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PROTEIN DEFICIENCY IN KERATOMALACIA*

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KERATOMALACIA is still one of the most serious eye diseases in countries where malnutrition plays an important role. Up to the present the term "keratomalacia" represents a fatal condition of the eye characterized by softening of the corneal tissue due to a severe vitamin A deficiency. Clinically, vitamin deficiencies in man are usually multiple, and in general they are associated with other nutritional disorders. This in contrast to the laboratory where single deficiencies are purposely produced. Therefore it can be assumed that the manifestation of keratomalacia in man is based on a more complicated pattern. This paper deals with protein deficiency in keratomalacia.

Material and Methods

The material comprised a group of ten patients suffering from keratomalacia, and for comparison a group of ten patients with xerophthalmia. All patients were badly nourished children of Indonesian origin, coming from poor areas of Central Java.

The keratomalacia group consisted of six boys and four girls, aged between 1 and 3 years; the xerophthalmia group was composed of eight boys and two girls, aged 1 to 4 years.

The examination of the eye was performed by the author using a hand slit lamp. All blood serum levels of vitamin A and proteins were estimated by the same laboratory technician. The estimation of the vitamin A content of the blood serum was done according to the photo-colorimetric method of Dann and Evelyn (1938). The concentrations of serum proteins were estimated colorimetrically according to the biuret method of Gornall, Bardawill, and David (1949). All these colorimetric estimations were performed with a Hilger Spekker photoelectric colorimeter.

Because of the evanescent nature of the test, readings corresponding with levels below 10 I.U. vitamin A/100 ml. were indicated as ±, readings above 10 I.U. being registered in figures.

Results

The Table (opposite) shows the serum concentrations of vitamin A and proteins in the two groups.

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TABLE
RESULTS IN KERATOMALACIA AND XEROPHTHALMIA

Group	Pat. No.	Age (yrs)	Sex	Vit. A (I.U./ 100 ml.)	Total Protein (g./100 ml.)	Albumin (g./100 ml.)	Globulin (g./100 ml.)	Alb./Glob. Quotient
Keratomalacia	1	1½	M	19	3·4	1·3	2·1	0·6
	2	2	M	±	4·0	2·1	1·9	1·1
	3	1½	M	0	4·3	1·7	2·6	0·7
	4	2	F	15	4·6	1·9	2·7	0·7
	5	2	M	21	5·3	1·3	4·0	0·3
	6	3	M	0	3·9	1·9	2·0	0·9
	7	2	F	±	4·2	2·0	2·2	0·9
	8	1	F	0	5·1	1·4	3·7	0·4
	9	1	M	18	3·9	1·5	2·4	0·6
	10	2	F	±	4·3	2·0	2·3	0·9
	Mean			±7·3	4·3	1·7	2·6	0·7
	Range			0–21	3·4–5·3	1·3–2·1	1·9–4·0	0·3–1·1
Xerophthalmia	1	2	M	±	5·7	2·9	2·8	1·0
	2	4	M	±	6·4	3·1	3·3	0·9
	3	3	M	23	5·8	3·0	2·8	1·1
	4	3	M	18	6·0	2·9	3·1	0·9
	5	2	M	20	7·1	3·7	3·4	1·1
	6	1½	M	0	6·6	2·6	4·0	0·7
	7	3	F	17	6·2	2·9	3·3	0·9
	8	2	M	±	6·4	3·0	3·4	0·9
	9	2	F	15	5·9	2·5	2·4	1·0
	10	3	M	0	6·1	3·1	3·0	1·0
	Mean			±9·3	6·2	3·0	3·2	0·9
	Range			0–23	5·7–7·1	2·5–3·7	2·8–4·0	0·7–1·1

Discussion

The difference in the concentrations of serum proteins in the two groups is most striking. The mean level of the total protein of the keratomalacia group is 4·3 g./100 ml., while the xerophthalmia group gives an average of 6·2 g./100 ml. The albumin-globulin ratio of the first group is 0·7 and that of the second group 0·9. Though the difference between the vitamin A values (±7·3 I.U. for the keratomalacia group and ±9·3 I.U. for the xerophthalmia group) seems to be not significant, the clinical pictures of keratomalacia and of xerophthalmia show typical difference.

These findings suggest that, besides the lack of vitamin A, protein deficiency plays an important role in the pathogenesis of keratomalacia. The small number of cases does not permit any final conclusions to be drawn. The interrelationship of vitamin A deficiency, protein deficiency, and other possible deficiency factors in keratomalacia deserves further investigation.

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