

High prevalence of vitamin A deficiency among children in Meghalaya and the underlying social factors

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Received – 05 January 2015

Initial Review – 07 March 2015

Published Online – 25 March 2015

Abstract

Objective: The objective was to estimate the prevalence of clinical vitamin A deficiency (VAD) in children 0-15 years, to determine the knowledge of nutrition and dietary practices, and to assess the social factors that are associated with vitamin A status in these children. **Design:** A cross-sectional study using household interviews with mothers of children 0-15 years and clinical examination of children for clinical VAD was conducted. A case-control study design was adopted to ascertain the knowledge and consumption of vitamin A rich foods and the associated social factors. **Setting:** Rural communities of Khasi tribal people in Pynursla Block, East Khasi Hills, Meghalaya. **Results:** The prevalence of clinical VAD in children 0-15 years was 4.5% (95% confidence interval [CI] 3.32-5.98). The prevalence in school age (5-15 years) children was 5.9% (95% CI 4.12-7.68), higher than among pre-school children of 2.49% (95% CI 1.16-3.84). The community has a term for night blindness, Matiar, for which treatment is the intake of beef liver either in raw, boiled or roasted form. The control group had better knowledge of vitamin A rich food than the cases and they consumed 28% more vitamin A rich food than the cases while intake of wild edibles was higher in case group by 9%. Maternal education and family size were found to be significantly associated with vitamin A status of children. **Conclusion:** VAD is a public health problem among children 0-15 years in Pynursla Block of East Khasi Hills District, Meghalaya. In order to effectively address this problem, it is essential to enhance the knowledge of nutrition and appropriate diets and to encourage the consumption of traditional foods especially locally available vitamin A rich foods.

Key words: *Vitamin A deficiency, Vitamin A deficiency in children, Vitamin A deficiency in Meghalaya, Vitamin A deficiency and social factors*

India has the largest number (35.3 million) of vitamin A deficient children in the world [1]. The prevalence of vitamin A deficiency (VAD) [2] among preschool children in the country varies widely between states and regions. It ranges from 0% in Kerala and 0.6% in West Bengal [3], to 1.3% in Maharashtra and 1.4% in Madhya Pradesh [2,4,5]. A high prevalence of xerophthalmia of 9.1% among preschool children has been reported from Aligarh district, UP [6]. The national average for the prevalence of Bitot spots among preschool children is 0.8% [2].

Though preschool children have been identified as a vulnerable group for VAD, older children may also have a high prevalence of VAD. In Tamil Nadu, Sampathkumar and Abel [7], found that the prevalence of VAD among children 9 years and above was higher than among preschool children. Similarly, in a study in Bareilly, the prevalence of xerophthalmia for school children (3-12 years) was 6.37%, but was highest for children in the age group 11-12 years at 7.26% [8].

To our knowledge, there are no studies reported so far from the state of Meghalaya on the prevalence of VAD in children. We undertook this study as there were several indicators pointing to the possible high prevalence of VAD in this state. First, there were several cases of VAD identified during the health camps and community camps conducted by the institution. Second, in Meghalaya, the coverage of vitamin A supplementation is low; only 38.5% of children aged 9 months and above received at least one dose of vitamin A supplement [9] and the average intake of vitamin A is only 296 µg RE per day [10], below the required intake of 400 µg RE per day [11]. Third, among children under 3 years of age, 42% are stunted, and 46% are underweight, indicating a high risk for VAD [12].

This study aimed to estimate the prevalence of VAD in children 0-15 years in the rural areas of East Khasi Hills District, Meghalaya, to assess the knowledge of nutrition and dietary practices and to determine the social factors that influence vitamin A status in children.

METHODS

The study was conducted in Pynursla Block of East Khasi Hills District, Meghalaya. This block was purposively selected as several cases of children with VAD were identified during the health camps conducted in three villages of the block by our university. Second, rural communities in this area still consume wild edibles foraged from the forest and the researchers wanted to analyze the relation between consumption of traditional diets and occurrence of VAD among children. Third, the characteristics of Pynursla Block, in terms of socio-economic indicators, agriculture and occupational patterns are typical of Meghalaya.

The study was performed in two phases:

Phase 1: Survey

Pynursla Block has 128 villages from which 8 villages were randomly selected: Mawpran, Nongsder, Pomshutia, Pomlum Wahrew, Mawbeh, Saitwait, Nongshyrngan and Riwai.

A sample size of 819 was arrived at as follows: taking the prevalence of xerophthalmia among children 0-15 as 9% [3,9,12], a confidence interval (CI) of 95%, and relative precision of 20%.

Interviews were conducted in all households having a child or children under 15 years of age. The presence of night blindness was ascertained by an interview with the mother and eye examination of children was conducted by an optometrist. The interviews with mothers were also used to assess the knowledge and consumption of vitamin A rich foods using a food frequency questionnaire. Data were analyzed using Ms Excel 2007 and Statistical Package for Social Sciences; version 17.0 for windows.

Phase 2: Case-control study

To ascertain the knowledge, consumption pattern of vitamin A rich food and social factors that affect the vitamin A status of

children, 42 mothers who presently have children with clinical VAD formed the cases. A matched control by age and sex was selected by taking a household without a child with history or clinical VAD in the same village nearest to the household with a child or children with clinical VAD was selected as a control. In total, there were forty households that formed the control group.

Ethical Issues

Approval for the study was obtained from the University Research Ethics Committee. Informed consent was taken from the community leaders and mothers. When any child with VAD was identified, an age-appropriate dose of vitamin A was given, and the child was referred to the nearest health center for follow-up.

RESULTS

Prevalence of VAD

In eight study villages, 1201 children under 15 years of age were screened: 636 males and 565 females. Prevalence of clinical VAD in children by age and gender is given in Table 1.

The prevalence of clinical VAD for children under 5 years was 2.49% (95% CI, 1.16-3.84). 12 children had night blindness; one child had both Bitot spots, and night blindness. The prevalence of VAD among children 5-15 years was 5.9% (95% CI 4.12-7.68) with 37 children having night blindness and three had Bitot spots. Severe forms of VAD such as corneal xerosis, corneal ulcers or keratomalacia were not seen in the children under 5 years or in children 5-15 years of age. In this age group, there was a gender difference in the prevalence of VAD with more males being affected than females ($0.10 > p > 0.05$). Overall prevalence rate of VAD in children under 15 years was 4.5% (95% CI, 3.32-5.98). However, the difference in the prevalence of VAD between males and females among all children 0-15 years was not statistically significant ($p > 0.5$).

Table 1: Distribution of clinical VAD by age and gender

Age group (in years)	Sex	Number of children examined	Number of children with VAD			Prevalence (%)
			Night blindness (%)	Bitot spots (%)	Total	
0-5	Male	265	5 (1.89)	0	5	1.89
	Female	258	7 (2.71)	1 (0.38)	8	3.10
	Total	523	12 (2.29)	1 (0.19)	13	2.49
5-15	Male	370	24 (6.48)	3 (0.81)	27	7.30
	Female	308	13 (4.22)	0	13	4.22
	Total	678	37 (5.45)	3 (0.44)	40	5.90
0-15	Male	636	29 (4.55)	3 (0.47)	32	5.03
	Female	565	20 (3.53)	1 (0.17)	21	3.89
	Total	1201	49 (4.07)	4 (0.33)	53	4.50

VAD: Vitamin A deficiency

Traditional Knowledge of VAD

Although all mothers were ignorant of the medical term “VAD,” they knew about night blindness as the community has a local term for it, Matiar. This term denotes night blindness and literally means “hen eyes”. Community identifies the onset of this illness by night blindness. In this regard, 87% of mothers knew and understood the local term and its connotation. Therefore, by using the local term, Matiar, mothers were able to identify and easily recall this disease in their children. The people also use a traditional treatment for night blindness, which is consuming beef liver in raw, boiled or roasted form.

Knowledge and Consumption of Vitamin A Rich Foods

In this study, vitamin A rich foods were categorized into market foods and wild edibles (mainly green leafy vegetables). It was found that the control group had better knowledge about these foods than the case group. Mother with poor knowledge about vitamin A rich foods was 2.5 times more likely to have a child deficient in vitamin A and the results were statistically significant (odds ratio [OR]=2.5, 95% CI, 1.04 to 6.36, p=0.04). It was also found that the control group consumes vitamin A rich foods more frequently (approximately 28%) than the cases. Between cases and controls, odds that a household with poor consumption of vitamin A rich food will have vitamin A deficient child is 1.5 times (OR=1.5) greater than in households that take more vitamin A rich foods. In terms of consumption of wild edibles, it was found that consumption was about 9% more frequent in case households than control households. The consumption of wild edibles is however subject to availability and was seasonal in nature.

Factors Associated with VAD

There were two factors that affected the vitamin A status of a child that were found to be statistically significant; maternal education, and family size. Maternal education was found to be an influencing factor; if the mother had no formal school education, she was 9.3 times more likely to have a child deficient with Vitamin A (OR=9.3, CI 2.83 to 30.59, p=0.0002). In terms of family size, households in case and control groups have 1 to 9 children with a mean of 4±2 in case households and 3±2 in control households. It was found that in a household having more than 2 children, odds of that household having child deficient in Vitamin A is 0.28 times higher (OR=0.28, CI 0.106-7.436, p=0.01).

Other social factors that were examined were the occupation of parents and number of earning members in the family. Among the study households, the two main livelihood activities were agriculture and daily wage labor. However, the results were not statistically significant.

DISCUSSION

The prevalence of clinical VAD among five children (2.49%) in this study is higher than the WHO global cut off of 0.5% [12] for VAD to be considered a public health problem in that area. By this yardstick, clinical VAD is a public health problem in Pynursla Block. Prevalence in this area is higher than the prevalence estimates in preschool children in other parts of India such as Kerala, Maharashtra, West Bengal, and Madhya Pradesh [2,3] except for Aligarh in Uttar Pradesh (9.1%). As in some other parts of India [7-8], the prevalence of VAD among children 5-15 years (5.90%) was higher than the prevalence in under-five children (2.49%). However, it was found to be less than the prevalence rates in Bareilly [8] and rural Maharashtra [13].

The traditional home remedy for VAD was consumption of beef liver, which is also consumed in other communities for the same reason such as in Nepal [14] and Niger [15]. Liver meat is a good source of vitamin A as it contains 800 retinol equivalents per 100 g [15]. In study area, liver seems to be a good source of vitamin A, as the other good sources of vitamin A such as oils of shark, cod or halibut or red palm oil are not available in the region. It is interesting to see the appropriateness of this home remedy which constitutes traditional knowledge of communities.

Though formal health care is available, yet in rural areas it cannot be easily accessed by communities due to distances e.g., in Pynursla Block, health centers are located at a distance of 12-40 km. In such a context, consumption of beef liver is not only beneficial, but could be encouraged as the first step for the treatment of night blindness or other forms of VAD. However, raw beef liver should be consumed cautiously as there are risks of contamination with *Campylobacter*, other pathogenic bacteria or tenia, which may cause gastrointestinal diseases [16-18]. As a part of health education, mothers should be taught that it is preferable to consume cooked beef liver [18].

Diet is a key factor in tackling VAD in children and knowledge about one's own traditional food may have an impact on dietary consumption as well as vitamin A status of children [19]. In this study, we found that a child is 2.5 times more likely to have VAD if the mother has poor knowledge of diet and nutrition. Though people still consume wild edibles and many know the nutritional benefit of these foods, this knowledge is being lost. In the Western Ghats of India, the foraging and consumption of wild edibles are increasingly stigmatized as symbols of poverty and “tribalness” (equivalent to “backwardness”) [20]. Such factors contribute to decrease in consumption of traditional foods, which leads to depletion of this valuable knowledge and neglect of traditional foods and their nutritional benefits. Consumption pattern is also affected by the nature of their environment [21]. In the study area, *jhum* cultivation, in which up to 60 varieties of crops can be

planted in the same area [22] is being replaced by broom grass cultivation. This type of cash crop monoculture threatens the survival of traditional food plants.

Maternal education has been identified as a factor that contributes positively not only to vitamin A status but also the general nutritional status of children [23,24], but studies also show that there is not a direct causal relationship [25,26]. While there are other factors that enhance the effect of maternal education on child health; socioeconomic status remains the primary pathway linking maternal education, and child nutritional and vitamin A status apart from other factors such as geographic residence, modern attitudes toward health care, health knowledge, and reproductive behavior [26,27].

This study found that smaller families, with fewer than two children are less likely to have a child deficient in vitamin A. A large family means higher expenditures for food, clothing and shelter, education, health, and other needs [28] and small families consisting of four members have an average income double that of large families of nine members or more [29]. One may conclude that the socio-economic status of family influences the health of children [21], but Appoh and Krekling found that poor economic status does not necessarily result in malnourished children. It rather depends on the ability of caretakers (mostly mothers) to undertake successful practices [30]. Evidently, there is a myriad of social and economic factors that influence child nutrition.

While VAD can be addressed from the medical perspective of diet, nutrition, and vitamin A supplements, this would obviously be a limited approach. The high-level expert group appointed by India's Planning Commission has noted that universal health coverage will only be possible if there is accompanying action on the social determinants of health [31]. Therefore, the sustainable strategy for the prevention of VAD will be through a multi-pronged approach and center of the strategy would be to ensure an adequate diet. This would entail working with communities to enhance the health and nutrition knowledge of mothers, to support beneficial traditional knowledge and practices, and to encourage the consumption of locally available vitamin A rich foods.

The interplay of medical and social factors has been observed in this study. However, our study has following limitations. First, data were collected in one (autumn) season only and seasonal differences in VAD status cannot be ascertained. Second, estimates of intake of wild edibles or vitamin A rich food could be affected by recall bias as mothers were allowed to use past 1-year as the period of recall.

CONCLUSION

VAD is a public health problem among children 0-15 years in Pynrusla Block of East Khasi Hills District, Meghalaya.

In order to effectively address this problem, it is essential to enhance knowledge of nutrition and appropriate diets and to encourage the consumption of traditional foods especially locally available vitamin A rich foods.

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Funding: None; Conflict of Interest: None Stated

How to cite this article: Nongrum MS, Kharkongor GC. High prevalence of vitamin A deficiency among children in Meghalaya and the underlying social factors. *Indian J Child Health*. 2015;2(2):59-63.