



Nutritional status surveillance of children in a health district in southern Brazil

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Abstract

Objective: To investigate the nutritional status of children referred by a primary care center to the Nutritional Surveillance Program (*Prá-Crescer*), and to follow up children at risk in a health district of Porto Alegre (RS), Brazil.

Methods: A retrospective cohort study was conducted with 674 children, aged between 6 and 59 months, referred to the *Prá-Crescer* Program. Height-for-age, weight-for-height and weight-for-age indices were used to evaluate nutritional status. The cutoff points were the 3rd and 10th percentiles of the NCHS standards. The nutritional status of 391 children at nutritional risk was followed up for 12 months. The chi-square test was used to analyze associations between variables.

Results: Fifty-eight percent of the children had nutritional deficit. Of these, 38.1% were undernourished (< P3), and 61.9% were at nutritional risk (between P3 and P10). Height-for-age deficit was the most frequent, and the age group mostly affected was 12 to 24 months. Among those at nutritional risk, 50.1% completed the follow-up, 33.5% did not start follow-up, and 16.4% were lost to follow-up. 41.3% recovered nutritional health, 10.2% showed some improvement, without correcting their anthropometric deficits. 39.8% did not show any improvement, and 8.7% had worsening of their deficits. Recovery of nutritional health occurred, on average, within 7.5 months.

Conclusions: This study showed the importance of following up children at nutritional risk and indicates that some aspects should be improved in surveillance programs. Such improvements may reduce the number of children lost to follow-up.

J Pediatr (Rio J). 2005;81(4):325-31: Nutritional surveillance, nutritional evaluation, nutritional status, malnutrition, anthropometry.

Introduction

The assessment of children's nutritional status is essential to verify the state of health of the pediatric population and to monitor the improvement in the quality of life of the population at large.¹ The essential aspect of nutritional assessment is related to its decisive influence over the risks of morbidity and mortality, as well as over child growth and development.¹

The inference about the general living conditions of the population stems from the multicausal origin of malnutrition and from the close relationship established between infant feeding and the level of commitment to basic requirements such as nutrition, sanitation, health care and education.^{1,2}

Growth is the expression of an extremely complex interplay between an individual's genetic potential and his/her living conditions, the latter of which are determined by his/her social insertion. Nutrition and growth are closely related, since children cannot achieve their genetic growth potential if their basic requirements are not properly met.³

Nutritionally speaking, the period between weaning and the fifth year of life is the most vulnerable segment of the life cycle.^{4,5} Rapid growth, loss of passive immunity and the development of an immune system against infections determine specific nutritional requirements during this period,^{2,6} demanding that nutritional status be monitored in this age range. That is why the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) regard the surveillance of children's nutritional status as

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extremely important, especially, in developing countries, highlighting the importance of early identification of children at nutritional risk or at risk for malnutrition and the implementation of measures that allow for the full recovery of children's nutritional and health statuses.⁷

The Municipal Department of Health of Porto Alegre, in May 1994, implemented the Program for Nutritional Surveillance of Children and Expectant Mothers, known in Portuguese as *Prá-Crescer*. The aim of this program is to identify and follow up children and expectant mothers at nutritional risk and treat them at health units, where basic measures will be taken to fully recover their health. The children are assessed by the basic health units and those at nutritional risk are invited to participate in the program. These children are then followed up on a monthly basis at the health units, where, besides basic health care, they receive basic food supplies from the program. During the study period, families received 4 kg of powder milk and one liter of cooking oil.⁸

The anthropometric data of the children at risk are evaluated every three months in order to check the improvement in nutritional status: recovery from or persistence in the risk situation.⁸

Those children who improve their nutritional status, i.e., whose anthropometric indices are all above the 10th percentile, are followed up for another three months, not being entitled to receive basic food supplies from the program after this period. However, they continue to be followed up at the health units, having the right to basic nutritional measures developed there. Children who do not show up for follow-up visits after two months in a row are excluded for noncompliance.

The aim of this study was to investigate the nutritional status of children assessed at basic health units and referred to the *Prá-Crescer* program, and to evaluate the improvement of those children who were at nutritional risk. The study was carried out at Health District 6, in the city of Porto Alegre, southern Brazil.

Methods

We used secondary data about the children cared for at the health units of Health District 6, who participated in the *Prá-Crescer* program. The data were provided by the Municipal Department of Health of Porto Alegre. In this region, there are 11 basic health units that care for the local population.

The population of children younger than five years amounted to 10,167 in 2000 (IBGE, 2000). Of these, 702 were referred to *Prá-Crescer*, between May 1999 and April 2000. It should be underscored that most children cared for at the basic health units have their anthropometric indices recorded. However, only those in whom anthropometric deficit is suspected or confirmed are referred to *Prá-Crescer*. Incoherent or inconsistent data were retrieved from children's medical charts. These problems could not be solved in 26 cases, so the respective children were excluded from the study.

The following variables were used to determine the nutritional status of 674 children: gender; age; weight/height (W/H), weight/age (W/A), height/age (H/A); and severity of anthropometric deficits, which were classified into nutritional risk (from the 10th to the 3rd percentile) and malnutrition (< 3rd percentile). To assess the improvement in the nutritional status of the children at risk, a retrospective cohort was used, in which the following aspects were analyzed: participation, non-compliance, and nonparticipation, in addition to improvement in the nutritional status, classified as negative (when the child was still at risk at the end of the assessment period, with or without deterioration of anthropometric indices) or positive (when recovery or an increase in the percentile occurred).

The association study between the variables of interest and the outcomes was made using the chi-square test for linear trend and association, followed by a residual analysis, if necessary, in order to determine the category that was accountable for the association observed.

For the analysis of the nutritional status outcome, the children were classified according to the *Prá-Crescer* categories. Thus, those children who surpassed the 10th percentile were regarded as having recovered their nutritional status; those who showed improvement, but remained below the 10th percentile were regarded as having improved; and those who maintained the same percentile were regarded as unchanged; and finally, those who had a decrease in their percentile were regarded as having deteriorated. In addition, we used Student's t test for paired samples⁹ in order to compare nutritional status at the beginning and at the end of the study period in terms of H/A, W/H and W/A.

This study followed the recommendations of Resolution 196/96 of the Brazilian Health Council, and was approved by the Research Ethics Committee of *Universidade Luterana do Brasil*.

Results

Of the 674 children assessed, 283 (42%) were well-nourished and 391 (58%) had at least one of the anthropometric indices below the 10th percentile. Among the latter ones, 61.9% were at nutritional risk and 38.1% were malnourished. Of 391 children, 226 (57.8%) had H/A deficit, 67 (17.2%) showed a W/H deficit, 58 (14.8%) presented W/A deficit and 40 (10.2%) had concomitant H/A and W/H deficits.

There was a male predominance among the assessed children; however, when evaluating nutritional status in relation to gender, no statistically significant association was observed between these variables, even though there is a larger percentage of girls at nutritional risk (Table 1).

As to age, nutritional risk was more frequent among two-year-olds, whereas well-nourished children were more frequently found after 47 months of life. The chi-squared test showed a linear trend after 12 months of life, and nutritional status tended to improve with the advance of age.

Table 2 indicates that 50% of the children at nutritional risk was followed up, whereas the great loss occurred due to nonparticipation. With regard to gender, nonparticipation was more frequent among girls, while follow-up was better among boys. However, the chi-square test for association did not show statistically significant differences.

There was a larger percentage of follow-up among infants aged less than 12 months, of nonparticipation among 2-year-olds, and of noncompliance among those older than 36 months. The differences were statistically significant.

Children with extremely poor nutritional status (concomitant H/A and W/H deficits) were less frequently followed up. On the other hand, the most frequently followed

up ones had a W/A deficit. These differences were not statistically significant, though.

According to the cutoff points used by the *Prá-Crescer* program, 51.5% of the followed up children had positive results, that is, improvement (10.2%) or recovery (41.3%) of anthropometric deficits. On the other hand, 39.8% maintained their nutritional status unchanged during the 12-month follow-up period and in 8.7% there was deterioration of the nutritional status.

With regard to gender (Table 3), despite the fact that a larger number of boys recovered their nutritional status, this difference was not statistically significant. The age of children was associated with the recovery of nutritional status. In the first year of life, most infants showed an

Table 1 - Distribution of children according to nutritional status, gender, age range. Health District 6, Porto Alegre (RS), Brazil, 1999-2000

	Well-nourished		Nutritional risk*		Total		p
	n	%	n	%	n	%	
Gender							0.380
Female	130	40.2	193	59.8	323	47.9	
Male	153	43.6	198	56.4	351	52.1	
Age range							0.000
06 –12	61	41.8	85	58.2	146	21.7	
12 –24	54	29.2	131	70.8	185	27.4	
24 –36	54	38.3	87	61.7	141	20.9	
36 –48	61	50.8	59	49.2	120	17.8	
48 –60	53	64.6	29	35.2	82	12.2	
Total	283	42.0	391	58.0	674	100.0	

* Presenting some indexes below the tenth percentile.

Table 2 - Distribution of children at nutritional risk according to compliance with the *Prá-Crescer* program, gender, age range, anthropometric deficit. Health District 6, Porto Alegre (RS), Brazil. 1999-2000

	Compliance						p	
	Non-participation		Non-compliance		Followed			Total
	n	%	n	%	n	%		
Gender							0.882	
Female	67	34.7	31	16.1	95	49.2	193	
Male	64	32.3	33	16.7	101	51.0	198	
Age range (months)							0.008	
06 –12	22	25.9	11	12.9	52	61.2	85	
12 –24	53	40.5	19	14.5	59	45.0	131	
24 –36	34	39.1	10	11.5	43	49.4	87	
36 –60	22	25.0	24	27.3	42	47.7	88	
Anthropometric deficit							0.247	
H/A and W/H	12	30.0	12	30.0	16	40.0	40	
W/H	25	37.3	10	14.9	32	47.8	67	
H/A	77	34.1	35	15.5	114	50.4	226	
W/A	17	29.3	7	12.1	34	58.6	58	
Total	131	33.5	64	16.4	196	50.1	391	

H/A = height/age; W/H = weight/height; W/A = weight/age.

unfavorable outcome, which was also observed among children aged between 24 and 36 months. The nutritional status of these children at these ages was significantly worse than in the second year of life and after 35 months.

The evaluation of the outcome of children with W/H, H/A and W/A deficits was made by comparing the anthropometric indices, in percentiles, at the beginning and at the end of the study period using Student's t test (Table 4). The results showed a statistically significant improvement in W/H and W/A indices. Nevertheless, the same did not happen to the H/A index.

Recovery of nutritional status occurred on average at 7.5 months (mode = 6 months), and 23.5% of the children recovered their nutritional status within the first three months of follow-up, 27.2% between the third and fifth months, 25.9% between the sixth and eighth months, and 23.5% between the ninth and 12th months.

Discussion

The use of secondary data has some limitations regarding their quality, which were observed in the loss of 26 cases (4% of the initially selected population). However, studies assessing programs for the recovery of the nutritional status conducted by other authors, using data from medical charts, showed losses of 18.5%¹⁰ and 19.13%,¹¹ greater than the ones found in the present study.

Of all children evaluated, a high percentage was at nutritional risk, a result that is in agreement with the percentages observed among the children assessed in Porto Alegre. In 2000, of 5,232 evaluated children, 61.6% was at nutritional risk.⁸ This probably occurs because health units pre-select the children, sending data about those supposedly at risk for evaluation, with the aim of trying to include them in the *Prá-Crescer* program.

Table 3 - Distribution of children at nutritional risk according to nutritional status outcome and gender, age range, anthropometric deficit. Health District 6, Porto Alegre (RS), Brazil, 1999-2000

	Nutritional status outcome						p
	Negative		Positive		Total		
	n	%	n	%	n	%	
Gender							0.582
Female	48	50.5	47	49.5	95		
Male	47	46.5	54	53.5	101		
Age range (months)							0.002
06 — 12	34	65.4	18	34.6	52		
12 — 24	21	35.6	38	64.4	59		
24 — 36	25	58.1	18	41.9	43		
36 — 60	15	35.7	27	64.3	42		
Total	95	48.5	101	51.5	196		

Table 4 - Outcome of children at nutritional risk according to anthropometric deficit. Health District 6, Porto Alegre (RS), Brazil, 1999-2000

	Negative		Positive		Total n	Initial mean (percentile)	Mean at 12 months (percentile)	Student's t test	p
	n	%	n	%					
W/H	11	34.4	21	65.6	33	5.07	22.11	4.75	0.000
H/A	59	51.8	55	48.2	114	3.68	6.62	1.89	0.061
W/A	17	50.0	17	50.0	34	5.76	15.02	2.71	0.011
H/A and W/H*	8	50.0	8	50.0	16	-	-	-	-

W/A = weight/height; A/I = height/age; P/I = weight/age.

* Due to the reduced number of subjects followed, differences between the percentiles at the beginning and after 12 months were not tested.

Most children showed H/A deficit, i.e., compromised linear growth, also known as stunting. Persistent nutritional deficiencies during childhood initially compromise weight and then they slow down growth speed, eventually affecting height.

A study based on world data describes malnutrition in 79 developing countries. Forty-three percent of the children had H/A deficit.¹² In a literature review including 38 anthropometric surveys conducted with children of up to five years old, the authors also found that this index was highly compromised.¹³ This finding was corroborated by other studies carried out in other cities¹⁴ and also in Porto Alegre.¹⁵⁻¹⁷

A slight male predominance was observed among the evaluated children. This trend was also perceived in other studies that investigated the nutritional status of children in the same region¹⁵ and in other cities¹⁸ and states.^{10,14} On the other hand, girls were the majority of the children at nutritional risk. Nevertheless, similarly to other studies,^{14,18,19} no association was found between gender and nutritional status.

Most children were in their first two years of life. Probably at this age, mothers seek health care more often due to the morbidity observed in this period, and because there is a better surveillance by health units, with programs that prioritize basic measures, such as immunization, management of diarrhea and respiratory diseases, breastfeeding promotion and monitoring of growth and development.^{10,20}

Likewise, there was a larger percentage of children at nutritional risk in the first two years of life, a result that is similar to that observed in other studies carried out in Porto Alegre.^{15-17,21} This may probably occur due to peculiar aspects of the NCHS curve, which used populations with different characteristics in its construction: those younger than 24 months were taller and thinner than those older than 24 months.²¹ This curve disjunction problem can increase the prevalence of retarded growth in children younger than 24 months. Furthermore, the birth of siblings, transition from breastfeeding to other kinds of food and the increased growth speed, causing an increase in nutritional requirements, may render children vulnerable and compromise their nutritional status.²¹

With regard to the participation in the program, only 50% of the children were followed up; and the largest loss occurred due to nonparticipation. Most health units use the principle of territorialization, that is, they are supposed to treat or attend to families that live in a given territory, defined as their "catchment area." However, families often seek health care outside this area, with the aim of receiving more benefits from the program, but not having a registry there. Consequently, these families cannot be easily found, since they do not belong to the health unit where the screening was made.

This indicates the importance of a link between users and the health units, so that their requirements can be properly met. Maybe this is the reason for the nonparticipation

of approximately one third of children at nutritional risk, stressing the importance of tracking the children who were lost to follow-up by implementing a protocol that allows locating them.^{14,15}

Another frequent problem is that, since parents want to include their children in the program, they have the anthropometric measurements of their children made at different units, but only register at the health unit near their place of residence.

In this study, noncompliance amounted to 16.4%. Higher rates of noncompliance, between 19 and 30%, were found by other authors^{11,19,22,23} in Brazilian programs for nutritional supplementation. Only Soares & Parente¹⁴ found a lower rate of noncompliance (9.6%).

The highest follow-up rate occurred in the first year of life, possibly due to the same reasons that led families to seek health units in this period of life.²⁰

The highest rate of nonparticipation in the second year of life may be explained by the birth of siblings, thus reducing the quality of health care for children at nutritional risk, or due to parent's lack of concern about their children's health. With regard to children older than 36 months, the high rate of noncompliance may be related to the fact that this age is closer to the maximum age allowed for participation in the program (five years).

Children with concomitant H/A and W/H deficits were the ones who had a shorter follow-up period. Perhaps because they belong to more socially vulnerable families, which often do not seek health care, either because of not having easy access to these services or not having a link with the health care team, or still, because of problems with the mother-child relationship.²⁴

The children with a better follow-up were those whose anthropometric deficit was more easily perceived by the family and by health care providers, i.e., the W/A deficit.²⁵

As to the improvement or recovery of the nutritional status, the study showed that 50% of the children had positive results, and that 41.3% was no longer at nutritional risk after an average of 7.5 months of follow-up. These data are similar to those of other studies, in which the nutritional status was recovered after 12 months of follow-up. Studies carried out in São Paulo revealed a recovery of 52.7%²⁶ and 60%.²³ In Porto Alegre, a study undertaken at some health units showed that 37% of the children recovered their nutritional status within 12 months of follow-up in the *Prá-Crescer* program.¹⁵

In Porto Alegre, differently from other cities that assess only the W/A index, the criterion for participation in the study is based on the H/A index. The linear growth of these children with a low H/A is compromised, indicating the presence of past malnutrition that has already affected height, resulting in a slower and more difficult recovery than those with a weight deficit.

The negative results, i.e., children who did not change their nutritional status or who showed deterioration, were more frequent among those children aged less than 12

months or between 24 and 36 months. For younger children, this may happen due to the fact that this is a transition period between breastfeeding and the introduction of new foods, with higher susceptibility to infectious diseases, loss of passive immunity and rapid growth, which requires a larger energy-protein intake.²⁰ In case of three-year-olds, the birth of siblings may have a negative impact on the quality of care received by these children. On top of that, this is a period in which children need a more active participation of their mother or surrogates in the provision of food and in the supervision of feeding, since at this age children start to feed by themselves.

The improvement in the nutritional status of children whose nutrition is compromised (concomitant H/A and W/H deficits) was hampered by the number of cases analyzed. This also occurred in another study about *Prá-Crescer*, which found a prevalence of 9.7%, quite similar to the 10.2% prevalence observed in the present study.¹⁵

Most of the children with weight/height deficit managed to improve their nutritional status. This result was also observed in other studies.^{11,27} Half of the children with W/A deficit attained positive results, which is in line with other studies.^{22,23}

Children with height/age deficit and concomitant H/A and W/H deficits showed difficulty in recovering their nutritional status, since more than 50% had a negative outcome. This result is somewhat expected because, as the hindrances to growth are overcome or minimized, there is weight gain, but linear growth resumes at a slower and tardy pace.

Possibly, a larger energy supply and better quality of care by the mother will result in quicker weight gain. However, short stature might persist due to other limiting factors, such as the content of dietary micronutrients and the persistence of other adverse family situations, which make children more vulnerable to infections.^{19,20} This may be one of the reasons for the difficulty in the improvement of height deficits, where more than 50% of the children have a negative outcome.

Although the 10th percentile was not surpassed, children at nutritional risk had a positive outcome, especially with regard to the W/A and W/H indices after 12 months of follow-up, which indicates that they are moving towards recovery.

Even though the analyzed population represents only the children of a health district of Porto Alegre, where a large percentage of the population shows social vulnerability, the results indicate the necessity to increase the participation in the program and the rates of nutritional status recovery.

A study about the assessment of child care practices related to malnutrition shows that, after a 3-month educational intervention in the families with malnourished children who live in poor neighborhoods, the W/H index had a recovery rate of 73.3%, without the use of any dietary supplementation.²⁸ This result highlights the importance of implementing adequate child care practices through health education and household visits as a way to follow up this population.

Nutritional status results from a set of biological, social, economic, cultural, environmental and emotional factors (mother-child bonding), as well as from their interrelationships. It is necessary to know about and acknowledge the role of the mothers of children at nutritional risk, so that these mothers, together with health professionals, can discuss about the difficulties encountered, develop strategies, and find solutions in order to improve the nutritional status of the children enrolled in nutritional surveillance programs. Thus, it is essential that individual and collective community assistance practices be reassessed.

Nutritional surveillance will be efficient if partnerships between the government and society are established, with the implementation of health measures and sustainable nutritional safety, which means providing access to decent and regular nutrition, with enough quality and quantity.^{5,29,30}

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