# Vitamin A deficiency in rural based tertiary care centre

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## Abstract

**Aims and objectives:** To study the incidence of clinical forms of vitamin A deficiency and create awareness for importance of dietary vitamin A among parents.

**Materials and Methods:** This cross sectional study was done in a rural based tertiary care centre which included 256 patients attending the paediatric OPD between the age group of 1 month to 10 years during July and August 2015. Questionnaires were prepared for socioeconomic status and nutritional status. An ophthalmic examination was carried out along with a trained paraopthalmic assistant in the paediatric OPD. The findings of torch light examination were confirmed on slit lamp examination. The positive findings of vitamin A deficiency were compared with the WHO classification. Statistical analysis was done by using the SPSS software V.11.

**Results:** The total number of children examined were 256 which included 101 (39.5 %) from rural areas and 155 (60.5 %) from urban areas. Conjuctival xerosis was noted in 19 (7.4%) children out of which 9 children (3.5%) were from urban and 10 children (3.9%) from rural areas. 21 children (8%) suffered from night blindness which is another sign of Vitamin A deficiency (XN).

**Conclusion:** Vitamin A deficiency affects most of the school going children in rural India and it occurs mainly due to dietary insufficiency hence can be prevented.

**Keywords:** Conjunctival xerosis, Incidence, Kuppuswamy scale, Xeropthalmia.

## Introduction

Vitamin A deficiency (VAD) is the one of the most important cause of preventable childhood blindness in the developing countries. Deficiency of vitamin A leads to a condition called xeropthalmia which means dryness of the various layers of the eyes. The term xeropthalmia includes various ocular manifestations of vitamin A deficiency from mild stages of night blindness and bitot spots to severe form of disease of corneal xerosis, ulceration and necrosis leading to keratomalacia.[1,2] Night blindness and bitot spots are considered to be mild forms of eye disease but they represent moderate to severe systemic vitamin A deficiency. The corneal involvement is the severe form of xeropthalmia and corresponds to a very low serum retinol concentration.[3] This suggests that children with eye signs are just the "tip of iceberg" and there may be many children in the community who have vitamin A deficiency but normal eyes and vision.[4] Sub clinical VAD which has not yet presented with clinical manifestation is a significant public health problem and hence it may be more rampant than clinical form of VAD.[5]

Vitamin A deficiency leads to a defective tear film because of the abnormal goblet cells of the conjunctiva. Goblet cells are essential for secreting the mucous layer of the tear film which in turn increases the wetability of the ocular surface for uniform spread of the tear film.[6]

The main reason for vitamin A deficiency in preschool age group is chronically insufficient of dietary vitamin A. This requires improving the nutritional status of the preschool children by changing the dietary habits which is done by parental education. The commonest vitamin A rich foods are ripe mangoes, papayas and green leafy vegetables like spinach.

Vitamin A deiciency is estimated around 2.8 million[7] in preschool children who are at a risk of blindness, which can be completely preventable. It requires proper dietary education to the parents and minimal changes in the dietary pattern of the children. It has been estimated that approximately 250,000 to 500,000[8] malnourished children go blind each year from a deficiency of vitamin A, approximately half of whom die within a year due to other associated nutritional deficiencies. [8]

The aim of the study was to determine the prevalence of vitamin A deficiency amongst the population in our area and its correlation with socioeconomic status and lack of awareness and to emphasize the need of vitamin A in the diet and contribute to the community responsibility.

## Materials and Methods

This was a hospital based cross sectional study done at a rural based tertiary care centre between the period of July 2015 to August 2015. The study was approved by Institutional ethical committee. The total numbers of children examined were 256 children who were aged between 1 month-10 years, of both sexes and with parents willing to participate in the study. They were selected from the routine paediatric OPD of the centre by convenience sampling method.

The exclusion criteria were - Parents not willing to participate in the study and children with multiple nutrional deficiencies and congenital disorders.

An informed written consent in patients own language was taken from the parents before their inclusion in the study. A detailed history starting with the demographic profile was taken. History regarding night blindness was specifically asked to the parents and also details of any other ocular complaints were noted.

Also, a detailed dietary history was taken, which included the number of meals, servings of vegetables and fruits. Emphasis was made on Nutrional status of the child by asking about the consumption of vitamin A sources such as green leafy vegetables, yellow fruits, dairy products, fish and juice. This was carried out by filling a questionnaire and granting 2 points for each question with a positive answer and total of 10 points were granted for positive answers of total five Nutritional questions. This method of scoring is followed by the nutritionist of our centre. The nutritional scale is given as follows

**Table 1: Nutritional scale [9]**

| **Nutritional status** | |
|---|---|
| Score of 4 or below | Low intake |
| Score of 5 to 6 | Moderate intake |
| Score of 6 or more | High intake |

Children who Scored 4 or below were considered low intake diet and those above 6 score were considered good intake diet, whereas score between 5 to 6 were considered as average intake.

A detailed history regarding the socioeconomic status was also taken and was graded according to the kuppuswamy scale. This was carried out by asking the parents regarding their education, occupation and monthly income. Scores were granted according to kuppuswamy scale with the maximum of 7 for education, 10 for profession and 12 for monthly family income. The scores received after asking relevant questions to the parents, giving them points and adding all, a total was received which is the 'L score'. Parents were graded accordingly and the parents were classified into following groups- Upper class, Upper middle class, lower middle class, upper lower class and lower class.

**Table 2: Scale for socioeconomic scale [10]**

| | |
|---|---|
| 26-29 | Upper class (I) |
| 16-25 | Upper middle (II) |
| 11-15 | Lower middle (III) |
| 5-10 | Upper lower (IV) |
| <5 | Lower (V) |

A detailed general examination was done to examine hair colour and texture, skin colour and type, pallor and clubbing.

Ocular examination was done by a torch light, skin surrounding the eyes, bulbar, palpebral conjunctiva and cornea were thoroughly examined. Bulbar conjunctiva was examined on the temporal side for the conjunctival xerosis and bitot spots. Those with positive conjunctival findings were taken to the eye OPD for a slit lamp examination. By slit lamp examination corneal details and the type of conjunctival findings were noted.

The positive findings of vitamin A deficiency were compared with the WHO classification as follows World Health Organization (WHO) classification of vitamin A deficiency and the age groups most affected[4]

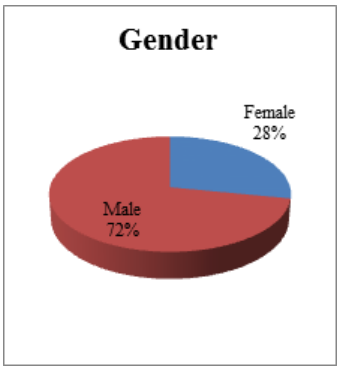
**Table 3:**

| **Grade of Xerophthalmia (years)** | **Peak age group** | **Type of deficiency** | **Risk of Death** |
|---|---|---|---|
| XN Night Blindness | 2-6; adult women | Long standing. Not blinding | + |
| X1A Conjunctival Xerosis | 3-6 | Long standing. Not blinding | + |
| X1B Bitot's spot | 3-6 | Long standing. Not blinding | + |
| X2 Corneal xerosis | 1-4 | Acute deficiency. Can be blinding | ++ |
| X3A Corneal ulcer/1<3 cornea | 1-4 | Severe acute deficiency. Blinding | +++ |
| X3B Corneal ulcer/ keratomalacia≥1/3 | 1-4 | Severe acute deficiency. Blinding | ++++ |
| XS Corneal scarring (from X3) | >2 | Consequence of corneal ulceration | +/- |
| XF Xerophthalmic Fundus | Adults | Long standing. Not blinding. Rare | |

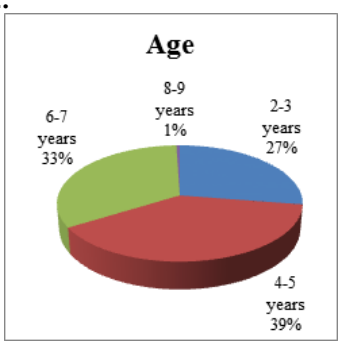
Statistical analysis was done by using the SPSS software.

## Results

**Pie Chart 1:**




**Pie Chart 2:**




Pie chart 1 and Pie chart 2 shows the demographic profile of the children included in the studies where n=256. There are 66 children (25.8%) in age group of 2-3 years and 93 children (36.3%) in 4-5 years whereas there are 80 children (31.3%) in 6-7 years and also 17 (6.6%) in 8-9 years.

There are 72 female (28.1%) patients while male patients are 184 (71.9%).

**Table 4: (n=256)**

| Kuppuswamy | | |
|---|---|---|
| | **Frequency** | **Percent** |
| I | 25 | 9.8 |
| II | 75 | 29.3 |
| III | 105 | 41.0 |
| IV | 46 | 18.0 |
| V | 5 | 2.0 |
| Total | 256 | 100.0 |

I-Upper class
II-Upper middle class3
III-Lower middle class
IV-Upper lower class
V-Lower class

Kuppuswamy scale denotes three variables, education, occupation and residential address for measuring socioeconomic status. As the table 4 shows, there were 25 (9.8%) patients in Upper class and 75 (29.3%) patients in Upper middle class whereas lower middle class consists of 105 (41%) patients and Upper lower class had 46 (18%) patients and lower class has 5 (2%) patients only. Most of the children belong to lower middle class i.e. 105 (41%).

**Table 5: (n=256)**

| Residence | | |
|---|---|---|
| | **Frequency** | **Percent** |
| Rural | 101 | 39.5 |
| Urban | 155 | 60.5 |
| Total | 256 | 100.0 |

Table 5 denotes patients location whether staying in rural area or urban area which was 101(39.5%) and 155(60.5%) respectively.

**Table 6: (n=256)**

| Conjunctival xerosis | | |
|---|---|---|
| | **Frequency** | **Percent** |
| Absent | 238 | 92.6 |
| Present | 19 | 7.4 |
| Total | 256 | 100.0 |

There are various signs of Vitamin A deficiency in children which are graded by WHO and according to the table WHO classification of Vitamin A deficiency and the age groups most affected; these signs are:

1. XN :-Night blindness
2. X1A:-Conjunctival xerosis
3. X1B:-Bitot's spots
4. X2:-Corneal xerosis
5. X3A:-Corneal ulcer/<1/3cornea
6. X3B:-Corneal ulcer/keratomalacia
7. XS:-Corneal scarring(from X3)
8. XF:- Xerophthalmic fundus

Table 6 shows conjunctival xerosis in patients and there are only 19(7.4%) patients with Conjunctival xerosis while in rest 238(92.6%) it is absent.

**Table 7: (n=19)**

| Conjunctival xerosis area distribution | | |
|---|---|---|
| | **Frequency** | **Percent** |
| Rural | 10 | 3.9 |
| Urban | 9 | 3.5 |
| Total | 19 | 7.4 |

Table 7 denotes distribution of conjunctival xerosis in rural and urban areas. Out of total 19 patients, there are 9(3.5%) patients from urban areas and there are 10 (3.9%) patients from rural areas.

**Table 8: (n=256)**

| Night Blindness | | |
|---|---|---|
| | **Frequency** | **Percent** |
| Present | 21 | 8 |
| Absent | 235 | 92 |
| Total | 256 | 100 |

Table 8 shows the number of patients presenting with the night blindness which is another sign of Vitamin A deficiency(XN).There are 21(8%) patients with night blindness and it is absent in others 235( 92%).

**Table 9: (n=256)**

| Other findings | | |
|---|---|---|
| | **Frequency** | **Percent** |
| Bitot spots | Nil | Nil |
| Corneal xerosis | Nil | Nil |
| Keratomalacia | Nil | Nil |

Table 9 shows other signs of vitamin A deficiency. These are bitot spots, corneal xerosis and keratomalacia and out of all the 256 children, it is absent.

## Discussion

In the study done by Sinha A, Kulkarni M, et al for "Vitamin A deficiency in School children in Urban Central India. 13 (ranging 7-21)", complete examination was carried out in the schools and questionnaire including profession of the parents, presence of visual and ocular symptoms and eating habits. Ophthalmologist examined the ocular motility and searched for strabismus, performed slit lamp examination of the eye like xerosis of conjunctiva, bitots spot, corneal xerosis and reported night blindness. On the basis of results in urban central India, prevalence of xerophthalmia was about 6.5%, based on bitot spots and /or night blindness.[8] Also in our study we noted that the prevalence of conjunctival xerosis was present in 7.4%.

Pal R, studied "Vitamin A deficiency in Indian rural preschool-aged children". They came out with the conclusion that conjunctival xerosis only, when accompanied by bitot spots had been included in positive signs. On the basis of data, preschool children suffering from vitamin A deficiency disorders was determined to be 6% and in our studies it was 7.4%.Wide inter-regional variations and prevalence of vitamin A deficiency was noted.[7]

Singh P, Saxena BN et al did a multicentre trial on "Vitamin A deficiency disorders in 16 districts of India" assessed children less than 6 years. The highest prevalence of bitot spots 4.71%corneal scar 0.5% and night blindness 5.17% was seen in gaya district. Not even a single case of Bitot spot was found in the screening from Mandi, Dehradun and Badaun districts which coincides with our study as we also did not found any cases of bitot's spots[11]

Shivali suri, Dinesh Kumar et al studied "Determinants of subclinical vitamin A deficiency among chidren 1-5 tears in a rural community of Jammu" amongst 750 children from 15 villages. They observed that the chances to develop subclinical vitamin A deficiency was higher among the younger age group i.e. 1-3 years and the risk reduced as the age advances. Similarly, we also found that conjunctival xerosis was found in the children between the age group of 1-5 years.[5]

V Singh and KP West Jr et al studied "Vitamin A deficiency and xerophthalmia among school-aged in Southeastern Asia children" and concluded that prevalence of night blindness and bitot spots in southeast asian region was 2.6%. In India, with its large population size the estimated VAD prevalence found was 2.8% in the school age children. Similarly, we found that incidence of conjunctival xeosis was 3.5% in the urban areas whereas it was 3.9% in rural areas.[12]

Agrawal VK1, Agrawal P1 et al studied "Prevalence and determinants of xerophthalmia in rural children of Uttar Pradesh, India" and found that prevalence of bitot spots in children below the age of 6 years was 0.9% and showed declining trend of VAD in the community. Similarly, the incidence of bitot spots was 0.0% in our study. But VAD still remains a public health problem and the prevalence according to WHO guideline is 0.5%.[13]

Agarawal VK, Agarawal P et al in their study of "Prevalence and determinants of xerophthalmia in rural children" found that prevalence of xeropthalmia i.e. night blindness and bitot spots was 5.4%. They also found that prevalence of xeropthalmia was found in lower socioeconomic strata with a large family. Similarly, we also found incidence of xeropthalmia was more in lower middle class of socioeconomic group. In our study, xeropthalmia was 3.9% in rural and 3.5% in urban areas. They did not find any corneal involvement during the study. Similarly, we also did not found any child with corneal involvement.[14]

## Conclusion

This study concluded that Vitamin A deficiency still remains a public health problem in urban as well as rural children of lower middle class population due to insufficient dietary intake. We conclude that a few ocular consequences due to vitamin A deficiency has reduced to a great extent in last decade but are still seen in a few children.

The study had some limitations like short duration and it did not represent the community as a whole as the children were taken from the Paediatric OPD.

We also tried to create awareness regarding importance of vitamin A in the diet by educating the parents and explaining the complications of its deficiency.

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