

## THE REHABILITATION OF THE MALNOURISHED BANTU INFANT

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The object of this paper is to describe a programme for the recovery of Bantu infants who have attended the Meadowlands Clinic and have failed to thrive. This term, 'failure to thrive', is preferred since it implies a totality of aetiology which must be taken into account in dealing with the complexities of malnutrition.

### *Environment and Social Conditions*

The pattern of aetiology varies with the geographical milieu. In rural areas famine arising from the failure of agriculture might be the prime cause of malnutrition, but in a Bantu urban population, e.g. in Meadowlands, malnutrition is linked with the socio-economic problems of an urban society of poor people.

The Sotho and Nguni women are integrated into the European economic structure. Most of the women are employed in domestic service, which results in an early return to work after confinement. The infant weaned at an early stage is left in the care of an old grandmother or other children. The invariable result is neglect and malnutrition.<sup>1,2</sup> The Vendas and Shangaans, on the other hand, lead a primitive life in this urban area. The women still wear leather skirts and rings on their feet. They stay at home and look after their children, but the general level of their income is lower than that of the other groups.

The reasons why Bantu infants fail to thrive can be summarized as follows:

- (A) **Inadequate or unbalanced diet.**
- (B) **As the result of:**
  - (1) Tuberculosis
  - (2) Syphilis
  - (3) Ascaris
  - (4) Repeated infections, e.g. (a) gastro-enteritis, (b) respiratory infections
  - (5) Congenital abnormalities
  - (6) Prematurity
- (C) **Socio-economic factors:**
  - (1) Working mothers
  - (2) Granny care
  - (3) Poverty
  - (4) Ignorance
  - (5) Chronic mental and physical illness of mothers
  - (6) Native customs, e.g. witchcraft
  - (7) Illegitimacy
- (D) **Miscellaneous:**
  - (1) Twins
  - (2) 'Going to the farms'
  - (3) Poor hygiene

The above factors are well known except for the strange anomaly of 'going to the farms'. Many nutrition workers will confirm that when native children are sent to live on the farms with their families — especially dairy farms, they return to the urban areas with gross malnutrition.

In the case of twins the bigger one usually thrives, while the leaner one deteriorates.

In all cases a careful history of the diet was taken. Not one of the infants in this project received an adequate diet. Mealie meal formed the bulk of the food. The addition of protein and other cereals was minimal. One of the most pernicious practices, which is widespread among the Bantu, is to give the children only a mealie meal diet during the weaning stage. Another practice is to buy an expensive, well-balanced, patent food and then to dilute it to such an extent that the resultant mixture has little more food value than plain water. Again, it is to be noted that the quantities of fresh milk available for

distribution and the quality and cleanliness of this milk are far from satisfactory.

To remedy the causes of the socio-economic conditions involved might be beyond the scope of medical practice, but education in regard to the diet and the supply of additional well-balanced foodstuffs are the best methods of combating the problem of malnutrition.

In spite of all efforts, certain other factors make rehabilitation nearly impossible. Mental deficiency and grave, chronic illness of the mother create conditions where understanding of the problems involved and the minimal care of the offspring cannot be carried out. In some cases, for example, when the husband deserts the family, the income declines to the zero level, and urgent welfare measures, which take time, must be instituted. In other cases (and this is very common) an old grandmother has to look after several children, and she often lacks the mental or physical capacity to cope with the demands of a young family.

The influence of the witchdoctor, now fortunately becoming rare, often counteracts the beneficial work done at the clinic.

Any nutritional programme that does not take into account the aetiological factors in deficiency diseases is bound to fail. Infants suffering from these diseases are particularly prone to gastro-enteritis and respiratory infections. Often no headway can be made at all, e.g. a little gain in weight is offset by continual relapses of infections which do not respond to therapy, as in the well-nourished infant.

### *Selection of Cases*

Infants who have failed to gain weight were selected for rehabilitation. Standards for normal weight of Bantu infants are difficult to obtain. The scale used in this project was the graph of weights prepared by the Department of Preventive and Family Medicine (University of Natal). This graph is not entirely satisfactory since it becomes asymptotic at 44 weeks, which makes extrapolation impossible and casts some doubt on the normalcy of the population from which the figures were compiled. From this graph infants in the lower 10 percentile group were chosen. Table I shows the gross weight retardation of the selected group when compared with European and Coloured median weights:

TABLE I. GROSS WEIGHT RETARDATION OF THE SELECTED GROUP

Age	Selected group 10% (lower)	Harvard study [Median <sup>3</sup> (boys)]	Coloured (Median <sup>4</sup> )
3 months .. ..	7½ lb.	12½ lb.	11 lb.
6 months .. ..	10½ lb.	16 lb.	16 lb.
9 months .. ..	12 lb.	20 lb.	18 lb.
1 year .. ..	12¾ lb.	22 lb.	21 lb.
1½ years .. ..	14 lb.	25 lb.	23½ lb.

In terms of absolute values many of these infants can be described as 'skeletons'. It is interesting to note that the relative gains in weight of all 3 groups are approxi-

mately equal, i.e. the weight has doubled itself during the period from 3 to 18 months.

It would be fallacious, however, to regard individual development as conforming to the smooth graph pattern of a group mean. The lower 10 percentile graph might reflect the weight progress of a healthy premature infant. In actual practice we have seen marasmic infants who have shown no weight increase for 6 months. The general pattern is a 'spiked' graph. Sometimes gains of 1 lb. are recorded in 1 week to be followed by recessions and then more moderate gains. In other cases, as if a hurdle has been passed, exceptional constant gains are recorded under treatment.

It poses a tremendous problem indeed from the health and nutrition standpoint that 10% of the normal Bantu population falls into this grossly malnourished group. An assessment was also made of 500 consecutive cards of infants of 0-12 months of age who were brought to this clinic (Table II).

TABLE II. CLINIC POPULATION: DISTRIBUTION OF WEIGHTS WHEN COMPARED WITH THE STANDARD

Standard .. ..	10%	80%	10%
Clinic distribution .. ..	14%	68%	18%

This is of course not a normal, but a 'clinic' population. The figures clearly illustrate the magnitude of the malnutrition problem which must be dealt with in clinic practice.

In addition to the above group, infants showing skin and mucous membrane changes indicating nutritional deficiencies were also included for rehabilitation, since kwashiorkor patients may show a temporary normal weight. We have seen these patients lose up to 4 lb. of oedema within a few days!

#### THE REHABILITATION PROGRAMME

The programme can be outlined as follows:

1. Talks on infant feeding are given to patients while they are waiting for their antenatal examinations. A flannel graph is used which is one of the best methods of illustrating correct feeding methods to an illiterate audience.
2. The care of the infant is again stressed by the mid-wifery staff attending mothers during the puerperium.
3. A trained social worker visits the homes if the social and economic conditions are not satisfactory.
4. Infants are placed on the 'rehabilitation list'. They visit the clinic at regular intervals. Home visits are paid to defaulters or where health recovery is unsatisfactory.
5. At each visit a careful clinical examination is made and intercurrent illnesses treated.
6. Adequate supplementary foods are supplied.

#### The Dietary Programme

The few infants under 3 months of age were fed on half-cream or full-cream milk powders according to recognized practice. For all the other children the supplements were given as follows: Dried skimmed milk, 2½ oz. per day, reconstituted as a fluid mixture in the proportion of 1 teaspoonful of the powder to 1 oz. of water, and 'pronutro' (see below) mixed with water to a thick consistency and eaten with the fingers or spoon-fed, 2½-3½ oz. per day depending on the age of the child. Composition and calorie values are as follows (Table III):

TABLE III. COMPOSITION OF CALORIE VALUES

Daily allowance	Calories	Protein	Fat	Carbo- hydrate
2½ oz. of dried skim milk .. ..	235	23 G.	64 G.	33 G.
2½-3½ oz. of pronutro .. ..	300-420	15.5-21.7 G.	9.1-12.7 G.	38.7-54.2 G.

Therefore, 535-655 calories and 38.5-44.7 G. of protein were added to the diet every day. Allowing 50 calories per lb. body weight, the above figures would show a caloric shortfall in infants over 13 lb.

Two important factors must be realized. These infants are so debilitated that they will not take the amounts of food set by theoretical standards. The process of rehabilitation must be carried out very slowly indeed. The second factor is that the mother must be made to realize that the food supplied is a supplement and not the total diet. When some progress has been made the mother is encouraged (and supervised) to give brown bread, potatoes, orange juice, sieved green vegetables, kaffir-corn (millet) porridge, and a little meat if it is available. The Shangaan/Venda people add peanuts and spinach to the diet. Mealie meal is not allowed in order to prevent the mother from taking the easiest way out and feeding the infant only on this food.

Extra vitamins were given to these children in the form of mixtures. If the weight gain was not satisfactory, or if there was a suspicion that the food was being divided among the other members of the family, extra food was given and the child on the rehabilitation list was brought to the clinic for daily feeds under supervision.

#### The Role of Pronutro in the Rehabilitation Programme

This food was developed after a considerable amount of research.

It contains: 22% protein; 12.9% fat; 1.5% fibre; 4.6% minerals; 0.46% calcium; 0.48% phosphorus; 0.008% iron; vitamin A, 1,500 I.U.; thiamine 0.86 mg. per 100 ml.; riboflavin 1.2 mg. per 100 ml. and niacin 7.7 mg. per 100 ml. It provides 120 calories per oz.

An analysis of the amino acids shows values in close agreement with those proposed by the FAO.<sup>5</sup> The biological experiments,<sup>6</sup> the metabolic studies,<sup>7</sup> and the clinical trials<sup>8,9</sup> to date have all given satisfactory results.

Apart from the chemical and biological values, a food to be used on a large scale to combat population malnutrition must be palatable, and priced so that it can be purchased by the lower income group. 2½ oz. of pronutro costs 1.2 cents, and a similar amount of dried skimmed milk 2.4 cents. Rehabilitation at 3.6 cents per patient per day is very reasonable indeed.

The manner of eating a food must receive consideration. Dried skimmed milk is bottle-fed and pronutro with its thick consistency is preferred to a soup where excessive dilution with water will diminish the food values.

As already stated, pronutro was not given to infants under 3 months of age. In patients with kwashiorkor it was withheld until the glossitis and inflammation of the mucous membranes subsided and also for short periods in patients with gastro-enteritis. (It must be stressed that this is *not* a controlled experiment to prove the value of

pronutro. Such experiments have already been carried out.<sup>7-9)</sup>

From a practical point of view dried skimmed milk and pronutro complement each other, and the values of both these foods must be taken into account in assessing the results. Dried skimmed milk has often been added to a high intake mealie diet in the hope that the extra proteins would balance this mixture. Other factors than proteins must, however, also be considered. Skimmed milk powder lacks fat and fat-soluble vitamins, of which vitamin A is the most important in South Africa. The iron content is extremely low — 3.2 oz. of skimmed milk powder only supplies 8% of the daily iron requirements of children 1-3 years old. With a lack of fat calories in the diet, bulky intakes are required to meet the caloric needs, or high-quality proteins are to be deaminized and burned for fuel purposes; with a daily lack of only 100 calories in the child playing around, as much as 25 G. of protein is to be burned. High protein intakes are, therefore, also associated with elevated blood-urea concentrations.<sup>10</sup> In infants receiving 7% of the total calories from protein, the blood urea ranged from 6.0 to 6.9 mg. per 100 ml. At 11% of calories from protein the average blood urea rose to 8.9, at 14% to 14.0, and at 20% to 22.6 mg. per 100 ml.

White maize commonly used is also devoid of vitamin A and low in iron and niacin. The iron contained in 4 oz. of maize satisfies only 30% of the needs of the 1-3-year-old child — hence the iron-deficiency anaemia with predominantly maize diets. Niacin deficiency may be made good by the tryptophane content of the milk if sufficient is eaten. Nutritional deficiencies existing in the maize and milk may be precipitated as growth is stimulated by the extra protein.

#### Assessment of Results

There might be some argument as to what would constitute 'health recovery'. The results of this experiment were assessed after 6 months. Nearly all the infants have been under our care for at least 4 months. The programme is continuing. The criteria adopted were:

1. That these infants should record a gain in weight equal to the normal *European* median gain in weight of similar age for the same period. The figures used were the median gains for boys computed from the Harvard study.<sup>3</sup>

These standards are deliberately set at a high level. Referring to Table I, if the infant kept to the actual growth pattern of the group one would expect a gain in weight of 2½ lb. for the period 6-12 months. For the result to be regarded as satisfactory progress in this project, we would expect a gain of 6 lb. (see Harvard figures) for this period. It might be thought that this stimulation of growth might cause other nutritional deficiencies. This has not been the case since the diet has been well balanced with extra vitamin supplies.

2. That overt clinical signs of malnutrition should be absent.

The patients were divided into 2 groups:

(a) Atrophic malnutrition with or without skin and mucous membrane changes — the well-known picture of the marasmic infant.

(b) Kwashiorkor. These patients form a separate entity

because the treatment is far more complex. In the initial stages, owing to inflammation of the mucous membranes, it is very difficult to get these infants to take any nourishment at all; hospital therapy is therefore essential. Successful treatment depends on the skill and care of the mother. This often cannot be provided because the initial cause of the complaint is the extreme neglect of the mother or the grandmother.

The population of this district is relatively stable, but there are constant 'visits' to relatives living in outlying districts. Such movements upset a programme of rehabilitation. On the other hand, people hearing of this service come to the clinic from the rural areas. They have no intention of staying any length of time, and once some improvement of the condition of the infant is noted, they depart. Of course, no true assessment of such results can be made, but for the sake of a complete record they are not omitted. It is hoped that the feeding instructions given to the parents will be of use when they return to their homes.

TABLE IV. AGE AND SEX DISTRIBUTION OF SELECTED CASES

	0-6 months	7-12	13-18	19-24	2-3 yrs.	3 plus	Total
Males ..	16	13	9	4	6	1	49
Females ..	8	11	6	7	11	2	45
Total	24	24	15	11	17	3	94

Table IV shows that approximately 50% of the selected patients were under the age of one year. In this age group there was only one patient with kwashiorkor, the rest being patients with atrophic malnutrition. The majority of kwashiorkor patients developed the condition between the ages of 13 and 24 months. On considering methods of combating population malnutrition, it is very difficult to exercise any control over this infant, pre-school group. Nutrition education in the antenatal period, and in addition the extension of infant and pre-school clinics, are the only methods available for the effective control of malnutrition in these children.

#### The Results of Rehabilitation

The total number of patients included in the rehabilitation programme was 102. An analysis, in terms of recovery of health, of the kwashiorkor group is given in Table V.

TABLE V. KWASHIORKOR GROUP

Satisfactory	Unsatisfactory	Omitted	Total
16	3	7	26

Of the 7 patients who failed to attend after the first visit, 2 died in hospital and 5 disappeared.

*Comments.* Of those that made a 'satisfactory' recovery, 2 had to be admitted to hospital after the first visit owing to the severity of the condition. They were discharged after 3 weeks and their rehabilitation was continued at the clinic. Only one patient relapsed during therapy, but he recovered and was still well at the final assessment. Of the 3 'unsatisfactory' patients, one died of pneumonia and one developed convulsions and had to be admitted to hospital. The third did not make any progress.

With reference to the outcome of treatment, the following observations should be noted: The skin and mucous membrane signs clear up rapidly. Oedema might show a dramatic improvement in a few days or may take weeks

to subside. The extreme irritability improves with treatment, but these infants remain listless and apathetic for a long period. In a few months the straight, reddish-grey hair show little signs of curling or thickening. As improvement continues there is a steady gain in weight without the onset of oedema, and the skin retains its normal lustre.

An analysis of the atrophic malnutrition groups is given in Table VI.

TABLE VI. ATROPHIC MALNUTRITION GROUP

Complete health	Exceptional	Failures	Omitted	Total
38	5	10	23	76

Of the 53 patients who came into the health recovery programme in a grossly malnourished state, 38 showed gains in weight equal to the expected gains of the median of American children in the Harvard study. Ten of these children had severe physical defects—2 suffered from congenital syphilis (1 with cerebral palsy and mental deficiency), 2 from primary tuberculosis, 3 from severe repeated respiratory infections, and 2 from congenital heart disease. With therapy these children made progress to the required set standard. In the 5 that made exceptional progress it seemed as if the growth process was suddenly accelerated. One infant weighed 7 lb. at the age of 1½ years. (It seems strange that parents could allow a child to deteriorate to this extent without seeking advice.) The child gained 7 lb. within 6 months. Another, weighing 11 lb. 11 oz. at 31 months doubled its weight in 4 months.

#### The Failures

The reasons why these infants failed to respond to treatment are listed below:

Two suffered from active primary tuberculosis.

In 3 cases the cooperation of the parents was so unsatisfactory that regular attendances were not made.

Five suffered from continual respiratory or gastrointestinal infections.

The results of the two groups taken together (omitting those who did not attend after the first visit) show that of the 72 children, 59 (82%) showed complete health recovery. Since the assessment of the results this progress has been continued and the new patients, especially those suffering from kwashiorkor, have shown similar satisfactory recovery. There would appear to be a trend (but it is too early to reach any definite conclusions) for fewer cases of malnutrition to occur in the area. This must be the final and permanent aim of any rehabilitation project.

#### CONCLUSIONS

Over 100 grossly malnourished children were placed on a health recovery programme.

Investigations were carried out into the diet, socio-economic causes, and underlying pathology of malnourishment. Lectures on nutrition education were given, and supplementary food supplied and medical therapy instituted. Careful surveillance and home visits were important aspects of the programme.

In population rehabilitation programmes in which food values, costs and palatability are important factors, dried skimmed milk and pronutro supplements promote health recovery of malnourished infants in a most satisfactory manner.

An otherwise poor prognosis, continual morbidity, high costs of hospitalization and relapses when these children return to their homes, make a health recovery programme of this nature an essential and important aspect of clinic practice.

In 82% of both selected groups (kwashiorkor and atrophic malnutrition) the gross manifestations of malnutrition were halted and recovery accelerated. In the atrophic malnutrition group, the standard of the median of American children of the Harvard study was attained.

Failure was due to lack of cooperation of the parents and intercurrent illnesses.

It is hoped that the true value of this programme will be seen in future when these preventable conditions will disappear as a result of education and the availability of well-balanced foods at reasonable costs.

#### SUMMARY IN INTERLINGUA

In iste projecto plus que 100 infantes con malnutrition atrophe e kwashiorkor esseva subjicite a un programma de rehabilitation.

Le factores etiologic in le dieta, le conditiones socio-economic, e le pathologia esseva investigate.

Esseva constatate que le dieta consisteva in omme le casos de mais con basse nivellos de proteinas e vitaminas. Un altere factor esseva le negligentia del parentes. Esseva etiam trovate que iste infantes suffreva de disordines respiratori e gastrointestinal de alte incidentia. Le tractamento includeva effortios educatori e le provision de dietas a alte contento de proteina, como per exemplo pronutro e siccate lacte discremate. Intercurrente maladias esseva tractate, e visitas al domicilios esseva facite quando le progresso del patientes non esseva satisfacite.

In 82 pro cento del casos, un complete restablimento del sanitate esseva obtenite. Le gruppo a kwashiorkor se restabliva sin ulle recidiva. Le infantes suffrente de malnutrition atrophe ganiava in peso e progrededa usque al livello median del juveniles american in le studio Harvard.

Non-progresso esseva causate per infectiones e manco de cooperation del parte del parentes e per le facto que iste infantes esseva negligite.

Per medio del methodos usate in le presente programma, un grande numero de casos de malnutrition esseva curate a un costo de 3-6 cents per patiente per die.

I wish to thank Mr. Phillip Hind for supporting this project. Dr. W. A. Odendaal gave most valuable advice on all aspects of the health recovery programme.

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