

Original Research Article

Prevalence of nutritional deficiencies among school going adolescents of Vadodara, Gujarat, India: a cross sectional study

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ABSTRACT

Background: Adolescent constitutes over 23% of the population in India. Critical development occurs during adolescence period. Growth spurt and increase in physical activity during adolescent period increases the nutrition and health needs of the adolescent. Objective was to study prevalence of nutritional deficiencies among school going adolescents of Vadodara city, Gujarat.

Methods: The study was carried during period from September 2018 to August 2019. After taking the permission of principals of 3 schools and consent of the parents of adolescents, 511 adolescents from 3 schools of Vadodara city were examined for signs of various nutritional deficiencies. The data was collected by predesign, pretested proforma and analyzed using SPSS 17.0 (Trial Version).

Results: Out of total 511 adolescents 253(49.5%) were female. Mean age of the study adolescents was 15.6 ± 1.81 years. Maximum numbers of the adolescents were in the age group of 10-14 years (60.3%). Mean age of female and male adolescents was 15.2 ± 1.71 years and 15.6 ± 2.01 years respectively. The study revealed that vitamin A deficiency was present in 38(7.4%) adolescents. Vitamin B complex deficiency signs were seen in 112(21.9%) adolescents. Vitamin C deficiency signs were seen in 43(8.4%) adolescents. Protein Energy Malnutrition was observed in 52(10.1%) adolescents. Essential fatty acid deficiency was observed in 56(10.9%) adolescents.

Conclusions: High prevalence of nutritional deficiencies among these adolescents needs great attention and health education.

Keywords: Adolescent health, Nutritional deficiencies, Malnutrition, Protein energy, School health, Vitamin deficiencies

INTRODUCTION

Critical development occurs during adolescence period. Pubertal development occurs during this period which includes 10-19 years of life. Major physical, cognitive, and psychosocial changes occur during adolescence period. These changes have important implications for health. As young people become increasingly independent, they face significant choices in areas such

as diet, substance use, sexuality, physical activity and use of health care services. Individual, family, social environment and other contextual factors shape these choices.¹

A school is a key location to educate adolescents about health, hygiene and nutrition and to put in place interventions to promote the health of adolescents. At the same time, poor health, poor nutrition and disability can

be barriers to attending school and to learning. Schools provide an environment, for learning skills, and for development of intelligence that can be utilized by students to achieve their goals in life. It is also observed that “to learn effectively, adolescents need good health.” Health is key factor in school entry, as well as continued participation and attainment in school.²

The school is also potentially a location for contracting infections or diseases. Finally, school setting influence childhood health behavior habits such as diet and physical activity and often track into adulthood. The common morbidities found in school age adolescents are nutritional deficiencies, dental, visual and hearing problems, respiratory infections, skin conditions, loco motor disabilities and congenital heart and other problems. The fact is that the most of these conditions are preventable or avoidable and curable especially in early stages by promotion of hygienic practices among school adolescents through proper health education by teachers, who are the first contacts.³

Adolescent constitutes over 23% of the population in India. Growth spurt and increase in physical activity during adolescent period increases the nutrition and health needs of the adolescent. Requirement of all nutrients is increased in adolescence.⁴ With this background in mind this study was planned to know prevalence of nutritional deficiencies among school going adolescents.

METHODS

The study was conducted during period from September 2018 to August 2019. Out of total 16 schools 3 schools were selected by purposive sampling. The permission of principals of schools was taken and informed written consent of the parents of adolescents was taken. Total population was 623 adolescent students.

Inclusion criteria

Adolescents whose parents gave consent were included in the study.

Exclusion criteria

Students whose parents did not give the consent and those who were absent on the day of examination were excluded from the study.

Study population was 511 adolescent students. These 511 adolescent students from these 3 schools of Vadodara City were examined using Pre-designed, pre-tested, semi-structured WHO standard with ICMR modifications questionnaire for nutritional deficiencies. Performa contained general information, anthropometry and general health check-up of the adolescents. The modification included deletion of columns irrelevant to the present study and addition of some columns to record

other health abnormalities specially which are common in adolescents.

Height

A standard height measuring stand was used. Height was recorded in the centimetre and the fractions were recorded nearest half centimetre.

Body weight

A spring type scale was used to record the body weight with light clothing. The weight was recorded in kilograms and fractions were recorded to the nearest half kilogram.

Nutritional deficiency

Nutritional deficiencies were ascertained by noting the deficiency signs clinically without conducting any biochemical tests.

Data was entered in Microsoft Excel and analysis was done using SPSS version 17 (trial version). Parameters such as rate, ratio and percentages were calculated. In order to have valid interpretation of rates, 95% confidence intervals (CI) were calculated. To test the significance of the difference among the statistical parameters in different subsets of population, suitable statistical tests were applied. They included chi-square test, Z- test and unpaired t-test.

RESULTS

Out of total 511 adolescents 253(49.5%) were female. Mean age of the study adolescents was 15.6±1.81 years. Maximum numbers of the adolescents were in the age group of 10-14 years (60.3%). Mean age of female and male adolescents was 15.2±1.71 years and 15.6±2.01 years respectively.

Vitamin A deficiency was present in total 38(7.4%) adolescents. 18(7.1%) were females and 20(7.7%) were males. The signs of vitamin A deficiency and gender was not significantly associated ($p>0.05$). Other signs of vitamin A deficiency such as Bitot's spot, corneal xerosis and corneal opacities were not observed in any adolescents (Table 1).

Table 1: Vitamin a deficiency.

Signs	Gender		Total (511)
	Female (253)	Male (258)	
Conjunctival xerosis	15 (5.9)	16 (6.2)	31(6.0)
Night blindness	3 (1.2)	4 (1.5)	7(1.4)
Total conditions	18 (7.1)	20 (7.7)	38(7.4)

(Figures in the parenthesis are percentages)

Chi-square: 0.07

Degrees of freedom: 1, $p=0.79$

Table 2 shows signs of vitamin B complex deficiency. Signs were seen in total 112(21.9%) adolescents. 50(19.8%) were females and 62(24.1%) were males. Many adolescents have multiple signs of vitamin B complex deficiency. Signs such as angular stomatitis (Female: 2.8% Male: 5.4% $p<0.05$) and geographic tongue (Female: 1.6% Male: 4.8% $p<0.05$) were significantly more observed in males than in females. The signs of vitamin B complex deficiency and gender was not significantly associated ($p>0.05$).

Table 2: Vitamin b complex deficiency.

Signs	Gender		Total (511)
	Female (253)	Male (258)	
Nasolabialdyssebacea	3(1.2)	2(0.8)	5(0.9)
Angular stomatitis	7(2.8)	14(5.4)	21(4.1)
Cheilosis	25(9.9)	22(8.5)	47(9.1)
Red and raw tongue	3(1.2)	4(1.5)	7(1.7)
Geographic tongue	4(1.6)	11(4.8)	15(3.0)
Pellagrous dermatosis	8(3.2)	9(3.5)	17(3.3)
Total conditions	50(19.8)	62(24.1)	112(21.9)

(Figures in the parenthesis are percentages)

Chi-square: 4.96

Degrees of freedom: 5, $p=0.42$

Vitamin C deficiency signs were seen in total 43(8.4%) adolescents. The prevalence rates in males and the females were 8.6% (22 adolescents) and 8.1% (21 adolescents) respectively. The signs of vitamin C deficiency and gender was not significantly associated ($p>0.05$) (Table 3).

Table 3: Vitamin C deficiency.

Signs	Gender		Total (511)
	Female (253)	Male (258)	
Spongy bleeding gums	15(5.9)	16(6.2)	31(6.1)
Petechiae	7(2.7)	5(1.9)	12(2.3)
Total conditions	22(8.6)	21(8.1)	43(8.4)

(Figures in the parenthesis are percentages)

Chi-square: 0.34 Degrees of freedom: 1, $p=0.5$

Protein energy malnutrition was observed in total 52(10.1%) adolescents. 23(9.1%) were females and 29(11.2%) were males. Many adolescents have multiple signs of protein energy malnutrition. The signs of protein energy malnutrition and gender was significantly associated ($p<0.001$). Thin and sparse hair was more common in girls and lack of luster of hair was more common in boys (Table 4).

Essential fatty acid deficiency in the form of phrynoderma was observed in total 56(10.9%) adolescents. Prevalence was more observed in males (31, 12.1%) than in females (25, 9.8%). Prevalence of essential fatty acid deficiency and gender was not significantly associated ($p>0.05$) (Table 5).

Table 4: Protein energy malnutrition.

Signs	Gender		Total (511)
	Female (253)	Male (258)	
Flag sign on hair	3(1.2)	5(1.9)	8(1.5)
Lack of luster of hair	9(3.6)	16(6.2)	25(4.9)
Thin and sparse hair	11(4.3)	8(3.1)	19(3.7)
Total conditions	23(9.1)	29(11.2)	52(10.1)

(Figures in the parenthesis are percentages)

Chi-square: 2.27

Degrees of freedom: 2, $p=0.32$

Table 5: Essential fatty acid deficiency.

Signs	Gender		Total(511)
	Female(253)	Male(258)	
Phrynoderma	25(9.8)	31(12.1)	56(10.9)

(Figures in the parenthesis are percentages)

Chi-square: 0.69

Degree of freedom:1, $p=0.4$

DISCUSSION

In our study, out of total 511 adolescents 253(49.5%) were female. Mean age of the study adolescents was 15.6 ± 1.81 years. Maximum numbers of the adolescents were in the age group of 10-14 years (60.3%). Mean age of female and male adolescents was 15.2 ± 1.71 years and 15.6 ± 2.01 years respectively. The study revealed that vitamin A deficiency was present in 38(7.4%) adolescents. Vitamin B complex deficiency signs were seen in 112(21.9%) adolescents. Vitamin C deficiency signs were seen in 43(8.4%) adolescents. PEM was observed in 52(10.1%) adolescents. Essential fatty acid deficiency was observed in 56(10.9%) adolescents.

In Uresh et al, out of total 421 students 205(48.6%) were female.¹ Mean age of the study students was 19.8 ± 1.66 years. Maximum numbers of the students were in the age group of 18-21 years (60.5%). Mean age of female and male students was 19.7 ± 1.79 years and 19.9 ± 2.01 years respectively. The study revealed that vitamin A deficiency was present in 28(7.0%) students. Vitamin B complex deficiency signs were seen in 96(23.1%) students. Vitamin C deficiency signs were seen in 44(10.5%) students. PEM was observed in 55(13.2%) students. Essential fatty acid deficiency was observed in 60(14.4%) students.

In Thakor N et al, age of the study adolescents (total 867) ranged from 5-19 years. Mean age was 13.80 ± 1.96 years. Out of 867, 434(49.9%) were boys and 433(50.1%) were girls. The study revealed that vitamin A deficiency was present in 54(6.2%) adolescents. Vitamin B complex deficiency signs were seen in 179(20.6%) adolescents. Vitamin C deficiency signs were seen in 86(9.9%) adolescents. PEM was observed in 77(8.9%) adolescents. Essential fatty acid deficiency was observed in 123(14.1%) adolescents.² In Srinivasan K et al, 61.4%

adolescents were in the age group of 10-14 years, 84.3% adolescents had one or more morbid conditions, 29.9% adolescents had skin disorders.⁵ In Panda P et al, 59.5% are boys and 40.5% are girls, 47.8% of adolescents were found to be normal as per their weight for age, 52.2% were malnourished. 28.4 % adolescents had mild, 17.0 % had moderate and 6.8% adolescents had severe degree of malnourishment, 5.6% adolescents had refractive errors.⁶ In Soumya Deb et al, 40.8 % boys and 25.93% girls were underweight, 76% of boys and 74% of girls were suffering from one or more morbidities.⁷

In Chandna S. et al, adolescents had night blindness in 35.9%, xerosis conjunctiva in 9.2%, Bitot's spots in 14.2%, nasolabial dyssebacea in 6.8%, angular stomatitis in 6.8%, cheilosis in 8.7% red and raw tongue in 1.6% , pellagrous dermatosis in 13.3%, bleeding gums in 15.2%, ecchymoses in 6.1%, lack of luster of hair in 26.5%, thinness and sparseness of hair in 24.3%, prevalence of anaemia in adolescents was 34%, 15.9% adolescents had phrynoderma.⁸ In Rema N et al, prevalence of vitamin A deficiency in boys was 5.65% and in girls was 8.64%.⁹ As per DLHS (2002-2004), In India 6-7% adolescents aged 10-14 years have problem with their eye sight.¹⁰

CONCLUSION

High prevalence of nutritional deficiencies among adolescents needs great attention and health education. There is definitely a need for well-planned, large-scale studies using standardized methodologies to estimate the prevalence of nutritional deficiencies among adolescents.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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