DELAY BETWEEN IMMUNE AND NUTRITIONAL RECOVERY,

IMPLICATIONS FOR TREATMENT AND DISCHARGE OF MALNOURISHED CHILDREN

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ABSTRACT

Malnourished children from low income families were hospitalized for a 2-month period in the Immune and Nutritional Rehabilitation Centre (CRIN) in Cochabamba (Bolivia). They received a special diet adapted to the form of malnutrition. Nutritional status was determined by daily clinical examination and weekly anthropometrical measurements. Immune status was assessed by weekly ultrasonography of the left lobe of the thymus and monthly determination of T lymphocytes subpopulations.

The 2-month longitudinal study showed that normal anthropometric values for discharge (-1 SD of the NCHS weight for height) were resumed after one month of rehabilitation whereas two months were required for a complete immunologic recovery (350 mm² of thymic area).

Malnourished children belong to disadvantaged population groups with high exposure to disease. In such environnement, a discharge based only on anthropometric criteria could explain frequent relapses, because the immune recovery took a longer time than nutritional recovery and the children were still immune-depressed.

INTRODUCTION

The treatment of severe Protein-Energy Malnutrition (PEM) implies clinical recovery, nutritional rehabilitation and prevention of relapse.

The criteria of discharge, recommended by OMS (Management of severe malnutrition,1995), is based on the threshold of 90 per cent of median reference weight for height.

Nevertheless, this criteria does not coincide with the recovery of other physiological parameters. For instance, immune deficiency in malnourished children is well known but immune recovery was often disregarded during nutritional rehabilitation.

Severe PEM children belong to disadvantaged population groups where exposure to disease is high. After discharge, the children return in the same pathogenic environnement. and the risk of relapse is increased.

To avoid or minimize the frequent relapses and the failure of nutritional recovery programs, we proposed to assess the nutritional immune-deficiency and stimulate the immune rehabilitation.

PATIENTS and METHODS

Severely malnourished children (mean age 16.9 months), hospitalized in the Hospital Materno-Infantil "G.Urquidi", Cochabamba, were admitted to the CRIN (Centre for Immune and Nutritional Rehabilitation) for a 2-month follow-up study, with the parental and hospital committee consent.

Kwashiorkor, Marasmus and combined PEM diagnoses were based on weight for height, arm/head circumferences ratio, and clinical findings: presence of edema, loss of subcutaneous tissue and diminished muscle mass.

The children received a 4-step diet for two months: a low lactose milk-based diet supplying 1.5 to 2.5 g of protein and 120 to 150 kcal /kg body weight /day, according to the PEM pattern (1 week); gradually increase of protein and energy (1 week); 5 g of protein and 200 kcal/kg/day (6 weeks); gradual decrease of protein and energy.

From admission, each child received a clinical examination daily and anthropometry was measured weekly. Mediastinal ultrasonography (ALOKA SSD-210, Tokyo) with a 5 MHz linear pediatric probe was realized weekly and used as a non-invasive method to immunological assessment. Previous studies shown that an area of 350 mm² for the ultrasonographic image of the left thymus lobe between 2nd and 4th ribs could be consider as a normal value for the standardized Thymic Area (STA).

RESULTS

The table 1 presents the evolution of some anthropometric parameters during a 9-week treatment.

The thymic ultrasonography provided direct evidence of nutritional thymic involution and progressive recovery during the rehabilitation.

According to weight for height, malnourished children reached the threshold for discharge (-1 SD or 90% of median reference NCHS), after a 4-week treatment (figure 1).

The cut-off for the mid upper arm circumference (MUAC): 13.5 cm for children under 2 years, was reached only after the 8th week (figure 2).

Children reached and exceeded the normal value for the standardized thymic area (350 mm²), only after a 8-week treatment (figure 3).

Unlike weight-for-height, the recovery period to reach the criteria for discharge based on MUAC was similar to the period for STA.

TABLE 1

Anthropometrical indexes and thymic area during a 9-week treatment (mean ± SD)

week	n	WHZ [1]	WHM [2]	MUAC [3]	STA [4]
0	92	-2.33 ± 0.98	78.4 ± 8.5	10.8 ± 1.6	70 ± 54
1	99	-2.22 ± 1.09	79.6 ± 9.6	11.1 ± 1.8	93 ± 83
2	95	-1.81 ± 1.11	83.4 ± 9.7	11.5 ± 1.6	140 ± 100
3	98	-1.46 ± 1.11	86.6 ± 9.8	11.8 ± 1.7	175 ± 118
4	95	-1.15 ± 1.07	89.5 ± 9.6	12.4 ± 1.7	193 ± 116
5	96	-0.95 ± 1.00	91.4 ± 9.1	12.7 ± 1.7	222 ± 126
6	94	-0.78 ± 0.95	93.0 ± 8.6	12.8 ± 1.7	250 ± 149
7	92	-0.67 ± 0.97	94.0 ± 8.9	13.1 ± 1.6	292 ± 148
8	91	-0.59 ± 0.93	95.0 ± 8.5	13.4 ± 1.6	324 ± 153
9	79	-0.52 ± 0.94	95.4 ± 8.6	13.5 ± 1.7	376 ± 150

[1] WHZ: Weight for height (z-score), [2] WHM: Weight for height (% median)
[3] MUAC: Mid Upper Arm Circumference (cm)
[4] STA: Standardized Area of Ultrasonographic Image of Left Thymic Lobe (mm) [2]

Fig.1. Evolution of weight for height (% median)

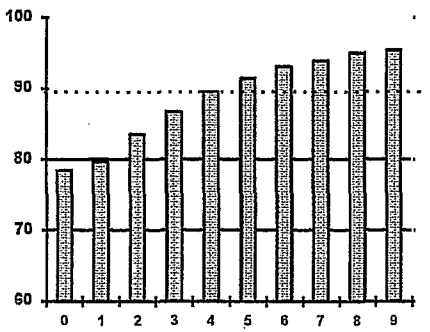


Fig. 2. Evolution of Mid Upper Arm Circumference (cm)

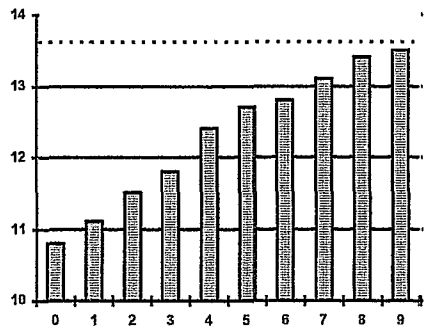
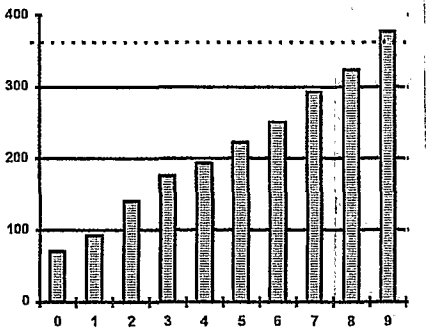


Fig. 3. Evolution of thymic area (mm²)



CONCLUSIONS

Normal anthropometric value for discharge (90% of median weight for height) was reached after 1 month of nutritional rehabilitation, whereas 2 months were needed to similar immunologic recovery. This lag means that children discharged on a weight-for-height criteria are nutritionally healthy but remain immunedepressed (ID) with an impaired host resistance to infections.

Most children with PEM belong to disadvantaged sections of the population. They lived in suburban areas and low income families with crowded living conditions and lack of sanitation where the exposure to disease is the greatest. After anthropometrical discharge, the ID-children return in the same pathogenic environment where they are more susceptible to infectious diseases with a high risk of relapse.

To prevent frequent relapses and reduce the high case-fatality rates yet observed in many centres, immune recovery could be considered as a part of the management of severe malnutrition. Previous studies show that zinc supplementation lessens the lag between nutritional and immune recovery and children could be discharged after the first month of treatment.

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