Prevalence of Clinical Vitamin A Deficiency Among Primary School Children in Urban Slums of Ahmedabad: A Cross Sectional Study

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ABSTRACT

Background: Although there is a substantial documentation of prevalence, severity and health consequences of vitamin A deficiency (VAD) in preschool-aged children, very few studies have been done to find out the extent of VAD in primary school children. Present study was carried out in school children (5-15 years age) from slum areas of Ahmedabad city to see the prevalence of xerophthalmia.

Aims: To clinically asses the prevalence of xerophthalmia among school going children in urban slums of Ahmedabad. To study the socio-demographic factors associated with VAD in urban slums

Settings and Design: The present study was designed as a cross sectional study conducted in primary schools of urban slums in Ahmedabad from October 2007 to July 2008.

Methods and Materials: 1000 children were randomly selected from 10 schools and examined with predesigned and pretested Performa. From each school 100 children were randomly selected from standard I-VII. Xerophthalmia was diagnosed if there was a history of night blindness, or on examination, there were signs of conjunctival xerosis, Bitot's spots, corneal xerosis or keratomalacia.

Statistical Analysis: The collected information was analysed by using the Microsoft Excel and the Epi info 3.4 software. Chi-square test was used for analysis.

Results: In this study prevalence of VAD was found to be 2.9%. Prevalence of VAD among girls (4.1%) was significantly high than boys (1.9%). In present study 0.5% cases of night blindness, 1.4% cases of conjunctival xerosis and 2.1% cases of Bitot's spot were found. Types of family, lower social class (class IV & V) and poor intakes of green vegetables were significantly associated with the vitamin A deficiency.

Conclusion: The observation of this study underlines the magnitude and severity of vitamin A deficiency in an age group that policy makers do not usually consider to be at risk in this respect.

Key Words: Ahmedabad, Vitamin A deficiency, Xerophthalmia, Night blindness, Bitot's spot

KEY MESSAGE

- Prevalence of vitamin A deficiency in older children (5-15 years) is high and it demands systemic evaluation of the extent of VAD in this age group.

INTRODUCTION

Deficiency of vitamin A has long been identified as a serious and preventable nutritional disease. It also contributes significantly, even at sub-clinical levels, to morbidity and mortality from common childhood infection. Studies suggest that ill health and risk of death from some infection are also increased even in children who are not clinically deficient but, whose vitamin A body stores is depleted [1-2]. Though one of the main causes of xerophthalmia is poor intake of vitamin A rich foods, it is also associated with poverty, ignorance, faulty feeding habits among the entire population but young children in particular [3]. At least 45 countries are now known to have serious vitamin A deficiency (VAD) [3-4]. Corneal scarring results from deficiency of vitamin A is responsible for about 19% of all causes of childhood blindness [5].

Surveys indicate that the intake of Vitamin A is, on an average, about half the recommended dietary intake. It is important that the dietary practices are improved and intake of Vitamin A rich foods be actively promoted. The diet and nutritional status of urban slum children in India is far away from being satisfactory. Lack of basic amenities like safe drinking water, proper housing, drainage and excreta disposal make this population more vulnerable to infection which further compromise the nutrition of those living in the slums. Children living in slum are more prone to nutritional deficiency disorders [6].

Present study was a small effort to assess the prevalence of VAD among school children of 5-15 years in urban slums of Ahmedabad, India.

MATERIALS AND METHOD

Selection of study population &sample size: A cross sectional study was conducted among primary school children in the age group 5-15 years. The study was conducted from October 2007 to July 2008. Total sample size was calculated of 1000 children considering 30 % prevalence of ocular morbidity in the pilot study. Sample size of 933.33 was calculated by considering 30% prevalence of ocular morbidity in the pilot study with the help of

formula 4pq/l² where (l= 10% of p). For practical reason and feasibility of survey, sample size of 1000 was decided for the study.

Sampling Method: Population of Ahmedabad city was 35, 20, 850 distributed in five zones (Census 2001). List of primary schools running in slums in each zone was obtained from Ahmedabad Municipal Corporation. From 531 schools, 10 schools were selected by the simple random sampling method. Two schools selected from each zone and 100 children from each school were examined to achieve desired sample size. First standard wise cumulative frequency was prepared according to roll no and class interval was calculated for the selection of 100 children proportionate representation from each class.

Training and Survey technique: Training for identification of various stages of vitamin A deficiency (xerophthalmia) was conducted at a local institute. Prior permission for the study was taken from the school authorities. The investigator filled a predesigned and pretested proforma after explaining the purpose of the study. The first child was selected randomly by lottery method. If selected child was absent, next child was selected. The questionnaire dealt with information regarding the child like age, sex, residential address, class in which the student is studying, education, occupation and income of parents and dietary intake of dark green leafy vegetables/yellowish fruits. All the children were examined in day light for vitamin A deficiency. Xerophthalmia was diagnosed if there was history of night blindness, or there were signs of conjunctival xerosis, Bitot's spots, corneal xerosis and keratomalacia on clinical examination [7]. Anthropometric measurements were recorded as per the standard WHO guidelines. Dietary intake of dark green leafy vegetables/yellowish fruits noted in terms of frequency of consumption per week [1]. BMI percentiles were calculated for each respective age group. The BMI percentile between the 5th percentile to less than the 85th percentile was taken as normal, the 85th to less than the 95th percentile was taken as overweight and that which was equal to or above the 95th percentile was taken as obese. Socio-economic classification of children was done by modified Prasad classification method. Children diagnosed having xerophthalmia were given two lakh IU of vitamin A solution on the spot and referred to local health institute.

Data analysis: All the data were analyzed by Epi-info 3.4.3. The chi-square test was used to test difference in proportions. Differences were considered statistically significant at 5% level.

OBSERVATION AND RESULTS

The present study was conducted among primary school children aged 5-15 years in urban slums of Ahmedabad. In total, 1000 examined including 53.6% boys and 46.4% girls [Table/Fig-1]. All the children examined were from age 5-15 years of age and mean age was 9 years. Among study participants, 88.6% belong to nuclear family and 45% had more than three siblings. 34.8% father and 34.8% mother were illiterate. Majority of children had their both parents (82.5%) working as unskilled/semi-skilled/skilled work. As per modified Prasad classification, 36.5% family belongs to lower (IV &V) social class. Body mass index was measured and 73.3% children found underweight and 16.6% overweight/obese.

[Table/Fig-2] shows age and sex wise distribution of VAD. Highest no of cases observed in age group 9 to 10 yrs (5.9%) and lowest in age group 13 to 14 years (0.8%). Higher prevalence in girls was statistically significant (p=0.03) but no significant association between age and VAD (p=0.11). [Table/Fig-3] shows various manifestation of vitamin A deficiency. Almost 3% of boys and girls

Variables	No (n=1000)	Percentage
Sex		
Boys	536	53.6
Girls	464	46.4
Type of family		
Nuclear	886	88.6
Joint	114	11.4
No. of siblings		
≤ 3	550	55.0
> 3	450	45.0
Paternal Education (n=988)		
Illiterate	344	34.8
Primary	404	40.9
Secondary	236	23.9
Higher secondary and more	4	0.4
Maternal Education (n=996)		
Illiterate	492	49.4
Primary	384	38.6
Secondary	120	12.0
Parents occupational Status (n=978)		
Both parents working	825	82.5
Father only working	153	15.3
Socio-economic status		
Class I	29	2.9
Class II	221	22.1
Class III	385	38.5
Class IV	331	33.1
Class V	34	3.4

[Table/Fig-1]: Socio-demographic characteristics of school going children aged 5-15 years in urban slums of Ahmedabad, India

Age groups (years)	No	VAD (%)	X² test	P-value
5-6	250	5 (2)		
7-8	253	7 (2.7)		
9-10	184	11 (5.9)	8.78	0.11
11-12	146	4 (2.7)		
13-14	113	1 (0.8)		
14-15	54	1 (1.8)		
Boys	536	10 (1.9)	4.39	0.03
Girls	464	19 (4.1)		

[Table/Fig-2]: Age and sex wise distribution of Xerophthalmia among school going children in urban slums of Ahmedabad, India

reported VAD in various forms of xerophthalmia. As per WHO standards of prevalence of night blindness >1% and Bitot's spot, >0.5% considered as public health problem among preschool and school children. The prevalence of night blindness 0.5%, Bitot's spot 2.1% and of conjunctival xerosis 1.4% was found in present study [Table/Fig-3].

Various factors like type of family-nuclear or joint, number of siblings, paternal education, maternal education, parent's occupational status-weather both parents working or father only working, social class as upper and middle(I,II &III) or lower (IV &V), nutritional status-normal weight or malnourished (underweight, overweight, or obese), and consumption of dark green leafy vegetables were

Ocular manifestation of VAD	Total no (n=29)	Prevalence (%) observed in present study	Prevalence (%) as per WHO standard*
Night blindness (XN)	5	0.5	>1.0
Bitot's spot (X1B)	21	2.1	>0.5
Conjunctival Xerosis (X1A)	14	1.4	-
Corneal Xerosis (X2), Keratomalacia (X3A,X3B) & Corneal Scaring (XS)	0	0	0

[Table/Fig-3]: Prevalence of Xerophthalmia among school going children in urban slums of Ahmedabad and its comparison with WHO standard [7]
* Prevalence more than WHO standards will be considered as public health problem

Variables	Yes (%) (n=29)	Total (n=1000)	X^2 test	P value
Type of family				
Nuclear	21 (72.4)	886	7.74	0.00
Joint	8 (27.6)	114		
Paternal Education (n=988)				
Illiterate	13 (44.8)	340	1.43	0.23
Primary	9 (31.0)	404		
Secondary	7 (24.2)	240		
Higher secondary and more	0 (0)	4		
Maternal Education (n=996)				
Illiterate	14 (48.3)	492	0.02	0.90
Primary	11 (37.9)	384		
Secondary	4 (13.8)	120		
Parents occupational Status(n=978)				
Both parents working	21 (72.4)	825	3.23	0.07
Father only working	8 (27.6)	153		
Socio-economic status				
Class I,II and III	11 (37.9)	635	8.42	0.00
Class IV and V	18 (62.1)	365		
Body Mass Index (BMI)				
Underweight	23 (79.3)	733	0.55	0.45
Normal weight	1 (3.5)	101		
Overweight	3 (10.3)	103		
Obese	2 (6.9)	63		
Dark green leafy vegetables				
< 3 times/wk	26 (89.7)	681	6.39	0.01
≥ 3 times/wk	3 (10.3)	319		

[Table/Fig-4]: Factors affecting vitamin A deficiency among school going children in urban slums of Ahmedabad, India

assessed to determine any association with VAD among school children [Table/Fig-4].

Occurrence of VAD was significantly high among children residing in joint family than nuclear family (p=0.00). No statistical significance was found for children having number of sibling three or more than three (p=0.06). Similarly, no association was found between education status of father (p=0.23) and mother (p=0.90) and occurrence of VAD. No association was found for parents working status and VAD (p=0.07). Significant number of cases of VAD reported among lower socio-economic children (class IV & V)

(p=0.00). Nutritional status of children was not found to be associated (p=0.45) with occurrence of VAD but the consumption of dark green leafy vegetables < 3times per week significantly associated with occurrence of VAD (p=0.01).

DISCUSSION

Although there is a substantial documentation of prevalence, severity and health consequences of vitamin A deficiency in preschool-aged children, extent of VAD in older children has not given much attention. Present study was carried out in primary school children (5-15 years age) from slum areas of Ahmedabad city to see the prevalence of VAD.

In present study prevalence of vitamin A deficiency was observed to be 2.9% which was similar to finding of a comprehensive study of morbidity in Tamilnadu [8]. Cross-sectional survey with multi-stage sampling of 3 of 19 districts (Baroda, Ahmedabad and Rajkot) in Gujarat state showed 6.30 % to 13.5 % prevalence in same age group [9]. Studies done on school children in other part of country show prevalence of xerophthalmia ranging from 1.8 % to 10.6% [10-14]. Evidence from various countries of South-eastern Asia had shown VAD ranging from 0.2 % to 15 % in school aged children [15]. In present study, highest no of cases were observed in age group 9 to 10 years (5.9%) and lowest in age group 13 to 14 years (0.8%). The prevalence of xerophthalmia among boys was 1.9% and in girls it was 4.1% and the difference observed was statistically significant, p=0.03. These observations were correlated with the Ethiopian study conducted by Tarik Kassaaye et al. [16], but not to the Lucknow study conducted by D. Kumar et al [10]. The prevalence of night blindness (0.5%) in the present study comparable to the Gupta et al., study [14]. Wedner et al., reported the higher prevalence (5.3%) of night blindness among school children (7-19years) but the study conducted in rural area of Tanzania [17]. Prevalence of vitamin A deficiency was higher in social class IV and V, than in social class I, II and III. This difference was statistically significant, p=0.00. Similar observation was found in the study done by Pal R et al [18].

Dietary deficiency of vitamin A leads to development of xerophthalmia in those children taking insufficient green leafy vegetables. This was also observed by Tarik Kassaaye et al and Faruk Ahmed et al [16,19].

This study suffers from two limitation, first is that we included children who were present at the time of data collection, if the selected child was absent next child selected. This could have an effect on prevalence of VAD. Second was we had collected the data regarding consumption of green leafy vegetables but not about other rich sources of vitamin A which could be significantly associated with prevalence of xerophthalmia.

The observation of this study underlines the magnitude and severity of vitamin A deficiency in an age group that policy makers do not usually consider to be at risk in this respect. It is important to educate the community about the important morbidity in school age children, their aetiology and prevention. Provision of rich food in vitamin A must be supplied regularly in Mid Day Meal. Increase awareness of school children and parents about importance of taking dark green leafy vegetables, yellow fruits and dairy products by respective Public Health people in the district. Identify high-risk children who are prone to develop vitamin A deficiency and intervene with appropriate strategy to prevent xerophthalmia amongst those children. If space is available than school kitchen

garden should be made, So that children can take message to their home to develop kitchen garden.

Vitamin A deficiency observed among children less than five years of age group in urban slums range from 5.3 % to 24.6 %. However, data on the 5 to 15 years age group not readily available for this under privileged group [20]. Efforts to reduce vitamin A deficiency in younger children to a level is not considered to be of public health significance which are encouraging but challenging the task remains in children 5-15 year age in which prevalence is high [15]. Further studies are required to map out the prevalence of vitamin A deficiency among 5 to 15 years age group in urban slum in other part of India, so that attention of the policy maker to this problem can be drawn.

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