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Original Research Article

VITAMIN A DEFICIENCY AMONG CHILDREN OF RURAL BIHAR: A COMMUNITY BASED STUDY

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Abstract

Background: Vitamin A deficiency is an important public health problem among children. The present study was conducted to estimate the prevalence of vitamin A deficiency and their predictors among children of 6-12 years age group of rural area of Eastern India. **Materials and Methods:** A community based cross-sectional study conducted on 1263 children of 6-12 years age group in three districts of Bihar by using cluster sampling technique. **Results:** Signs of vitamin A deficiency was present in 108 children (8.5%). Factors like male gender, illiteracy of parents, type of houses, presence of anaemia were significantly associated with vitamin A deficiency. Being a male child, illiteracy of father and presence of anaemia in children were predictors of xerophthalmia in this study. **Conclusion:** The finding of a high prevalence of vitamin A deficiency in older children in present study is of concern and need adequate intervention strategies to address this issue.

INTRODUCTION

Vitamin A deficiency is the leading cause of preventable childhood blindness and increases the risk of death from common childhood illnesses such as diarrhoea. The World Health Organization has classified vitamin A deficiency as a public health problem affecting about one third of children aged 6 to 59 months in 2013, with the highest rates in sub-Saharan Africa (48 per cent) and South Asia (44 per cent).[1]

Xerophthalmia is the clinical spectrum of ocular manifestations of vitamin A deficiency; these range from the milder stages of night blindness and Bitots spot to the potentially blinding stages of corneal xerosis, ulceration and necrosis i.e. keratomalacia.[2]

Vitamin A deficiency (VAD) is the leading cause of preventable childhood blindness among the children residing in lower and middle income countries, and contributes significantly to childhood morbidity and mortality from infectious diseases.[3]

In India, vitamin A deficiency continues to be a major public health nutritional problem. India was the first country to start using large-dose vitamin A supplementation under The National Prophylaxis Programme against Nutritional Blindness in 1970. Under this program, which is sponsored by the Ministry of Health and Family Welfare, Government of India, children between 9 months to 60 months are given six-monthly doses of vitamin A as recommended by the World Health Organization (WHO). Although the supplementation program was started as a short-term measure to prevent blindness in children, it has been going on for more than four decades, and its continuation has become a subject of national debate.[4,5]

The prevalence of VAD exists as a public health nutrition problem that has been consistently observed to rise with age, from the second year of life throughout the pre-school years.[6] 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.[7] As seen, VAD is a major contributor to the mortality of children under 5 years of age, and improving the vitamin A status of deficient children through supplementation enhances their resistance to disease

and can reduce mortality from all causes by approximately 23%.[8,9]

Most of the studies related to VAD are among under five children. Very few studied on VAD have included children from higher age group. Therefore, the present study was undertaken to estimate the prevalence of vitamin A deficiency and their predictors among children of 6-12 years age group of rural area of Bihar.

MATERIALS AND METHODS

This community based cross sectional study was a part of Iodine Deficiency Disorder (IDD) survey conducted among children of 6-12 years age group in Gopalganj, East Champaran and West Champaran districts of Bihar which is situated in Eastern part of India.[10]

Sample Size: The sample size studied in IDD survey was 1263. The study sample had sufficient power to estimate the prevalence of vitamin A deficiency at 95% confidence level, 5% absolute precision and a design effect of 2 with expected prevalence of VAD as 3% based on a previous study.[11]

Sampling Technique: Cluster sampling was adopted for selection of village as a cluster. In selected districts, block wise village list was collected for preparing a sampling frame. Three blocks were randomly selected from each district and from each block 10 villages were randomly selected assuming village as cluster. From each selected village, 14 household were selected randomly and from each household one child of 6–12 years age group was selected. If in a house a child of desired age group was not present the neighbouring house was selected for the study. A pretested semi-structured questionnaire was used for data collection.

The questionnaire dealt with information regarding the age, sex, residential address, class in which the participant is studying, education, occupation and income of their parents along with their family size. All the children were examined by qualified MBBS doctors in day light for vitamin A deficiency. The WHO classification of xerophthalmia was adopted in the study. 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.[12] The clinical diagnosis of vitamin A deficiency done by one person was reconfirmed by another person. Anemia was assessed by examination of lower palpebral conjunctiva and palm in day light. Socio economic status was assessed by using modified B.G. Prasad classification.[13]

Statistical Analysis: It was performed by statistical software SPSS version 22. Association between VAD and different socio-demographic variables was assessed by using chi-square test. The strength of association between variables was measured by calculating the odds ratio (OR) from multivariable logistic regression models. In all cases the level of rejection of a null hypothesis was 0.05.

Ethical issue: The study was approved by Institute ethical committee of Patna Medical College, Patna. Written consent was obtained from head of the household after informing them about purpose of the study. Children suffering from xerophthalmia were given 200,000 IU of Vitamin A orally daily for two days.

RESULTS

A total of 1263 children were included in the present study in which 26.1% children were from 6-7 years age group, 30.1% children from 8-9 years age group and 43.8% children were from 10-12 years age group. There was a slight preponderance of male children (53%) in the study sample. Most of study population belonged to lower socio-economic status (55%). Most of the children (44.1%) were living in kutchha houses. Sanitary latrines were present in only 65% houses. Father's literacy was 53% while mother's literacy was just 28%. Anemia was present in 8.8% children. Signs of vitamin A deficiency was present in 108 children (8.5%). In which conjunctival xerosis was present in 6.7% children, Bitot's spot was present in 1.1% children while corneal xerosis was present in 0.7% children. [Table 1, Figure 1]

Vitamin A deficiency (VAD) were present in significantly higher proportion ($p<0.05$) in boys (10.2%) in comparison to girls (6.6%). VAD was significantly higher among children of illiterate father and mother. The prevalence of VAD was 3.2% among upper socio economic class, 8.3% among middle socio economic class and 9.7% among lower socio economic class but the association was not significant. The children who were living in kutchha houses had more VAD problem (10.8%) in comparison to children living in pucca (5.2%) and mixed houses (7.7%) with p value 0.022. The cases of VAD were more among anaemic children (35.1%) than nonanaemic children (6%) and the association was significant ($p<0.001$). [Table 2]

In multinomial logistic regression analysis, vitamin A deficiency was significantly associated with male sex ($P < 0.01$; odds ratio = 1.73; 95% confidence interval, 1.11-2.70), father's illiteracy ($P = 0.01$; odds ratio = 1.99; 95% confidence interval, 1.17-3.38) and anaemia ($P < 0.001$; odds ratio = 0.107; 95% confidence interval, 0.06-0.17). [Table 3]

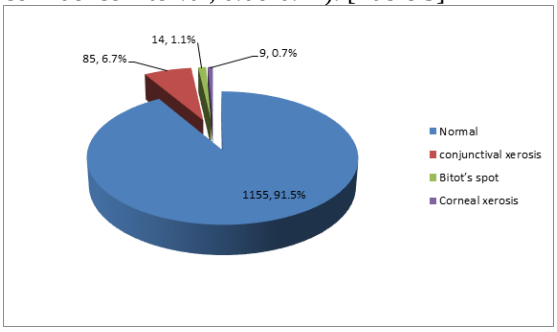

Figure 1: Prevalence of Vitamin A deficiency among study subjects (N=1263)

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Table 1: Distribution of study participants according to their demographic profile and Xerophthalmic status (N=1263)

Variables		Frequency	Percentage
Age group (in years)	6-7	330	26.1
	8-9	380	30.1
	10-12	553	43.8
Gender	Male	674	53.4
	Female	589	46.6
Socio economic status	Upper	124	9.8
	Middle	446	35.3
	Lower	693	54.9
Birth order	2 or less	721	57.1
	3 or more	542	42.9
Housing type	kutchha	557	44.1
	Pucca	267	21.1
	Mixed	439	34.8
Sanitary latrine	Absent	437	34.6
	Present	826	65.4
Anemia	Present	111	8.8
Literacy of fathers		674	53.4
Literacy of mothers		356	28.2

Table 2: Association of VAD with different factors using chi-square test

Variables		Normal	VAD	Chi square	p-value
Gender	Male	605(89.8)	69(10.2)	5.26	0.022
	Female	550(93.4)	39(6.6)		
Age group	6-7 years	302(91.5)	28(8.5)	1.11	0.574
	8-9 years	343(90.3)	37(9.7)		
	10-12 years	510(92.2)	43(7.8)		
Literacy of fathers	Illiterate	518(87.9)	71(12.1)	17.32	<0.001
	literate	637(94.5)	37(5.5)		
Literacy of mothers	Illiterate	820(90.4)	87(9.6)	4.45	0.035
	literate	335(94.1)	21(5.9)		
Birth order	2 or Less	668(92.6)	53(7.4)	3.09	0.079
	3 or More	487(89.9)	55(10.1)		
Socioeconomic Status	Upper	120(96.8)	4(3.2)	5.64	0.060
	Middle	409(91.7)	37(8.3)		
	Lower	626(90.3)	67(9.7)		
House type	Kutcha	497(89.2)	60(10.8)	7.61	0.022
	Pucca	253(94.8)	14(5.2)		
	Mixed	405(92.3)	34(7.7)		
Anemia	Absent	1083(94.0)	69(6.0)	110.0	<0.001
	Present	72(64.9)	39(35.1)		

(The figures in parenthesis denotes percentage)

Table 3: Logistic regression analysis showing predictors of Vitamin A deficiency

Factors	B	Significance	Odd's ratio	95% C.I.
Male	0.551	0.015	1.73	1.114 – 2.702
Female	Reference			
Father illiterate	.688	0.011	1.99	1.169 – 3.387
Father literate	Reference			
Mother illiterate	-0.231	0.468	0.79	0.425– 1.481
Mother literate	Reference			
Anemia absent	-2.232	<0.001	0.10	0.065 – 0.176
Anemia present	Reference			
Katcha house	0.034	0.893	1.03	0.629-1.703
Pucca house	-0.149	0.662	0.86	0.441-1.683
Mixed house	Reference			

DISCUSSION

Vitamin A deficiency (VAD) among the rural children in India is continues to be a major nutritional problem of public health significance, even after the implementation of national vitamin A prophylaxis programme for more than four decades. Most of the studies focus problem of Vitamin A deficiency among under five children. This study provides the prevalence of Vitamin A deficiency among older children. Despite inadequate coverage and poor implementation of the programme, blindness due to VAD in children has almost disappeared, though subclinical VAD is still widely prevalent.[14] Bihar is a state belongs to Empowered Action Group (EAG) with poor health indicators and lack of proper health facilities in rural areas. There is a wide disparity in health infrastructure between rural and urban areas. Although most of the studies had done on status of Vitamin A deficiency among preschool aged children the present study was carried out in children of 6-12 years age group of rural population of Bihar.

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The present study shows 8.5% prevalence of vitamin A deficiency among children. Conjunctival xerosis was present in 6.7% children, Bitot's spot was present in 1.1% children while corneal xerosis was present in 0.7% children. Almost similar findings with prevalence of 10.6% was found by Chaturvedi et al in rural area of Delhi.[15] Sachdeva et al. reported the prevalence of VAD (9.1%) among school children in Aligarh.[16] A study by Sinha et al in central India reported a prevalence of 6.5% while Khandait et al, reported a prevalence rate of 8.7% in children living in low-income regions in Nagpur.[17,18]

The higher prevalence of VAD observed in children of 6-12 years age group may be either due to poor dietary intake and/or non-coverage of vitamin A supplementation among above 2 years old children. As the main focus of health workers under routine immunization is to target children for their full and complete immunization, the older children after their booster dose of 18-24 months loses focus for their vitamin A supplementation.

The association between prevalence of VAD and different socio-demographic factors revealed that prevalence was significantly higher among boys, illiterate parents, children living in kutcha houses. Poverty and ignorance, in close association with low literacy of parents, are the important underlying factors for the extensive prevalence of VAD in India.[14] A higher prevalence of xerophthalmia was observed in boys, lower socioeconomic status and children with family size of five and above by Agrawal et al from Uttar Pradesh.[19] Arlappa et al reported that prevalence of VAD was significantly higher among the rural children of socio-economically marginalized sections of the communities such as Scheduled Caste (SC) & Scheduled Tribe (ST), labourers, illiterate mothers and those residing in the kutcha houses and households where the facility of sanitary latrine was absent.[20]

The cases of VAD were more among anaemic children (35.1%) than nonanaemic children (6%) and the association was significant ($p<0.001$). This may be because anemia is associated with inappropriate consumption of vitamin, micro and macronutrients along with various infections which further precipitate or aggravate vitamin A deficiency. The National Nutrition Strategy evolved by NITI(National Institution for Transforming India) Aayog gives attention to strengthening of the programme for control of VAD through vitamin A supplementation as per the MoHFW guidelines, which encourage young child feeding practices and improving dietary intake of vitamin A.[21,22]

CONCLUSION

The finding of a high prevalence of vitamin A deficiency in older children in present study is of concern and warrants further investigation. Despite the fact that several national nutrition programmes are in operation, especially for the benefit of children, the prevalence of vitamin A deficiency continues to be problem of public health concern. There is a need for the sensitization of community through health education and appropriate Behavioural Change Communication (BCC) activities.

Limitation of study: Serum retinol would be a better parameter to assess vitamin A deficiency but we were unable to measure it due to financial limitation. Since it was a cross sectional study we are unable to establish a temporal association.

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