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Research Article

Intake of vitamin A & its association with nutrition status of pre-school children

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ABSTRACT

Background: Vitamin A is an essential micronutrient for the immune system. Its deficiency is one of the most important causes of preventable childhood blindness and is a major contributor to morbidity and mortality from infections. Studies have linked vitamin A deficiency to a greater risk of malnutrition. Therefore the present study was planned to assess the intake of Vitamin A in pre- school children and to find out its association with nutritional status of Pre- School children.
Methods: A cross-sectional study was conducted in urban and rural Lucknow, Uttar Pradesh, India. Children (n=400) of 12-59 months were randomly selected and mothers were interviewed after taking informed consent on pretested predesigned questionnaire on socio-demographic and Dietary intake. Anthropometry was performed using standard procedures.
Results: The mean age of children was 31.9 months and mean intake of Vitamin A was 344.8 µg. Underweight, stunting and wasting was seen in 43.7%, 51.3 % and 21.8% of children respectively. Stunting was associated significantly with mean Vitamin A intake ($p<0.005$). 54% children had been administered Vitamin A in past six months. Signs of Vitamin A deficiency were seen in only 6.2 % children. On Multivariate analysis Height / Age Z score was significantly associated with Vitamin A intake (OR-2.8, 2.5-14.0).
Conclusions: The prevalence of malnutrition for pre-school children is worrying. There is low intake of Vitamin A. There is need to find innovative and effective ways of reaching the community for educating them on balanced diet particularly rich in vitamin A.

Keywords: Vitamin A, Stunting, Nutrition status, Pre- school

INTRODUCTION

Growth retardation is highly prevalent in developing countries. Inadequate dietary intakes and frequent infections are well-known causes of growth retardation. However, the role of specific micronutrient deficiencies in the etiology of growth retardation has gained attention more recently. Micronutrient deficiencies are highly prevalent in low-income countries, and the most probable causes are low content in the diet and poor bioavailability. More than half of preschool children are anemic, and an estimated 75 million and 140 million preschool children have clinical and subclinical vitamin A deficiencies (VAD), respectively.[1]

Vitamin A is an essential micronutrient for the immune system. Its deficiency is one of the most important causes of preventable childhood blindness and is a major contributor to morbidity and mortality from infections. The primary cause of VAD is lack of an adequate intake of vitamin A, and may be exacerbated by high rates of infection, especially diarrhoea and measles.[2]

Preschool-age children along with pregnant women are considered to be populations most at-risk for VAD due to their increased demands for vitamin A and the potential health consequences associated with VAD during these life stages. Approximately one third of the world's preschool-age population is estimated to be vitamin A deficient. The WHO regions of Africa and South-East Asia have the highest burden of VAD, where 44–50% of preschool-age children are affected.[3]

India has the highest prevalence of clinical and subclinical VAD among South Asian countries; 62% of preschool children were reported to be deficient in vitamin A.[4] In developing countries not only VAD is common but there are also high rates of malnutrition.

Surveys indicate that the intake of Vitamin A is, on an average, about half the recommended dietary intake.[5] Studies have linked vitamin A deficiency to a greater risk of malnutrition.[6] Therefore the present study was planned to assess the intake of Vitamin A in pre- school children and to find out its association with nutritional status of Pre- School children.

METHODS

Study area:

A cross-sectional house to house study was conducted in district Lucknow in one rural block (Malhiabad) and one urban sector (Chowk) which was chosen randomly.

Sample size and survey: Sample size was calculated based on the formula 4PQ/L2, where P is the prevalence (50%), Q is 100-P (50) and L is the permissible error i.e. 10% of P, sample size comes out to be ~400.[7]

Requisite sample size was reached in two stages: first stage, number of household to be taken for the survey was decided according to population proportion to size (PPS). In second stage, simple random technique was used to select the first household for the survey. A household wise complete list of eligible sampling unit i.e. children of 12-59 months of age, was prepared separately for all villages and Mohall's. Serial number were allotted by sequence to household in each of the list, starting from randomly selected household and desired number of household were selected with the help of random number table. In case of non-availability of the child in selected household due to any reason, next household was selected for the survey in order to attain the adequate sample size.

Prior to the administration of predesigned pretested oral questionnaire, each respondent was explained the purpose of the study and verbal informed consent was obtained. Mother of child was preferred as primary respondent. In the absence of mother, father was taken as respondent. The confidentiality of the information was assured. Interview was started with general discussion to gain confidence and it slowly extended to specific points. During interview, we used questionnaire with direct questions. Questions included information on demographic and socio-economic variables and dietary intake.

Dietary intake in children: Data regarding dietary intake was obtained by the twenty four hour recall method. Mothers who were still breast-feeding were asked to report the number of times they breast-fed their child in the previous 24 h. The raw amounts of food used for cooking for the family, the total volume of food cooked for the family, and the volume of food consumed by the indexed child was enquired by demonstrating standardized utensils. Details of locally used recipes were also obtained. Raw equivalents of cooked food consumed by the child were calculated from the above procedure. The Vitamin A intake was calculated by using a database derived from Indian food composition tables.[8]

Mother were enquired of a child having problems functioning in the evening or having the child verbally tell the mother he or she cannot see in evening[9] Anthropometry was performed by standard technique.[10]

Anthropometric data was entered in WHO Anthro (version 2, 2005) and macros, and Z scores of Weight, Height/length and weight for height were computed. Height for age Z scores <-6.0 and >+6.0, weight for age Z scores <-6.0 and >+5.0 and weight for height Z scores <-5.0 and >+5.0 were not included in study.[11] The data was also analyzed for digit preference in cases of age estimation, weight and length/height.

Children were graded as stunted (height for age Z score <-2), wasted (the weight for height Z score of <-2), similarly a weight for age Z score of <-2 as underweight.

Data was entered by two different persons separately on Microsoft Access and cross matched to detect any discrepancy in data entry before the data was analyzed using SPSS software version 17.01 for Windows XP.

RESULTS

Four hundred children of age group 12-59 months were studied. Majority of children were Muslim (84.5%) belonging to Social Class V (61.6%) and head of the family were literate (63.0%). The mean age of children was 31.9 months and mean intake of Vitamin A was 344.8 µg. Underweight, stunting and wasting was seen in 43.7%, 51.3 % and 21.8% of children respectively. Stunting was associated significantly with mean Vitamin A intake ($p<0.005$) (Tables 1, 2). 54% children had been administered Vitamin A in past six months.

Table 1: Socio- demographic and anthropometric profile of the study population and its association with dietary vitamin A intake.

Socio-Demographic Factors	Categories	N (%)	Mean Vit A Intake	S.D.	Statistical Test Results
Residence	Urban	210(52.5)	346.7	85.6	>0.005
	Rural	190(47.5)	342.7	74.9	
Religion	Hinduism	134(33.5)	342.6	72.5	>0.005
	Islam	266(66.5)	345.9	84.5	
Type of Family	Nuclear	240(60.0)	343.2	83.9	>0.005
	Joint	160(40.0)	346.4	75.8	
Literacy status of Head of the family	Illiterate	148(37.0)	336.8	74.1	>0.005
	Literate	252(63.0)	349.5	84.1	
Social Class	II	8(2.0)	381.2	94.1	>0.005
	III	55(13.7)	328.7	61.7	
	IV	91(22.7)	339.9	81.5	
	V	246(61.6)	349.0	83.3	
Child Age (months)	12-23	118(29.5)	358.0	99.6	>0.005
	24-35	119(29.5)	349.7	72.7	
	36-47	102(25.5)	339.4	91.4	
	48-59	61(15.2)	339.1	62.9	
Sex	Female	201(50.2)	342.1	80.9	>0.005
	Male	199(49.8)	347.6	80.5	
Underweight	No	225(56.3)	346.2	88.6	>0.005
	Yes	175(43.7)	343.1	69.3	
Wasting	No	313(78.2)	345.1	81.5	>0.005
	Yes	87(21.8)	343.9	78.0	
Stunting	No	195(48.7)	356.1	88.9	0.006
	Yes	205(51.3)	334.1	70.5	

Table 2: Mean values of certain variables.

Variables	Mean	S.D
Child Age In Months	31.9	13.2
Vitamin A Intake	344.8	80.6
Z score of W/H	-0.89	1.3
Z score H/A	-1.77	1.3
Z score W/A	-1.60	1.1

Table 3: Pattern of vitamin A deficiency.

	Female (199)		Male (201)		Total (400)	
	No.	%	No.	%	No.	%
Vitamin A Deficiency	**11**	5.5	**14**	6.9	**25**	6.2
Night Blindness	1	0.5	4	1.9	5	1.3
Bitot's Spot	4	2.0	5	2.5	9	2.2
Conjunctival Xerosis	6	3.0	5	2.5	11	2.7

Table 4: Factors associated with vitamin A intake on multivariate analysis.

Characteristics	OR	Sig.	95.0% Confidence Interval	
			Lower Bound	Upper Bound
Village/Mohalla	.784	.433	-11.046	25.707
Religion	.624	.533	-13.317	25.707
Social Class	1.063	.288	-4.630	15.538
Education of Head of the Family	2.356	.019	3.489	38.679
Childs age group	1.249	.212	-2.035	9.131
Child sex	.491	.624	-11.941	19.880
Weight/Height Z score	.25	.797	-6.815	5.237
Weight/Age Z score	1.6	.109	-1.23	12.27
Height/Age Z score	2.8	0.005	2.528	14.076

Signs of Vitamin A deficiency were seen in only 6.2 % children. Most common form of VAD was conjunctival xerosis (Table 3).

On Multivariate analysis no socio-demographic factor was statistically associated with Vitamin A Intake. Height / Age Z score was significantly associated with Vitamin A intake (OR-2.8, 2.5-14.0) (Table 4).

DISCUSSION

Overall, dietary vitamin A intakes was low in this study population. Mean intake was only 344.8 as compared to the required RDA of 400. The intake of Vitamin A is dependent on the availability of diet rich in Vitamin A. the usual source being green leafy vegetables and seasonal fruits like papaya and mango. In a population which is sub economical, dairy source of Vitamin A is usually a rare entity. Breast milk is the only available source which also is available only to young children and is not available after two and a half years of age. In our study also it was seen that Vit A intake decreased with age (although not significant). The relatively higher intake of Vit A in early life is due to breast feeding. Similarly, the survey done by National Nutrition Bureau (NNB) revealed the diets of rural pre-school children were grossly deficit in terms of vitamin A, where the median intakes were deficit by 66-81% as against the RDA of 400 µg. The median vitamin A intakes of 84% of pre-school children were not even 50% of their RDA.[12] A study in South India also revealed that the mean Intake of Vit A in preschool children is inadequate.[13]

In our study, 54 % children had reported to be supplemented with Vitamin A mega dose in past six months, whereas, DLHS-3 survey projects only 44% coverage in Vitamin A supplementation for Lucknow.[14] This somehow explains the low prevalence of VAD in the studied population Inspite of diet being relatively poor in Vitamin A.

Although NNB survey has shown that Vitamin A intake is associated with place of residence, religion, socio economic status and even gender, our study did not showed any significant relationship with any of these socio-demographic characteristics.[12]

The pre-school children in the studied population had alarmingly high prevalence of underweight, wasting and stunting. Although Vitamin A intake was less in underweight and wasted children, only stunted children had significantly low intake of Vitamin A. Reduced Vitamin A intake is associated with growth retardation as it reduces serum secretion of IGF-1 which is responsible for secretion of nocturnal growth hormone.[15]

Some of the limitations of these findings are methodological issues related to the estimates of intake. Recall bias may have affected the estimates because mothers were asked to use the 24 hour recall period. The other issue is of estimation of portion size, which is sometimes difficult to ascertain in young children. Since this being a cross sectional study a comment on causal inference cannot be ascertained.

CONCLUSION

The prevalence of malnutrition for pre-school children is worrying. There is low intake of Vitamin A. Vitamin A supplementation is only 54% in the six months preceding the survey is also of great concern, given that it is freely available for all children. There is need to find innovative and effective ways of reaching the community for inculcating in them the importance of diet diversity. Balancing the cultural constraints is also important as diet of children varies culturally. Breastfeeding which sometimes may be the only non-vegetarian source of Vitamin A should be promoted and should be continued till the mother can sustain.

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