SHORT COMMUNICATION

Prevalence of Clinical and Sub-Clinical Vitamin A Deficiency Among Rural Preschool Children of West Bengal, India

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A community based cross-sectional study was carried out in rural areas of West Bengal with the aim to assess the prevalence of vitamin A deficiency (VAD) among rural preschool children. Clinical examination was carried out on 9,228 children for the signs and symptoms of VAD and a sub-sample of 590 children were covered for the estimation of blood vitamin A levels using dried blood spot (DBS) method. The prevalence of Bitot's spots was 0.6% (95% CI=0.44, 0.76), which is more than the public health significance, and it increased with increase in age. The prevalence was significantly higher (P<0.001) among boys (0.8%) as compared to girls (0.4%). The proportion of children with subclinical vitamin A deficiency (blood vitamin A < 20µg/dL) was 61% (95% CI: 52.3-65.1), and it was significantly (P<0.01) higher among the children of lower socioeconomic communities.

Key words: *Bitot's spots, India, Preschool children, Vitamin A deficiency.*

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Vitamin A deficiency (VAD) is the most important cause of preventable blindness in young children [1] and is closely associated with increased frequency of respiratory infections, diarrhea, measles and childhood mortality [2,3]. Not many studies are available on prevalence of VAD among the rural preschool children in India. Such studies would be useful to initiate nutrition intervention programs in deficient areas. Keeping in view of the magnitude of the problem, the National Nutrition Monitoring Bureau (NNMB) carried out this survey. The objective was to assess the prevalence of VAD among the rural preschool children of West Bengal.

METHODS

A population based cross-sectional study was carried out adopting the multi-stage stratified random sampling procedure. The district or part of the district with a population of 1.8 million was considered as one stratum. A total of 16 strata were selected randomly from the State, and a sub-sample of 80 villages at 5 villages per stratum was selected randomly from 16 strata.

Assuming the prevalence of Bitot's spots as 1% [4], confidence interval (CI) of 95% and relative precision of 20%; a sample size of 9,508 was arrived for the clinical VAD at the State level. Similarly, by assuming the prevalence of subclinical VAD as 50% [5], confidence interval (CI) of 95% and relative precision of 10%, the sample size arrived at was 400 preschool children. The village was divided into five geographical areas based on natural groups of houses or streets. The required number of children to be covered in a village and in each geographical area was determined on the basis of probability proportional to size (PPS) method.

Clinical examination was carried out on a total of 9228 preschool children to assess the clinical VAD, and a sub-sample of 590 children were covered for the estimation of blood vitamin A from dried blood spot (DBS), using high-pressure liquid chromatography [6]. Ethical clearance was obtained from

National Institute of Nutrition Ethical Review Board. Written informed consent was obtained from the parents.

The data were analyzed using Statistical Package for Social Sciences; version 15.0 for windows [7]. Bivariate analysis was performed by the chi-square test to study the association between the prevalence of VAD and socio-demographic variables. Step-wise logistic regression was performed to identify the best set of socio-demographic variables associated with the prevalence of VAD.

RESULTS

Distribution of prevalence of VAD among pre-school children by age group and gender is presented in ***Table* I.** The results show that the overall prevalence of Bitot's spot, in pre-school children was 0.6% (95% CI 0.44-0.76), and the prevalence was significantly ($P<0.001$) higher among the children of 3-5 year age group (compared to the children of 1-3 year age group) and among boys (as compared to girls). The median blood vitamin A was 16.6 µg/dL (95% CI 3.9-62.6) **(*Table* II)**.

The prevalence of VAD was significantly ($P<0.01$) higher among the children of scheduled tribes and scheduled castes compared to children of other communities. Family size, occupation, literacy level did not have any bearing on the prevalence of VAD. Stepwise logistic regression analysis revealed that the age group and community are positively associated with the prevalence of Bitot's spots, where the preschool children belonging to scheduled tribe (OR =4.5; 95% CI: 2.1-10.5) and children of 3-5 years (OR =1.4; 95% CI: 1.0-2.0) were at higher risk for VAD.

TABLE I PREVALENCE (%) OF VITAMIN A DEFICIENCY (VAD) BY AGE GROUP AND GENDER

	N	NB	Conjunctival xerosis*	Bitot's spots*	VAD†*
Age group					
1-2+	3932	0.1	0.8	0.1	0.9
3-4+	5296	0.2	5.8	1.0	6.0
Pooled	9228	0.2	3.7	0.6	3.8
Boys	4492	0.2	4.6	0.8	4.8
Girls	4736	0.1	2.8	0.4	2.9

**P<0.001 both for age group and gender; †total vitamin A deficiency; NB: night blindness.*

DISCUSSION

Prevalence of VAD is a public health concern among the children residing in rural areas of West Bengal. Although the prevalence of clinical VAD was below the figures reported for rural preschool children of India (0.8%) [8] and Maharashtra (1.3%) [9], the subclinical vitamin A deficiency which is considered as prolonged dietary deficit of vitamin A was high (61%) compared to the prevalence among the children of Maharashtra (55%) and that reported from Nigeria (29.5%) [9,10].The major contributing factors for high prevalence of VAD are poor dietary intake of vitamin A and an increasing reliance on basic staples. About 81% of pre-school children of West Bengal were not consuming even 50% of the RDA of vitamin A [11].

The coverage of preschool children for biannual massive dose vitamin A was only 4% as against the 23%(5) and 30% [12] at the National level. Hence,

TABLE II BLOOD VITAMIN A LEVELS (µg/dL) BY AGE GROUP AND GENDER

	n	Mean ± SD	Median	Range	< 20µg/dL (%)	95% CI
Age group						
Age 1-2 + (y)	233	19.1 ± 10.05	18.1	3.9-62.6	55.4	49.0-61.8
Age 3-4 + (y)	357	18.3 ± 8.92	16.3	4.4-60.0	65.0	60.1-69.9
Pooled	590	18.6 ± 9.39	16.6	3.9-62.6	61.2	52.3-65.1
Boys	282	18.7 ± 9.42	16.7	4.4-62.6	60.3	54.6-66.0
Girls	308	18.6 ± 9.37	16.6	3.9-60.0	62.0	56.6-67.4

WHAT THIS STUDY ADDS?

- VAD is major public health problem among rural preschool children of West Bengal, and the prevalence is significantly higher in the 3-5 years age group.

there is a need to strengthen the existing massive dose vitamin A program to minimize the prevalence of VAD. It is also necessary to encourage the community to consume variety of foods rich in vitamin A and other micronutrients through dietary diversification and horticulture intervention to ensure nutrition security, through Health and Nutrition Education (HNE) and appropriate Information, Education and Communication (IEC) activities.

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