

Keratomalacia: A Case Report from North India

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Abstract

Introduction: Severe Vitamin A deficiency (VAD) leads to disturbance in the preservation of epithelial surfaces, leading to atrophic changes in the normal mucosal surface of the cornea, with loss of goblet cells and substituting the normal epithelium by an improper keratinized stratified squamous epithelium. Additionally, the substantia propria of the cornea ruptures and liquefies, which is consequential in Keratomalacia. This communication aimed to report the case of Keratomalacia, a severe form of ocular manifestation of vitamin A deficiency, and to reiterate the importance of strengthening and continuing of universal vitamin A supplementation (VAS) programme in India.

Methods: During the community-based nutrition survey, we came across a six-year-old girl child with Keratomalacia in the left eye.

Results: The entire cornea in the left eye was found ulcerated with distorted margins rendering the girl completely blind. Similarly, corneal opacity was also observed at the median side of the cornea (at 3°clock position) in the right eye.

Conclusion: VAD among children under five years of age continues to be a public health concern in India. Discontinuing the existing universal VAS programme would lead to the re-emergence of nutritional blindness in India. Hence, it is highly recommended to continue the existing universal VAS programme in India until children's dietary intakes and sub-clinical vitamin A levels improve optimally. It is also reiterated that the community should be persuaded to eat foods rich in both preformed and provitamin A through appropriate health and nutrition education interventions and behavioral change communication (BCC) methods.

Keywords: Keratomalacia; Bitot's Spot; Vitamin A Deficiency; VAD; VAS

Introduction

Vitamin A is a vital micronutrient mandatory for normal vision as an essential constituent of rhodopsin and the differentiation and performance of the conjunctival membranes and cornea [1,2]. Vitamin A deficiency (VAD) is one of the main reasons for avoidable childhood blindness. Its ocular expressions comprise night blindness, conjunctival xerosis, Bitot's Spots, corneal xerosis, corneal ulceration and Keratomalacia. VAD may perhaps be credited to restricted access to animal-sourced foods composed of preformed vitamin A (Retinol) and poor intakes of provitamin A (beta-carotene) rich foods owing to poverty and ignorance [2]. VAD persists to be an important nutritional problem of public health concern in India [3], where it contributes to 40% of VAD children in the developing world [4].

Case History

In the community, I came across a six-year-old girl with Keratomalacia, a severe form of ocular manifestation of VAD in the left eye in the Dibrugarh city of the Assam state, India. On inquiry, her parents reported that they had noticed the haziness of the cornea in the left eye of their daughter right from the age of two, and it eventually led to ulceration of the cornea. On examination, the entire cornea in the left eye was found ulcerated with distorted margins rendering the girl completely blind (Figure 1). Similarly, corneal opacity was also observed in the right eye at the cornea's median side (at 3° clock position) (Figure 2). By the time the Ophthalmologist was consulted, the child had suffered a significant vision loss in the left eye. The child did not receive any stipulated primary vaccination, and she did not receive even a single massive dose of vitamin A supplementation (VAS). The younger sister of this girl, aged two years, was also examined clinically, and she also was found to have conjunctival xerosis and immature Bitot's spot in both eyes.

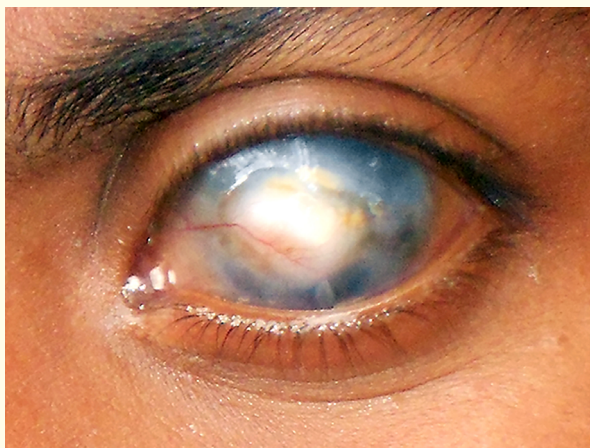


Figure 1: Keratomalacia- Left Eye.



Figure 2: Keratomalacia- Left Eye and Corneal scar- Right Eye.

Discussion

VAD is the major reason for preventable childhood blindness and persists to be one of the leading nutritional problems of public health concern in India. The proportion of rural preschool children in India with Bitot's spots, an objective clinical manifestation of VAD was 0.8% [5] and the corresponding figures reported for the north [6] and south [7] Indian states were 0.9% and 0.6% respectively, making VAD a public health problem. Likewise, the prevalence of sub-clinical VAD (serum retinol ≤ 20 $\mu\text{g}/\text{dl}$) was 62% in India [5] and the corresponding figures were reported in the north [6] and south [7] India were 64% and 59.3%, respectively.

Although the prevalence of clinical VAD declined over a period of time, the maximum percentage of the world's VAD children still live in India [4,8]. The periodic National Nutrition Monitoring Bureau (NNMB) population-based studies in India revealed that the diets of rural preschool children were grossly deficient in vitamin A [9].

Nutritional blindness due to VAD among children under five was reported in India during the 1950s and 1960s [10]. As reported by Rahi, *et al.* in 1993, the prevalence of severe visual impairment or blindness attributable to VAD was 18.6% in India [11]. Keeping in view the high prevalence of nutritional blindness due to VAD amongst preschool children, the Government of India had launched the National Prophylaxis Programme against Nutritional Blindness (NPPNB) owing to VAD in the year 1970. Under this programme, nine bi-annual massive doses of vitamin A solution (MDVAS) were supplemented for children 6 - 59 months.

During the past two decades, there has been constant opposition by a section of nutrition experts to the prolongation of the universal vitamin A supplementation programme in India. Their opposition has gained momentum following the Comprehensive National Nutrition Survey (CNNS) [12-15] report in 2020. The Expert Committee constituted by the Government of India recommended discontinuation of the existing universal VAS in all the States/Union Territories except in three states, i.e. Jharkhand, Mizoram, and Telangana, based on CNNS findings [12]. The CNNS study findings claims were not nationally representative of the true situation since the survey covered only 6,694 children aged 1 - 4 years as against the 20,350 children proposed in the study design [12].

The Ministry of Health also recommended modifying the age group of children from 6 - 59 months to 6 - 36 months and the total number of MDVAS doses from nine to five doses. In this regard, it needs to be mentioned here that in 1992, the coverage of VAS was narrowed to children aged 9 - 36 months owing to the shortage of vitamin A solutions. However, in 2006, with the increased prevalence of VAD in 36 - 59 months children, the Government of India expanded the target age group to 9 - 59 months. Therefore, it is suggested not to make any changes in the age group of children under the VAS programme.

Although food-based approaches have been known for a long time and have been an integral part of the VAD control program, the dietary intakes of vitamin A have remained persistently low and have not changed much at all in the past four decades [16]. Periodic National Nutrition Monitoring Bureau (NNMB) surveys also revealed that the diets of rural, tribal, and urban preschool children were extremely poor in vitamin A, where 80 - 89% of children were not consuming even 50% of their RDA (Recommended Dietary Allowances) [9]. Therefore, discontinuing the VAS programme in haste before improving dietary vitamin A intake may lead to the re-emergence of nutritional blindness in India [17]. It is evident from a study that reported corneal xerosis (0.3%) and corneal scars (0.5%) exist among children in Uttar Pradesh [18]. Therefore, the universal vitamin A supplementation programme should be continued as a short-term intervention and the food-based approach until the dietary consumption of vitamin A gets improved and sub-clinical vitamin A levels are no more a public health concern. Similarly, a comprehensive state and nationally representative study should be conducted to evaluate the ground realities of preschool children's vitamin A status before implementing any alteration in India's existing vitamin A policy.

Conclusion

Despite the decreased prevalence of sub-clinical vitamin A deficiency among children under five years of age, it is still a public health concern in India. The decline in the prevalence of VAD among children under five years over time could be attributed to the coverage of children under the VAS programme. Discontinuing the existing universal VAS programme would lead to the re-emergence of nutritional blindness among children from poor and marginalized households in India. The diets of under five-year-old children are extremely poor in vitamin A with a gap (deficit) between the actual intake and the RDA was 84 - 91%, and about 81 - 89% of children were not consuming even 50 % of their daily requirement. Hence, it is highly recommended to continue the existing universal VAS programme in India until children's dietary intakes and sub-clinical vitamin A levels improve optimally. It is also reiterated that the community should be persuaded to eat foods rich in both preformed and provitamin A through appropriate health and nutrition education interventions and behavioral change communication (BCC) methods.

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Conflicts of Interest

None.

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