CARTAS AL EDITOR

IMPACT OF A FEEDING PROGRAM ON PRESCHOOL CHILDREN WITH SEVERE MALNUTRITION

Dear Sirs:

Few studies have attempted to evaluate the nutritional impact of feeding programs in children with severe protein-energy malnutrition (PEM) (1). Our purpose now is to report the nutritional impact of a special feeding program, evaluated retrospectively under routine working conditions.

The program was ancillary to a larger study that extended from January 1969 to September 1977 in four rural villages of eastern Guatemala, which assessed the impact of mild to moderate malnutrition on the physical growth and mental development of preschool children (2). Socioeconomic characteristics of the study children and their families have been previously described (3). Those children with third degree malnutrition on the Gómez scale (4) or those with reports from the mother which indicated a severe nutritional problem were considered as "severely malnourished" and selected for the special feeding program. These subjects remained in the program until they were judged to have recovered, usually from 3 to 6 months. These severe PEM children were fed directly by the project personnel at the outpatient clinic. In two of the villages, all subjects received a high-protein drink resembling the local gruel, *atole* (173 Kcal/180 ml). In the other two villages, they received a local drink which contained no protein, *fresco* (59 Kcal/180 ml). The subjects in the *fresco* villages special feeding program received milk in addition, (119 Kcal/180 ml). The average total consumption of these supplements was 360 ml per day. Both *fresco* and *atole* contained

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vitamins and minerals which were limiting in the normal diet (5). Medical attention was given as needed.

Height and weight were measured for all children in the longitudinal study at 15 days and at 3, 6, 9, 12, 15, 18, 21, 24, 30, 36, 42, 48, 60, 72, and 84 months of age, respectively. The data corresponding to the period immediately preceding, and the period following commencement of the special feeding program were used in the present analysis. Data on height for age, weight for age, and weight for height were expressed in terms of percentiles and percentages of the 50th percentile using a computer program which replicates the standards of the National Center for Health Statistics (6). These values allow for the assessment, independent of age, of changes in relative standing of the children before and after the program.

From a total of 1,519 children included in the longitudinal study, 147 (9.7%) were diagnosed as having severe PEM. Sixty-three were excluded from the analysis because of missing data, and 11 children who died were not included. The sample size was, therefore, of 73 children.

Given their severe physical growth retardation, it was not possible to use percentiles of height or weight for age, as these variables show minimal variation among the study subjects. Instead, percentages of the 50th percentile, or median, were used, as these reflect variability in the lower ranges and are normally distributed.

In order to evaluate the impact of the program on these children, mean values were calculated for percentage of median height for age, weight for age, and weight for height preceding and subsequent to the initiation of treatment. Table 1 presents these values broken down by initial status and age groups. A trend may be noted for individuals in the lower initial status groups to show greater gains than individuals in the higher initial status groups. Correlation analysis was performed to test this trend.

Table 2 shows the proportion of children falling below critical points of the NCHS distribution and the proportion of children who fell below the mean values of the longitudinal population before and after the program. The proportion of children whose percentile of weight for height was below that of the mean of the longitudinal population declined significantly from 76% to 62% ($n=73$; $P < 0.01$). However, the proportion of the study group falling below the 15th percentile of the reference standards did not change significantly. These results

TABLE I

ANTHROPOMETRIC DATA OF THE STUDY POPULATION EXPRESSED AS PERCENTAGES OF THE 50th PERCENTILE OF NCHS STANDARDS

Categories in percentages of: The median	Before the special feeding program				After the special feeding program	
	Age (months)	n	$\bar{x}$ (%)	SD (%)	$\bar{x}$ (%)	SD (%)
Weight for age						
< 60%	all	8	56.01	3.18	61.89	7.53
60% - 74%	⩽ 24	28	67.30	3.43	71.66	8.84
	> 24	9	68.45	2.97	72.26	5.12
⩾ 75%	⩽ 24	15	78.35	3.26	77.10	10.09
	> 24	17	82.20	4.37	84.76	4.51
Height for age						
< 85%	all	20	82.36	1.48	83.68	3.34
85% - 89%	⩽ 24	19	87.88	1.64	87.58	3.06
	> 24	11	87.46	1.34	89.51	1.64
⩾ 90%	⩽ 24	16	92.26	1.68	91.20	3.00
	> 24	10	92.62	1.57	92.43	2.16
Weight for height						
< 85%	all	21	81.20	3.50	86.37	6.79
85% - 94%	⩽ 24	28	90.29	3.16	92.62	7.10
	> 24	11	90.20	3.91	98.21	6.81
⩾ 95%	⩽ 24	15	99.98	3.16	93.29	8.82
	> 24	10	100.00	6.32	103.23	7.30

TABLE 2

PROPORTION OF THE SPECIAL FEEDING PROGRAM SAMPLE* BELOW CRITICAL LIMITS OF NCHS PERCENTILES AND BELOW THE MEAN OF THE LONGITUDINAL POPULATION

	Percentile wt/age		Percentile ht/age		Percentile wt/ht	
	% below 5th percentile NCHS	% below mean of the long. population	% below 5th percentile NCHS	% below mean of the long. population	% below 15th percentile NCHS	% below mean of the long. population
Before	86	95	92	96	45	76
After	84	91	95	94	42	62**

* n = 73.

** P < .01.

imply that while the study group did not change in relation to the NCHS standards, there was improvement relative to the longitudinal population, and that the longitudinal population declined relative to the standards. It is concluded, therefore, that al least regarding weight for height, no further decline, as was characteristic of the total population, occurred in the study group.

In summary, 1) There was a nutritional impact of the special feeding program on weight for height; 2) the effect of the program on weight for age and height for age was insufficient to either improve percentile standing or significantly change the status of the children relative to their peers; 3) a greater positive change is noted in children with lower initial scores than in those who have higher initial scores; and 4) the significance of gains in such programs must be evaluated in terms of percentile standing, in addition to percentages of medians, so as to assess meaningfully their impact on the physical growth of the study subjects.

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BIBLIOGRAPHY

1. Beghin, I. D. & F. E. Viteri. Nutritional rehabilitation centres: an evaluation of their performance. **J. Trop. Pediat. Environ. Child Health,** 19: 403-416, 1973 (Monograph No. 31).
2. Klein, R. E., J-P. Habicht & C. Yarbrough. Some methodological problems in field studies of nutrition and intelligence. In: **Nutrition. Development and Social Behavior.** D. J. Kallen (Ed.). Proceedings of the Conference on the Assessment of Tests of Behavior from Studies of Nutrition in the Western Hemisphere. Washington, D. C., U. S. Government Printing Office, 1973, p. 61-75. (DHEW Publication No. (NIH) 73-242).
3. Mejía-Pivaral, V. **Características Económicas y Socioculturales de Cuatro Aldeas Ladinas de Guatemala.** Guatemala, C. A., Instituto Indigenista Nacional, Talleres Tipográficos de la Editorial Galindo, 1972, 300 p. más 8 mapas. (Publicada dentro de la Serie **Guatemala Indígena,** volumen 7, No. 3, julio-septiembre, 1972).

4. Gómez, F., R. R. Galván, J. Cravioto & S. Frenk. Malnutrition in infancy and childhood with special reference to kwashiorkor. In: **Advances in Pediatrics.** S. Levine (Ed.). Chicago, Yearbook Publications 7: 131, 1955.
5. Lechtig, A., J-P. Habicht, E. de León, G. Guzmán & M. Flores. Influencia de la nutrición materna sobre el crecimiento fetal en poblaciones rurales de Guatemala. I. Aspectos dietéticos. **Arch. Latinoamer. Nutr.,** 22: 101-115, 1972.
6. Hamill, P. V. V. NCHS growth curves for children. In: **Vital and Health Statistics.** Series 11, Data from the National Health Survey No. 165. Washington, D. C., U. S. Government Printing Office, 1977. (DHEW Publication (PHS) 78-1650).