

Plasma retinol levels of pre school children in the sugar-cane area of northeast Brazil

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SUMMARY

A relationship was observed between nutritional status according to Gómez's classification and plasma retinol levels, in 427 preschool children of the sugar-cane area of Pernambuco, in Northeast Brazil.

Evidence collected suggest that in the 3rd. degree malnutrition the risk of vitamin A deficiency is considerably enhanced (11.5% of those children being in the "deficiente" range).

The authors discuss briefly some particularities of hypovitaminosis A in the area and recommend the systematical use of vitamin A in the treatment of protein-calorie malnutrition.

Earlier studies by investigators at the Institute on vitamin A deficiency in Northeast Brazil, particularly in the sugar-cane area of Pernambuco (the so-called "zona da Mata") (1-3) permit us to draw the following basic conclusions:

1) Low serum retinol tend to occur in the youngest population groups, especially in the 1-4 years children; 2) there probably is a cyclic rhythm of this nutrient, with alternated periods of maximum intake and minimum consumption during the year; 3) plasma retinol varies more widely in youngsters, probably due to a more significant diversity of nutritional status in this group.

The aim of the present study was to determine whether or not there was a correlation between degrees of nutrition,

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as defined according to Gómez's classification (4) and retinol levels in plasma of preschool children of this area, during the period of the year when blood concentration of this nutrient are expected to be lowest (March-April-May).

MATERIAL AND METHODS

427 children (aged 1 to 4 years) were selected in the cities of Ribeirão, Gameleira, and Água Preta. Special efforts were made to study a larger number of children from the 3rd. degree malnutrition group. Within each group, however, the selection was made at random. The final sample, therefore, is stratified.

Gómez's method was used in the classification of the nutritional status (4). The 50th percentile of the Harvard School of Public Health Chart was used as the standard (5). Children whose weight varied from 91 to 110% of this standard were considered normal; those whose weight was 76 to 90% of the standard were classified in the first degree of malnutrition; those whose weight was 61 to 75% of the standard were classified as 2nd. degree malnutrition; and those whose weight fell below 60% of the standard were classified in the 3rd. degree malnutrition group.

Blood specimens were collected by venipuncture, before breakfast. A modified Carr-Price Test (micromethod) (6), using trifluoroacetic acid was used for retinol determination in plasma.

RESULTS

Retinol levels in the serum decreased in proportion to the diminishing nutritional status: the mean values of serum retinol, expressed per 100 ml of serum, varied from 36.3 mcg in normal children to 22.0 mcg in children suffering from 3rd. degree malnutrition (Table 1).

The difference between the mean level of the 3rd. degree group was significant when compared to the normal ($P < 0.05$). All other differences were not significant at the level of $P < 0.05$ (test used was analysis of variance). The percent distribution of serum retinol values compared to the ICNND criteria (7) showed that the "low" and "deficient" values

TABLE 1
RELATIONSHIP BETWEEN SERUM RETINOL AND DEGREE
OF NUTRITION

NUTRITIONAL STATUS	NUMBER OF CASES	MEAN SERUM RETINOL mcg %	STANDARD DEVIATION
Normal	88	36.3	± 13.7
1st. Degree Malnutrition	207	34.4	± 14.6
2nd. Degree Malnutrition	106	31.7	± 15.3
3rd. Degree Malnutrition	26	22.0	± 15.3

Analysis of variance.

Normal vs. 3rd. degree significant $P < 0.05$.

combined were found in 10.2, 14.9, 23.6 and 53.8 percent of the children in the normal, 1st., 2nd. and 3rd. degree groups, respectively (Table 2).

DISCUSSION

In spite of its clinical limitations, Gómez's classification has unquestionable interest for public health services; it represents the cumulative epidemiological history of undernutrition of a community. According to this criterion, Gómez's classification was used.

Our data confirm the existence of factors common to protein calorie malnutrition, defined on the basis of weight-deficit, and hypovitaminosis A. The fall of plasma retinol in the 3rd. degree group is particularly significant, since it suggests that those children are specifically exposed to a higher risk of vitamin A deficiency. Actually, among 26 cases, the average plasma level was close to the 20 mcg level while in the 2nd. degree the mean was close to 30 mcg, which is considered an acceptable average for well-nourished population (7). In addition, the fact that 50% of the children in the 3rd. degree

TABLE 2

PERCENT DISTRIBUTION OF VALUES FOR SERUM RETINOL IN RELATION TO DEGREE OF NUTRITION

NUTRITIONAL STATUS	NUMBER OF CASES	DEFICIENT < 10 mcg%	LOW 10-19 mcg%	ACCEPTABLE 24-49 mcg%	HIGH 50 mcg%
Normal	88	2.3	7.9	78.4	11.4
1st. Degree Malnutrition	207	4.3	10.6	72.5	12.6
2nd. Degree Malnutrition	106	5.7	17.9	65.1	11.3
3rd. Degree Malnutrition	26	11.5	42.3	42.3	3.9

were below the 20 mcg limit suggest that the risk of vitamin A deficiency in this group is not to be underestimated. This observation is strengthened further by the fact that 12% of the latter children were in the "deficient" range.

This seems to be the point of major practical interest in our study. It has been shown that in the area under consideration, about, 3% of all children between 1 and 4 years of age are in the 3rd. degree of malnutrition (7). One should, therefore, take into consideration the particular risk of vitamin A deficiency to which those children are exposed, and easily identify them in the health services on the basis of their weight deficit. A few years ago in Fortaleza a group of clinical investigators has already recommended that all malnourished children assisted in pediatric services should be considered as potentially vitamin A deficient (8). It seems that this consideration should be given priority in our area of action, and that high dosages of vitamin A should be systematically given to all malnourished children assisted by the health services, at least during the period of the year when plasma retinol is the lowest.

In literature on hypovitaminosis A one can find a great diversity of findings between workers who studied the problem in different parts of the world. For example, while in India, Indonesia, and Jordan xerophthalmia lesions are common among severely malnourished children (9, 10), in Central America this is not so often the case. In Haiti, however, about 12% of 3rd. degree cases have ocular lesions of vitamin A deficiency (11).

Our particular series of studies represent an attempt to correlate the epidemiology of protein-calorie malnutrition with that of hypovitaminosis A in the area of endemic malnutrition. We feel that the parallel clinical and dietetic studies—which are now underway—will bring further clarification to the question. It is possible that some of the children with 3rd. degree malnutrition were already suffering from an impaired blood plasma transport of retinol, which aggravated their vitamin A status. Arroyave has demonstrated this to be the case in children with kwashiorkor (12).

CONCLUSIONS

1. A relationship was found between the nutritional status of preschool children, as assessed through Gómez's classification, and retinol levels in plasma.
2. Children in the 3rd. degree malnutrition had significantly lower plasma retinol levels than any other group.
3. More than one-half of the children classified as 3rd. degree had plasma retinol levels below the "acceptable" range. 11.5% of the children were in the "deficient" group. This finding suggests that children with a marked weight deficit are exposed to a considerably high risk of vitamin A deficiency.
4. For practical purposes, it seems advisable to recommend the routine administration of vitamin A to all 3rd. degree malnutrition cases as part of the standard treatment acknowledging the need to further study the efficiency of this recommendation.

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RESUMEN

Niveles de retinol en el plasma de niños preescolares pertenecientes al área azucarera del Nordeste de Brasil

Se observó una relación entre el estado nutricional —según la clasificación de Gómez— y los niveles de retinol en el plasma de 427 niños preescolares en el área azucarera de Pernambuco, Nordeste de Brasil. Los resultados sugieren que el riesgo de deficiencia de vitamina A aumenta considerablemente en la desnutrición del tercer grado (11.5% de los niños considerados "deficientes").

Los autores discuten sumariamente algunas particularidades de la hipovitaminosis A en el área y recomiendan el uso sistemático de esta vitamina en el tratamiento de la desnutrición proteico-calórica.

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