



Original Research Article

Prevalence of xerophthalmia and coverage of vitamin A prophylaxis programme in slums of rural and urban communities amongst children less than 6 years of age

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ABSTRACT

Purpose: To determine the prevalence of xerophthalmia in a high risk age group of children less than 6 years of age and to assess the coverage of prophylaxis so that the efficiency of vitamin A prophylaxis programme can be analysed.

Design: A cross sectional study was conducted from 15th June 2015 to 15th August 2015.

Materials and Methods: 442 children aged 0-6 years were enrolled in a cross-sectional study from randomly selected anganwadis in 3 urban and rural communities. Parents/caregivers were interviewed about night blindness and other symptoms of xerophthalmia, consumption of vitamin A rich foods, history of vitamin A supplementation till date of examination, measles vaccination status. Children were examined for manifestations of xerophthalmia and were classified according to their ocular signs as per WHO criteria.

Results: Out of 442 children 232 were male and 210 were female. Out of 442 children, 403 (93.73%) were given vitamin A supplements by the age of 6 years. Out of 442 children, none complained of day or night blindness. No child had Bitot's spots, corneal xerosis, scars or keratomalacia, but 6 children had bilateral conjunctival xerosis. The prevalence rate of conjunctival xerosis is 1.35%. The prevalence rate of xerophthalmia according to its ocular manifestations as given by WHO, is 0%.

Conclusion: A prevalence rate of xerophthalmia 0% is indicative of the success of the vitamin A prophylaxis programme and coverage of vitamin A prophylaxis 93.73% can be attributed to the efficient implementation of the programme by the anganwadi workers.

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1. Introduction

Vitamin A deficiency is a major public health nutrition problem in the developing world. It causes a spectrum of diseases ranging from ocular to systemic manifestations. Xerophthalmia (dry eye) refers to all ocular manifestations of vitamin A deficiency (VAD). It includes not only the structural changes affecting the conjunctiva, cornea and occasionally the retina, but also the biophysical disorders of retinal rods and cones functions.¹ Xerophthalmia can occur in any age group, however, the highest incidence has been observed in preschool children. It has been previously estimated that globally 127 million preschool-

aged children under 5 years of age are vitamin A deficient (serum retinol <0.7 mol/l or having abnormal impression cytology), of which 4.4 million have xerophthalmia.² The largest numbers of vitamin A deficient children live in India, that is, 35.3 million. Forty per cent of all preschool-aged children with xerophthalmia (1.8 million) in the developing world live in India, a number that also accounts for 88% of all cases in South and Southeast Asia.³

Current prevalence of manifestations of xerophthalmia is about 0.8% which ranges from nil in Kerala to a maximum of 1.2-1.4% in states of Maharashtra, Andhra Pradesh and Madhya Pradesh.⁴⁴ The prevalence was higher than WHO cut off level of 0.5% indicating its public health significance. Therefore the aim of this study was to assess the prevalence of xerophthalmia in children <6 years in slums of rural and

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urban communities.

VAD especially affects preschool children, as they have high requirements due to increased physical growth and have low dietary intake. Further, episodes of illnesses such as acute respiratory tract infection and measles, which deplete vitamin A reserves from the body, are common in this age group.⁵ VAD can cause xerophthalmia and lead to blindness, limit growth, weaken innate and acquired host defences, exacerbate infection and increase the risk of death.⁶

Though one of the major causes for VAD is chronic dietary deficiency or malabsorption of vitamin A, it is also associated with numerous risk factors. These risk factors can be classified as nutritional and demographic.

Nutritional risk factors contributing to VAD are faulty feeding habits, insufficient dietary intake, poor quality of vitamin A rich foods, and age up to which breastfeeding was continued. Demographic risk factors include nutritional status and literacy rate of the mother.

The management of VAD should include the treatment of xerophthalmia and other manifestations of VAD, along with prophylaxis of the high risk population, that is, preschool children, aged 0-6 years. Prophylaxis of VAD can lead to concurrent reduction in magnitude and severity of precipitating and contributory factors such as measles, acute diarrhoeal and respiratory infections.

With the aim of reducing blindness due to VAD, The National Prophylaxis Programme against Nutritional Blindness due to vitamin A deficiency (NPPNB due to VAD) was started in 1970. Under the aegis of this program, 9 mega doses of vitamin A supplementation are given to cover children 9 months to 5 years, since 2007. Under the modified regimen there has been some improvement in coverage with the first dose (50 – 75 percent). However, the coverage for subsequent doses is low.⁷ It is a matter of concern that only <21% of children of 12-35 months receive a vitamin A dose.⁸ This gave a tremendous impetus for the execution of this project – firstly to determine the prevalence of xerophthalmia, and secondly, the coverage of prophylaxis.

2. Materials and Methods

Ethical clearance was obtained from the Institutional Ethics Committee. The study was carried out from 15th June 2015 to 15th August 2015 in anganwadis of 3 slums of urban and rural communities. It is a cross sectional study. 442 children of 0-6 years of age belonging to rural and urban slum communities were enrolled in a cross-sectional study from randomly selected anganwadis in 3 urban and rural communities. Anganwadi workers were informed of the purpose and nature of study to ensure high response rates and maximum cooperation. Verbal consent for participation was obtained from the adults accompanying the children. History of difficulty in vision during the day and night was

ascertained.

Parents/caregivers were interviewed about night blindness and other symptoms of xerophthalmia, consumption of vitamin A rich foods, history of vitamin A supplementation till date of examination and measles vaccination status. They were also asked about breast feeding and literacy status of mother. Children were examined for manifestations of xerophthalmia and were classified according to their ocular signs as per WHO criteria (Table 1). Examination of the eye using a torch and magnifying loupe was done in the presence and under the guidance of an ophthalmologist. Signs were compared and diagnosed using WHO references. Reconfirmation whether vitamin A supplementation has been done or not was ascertained. Diagnosis was made after comprehensive and detailed history and examination. Further analysis of the data was done using statistical tools. A pre-tested and pre-edited simple face to face questionnaire was administered for easy collection and assessing of data.

Statistical analysis: Children aged 0-6 years were enrolled into a cross-sectional study from randomly selected anganwadis. Data was entered in Microsoft Excel and analyzed using EpiInfo 7. Qualitative data was summarized using proportions and 95% confidence interval. Quantitative data was analyzed using mean and standard deviation. Appropriate statistical tests such as Chi square were used.

3. Results

442 children of 0-6 years were enrolled in this study, out of which 232 were male and 210 were female. Out of total 442 children examined, 403 were given vitamin A supplements by the age of 6 years and 39 children had not received vitamin A supplements (Figure 1). Out of 39 children who had not received vitamin A supplementation, 12 children were aged less than 6 months, and 27 were aged more than 6 months. Therefore out of 430 children who were more than 6 months, 27 had not received their first vitamin A supplement. The percentage of children who had received their Vitamin A supplements is 93.73% (with CI of 95%). Out of 442 children none complained of day or night blindness. On examination of the same 442 children, no child had Bitot's spots, corneal xerosis, scars or keratomalacia. But 6 children had bilateral conjunctival xerosis (Table 2). The prevalence rate of conjunctival xerosis is 1.35%. None of children complained of any symptoms, nor did any of the children have definite signs of vitamin A deficiency. The prevalence of xerophthalmia according to its ocular manifestations as given by WHO, is 0% (with 95% CI). Out of 442 children, 406 children were vaccinated for measles and 36 were not vaccinated by the age of 6 years (Figure 2) Out of the 36 children who were not vaccinated, 18 were below the age of 9 months, 6 were in the age group of 9-12 months and 12 children were aged more than 12 months. 18 children less than 6 months of age were exclusively breast-fed. None of them

showed any ocular manifestation of xerophthalmia. Out of 442 children examined, 369 mothers were literate and 73 mothers were illiterate. Out of 73 illiterate mothers 11 of their children had not received vitamin A supplements. Out of 442 children, 162 of their diet consisted of vitamin A consumed from plant sources (Table 3). 6 of the 162 children had conjunctival xerosis.

Table 2: Ocular manifestations of xerophthalmia

Ocular manifestations	Yes	No
Day blindness	0	442
Night blindness	0	442
Conjunctival xerosis	6	436
Bitot’s spots	0	442
Corneal scars	0	442

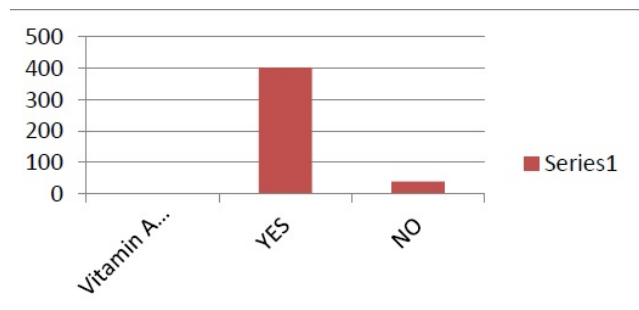


Fig. 1:

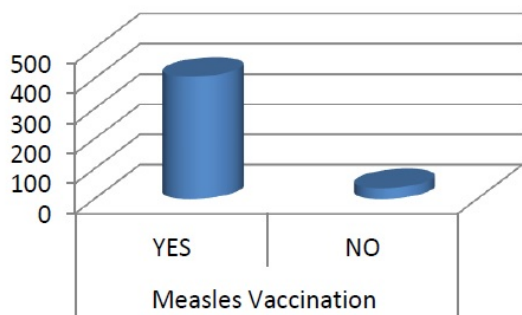


Fig. 2:

Table 1: The classification of xerophthalmia, as per WHO criteria

XN	Night blindness
X1B	Bitot’s spots
X2	Corneal xerosis
X3A	Corneal ulceration/keratomalacia (< 1/3 corneal surface)
X3B	Corneal ulceration/keratomalacia (>1/3 corneal surface)
XS	Corneal scar due to xerophthalmia
XF	Xerophthalmic fundus

4. Discussion

VAD has a plethora of clinical manifestations, ranging from xerophthalmia to disturbances in growth and susceptibility to severe infection.⁹ Vitamin A is an essential nutrient that cannot be synthesised so it must be obtained through diet.¹⁰ Deficiency of sufficient duration or severity can lead to disorders that are common in vitamin A deficient

Table 3: Consumption of Vitamin A rich foods

Score	Vitamin A Content	Frequency
0	Contain no vitamin A	0
1	Vitamin A from plant sources	162
2	Vitamin A from animal sources	0
3	Vitamin A from both sources	280

population such as xerophthalmia, anemia, and weakened host resistance to infection, which can increase the severity of infectious diseases and risk of death.¹¹

In our study the percentage of children who had received their Vitamin A supplement is 93.73%. This coverage rate is much higher than the national average of 53% as calculated in 2013.¹² We found that no child had Bitot’s spots, corneal xerosis, scars or keratomalacia. But 6 children had bilateral conjunctival xerosis. The prevalence rate of conjunctival xerosis is 1.35%. Conjunctival xerosis is a subjective sign of xerophthalmia. The sign may depend on the interpretation of the examiner. Vitamin A deficiency is not the only cause of conjunctival xerosis; it can be due to under-secretion of the tears and conjunctival secretions due to varying causes such as dry and dusty climate, ocular trauma, or any condition in which the eyelids do not close properly. Therefore the prevalence rate of xerophthalmia according to its ocular manifestations as given by WHO, is 0%. This is an improvement from the prevalence rate of 1.32% in the area from 2003.¹³

Measles is an important contributory and consequential risk factor for vitamin A deficiency in children. Vitamin A has been proven to reduce the mortality from measles in children.¹⁴ Therefore along with measles vaccination; vitamin A supplementation is given in the 9th month according to the National Immunization Schedule. In our study only 4.24% of the children have not received their measles vaccine after the 9th month.

Children who were exclusively breast-fed none of them showed any ocular manifestation of xerophthalmia. Breastfeeding therefore plays a role in preventing xerophthalmia. According to a case control study in Bangladesh, breastfeeding led to a 65% reduction in vitamin A deficiency.¹⁵ Also the literacy status of the mother plays a role in the health of her child.

In our study children who consumed vitamin A from plant sources had conjunctival xerosis. Consumption of food poor in vitamin A plays a major role in the

development of its deficiency. Plant sources have poor bioavailability as compared to animal sources. Therefore children consuming a vegetarian diet or a diet lacking in liver, meat, eggs and milk are more likely to develop vitamin A deficiency.¹⁶

5. Conclusion

In conclusion, a prevalence rate of xerophthalmia 0% is indicative of the success of the vitamin A prophylaxis programme and a coverage rate of vitamin A prophylaxis 93.73% can be attributed to the efficient implementation of the programme by the anganwadi worker.

A larger population of children needs to be examined to comprehend the overall status of vitamin A deficiency in the community. Also, only those children present at the anganwadi were examined over the course of 8 weeks. A larger population-based door to door survey needs to be done for accurate estimation of the burden of vitamin A deficiency. Vitamin A prophylaxis programme needs to be expanded to achieve a 100% coverage rate.

6. Conflict of interest

None.

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