

The product albumin by alpha-globulin in the assessment of protein nutritional status

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The product albumin by alpha-globulins ($A \times \alpha$) was determined in the serum of two hundred preschool children with protein-calorie malnutrition grouped according to clinical-anthropometric categories, and the results were compared with those obtained in a group of one hundred well-nourished children of the same age range. Though values obtained in malnourished children showed significant differences from those obtained in the controls, this parameter does not allow a biochemical distinction among the four groups studied.

Several biochemical parameters have been employed for assessing the impairment of protein nutrition in protein-calorie malnourished children [3]. The product of serum albumin by alpha-globulins ($A \times \alpha$) has scarcely been utilized and information concerning its application for the above-mentioned purpose is insufficient for appraising its reliability. RAMOS-GALVÁN et al. [8] pointed out that this index showed a clear difference between non-oedematous and oedematous malnourished infants and children, allowing a distinction between marasmic and kwashiorkor lines of development in protein-calorie malnutrition.

Our own experience [1] with this parameter allowed to verify its greater sensibility when compared with other biochemical studies such as amino-acid balance, serum albumin or total serum proteins, but we have not yet proved a correspondence of

this parameter with clinical-anthropometric classifications of protein-calorie malnutrition.

PATIENTS AND METHODS

Two hundred preschool children with protein-calorie malnutrition, apparently free of infection, aged 12–59 months, were studied. In each child, a clinical-anthropometric assessment of the nutritional status was performed, height and weight were recorded, and the presence or absence of clinical oedema was investigated [5].

Values obtained for height and weight were referred to the Harvard standards [9]. Weight deficit was appraised as a percentage of the mean for chronological age. The patients were grouped according to the classification formulated at the Wellcome Trust Meeting held in Jamaica [6] into four categories as follows: underweight, marasmus, kwashiorkor, and kwashiorkor-marasmus.

A venous blood sample was taken from each child, and after centrifugation serum

total proteins and albumin were determined with the biuret method [4].

Protein fractions were obtained by paper electrophoresis on Whatman's 3 paper, using barbiturate buffer pH 8.9, $\mu = 0.06$ [10]. The product $A \times \alpha$ was calculated by multiplying the serum albumin value by the sum of α_1 - and α_2 -globulin concentrations.

The same investigations were carried out in a control group of one hundred well-nourished children of the same age group.

Analysis of variance for a completely randomized design and superposition of intervals was the statistical method employed [7].

RESULTS

Results are shown in Table I. The analysis of variance comprising the control groups and the four groups of malnourished children showed for F a figure of 187.15 ($p < 0.01$). The control group yielded values significantly higher than those in any of the four test groups. Underweight group values showed significant differences from kwashiorkor

($p < 0.01$), but no differences were found among the remaining groups ($p > 0.05$).

DISCUSSION

RAMOS-GALVÁN et al. [8] reported mean values for $A \times \alpha$ below 1.8 ($\bar{x} = 1.28 \pm 0.20$) for oedematous, and between 1.53 and 2.40 ($\bar{x} = 2.21 \pm 0.17$) for non-oedematous patients. In the present study, though our mean values were not as low as those quoted above, a significant difference was found between the controls and each group of malnourished children, especially the kwashiorkor group. No differences could be demonstrated between the marasmus and kwashiorkor-marasmus, or between the underweight and the marasmus groups.

In a previous study of non-oedematous malnourished preschool children [1], the mean $A \times \alpha$ values differed from those in the control group at the highest level of significance

TABLE I

Albumin by alpha-globulin values in normal and in malnourished preschool children

Group	N	\bar{x}	S^2	S	$S\bar{x}$	V
Control	100	3.35	0.13	0.36	0.04	10.86
Underweight	89	2.63	0.11	0.32	0.03	12.35
Marasmus	48	2.24	0.09	0.29	0.04	13.15
Kwashiorkor	29	1.83	0.09	0.28	0.05	15.98
Kwashiorkor-marasmus	34	2.28	0.09	0.30	0.05	13.00

N = number of cases

\bar{x} = mean

S^2 = variance

S = standard deviation

$S\bar{x}$ = standard error of the mean

V = coefficient of variation

At the same time, the highest correlation coefficients were obtained between amino-acid balance and $A \times \alpha$. An increase in globulins during acute infections may alter the product $A \times \alpha$. High α_2 globulin values were found in marasmic children with acute diarrhoeal diseases or measles [2]. Our patients were apparently free of infections and showed almost invariably low figures for α_2 globulins.

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