

α_2 HS-glycoprotein serum levels in protein-energy malnutritionBY F. P. SCHELP, OUSA THANANGKUL, VENUS SUPAWAN
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1. α_2 HS-glycoprotein accumulates in bone and dentine and its plasma levels could vary in conditions in which the rate of bone formation is altered.
2. The plasma concentration of this protein was found to be lower in thirteen children suffering from protein-energy malnutrition compared with age-matched healthy preschool children.
3. This finding might be associated with the phenomenon of stunting in protein-energy malnutrition.

α_2 HS-glycoprotein is synthesized by the liver and a proportion is subsequently accumulated in bone tissue (Triffitt *et al.* 1976). Its level in plasma may vary in conditions where bone metabolism is altered (Ashton *et al.* 1976). Protein-energy malnutrition usually is associated with growth retardation. Therefore changes in α_2 HS-glycoprotein concentration in plasma in protein-energy malnutrition might be of interest. Anthropometric factors, weight-for-height and height-for-age and the plasma protein albumin, as well as α_2 HS-glycoprotein, were studied in thirteen children admitted to the Anemia and Malnutrition Research Center because of protein-energy malnutrition on the second and fiftieth day after treatment. The same factors were investigated in six healthy, age-matched, preschool children.

EXPERIMENTAL

Thirteen consecutive cases of clinical protein-energy malnutrition complicated by infectious diseases, mainly diarrhoea, were admitted to the ward of the Anemia and Malnutrition Research Center in Chiang Mai, approximately 700 km north of Bangkok, Thailand. According to a scoring system, as described elsewhere (Schelp *et al.* 1979), six patients suffered from marasmus and seven either from marasmus-kwashiorkor or kwashiorkor. The results obtained from the patients were compared with those from six healthy children whose parents were low ranking government officers at the Faculty of Tropical Medicine, Bangkok. For this investigation blood samples from the patients drawn on the second day after admission and on the fiftieth day after treatment were used. Sera for determination of protein were stored at -20° before electrophoresis.

METHODS

Anthropometry. The SD score of weight-for-height and height-for-age were calculated as suggested by Waterlow *et al.* (1977), based on a North American standard (National Center for Health Statistics, 1976).

Serum proteins. For quantitative measurement of albumin and α_2 HS-glycoprotein electroimmunoassay (rocket immunoelectrophoresis) was used (Laurell, 1972). Rabbit antisera for protein determination were supplied by Behring Werke, Marburg, West Germany.

Statistical analysis. For each factor in each group the median was determined and the

Table 1. Age, SD score weight-for-height†, SD score height-for-age‡, albumin and α_2 HS-glycoprotein in six healthy preschool children and thirteen children suffering from protein-energy malnutrition (PEM)

	(Median values and ranges in parentheses)		
	Healthy preschool children	PEM children	
Group no....	1	2nd day after admission	50th day after admission
Age (month)	34 (7 to 43)	2 36 (11 to 60)	3 —
SD score weight-for-height	—1.46* (+1.75 to -2.20)	-3.08*† (-2.29 to -5.56)	-0.66† (-1.29 to +0.42)
SD score height-for-age	-2.04* (+1.84 to -4.14)	-4.09* (-3.37 to -5.86)	-4.16 (-2.22 to -5.44)
Albumin (g/l)	—	20† (11 to 27)	37† (28 to 41)
α_2 HS-glycoprotein (mg/l)	645* (495 to 776)	418*† (269 to 583)	682† (495 to 990)

* Median for group 1 differed significantly from that for group 2 ($P < 0.01$).

† Median for group 2 differed significantly from that for group 3 ($P < 0.01$).

‡ Calculated as suggested by Waterlow *et al.* (1977).

upper as well as lower extreme value was recorded. Comparison of the median values was made by either the dependent or independent non-parametric test (Wilcoxon test).

RESULTS

Anthropometric factors indicated that the children suffering from protein-energy malnutrition were wasting and stunting according to the SD score weight-for-height and height-for-age compared with the healthy preschool children (Table 1). After 50 d of treatment weight-for-height and albumin levels indicated a significant recovery of the patients. α_2 HS-glycoprotein concentrations were significantly lower in the group of the patients at the second day after admission compared with values obtained after recovery and from age-matched healthy children.

All attempts to correlate the factors determined by calculating linear or multiple regression failed.

DISCUSSION

α_2 HS-glycoprotein accumulates in large amounts in bone and dentine in comparison with other plasma proteins (Ashton *et al.* 1976). Its function in hard tissue is not yet clear. The conversion of an amorphous calcium phosphate to crystalline hydroxyapatite is slowed down in the presence of serum proteins (Blumenthal *et al.* 1975). Ashton *et al.* (1976) theorized that α_2 HS-glycoprotein might be important in the stabilization of this regulatory phase and if this protein becomes concentrated in the bone during calcification, then the concentration of the α_2 HS-glycoprotein in plasma could vary in conditions in which the rate of bone formation is altered. Ashton *et al.* (1976) found that α_2 HS-glycoprotein levels decreased in patients with Paget's disease of the bone, a condition in which both the formation and resorption of bone are elevated, associated with decreased rates of mineralization. It was suggested that the plasma α_2 HS-glycoprotein concentration may be related to the amount of mineralization taking place. Decreased levels of α_2 HS-glycoprotein in this study indicated that mineralization in protein-energy malnutrition might be impaired too. Further studies in bone mineralization and growth in protein-energy malnutrition in association with α_2 HS-glycoprotein might help to understand the phenomenon of stunting in malnutrition.

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