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USEFULNESS OF PREALBUMIN MEASUREMENT IN NUTRITIONAL SURVEYS. B. Maire \*, E. Benefice, P. Le François and S. Chevassus - ORSTOM - Nutrition BP. 1386 Dakar, SENEGAL.

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Plasma prealbumin ( thyroxine binding prealbumin) measurement has recently been suggested as the most sensitive indicator of protein-energy nutritional status. To assess its value, the level of prealbumin has been measured routinely in more than 3,000 persons of all ages and both sexes during the course of various nutritional field surveys conducted in different countries of West Africa, on a representative basis. The levels of prealbumin are constantly lowered being on an average 60 to 75 % of the normal level usually observed in developed countries. Albumin and prealbumin never correlate significantly with weight for height values. These results are at variance with those of other authors but were obtained in a different ecological situation. The two proteins are weakly correlated, with a coefficient ranging from 0.20 to 0.50. Longitudinal data obtained in infants and children, in a sample of similar ethnic origin, have shown that prealbumin exhibits frequent and ample variations to environmental stimuli (food, infections). It therefore seems likely that its measurement may be useful in longitudinal studies where only the week/or month to month variations are really relevant, but may lead to confusion if used as a sensitive criterion for marginal protein-energy deficiency in cross-sectional surveys.

USEFULNESS OF PLASMA PREALBUMIN  
IN NUTRITIONAL SURVEYS

While the measurement of anthropometric parameters - mainly weight and height - and of plasma albumin concentration were commonly used for the assessment of protein-energy malnutrition, Ingenbleek, in 1972, introduced the measurement of TBPA - or Thyroxine Binding Prealbumin.

The first slide shows his classical results : the TBPA levels were very reduced in malnourished children and rose steeply with nutritional rehabilitation.

He later showed - next-slide - the plasma prealbumin values were the lowest at the time where malnutrition was maximum with early and ampler variations by comparison to albumin.

His findings were further confirmed by workers in hospital settings indicating that prealbumin was indeed a very sensitive indicator of changes of the protein energy nutritional status according to changes in dietary input.

Therefore this parameter appeared to comply with the characteristics of a good marker of nutritional status, that is to say : sensitivity and response to changes in dietary intake, along with easiness of the assay, and since then it has been used by various investigations in field surveys to detect mild-to-moderate protein-energy malnutrition.

Last year, Ogunshina and Hussain published data from Nigeria - next slide which show that TPBA is well correlated with weight-for-height. It is even slightly better to discriminate between normal and mildly malnourished and a value of less than 2 g/l was generally associated with malnutrition.

However, a report from Bleiberg indicated that very low values of prealbumin are common in Upper-Volta, without any correlation with the weight for height deficit, suggesting that other factors than protein-or-energy deficiency may intervene.

We have also been intrigued by the fact that prealbumin was constantly lowered in the Sahelian region as shown in the next slide. These are values recorded for males, at all ages, in a rural part of Senegal by comparison to those of a well nourished population from the same country.

As we have routinely assayed this protein in our various recent nutritional surveys in West Africa, we have observed the following facts :

\* Firstly it appeared evident that either weight for height, albumin or prealbumin are really different indices.

The next slide shows the absence of a relationship between weight for height and albumin - there in children from Mali. The correlation coefficient is non significant. On the next slide, it is evident that prealbumin in the same population shares the same absence of a relationship with weight for height. This is in accord with Bleiberg and at variance with Ogunshina's data.

Finally the next slide shows that there is an obvious relation between plasma albumin and prealbumin, but the correlation coefficient is not very high ; no more than 16 % of the variance being explained in any case.

\* Secondly we compared the frequency distribution of these three indices in different populations. As indicated on the next slide - here three different populations from Senegal, - it appears that prealbumin offers very different distributions even when weight for height and albumin distribution do not differ.

\* However, when we looked at seasonal differences, that is differences between two seasons, where both food availability and energy expenditure are different, as shown on the next slide - this is an example in Mali -, the variations of prealbumin are not greater than those of albumin.

\* Finally we measured plasma prealbumin repeatedly in infants and children in the course of a longitudinal study of the growth from birth to weaning age. A typical example of an individual curve obtained is shown on the next slide. We have observed, on a general basis, ample and sudden variations of prealbumin with no necessary relation to albumin and/or weight-for-height variations. And these variations were highly negatively correlated with a change in the level of orosomucoid, an acute phase reactant protein which is considered generally as a good marker of an inflammatory stress. And most of the time these variations were related to symptoms of various infections : fever, diarrhoea, rash, for example, which are rather common in infancy and childhood.

It appears therefore that if there is no doubt that prealbumin may decrease as a function of protein energy nutritional status, in inflammatory stresses may also be responsible for the low values observed.

As shown on the next slide, where mean prealbumin values recorded in various Sahelian regions are listed in an increasing order, there is high correlation not only with the percentage of clinical malnutrition but also with the children mortality rate, mainly linked to infectious diseases, in the same regions. Then, prealbumin levels reflect more a general health status than, specifically, nutritional status.

Now, what are the consequences attached to such low levels of prealbumin ?

Ingenbleek and others have shown that this protein which carries Retinol-Binding-Protein - it self carrying retinol - could be the limiting factor for vitamin A status.

As reported on the next slide, we have looked at the relation between prealbumin and vitamin A in adults, - and children, next slide - It confirms that at all ages there is a tight link between both parameters.

However, as variations of prealbumin levels are ample and frequent, it is certainly difficult to predict any risk of vitamin A deficiency from one single measurement either of prealbumin, RBP or vitamin A for a given individual. In children in Mali, as you can see, several individuals had values close to 10ug/dl; however no cases of xerophthalmia have been detected in this area. In fact, it is very rare that a child stays on a long time with a level of prealbumin lower than 10 ug/dl, that is to say with a risk to have deficient retinol level (close to 10 ug/dl) without being rather deeply malnourished or very severely infected.

The last risk evoked by Ingenbleek is goiter. As vitamin A is necessary for the synthesis of thyroglobulin, a long depression of prealbumin and there of vitamin A may lead to a thyroglobulin deficiency which may favour the apparition of goiter. In fact we have seen no link between a high frequency of low values of prealbumin and an increased incidence of goiter in the populations surveyed. It then may be an associated factor, but certainly not an important one.

In conclusion, we have found that measurement of prealbumin is of low value in children to assess marginal malnutrition because of its sensitivity to inflammatory stress which is common in these ages.

It may be more useful in adults, where inflammation, as assessed by the measurement of orosomucoid seems to be less frequent. But it is probably more a reflect of a metabolic adaptation to varying food intake rather than an indicator of nutritional status, since very different values of prealbumin do not appear to influence, on a long term, body weight.

*with similar variations of*

*be correlated*