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PAI Textbook of PEDIATRICS



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4
CHAPTER

Vitamin A Deficiency

Anoop Verma

INTRODUCTION

Vitamin A deficiency (VAD) is the leading cause of preventable blindness seen in children. Vitamin A (VA) is responsible for the formation of rhodopsin. VA maintains epithelial tissues integrity and is important for lysosome stability and glycoprotein synthesis. Children are prone to VAD due to decreased dietary intake and poor absorption leading to depleted VA stores in the body. The high prevalence of infectious diseases such as measles, diarrhea, respiratory infections, and lack of education are contributing factors for VAD.

The dietary sources of VA are milk, egg, fish liver oils. Beta carotene, which is a precursor of VA is found in yellow fruits and vegetables, e.g., papaya, mango, carrot, and green leafy vegetable. VAD is less seen below 6 months of age due to rich liver storage during the early months and milk being the rich source of VA.

WHO CLASSIFICATION: MAJOR SIGNS AND SYMPTOMS OF VAD

	Primary signs	***Secondary signs***
X1A	Conjunctival xerosis	XN: Night blindness
X1B	Bitot's spot	XF: Fundal changes
X2A	Corneal xerosis	XS: Corneal scarring
X2B	Keratomalacia	
X3A	Corneal ulceration < (1/3)	
X3B	Corneal ulceration > (1/3)	

- *XN (Night blindness)*: Night blindness is the earliest manifestation of VAD. Children are unable to move as the night sets in, and prefer to sit in a secure corner, often unable to search food or toys. Night blindness responds fast, and takes usually 24–48 hours, to VA therapy.
- *Conjunctival xerosis*: Conjunctiva becomes dry, wrinkled, and smoky. There is transformation of normal columnar epithelium to the stratified squamous type, in VAD histologically. This results in loss of goblet cells and formation of agranular cell layer and keratinization.
- *X1B*: Bitot's spots are patches of bulbar conjunctival xerosis seen in the temporal quadrant, as an isolated oval or triangular patch adjacent to the limbus in the interpalpebral fissure. It is almost always bilateral. It has foamy or cheesy appearance due to accumulation of saprophytic bacteria and keratin. Bitot's spots are readily recognized and serve as a useful clinical criterion for assessing the VA status of the population.

  Bitot's spots should not be confused with pinguecula or pterygium, which are more often nasal than temporal and limited largely to adults. Pinguecula is an elevated, fatty, yellowish lesion whereas, pterygium is fleshy and actually invades the cornea.

  Bitot's spot is sometimes seen in the absence of active VAD in school-growing children. Careful history of previous bouts of night blindness or xerophthalmia must be asked; this lesion is inactive Bitot's spot. To differentiate active and inactive Bitot's spot, one has to observe their response to VA therapy. Active conjunctival xerosis and Bitot's spots begin to resolve within 2–5 days and most will disappear within 2 weeks.
- *X2*: Corneal xerosis—Corneal changes begin early in VAD, long before they can be seen with the naked eye. The cornea develops into classical xerosis, with a hazy, lusterless, dry appearance, first observable near the inferior limbus. Many children with night blindness have characteristic superficial punctuate lesions of the inferonasal aspects of the cornea, which stain brightly with fluorescein. Early diagnosis is only possible through a slit-lamp examination. In follow-up, corneal xerosis responds within 2–5 days to VA therapy, with the cornea regaining its normal appearance in 1–2 weeks.
- *X3 A-X3 B*: Corneal ulceration/keratomalacia involving less than one third of the corneal surface (X3A) generally spares the central pupillary zone, and prompt therapy preserves useful vision. More widespread involvement (X3B), especially generalized liquefactive necrosis usually results in perforation, extrusion of intraocular contents, and loss of the globe. Prompt therapy may still save the other eye and the child's life.

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PRESCRIPTION ASSISTANCE

TABLE 1: Laboratory diagnosis according to etiology of rickets.

Pharmacological name	*Market preparation*	*Availability (drops/syrup/ tablets/injection)*	*Dosages*
Vitamin A	Aquasol, Vitamin A cap (USV), Rovigon tablet	Cap Aquasol 50,000 IU, and injection 100,000 IU in 2 mL	*Doses*: See the text Vitamin A supplementation
Vitamin A	Aquasol, Vitamin A Cap (USV), Rovigon tablet, Lukvit drops, Arovit tablet	Cap Aquasol 50,000 IU, and injection 100,000 IU in 2 mL Vitamin A cap (USV), Rovigon (Vitamin A 10,000 IU + Vitamin E 25 mg) Lukvit Drops 1 lakh U/mL	*Doses*: See the text Vitamin A supplementation By Lukvit A

- *XS corneal scaring*: The after effect of VAD include opacities or scars of varying densities leading to loss of intraocular contents, phthisis bulbi, and a scarred shrunken globe.
- *XF*: Xerophthalmic fundus—The small white retinal lesions described in some cases of VAD are of investigational interest only. They may be accompanied by constriction of the visual fields and will largely disappear within 2–4 months in response to VA therapy.

DIAGNOSIS

- The clinical recognition is very important. Follow the *WHO clinical classification* of VAD and grade them accordingly.
- *Serum retinol* measurements <20 μg/dL is indicative of VAD.
  It must be adjusted to C-reactive protein (CRP) levels for subclinical infections, otherwise it can overestimate VAD burden. It may not be an operationally feasible indicator for community use.
- Staining of eye with 1% *Rose Bengal*
- *Pupillary reflexes*: Early sign can be picked up by flashing light to the pupil and covering other, the degree of impairment of PR can be estimated.
- *Dark adaptometry* is a simple tool for VAD.

PREVENTION

The Government of India is running Vitamin A Prophylaxis Program; according to this program, children between 9 months and 5 years are given nine mega doses of VA at 6-month interval. The first two doses coincide with MMR vaccination and DPT first booster in a dose of 1 mL for infants and 2 mL after 1 year. VA supplementation causes considerable reduction in child mortality.

TREATMENT OF VITAMIN A DEFICIENCY

Oil miscible vitamin A	*<1 year (IU)*	*>1 year (IU)*
Immediately (D1)	1 lakh	2 lakh
Next day (D2)	1 lakh	2 lakh
After 2–4 weeks (D14–21)	1 lakh	2 lakh
Severe PEM (repeat monthly till PEM resolves)	1 lakh	2 lakh

(PEM: protein-energy malnutrition)
Parenteral doses: in persisting vomiting and severe malabsorption
Source: Elizabeth KE. Nutrition and Development, 4th edition.

In keratomalacia, atropinization and ophthalmic consultations are needed. Water-soluble preparation such as aquasol is given 5,000 IU/kg/d, intramuscular for 5 days followed by oral therapy. The another way is to give 5,000 IU/kg/d for 5 days followed by 25,000 IU/d till recovery (Nelson Textbook of Pediatrics).

SUGGESTED READING

1. Elizabeth KE. Nutrition and Development, 4th edition. Hyderabad: Paras Medical Publishers.
2. Imdad A, Herzer K, Mayo-Wilson E, Yakoob MY, Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. Cochrane Database Syst Rev. 2010;(12):CD008524.
3. World Health Organization. (2011). WHO Guideline: Vitamin A supplementation for infants and children 6–59 months of age. [online] Available from: http://www.who.int/nutrition/publications/micronutrients/guidelines/vas_6to59_months/en/. [Last accessed May, 2021].

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PAI Textbook of PEDIATRICS

The book is a sincere and dedicated effort of Pediatric Association of India to come up with a short book in a textbook style to cater to the need for pediatric office practice. Proper care has been taken to preserve the interest of undergraduates, postgraduates, practitioners and super-specialists.

This book is a comprehensive collection of 175 important pediatric topics of day-to-day practice. These conditions are quite often seen in our routine outpatient. The style of the book is focused to cater to the instant need of a busy practitioner, who can refer the book as table-top reference. The crisp text is clinically focused to clinical presentation, the investigations and the management in short.

The unique idea of adding "prescription assistance" at the end of many chapters will help practitioner to be aware of various available market preparation of the drugs with doses and direction for use.

The involvement of specialists and super-specialists in different subspecialty branches of the pediatrics has enriched the content worth reading and following. The contents in the book are contributions from eminent teachers, specialists and super-specialists in pediatric practice from across the country. The vast experience and focused vision of the contributors are very well depicted in each chapter of the book.

The shape of the book is the blessings of our seniors and colleagues who have been the regular critic and supportive to come up to the present wonderful shape.

Anoop Verma is a Senior Pediatric Consultant, practicing at Raipur, Chhattisgarh, India, for more than three decades. He is amongst the most active academician who has profound national acceptability. His lectures are very much appreciated and are full of interesting material.

He was honored by various prestigious fellowships of various scientific organizations. He was conferred Fellowship of Indian Academy of Pediatrics (IAP) (2003), Fellow of Indian Academy of Medical Sciences of IMA (2005), Fellow of College of General Practitioner of IMA (2008), Fellowship of Pediatric Association of India (2017), and Honorary Fellowship of Academy of Pediatric Neurology (2018).

He authored well-known books like *Spotters in Pediatrics, Pediatrics Secrets, Clinical Pediatric Neurology.* As an Editor-in-Chief of *IAP Textbook of Pediatric Neurology* (1st and 2nd editions); an Editor in *IAP Textbook of Pediatric Radiology;* as a Section Editor in *Neurology in IAP Color Atlas of Pediatrics,* Chapter contribution in *IAP Textbook of Pediatrics*. He has contributed about 25 publications in national and international journals and books.

He was given the responsibility of National Chairperson, Academy of Pediatric Neurology from 2009 to 2012, National Convener of IAP Taskforce on Epilepsy and Movement Disorders, and as a National Coordinator "Clinical Clues Module" of IAP 2020.

He was conferred various awards and gold medals in various conferences. In 2017, Dr DS Dave Oration Award of Chhattisgarh Academy of Pediatrics; in 2018, Dr SK Ghatak Memorial Oration of West Coal Field Branch of IAP, Asansol, West Bengal; and IMA Doctor of the Year Award 2015 by National IMA.

He was National Vice President of IAP in 2005, National Executive Board member of IAP 5 times, National Chairperson of Academy of Pediatric Neurology from 2008 to 2012, National Coordinator of Clinical Clues Module of IAP 2020. At present, he is National Secretary General of Pediatric Association of India.

He has a strong belief that our pediatric OPD is a real treasure, we have to examine each patient with curiosity mixed with interest. Nothing is rare in medicine; every disease is around and can be picked, provided your acumen works in time.

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