### **Original Research Article**

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# Vitamin deficiency prevalence in primary school children in Punjab, India

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#### **ABSTRACT**

**Background:** Vitamin deficiencies are the conditions which are prevalent in the society and parents are unaware of them due to their asymptomatic nature. Overcoming this deficiency is integral in achieving the second Sustainable Development Goal charted out by the United Nations. Treatable and preventable nature of these conditions needs to be emphasized. Aims and objectives of the study were to study the prevalence of clinical features of vitamin deficiencies in primary school children.

**Methods:** This single point cross sectional study was conducted in primary school children in Faridkot and comprised of students in the age group of 5-11 years. A total of 849 students were clinically examined. The clinical features of vitamin deficiencies were recorded. Descriptive analysis was used for interpretation.

**Results:** Overall incidence of vitamin deficiency features was 18.96%. The features of vitamin A, B complex, C, and D deficiency were seen in 7.18%, 18.02%, 3.06% and 8.48% respectively. Some children have more than one deficiency features.

**Conclusions:** The primary school children do suffer from vitamin deficiencies and there should be timely evaluation for these diseases. Larger studies substantiated with blood levels would provide more insight into these conditions.

Keywords: Clinical features, Primary school children, Vitamin deficiency

#### INTRODUCTION

Vitamin deficiencies in developing countries are the "hidden hunger" which strike the core of health and vitality. Vitamin and mineral deficiencies affects over two billion people in 80 developing countries. These deficiencies can affect any and every system of body and contribute not only to high rates of maternal and child deaths but also increase the morbidity like blindness, decreased IQ, lowered immunity, growth impairment and affliction by various diseases. Severe malnutirition is associated with deranged auditory functions, which is also accompanied with vitamin deficiencies. The global burden of these diseases should be an eye-opener for the government to take steps to curb this problem. These

conditions are prevalent in the society and parents are unaware of them due to their asymptomatic nature.

It has been recognized that addressing vitamin and micronutrient deficiencies is integral to achieving the second Sustainable Development Goal (SDGs) charted out by the United Nations.<sup>2</sup> Improving nutrition is not only directly connected with the second SDG of ending hunger, achieving food security and improved nutrition and promote sustainable agriculture by 2030 but has a vital role to play in achieving other SDGs, particularly those related to improvements in primary education, child mortality, maternal health, and the ability to combat disease. The primary school going children are even more prone to get the vitamin deficiency disorders as reported

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by World Health Organization that 66 million primary school-age children attend classes hungry across the developing world.<sup>3</sup> The clinical features of vitamin deficiency in school children are less studied and most of the studies are confined to the preschool age. This study was done to find the pattern of these deficiencies in the primary school going children of Punjab, India.

#### **METHODS**

This school based one point cross sectional descriptive study was done in various government primary schools of district Faridkot, Punjab, India. All the students studying in the school were eligible for enrolment. The students who were absent on three consecutive days of visit were excluded. The students for whom the consent was not given were excluded. The study was conducted on 849 children. This study was approved by the hospital ethical committee and research advisory committee of the institute. Information on the study variables was collected using a pretested, semi-structured questionnaire consisting of socio-demographic details and questions on features of vitamin deficiencies. The age, sex, weight, height, religion, number of siblings, birth order, primary diet, of the children noted. Information regarding education, occupation, monthly income of the family was taken.

The detailed clinical examination of the subject was done. The history of night blindness and presence or absence of corneal xerosis, conjuctival xerosis, bitot spots, corneal opacities corneal ulceration, corneal scarring and dry scaly skin was seen for vitamin A deficiency. For the features of vitamin B1 deficiency, history of photophobia, anxiety, depression, muscle weakness and findings of areflexia, ataxia, squint or edema were noted. The history of burning eyes, soreness of tongue, glossitis, cataract, chelosis, corneal vascularisation and dermatitis were seen for vitamin B2. For the niacin deficiency diarrhoea, dementia, rash aggravated by sunlight, alongwith the features of dermatitis and glossitis was noted. The history of convulsions, vomiting, dizziness, oral ulcers, hyperirritability was asked for Vitamin B6 deficiency. The baby was examined for neuropathy and anemia for Vitamin B12 deficiency. The long bone tenderness, scorbutic rosary, bleeding gums, anemia and history of anorexia, diarrhoea, and painful gums was asked for the vitamin c deficient features. The features of vitamin D examined included craniotabes, widened wrists, pigeon chest, rachitic rosary, harrison sulcus, knock knee, bow legs, double malleoli, fractures and history of long bone tenderness. Dysarthria, steatorrhea, muscle weakness were asked for vitamin E deficiency and features of ophthalmoplegia, ptosis, and areflexia noted. Bleeding tendencies were asked for vitamin K and dementia and anemia for folic acid features. The features of insomnia, burning feet and dermatitis were asked for the panthothenic acid deficiency. For biotin deficiency, we asked about vomiting, anorexia, diarrhoea and dermatitis.

Data was collected by the investigators, compiled, filled in a prevalidated proforma and analyzed using descriptive analysis using Microsoft Excel<sup>TM</sup> and statistical tests.

#### Informed consent

Patient information form and consent form in vernacular language was given to school authorities to get it noted from the parents or guardians. They were collected on the day of study. Confidentiality of the subjects was maintained.

#### **RESULTS**

Out of total 897 students enrolled, 849 students were included in the study.

Table 1: Baseline variables.

Variables		
Age in years		8.37±0.72
Weight in grams		$20.17 \pm 1.98$
Height in cm		$119.62 \pm 10.83$
Sex	Boys	538 (63.4)
	Girls	311 (36.6)
Religion	Sikh	651 (76.7)
	Hindu	195 (23.0)
	Muslim	2 (0.2)
	Others	1 (0.1)
Primary diet	Vegetarian	561 (66.1)
-	Non-vegetarian	288 (33.9)
Educational	Less than 10 <sup>th</sup>	361 (42.5)
qualification	$10^{\text{th}}$ to $< 10+2$	126 (14.8)
of mother	10+2	58 (6.8)
	Graduate	32 (3.8)
	Postgraduate	12 (1.4)
	Illiterate	260 (30.6)
Occupation	Nil	725 (85.4)
of Mother	Daily wages	101 (11.9)
	Private Job	23 (2.7)
Educational	Less than 10 <sup>th</sup>	171 (20.1)
qualification	$10^{\text{th}}$ to $< 10+2$	183 (21.6)
of Father	10+2	199 (23.4)
	Graduate	164 (19.3)
	Postgraduate	35 (4.1)
	Illiterate	97 (11.4)
Occupation	Nil	33 (3.9)
of Father	Daily wages	341 (40.2)
	Private Job	391 (46.1)
	Govt. Job	84 (9.9)
Income of	< 5000	108 (12.7)
Family per	5000-10000	385 (45.3)
month	10000-20000	265 (31.2)
	more than 20000	91 (10.7)

The values shown are mean  $\pm$  sd, and value (%).

The parents/guardians of seventeen children did not give consent and 31 children did not report to school during the study period leading to response rate of 94.6%. The baseline variables are shown in Table 1. The most common vitamin deficiency found was that of vitamin B complex followed by vitamin D. We could not detect the clinical features of deficiency of Biotin, Pantothenic acid, vitamin K and vitamin E in any of the subjects. The most common manifestation of vitamin A deficiency was Bitot

spots followed by night blindness. Angular stomatitis and oral ulcers were most frequent in vitamin B complex deficiency. The vitamin C deficiency features encountered most frequently were bleeding gums and painful gums. Wrist widening was the most common presenting feature in vitamin D deficient children. The details of various vitamin deficiencies are presented in Table 2.

Table 2: Details of individual vitamin deficiency (n=849).

Vitamin	N (% of total subjects)	Symptom*	N (% of individual vitamin deficiency)
Vitamin A	61 (7.18)	Bitot spots	23 (37.7)
		Night blindness	11 (18.0)
		Conjuctival xerosis	19 (31.1)
		Corneal xerosis	8 (13.1)
		Dry scaly skin	21 (34.4)
Vitamin B Complex	153 (18.02)	Oral ulcers	85 (55.6)
		Angular stomatitis	78 (51.0)
		Chelosis	89 (58.2)
		Dermatitis	16(10.5)
Vitamin C	26 (3.06)	Bleeding gums	21 (80.8)
		Painful gums	18 (69.2)
		Scorbutic rosary	4 (15.4)
		Long Bone tenderness	10 (38.5)
Vitamin D	72 (8.48)	Rachitic rosary	27 (37.5)
		Widening of wrist	58 (80.6)
		Bow legs	19 (26.4)
		Knock knee	13 (18.1)
		Pigeon chest	17 (23.6)

#### **DISCUSSION**

This study was done to see the incidence of vitamin deficiencies in primary school children in the age group of 5-11 years. In present study features of vitamin D deficiency were present in 8.48% of school going children which was significantly lesser than a study done (38.3%) in school-age children in Tehran and Saudi Arabia. 4,5 Similar to our study lesser prevalence of vitamin D deficiency based on clinical features was found in studies done in Kurukshetra (4%) and Dhule (1.17%).<sup>6,7</sup> The low prevalence in present study is because of use of clinical features only whereas other studies had included the subclinical cases also. Most of the studies on Vitamin D deficiency have been done using the blood levels of vitamin D but little literature is available about clinical features of deficiency in school going children in India.

Vitamin A deficiency had a high prevalence rate of 7.18% in present study which was similar to studies done in school children of Bareilly and Aligarh. 8.9 A large study from central India had noted higher prevalence of

vitamin A deficiency whereas children from Ahmedabad showed a lower prevalence. 10,11 The high prevalence of this disease should prompt us to find the causes as this is being covered under national health programmes. Features of vitamin C deficiency was seen in 3.06% of children which was in accordance to Nagtilak et al and Rao et al and was lower than that reported by Sundaram et al and Sachdeva et al. 6,7,12,13

Clinical features of vitamin B complex deficiency were noted in 18.02% of the children in our study, which was similar to a study done in Kolkata, while prevalence of angular chelosis, stomatitis and glossitis was in range of 1.8-6.2% as per study in school children 6-16 years in Hyderabad. <sup>14,15</sup> The features were more common in studies done in Kurukshetra. <sup>6</sup>

The difference in the prevalence of the clinical features can be explained by the diversity of the subjects, different localities and socio economic status. The clinical features also depend upon the type of diet consumed and cultural practices followed in that area.

Limitations of present study are that it was carried in primary schools where enrolment of students was not representative of general public so extrapolation on whole population is not possible. As this study is based on clinical examination only and blood samples for vitamin levels were not drawn, actual number of children having low levels of vitamins in body would have been much higher. A larger study done at a multicentric level along with correlation with the blood levels would throw more light on the vitamin deficiencies prevalent in the primary school children.

#### **CONCLUSION**

The primary school children do suffer from vitamin deficiencies and there should be timely evaluation for these diseases to prevent chronic morbidities. Overt diseases represent only the proverbial 'tip of iceberg' and all efforts should be made to prevent the subclinical cases also. The parents should be educated regarding the diet modifications to prevent vitamin deficient states.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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