22.2 days) (Anova test:  $p = 0.01$ ).

Among the 381 children, 55 (14.4%) died and 95 (25%) absconded (Table II). Among the 55 deaths during hospitalization, 33 (60%) occurred in the 1st week (mode = day 1).

The case fatality rate was highest in the group with kwashiorkor with a W/H less than  $-3$  SD (35.7%), and in those with marasmus with a W/H less than  $-5$  SD (25.9%) (Table III). Of the 70 marasmic dehydrated children, 16 (22.9%) died compared to 18 (8%)

TABLE III. Case fatality rate among registered children according to the admission nutritional status, Tahoua Feeding Centre, Niger (February 1987–May 1988)

Nutritional status	Death	Total	Case fatality rate (%)	Relative risk and 95% confidence interval
Kwashiorkor < -3 SD* W/H**	15	42	35.7	3.6 (2.1–6.2)
Marasmus < -5 SD W/H	7	27	25.9	2.6 (1.3–5.4)
Marasmus ≥ -5 SD W/H or Kwashiorkor ≥ -3 SD W/H	30	305	9.8	1 (reference group)
Total	52	374***	14.4	

\*Weight-for-height.

\*\*Standard deviation.

\*\*\*Seven children had unknown W/H.

TABLE IV. Mortality rates per person/days of follow-up among children included in Study 2, Tahoua, Niger (February 1987–May 1988)

Status	Number of days follow-up	Number of deaths	Mortality rate/10 000/day	RR 95% CI
Absconded ( <i>n</i> = 36)	3 463	17	49.1	7.1
Recovered or discharged ( <i>n</i> = 107)	27 661	19	6.9	(3.1, 13.7)
Total	31 124	36	11.6	

of the 223 marasmic normally hydrated children (relative risk [RR] = 2.8; 95% confidence interval [CI] = [1.5–5.2]). The only significant risk factor for absconding was the status nomad (25/61) vs sedentary (64/252) (RR = 1.6; 95% CI = [1.1–2.3]).

### Study 2

Among the 210 children who had left the therapeutic feeding centre during the year 1987, 143 (68.1%) were visited at home at least 3 months later. The assumption that the children included in the analysis were representative of the original group was verified by a comparison of age, nutritional status

and duration of stay in hospital between those visited at home and those lost during follow-up. No difference was observed.

The long-term results are presented for the 143 children included in follow-up (Table IV). Of the 107 children who had recovered or who had been discharged from hospital with medical approval, 19 died during follow-up (27 661 days for this group). Of the children who had absconded during hospitalization, 17 died during follow-up (3463 days). The risk of dying among the children who absconded was 7.1 times higher than the risk observed among the two aggregated other groups.

TABLE V. Nutritional status among children included in follow-up 3-16 months after admission to the feeding centre by mode of issue from the centre, Tahoua, Niger (April-May 1988)

Status	Nutritional status (W/H)			Total No. (%)
	$\geq -2$ SD No. (%)	$< -2$ SD-3 SD No. (%)	$< -3$ SD No. (%)	
Recovered	48 (84.2)	9 (15.8)	0 (0)	57 (100)
Discharged	15 (50.0)	10 (33.3)	5 (16.7)	30 (100)
Absconded	12 (63.1)	5 (26.3)	2 (10.5)	19 (100)
Total	75 (70.7)	24 (22.6)	7 (6.6)	106* (100)

\*1 missing datum.

Of the 57 children who had recovered during hospitalization and who survived, nine were less than  $-2$  SD (16.2%) at the control visit (Table V). No relapse (W/H  $< -3$  SD) was observed in this group. The nutritional status of those who were discharged with medical approval showed that 50% (15) of them were still malnourished (W/H  $< -2$  SD). The nutritional status of three (10%) children had worsened after they left the centre and 19 (64%) had steadily improved their nutritional status (improvement of W/H more than 0.5 SD).

Five of the deaths at 3 months among the children who were discharged or who recovered and one death in the group who absconded were owing to measles. The measles case fatality rate during the follow-up period was 60% (6/10); none of the children who died had received measles immunization. The other main causes of death were diarrhoea (27.8%) and fever (22.2%).

Children belonging to the age group 6-17 months at the beginning of the follow-up period had a risk of dying 2.1 times higher than children aged more than 17 months (28/88 (31.8%) vs 8/55 (15.1%); 95% CI=(1.1, 4.3)).

Fifty-one (36%) of the children traced had been followed-up in preventive consultation since they left the feeding centre. Fifty-eight

TABLE VI. Knowledge and attitude of mothers after the follow-up period (3-16 months), Tahoua, Niger, April-May 1988

	No. (%) (n = 143)
Children followed up in preventive consultation*	51 (36)
Knowledge of porridge recipe	83 (58)
Knowledge of ORT** preparation	82 (57)

\*Food diversity, meals.

\*\*ORT: Oral rehydration therapy.

per cent of the mothers had good preventive knowledge of the porridge recipe and 57% of oral rehydration (Table VI).

## Discussion

The bed capacity of the centre (20 beds) seems to be adapted to the average number of admissions (average = 23.8 admissions/month) for therapeutic feeding. The main age group recruited by the centre (6-29 months) is also the at-risk age group found in several cross-sectional surveys conducted in the same area during the same period of time.<sup>5,10</sup> Meanwhile, the 18-29 months age group seems under-represented considering the results of the survey which found the same level of severe PEM between 6 and 17 months and 18 and 29 months. Such a difference can be

explained by a poor attendance at preventive services after 18 months of age.

A case fatality rate of 14.4% is lower than usually reported for hospital rehabilitation of severely malnourished children.<sup>2,13</sup> In the present study, only severe and often complicated cases were enrolled, so it is difficult to compare our results with those of other studies which used different selection criteria.<sup>9</sup> In this study, cases were managed in a rural district hospital without any sophisticated facilities, and with all the typical restrictions such as staff shortages and lack of money.<sup>6,8</sup> One characteristic of the centre was that it was organized in a very simple building totally independent of the paediatric ward. Most of the time the centre was managed by a nurse and an auxiliary nurse. Participation of mothers was a main objective of the team.

In the present study, the risk factors for death were nutritional and hydration status of children at registration time. These findings are consistent with those of M. Roosmalen-Wiebenga *et al.* who individualized children classified as having marasmic kwashiorkor as a high risk group for mortality.<sup>9</sup> Dehydrated marasmic children were among the most difficult to manage and we observed that most of the deaths occurred during the 1st week of hospitalization.<sup>13</sup> For all these at-risk children, specifically during their 1st week of hospitalization, a special unit had to be set up inside the rehabilitation centre.

The short stay of about 3 weeks median for recovery compares favourably with the much longer mean duration of most other programmes for children with severe PEM reported in the literature (range 6 weeks to 8 months).<sup>3,4,7</sup> Again, these results are consistent with studies in rural district hospitals in Tanzania and Nigeria.<sup>9,11,12,14</sup> This is extremely important economically (reduction of the cost of hospitalization) and also socially (limiting the absence of the mother from home). The recovery time is longer for patients with kwashiorkor because they need a preliminary period to lose their oedema (about 1 week, according to the severity of the case).

Follow-up of severely malnourished children discharged from hospital proves to be feasible in a large rural area with poor communications and minimal infrastructure. A relatively high percentage (68%) of the children eligible for follow-up could be traced. Furthermore, considering the main characteristics, there was no difference between the children traced and the children lost to follow-up in each discharge group. These findings may suggest that children traced during follow-up are representative of the overall population hospitalized during 1987.

Our estimation of the positive impact of therapeutic feeding on the mortality rate is limited because of the lack of an adequate non-exposed group to compare with the follow-up of discharged children. A further retrospective cohort study should be developed, selecting non-exposed among children of the same age, same nutritional status, living in the same locality but not exposed to the feeding centre.

The nutritional status was satisfactory in the group considered to have recovered when they left the centre. There were no relapses and their nutritional status was similar to that observed in the general population of the area.<sup>5</sup> In the group discharged with medical approval, the nutritional status of children was still poor but most of them improved during the follow-up period. These results and the relatively low rate of mortality in this group suggest that it is reasonable to discharge children as soon as their oedema has disappeared, their infection has been treated, recovery (weight gain) has started and their appetite has returned. The behaviour of the mother during a child's hospitalization is probably another important criterion for a successful recovery.

To improve the outcome in such a centre, the most important aim is to reduce the rate of children who abscond. Almost half of the children who had absconded died during the follow-up period. The nutritional status of these children at entrance, a major prognostic factor, is not different from the nutritional

status of the children who were discharged. Consequently, treatment acceptability to the mother or other caretaker has to be considered as a major factor.

To reduce the mortality during the follow-up period, all children have to be immunized against measles as soon as they are admitted to the centre. This strategy was impossible to apply in Tahoua owing to logistical problems such as the unavailability of vaccines. This problem must be solved in all nutritional rehabilitation centres which serve a population at high risk of dying from measles.

It seems reasonable to consider that the nutritional status of children when they leave a centre is a major prognostic factor for survival or death. We have to balance that fact of keeping the mother and child longer in the centre with the risk of drastically increasing the absconding rate. The reduction of the duration of stay should also be balanced with the possibility of preparing the mother to manage the recovery phase at home. At this point, it is very important to organize active follow-up of these children in existing MCH services. The attendance rate for preventive consultation is very low among children in Niger, probably owing to the scarcity of MCH services and the distances between housing and the existing centre.

As shown by the high rate of knowledge of preventive measures when compared with the results of the different cross-sectional studies conducted in the same area (citing less than 20% of the mothers knowing the messages), nutritional rehabilitation centres seem to be an excellent place to give educational messages to the mothers.

## Conclusions

The results of this study have to be interpreted in a context where the rate of severe malnutrition is very high even during periods without famine. Long-term results suggest that nutrition rehabilitation centres may have a definite place in the management of PEM. The results of the study provide the following practical suggestions for dealing with severely

malnourished children. Duration of stay in hospital should be limited. An intensive care unit in the centre should be established to manage high risk children as well as all the other children during the first week of hospitalization. All children admitted to the centre should be immunized against measles. The stay in hospital of the mothers or other caretakers should be used to deliver practical educational and preventive messages. A follow-up system at home or at community level should be set up and integrated into comprehensive MCH services.

## References

- 1 Waterlow JC. Classification of PEM. In: Beaton GH, Bengoa JM, eds. *Nutrition in Preventive Medicine*. Geneva: WHO, 1976; 530-55.
- 2 Cook R. Is hospital the place for the treatment of malnourished children? *J Trop Pediatr* 1971; 17: 15-25.
- 3 Beghin I, Viteri F. Nutritional rehabilitation centres: an evaluation of their performance. *J Trop Pediatr* 1973; 19:215-19.
- 4 Beaudry-Darisme M, Latham MC. Nutritional rehabilitation centres: an evaluation of their performance. *J Trop Pediatr* 1973; 19:299-332.
- 5 Médecins Sans Frontières. FEWS Rapports de 3 Enquêtes Nutritionnelles; Tahoua, Maradi, Niger 1987-88.
- 6 Spalding E, McCrea J, Rutishauser IHE, Parkin JM. A study of severely malnourished children in The Gambia. *Environ Child Health* 1977; October: 215-19.
- 7 Schneidemann I, Bennett F, Rutishauser I. The nutrition rehabilitation unit at Mulago Hospital, development and evaluation. *J Trop Pediatr* 1971; 17:25-34.
- 8 Gueri M, Andrews N, Fox K, Jutsum P, St Hill D. A supplementary feeding programme for the management of severe and moderate malnutrition outside hospital. *J Trop Pediatr* 1985; 31:101-8.
- 9 Van Roosmalen-Wiebenga MW, Kusin J, de With C. Nutrition rehabilitation in hospital—a waste of time and money? *J Trop Pediatr* 1986; 32:240-3 and 33:24-8.
- 10 Quelin G, Pecoul B, Amadou B, Baker S. Les facteurs de risques de malnutrition aigüe en zone subsaharienne au Niger. *Med Trop* 1991; 51:335-42.
- 11 Smith IF. Rehabilitation of protein energy metabolism and hormonal status in Nigerian children. *Nutrition Reports International* 1981; 24:603-13.
- 12 Smith IF, Taiwo O. Patterns of weight gain in hospitalized protein-energy malnourished Nigerian children. *Nutr Rep Int* 1983; 27:723-31.

- 13 Tolboom JJ, Ralitapole-Maruping AP, Kabir H, Molatselil P, Anderson D. Severe protein energy malnutrition in Lesotho, death and survival in hospital, clinical findings. *Trop Geogr Med* 1986; 38: 351–8.
- 14 Janssen F, Bouton JM, Vuye A, Vis HL. Evaluation of clinical and biological parameters in marasmic kwashiorkor children treated by parenteral nutrition. *J Parenter Enteral Nutr* 1983; 7:26–36.