Brief Reports

Subclinical Vitamin A Deficiency in Infants and Young Children

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Vitamin A deficiency is one of the common causes of blindness in children in India and other developing countries^). Clinical screening of pre-school children is quite useful to supplement vitamin A well before xerophthalmia becomes obvious(2). However, subclinical vitamin A deficiency is missed particularly in apparently normal children who don't have any obvious signs or symptoms of vitamin A deficiency.

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Inview of the high prevalence of vitamin A deficiency and of other problems like acute respiratory infections and diarrheal diseases associated with it, it is imperative to screen cases with subclinical vitamin A deficiency before they have frank xerophthalmia. This pilot study was carried out to detect subclinical vitamin A deficiency in normal children with the help of conjunctival impression cytology (CIC).

Material and Methods

The study was undertaken in the Child Health and Promotion Clinic (CHPC) of Kalawati Saran Children's Hospital, New Delhi which is a separate clinic for normal children for immunization and growth monitoring. Children between 6-24 months were randomly selected without any bias depending upon the consent for taking a sample of conjunctival scrapings for CIC. All the patients whose parents consented to be included in the study were enrolled and details regarding feeding, introduction of top milk/solids, socioeconomic status, history of measles, number of episodes of acute respiratory infection and diarrhea during past 6 months, and immunization status were recorded. Children who had received vitamin A supplement during the past 6 months and the ones with signs/symptoms of vitamin A deficiency were not enrolled.

Conjunctival impression cytology (CIC) was used to determine subclinical vitamin A deficiency. For this purpose celullose acetate paper was cut in a triangular piece. The procedure for collection of conjunctival scraping was

explained to the mother. Paper was held with a forceps, eye lids were retracted gently to expose the temporal conjunctiva. Tapering end of paper was placed in contact with bulbar conjunctiva and was held in contact for 1-3 seconds, then was removed with a pulling motion and was immediately transferred to a vial containing fixative (70% ethyl alcohol, 37% formaldehyde and glacial acetic acid in 20:1:1) and was fixed for 10 minutes. The paper was stained with PAS stain, transferred to glass slide, and then examined under light microscope. Staging of stained preparation was done according to grading suggested by Natadisastra *et al.* and other workers(3-5). Stages 0 and 1 were taken as normal and stage 2 and above as abnormal. Clinical variables of children with and without subclinical vitamin A deficiency were compared and statistical analysis done by Chi square test.

Results

Fifty two normal children attending CHPC during the study period were initially enrolled in the study but since the material for CIC was inadequate in 5 cases, the final analysis was done only in 47 cases which included 28 males (59.6%) and 19 females (40.4%). The age distribution of the cases ranged from 6-24 months with 34 infants between 6-12 months (72.3%) and 13 children between 13-24 months (27.7%). Nineteen of forty seven children (40.4%) had subclinical vitamin A deficiency, 13/19 cases (68.4%) were between 6-12 months and 2/19 of these cases (10.5%) had stage 4/5 CIC *(Table I)*. A total of 14.7% of infants had CIC stages 3 and 4. Comparison of various clinical parameters in children with and without subclinical vitamin A deficiency revealed that there was no significant difference in their feeding pattern, time of weaning, socioeconomic class, nutritional status, and recent history of acute respiratory infections and diarrhea *(Table II)*. None of the cases in either group had suffered from measles in the past 6 months and all the subjects were appropriately immunized for their age.

Discussion

The conjunctival changes of xerophthalmia are the most accessible physiological index of vitamin A status which are widely used to detect vitamin A deficiency in high risk patients as well as in population surveys. However, subclinical vitamin A deficiency is missed on routine examination. Presently serum vitamin A levels are the only objective determination of vitamin A deficiency(3). However, serum vitamin A levels suffer from poor correlation with body stores, except under" conditions of severe depletion and thus are

TABLE I—*Conjunctival Impression Cytology.*

Age (mo)	Total no of cases	Stages 0 & 1 No.	%	Stage 2 No.	%	Stage 3 No.	%	Stage 4 No.	%	Stage 5 No.	%
6-12	34	21	61.8	8	23.5	3	8.8	2	5.9	0	0
13-24	13	7	53.8	6	46.2	0	0	0	0	0	0

TABLE II—*Comparison of Clinical Parameters*

Parameters	Stages 0-1 CIC (n=28)		Stages 2-5 CIC (n=19)	
	No.	%	No.	%
Feeding pattern				
Breast fed	6	21.4	4	21.0
Top fed	4	14.3	1	5.3
Breast+Top	6	21.4	3	15.8
Mixed feeding	12	42.9	11	57.9
Late weaning	25	89.3	19	100.0
Socio-economic class				
Classes I & II	6	21.4	5	26.3
Classes III & IV	22	78.6	14	73.7
Nutritional status				
Normal	18	64.3	10	52.6
Grade I	7	25.0	7	36.8
Grade II	3	10.7	2	10.5
History of ARI	10	35.7	8	42.1
History of Diarrhea	7	25.0	6	31.6

not a direct indication of individual physiologic status. Moreover, estimation of serum vitamin A levels require invasive sampling procedure, sophisticated, equipment and highly trained personnel which is impractical in developing countries. Egbert *et al.(6)* for the first time described simple conjunctival impression cytology as a tool to detect vitamin A deficiency. Later studies(3-5,7) have further confirmed the clinical application of CIC as a diagnostic tool by evaluating the conjunctival cytology and comparing it with clinically detectable vitamin A deficiency and plasma retinol concentration.

Subclinical vitamin A deficiency as suggested by conjunctival morphology of stage 2/5 and above, was detected in (40.4%) of normal children between 6-24 months of age which is quite an alarming figure. Even though a high incidence of vitamin A deficiency in Indian children ranging from 4.38-13.21% has been reported(8), not many reports are available on subclinical deficiency of vitamin A in our patient population. Vitamin A deficiency is common in young children because children are born with limited vitamin A reserves and are dependent for the first 6 months of life on vitamin A provided in the breast milk. After 6 months of life, child requires supplementary feeding with foods rich in vitamin or provitamin A. If the supply of

vitamin A is inadequate, these children are at a greater risk of vitamin A deficiency due to poor intake of vitamin A from sources other than breast milk when the body reserves are also at their lowest.

Vitamin A deficiency is reported to be associated with diarrhea, acute respiratory infection, measles and a variety of other common infectious diseases(10). In our observations, no significant difference was noticed between subclinical vitamin A deficiency and frequency of episodes of diarrheal diseases and acute respiratory infections indicating that subclinical deficiency may not play a significant role in causing increased frequency of these disorders till vitamin A deficiency becomes more pronounced. However, a deleterious effect of these infections on vitamin A deficiency can not be underscored. These infections in children with subclinical vitamin A deficiency, with poor dietary intake and marginal body stores, can precipitate a clinical disease.

Subclinical vitamin A deficiency is alarmingly high in infants even in nutritionally and socioeconomically better strata of children. The problem assumes more significance because they are apparently healthy and if timely vitamin A supplementation is not given, any intercurrent infection is likely to worsen the vitamin A status and result in known consequences of xerophthalmia. Early weaning with foods containing adequate amount of vitamin A and incorporation of vitamin A prophylaxis along with routine immunization will go a long way to prevent vitamin A deficiency in our vulnerable patient population.

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