NUTRITIONAL DISORDERS IN ADOLESCENT GIRLS

G. Kapoor
S. Aneja

ABSTRACT

Four hundred and fifty four adolescent girls (11-18 years) were screened for nutritional disorders by anthropometry (weight, height and triceps skinfold measurements), clinical examination and hemoglobin estimation. Of these, 56% belonged to high socio-economic groups (Group A) and the rest (44%) to lower middle class (Group B). A large number of girls from Group B were undernourished (35.5% had weight/ height^2 less than the fifth percentile of reference standard) stressing the need for nutritional screening, nutrition and health education. Obesity was prevalent in 3.1% of Group A adolescents. Goitre grade I or more was observed in a high proportion of Group B girls, stressing the need for continued consumption of iodized salt in Delhi. Anemia appears to be a major health problem in adolescent girls in both groups (47, 56% in Groups A and B, respectively) underlying the need for iron supplementation along with health education.

Key words: *Adolescent girls, Nutritional disorders, Anemia, Goitre.*

The demands of rapid growth and development on one hand and those of teenage pregnancy on the other make adolescence a stage of acute physiological stress. However, these potential mothers and future home makers are likely to face the constraints of nutritional inadequacy due to socio-economic limitations. The assessment of their nutritional status is a relevant pre-requisite to ensure not only healthy adolescence but also healthy motherhood accompanied with reduction in perinatal mortality rate. Hence the present study was carried out to assess the extent of nutritional disorders in adolescent girls.

Material and Methods

Four hundred and fifty four girls, aged 11-18 years, from public and government schools were screened. They were grouped into high socio-economic groups (Group A Class I socio-economic status scale, Kuppuswamy classification)(1) and lower middle income group, (Group B Class III socio-economic status scale). All the adolescents were apparently healthy and those with physical deformity or history of recent medical illness likely to influence their physical health were excluded from the study. Sampling was done by using the stratified random sampling technique.

From the Department of Pediatrics, Kalawati Saran Children's Hospital, Lady Hardinge Medical College, New Delhi 110 001.

Reprint requests: Dr. G. Kapoor, 132, Jorbagh, New Delhi 110 003.

Received for publication: May 13, 1991;
Accepted: March 13, 1992

Chronological age at the time of sampling was the age criterion for inclusion in the sample and age in completed years was taken for analysis(2). A thorough clinical examination was done and nutritional deficiencies were looked for. The anthropometric measurements including weight (Detecto beam balance), height (height anthropometer) and skinfold thickness at triceps (Harpenden skinfold caliper), were made by standard methods(3). Standardization exercises were conducted to ensure the reliability and reproducibility of the study(4). All observations were made by a single observer, eliminating inter-observer errors. The reference standards used were those of the National Centre for Health Statistics (NCHS)(2). Values of weight/height^2 less than 5th percentile and triceps skinfold thickness (TSF) and weight/height^2 more than 95th NCHS centile were the criteria used for detection of undernutrition and obesity, respectively(5,6).

Hemoglobin estimation was done by the cyanmeth-hemoglobin method(7). The criteria for detecting anemia were as per the WHO recommendations (values less than 12 g/dl, as all were non-pregnant)(8).

The data was analyzed on computer at the Institute for Research in Medical Statistics, New Delhi. Statistical analysis included application of Student 't' and Z test wherever required.

Results

Fifty six per cent (253/454) of the adolescent girls belonged to Group A and the rest (44%) to Group B. Prevalence of undernutrition was 35.5% (71/201) in Group B and 9.8% (25/253) in Group A by the body mass index (BMI) ($p<0.001$, Z test). *Table I* highlights that BMI of the adolescents of Group A was mainly distributed within the 5th and 95th NCHS percentiles, whereas in Group B, a significant number were less than the 5th percentile. TSF detected obesity in 3.1% (8/253) and BMI in 2.7% (7/253) of the Group A girls. None of the Group B adolescents were obese. A coincidental study among boys (unpublished data) revealed no significant sex difference.

Anemia occurred in 46.6% (117/251) of Group A and 56% (110/195) of the Group B girls (Z test, $p>0.5$).

The prevalence of goitre grade I or more by age is presented in *Table II*, the difference in Groups A and B being highly significant at all ages. A coincidental survey in boys from the same schools (unpublished data) showed significantly lower incidence (0.4 and 4.5% in Groups A and B, respectively).

Dental caries occurred in 23.3% (59/253) of Group A and 13.4% (27/201) of Group B girls (Z test, $p<0.001$). Clinical

TABLE I—*Distribution of Wt/Ht^2 of the adolescents with reference to NCHS percentiles*

Group	No.	NCHS percentiles			
		<5th	5th-50th	51st-95th	>95th
A	253	25**	117	104**	7
B	201	71**	100	30**	–

** Z test, $p<0.001$.

TABLE II—*Prevalence Goitre Grade I and More*

Age (yrs)	n	Group A		n	Group B	
11	35	1	(2.8)	28	3	(10.7)**
12	37	2	(5.4)	26	5	(19.2)**
13	32	1	(3.1)	26	6	(23.0)**
14	34	2	(5.8)	25	9	(36.0)**
15	36	2	(5.5)	30	16	(53.0)**
16	36	1	(2.7)	30	5	(16.6)**
17	33	0	(0.0)	28	4	(14.2)**
18	10	1	(10.0)	8	2	(25.0) †
Total	253	10	(3.9)	201	50	(24.8)

Figures in parentheses indicate percentages.
** Z test, $p < 0.001$; † Student 't' $p < 0.001$.

signs and symptoms of overt vitamin deficiencies did not occur in either of the groups.

Discussion

Adolescence is not only a period of dynamic growth but inadequate(9) and improper dietary habits and the added stress of teenage pregnancy make it a high risk group for nutritional deficiency disorders. The pattern of growth is further complicated by the variability in onset, duration and intensity of pubertal growth spurt. Hence, accurate assessment of nutritional status of this age group is difficult with simple weight or height parameters alone and composite indicators like body mass index have been found to be more reliable(10-15) and suitable for application to adolescents. Complex parameters like energy protein index(16) are also reported to be reliable in this age group. Various workers(10) have found BMI to have the best correlation with weight and triceps skinfold as compared to weight/height and weight/height^3.

Using BMI, undernutrition was detected in a significant proportion of girls from the lower socio-economic class. It is reasonable to assume that majority of our non-school going adolescents belong to an even lower socio-economic scale and the incidence of undernutrition is likely to be even higher. Although inadequate nutrient intake appears to be the most probable etiologic factor, other factors like helminthic infestation and malabsorption syndrome are also likely contributory causes.

Diet surveys in Indian adolescent population have shown that the diets are inadequate in all foods including iron, proteins, calcium and calories(9). Any intervention programme would be required not only to increase total food intake but ensure a judicious combination of foods so that the requirements of energy, protein, iodine, iron and vitamins are met.

Obesity was not a major problem even in the high income group. A similar incidence was reported in another study in Delhi(17).

The incidence of anemia was alarmingly high in both groups. Moreover, hemoglobin estimation probably under-estimates the problem by missing out those with low iron stores. Although, the net iron demand of puberty is similar in both sexes(5), a higher incidence of anemia in girls is due to the recurrent menstrual loss and the more acute iron deficit. Moreover, the iron density of food consumed by both boys and girls is similar, and the caloric intake of boys is very considerably increased during adolescence as compared to only a moderate increase in girls. Hence, it is not possible for the iron deficit to be met by diet alone in the latter as compared to the former. Poor iron content and poor bio-availability of Indian diets further compound this problem.

It is, therefore, suggested that supplementation of iron be ensured in adolescent girls. It may be pointed out that though iron and folate supplementation in pregnant mothers is well established in our National Anemia Control Programme(18), adolescent girls have not yet been identified as a vulnerable risk group except by the Nutrition Chapter of the Indian Academy of Pediatrics.

Goitre grade I or more, was observed in a very high proportion of girls from the lower socio-economic status. This is compatible with the identification of Delhi as one of the goitre endemic areas of the country(19) and stresses the need for continued consumption of iodized salt in Delhi. Increased incidence in this group implies total nutritional inadequacy as a probable etiological agent, since 90% of iodine intake in Indian diet is obtained from food.

Dental caries was observed to occur more frequently in the affluent population as is also reported by other workers(20,21). This is probably explained by the higher intake of candies and chocolates and eating in between meals. Girls have *per se* been found to be constitutionally more susceptible to tooth decay(22).

Hence, the present study reveals that undernutrition was a major problem in the lower socio-economic adolescent girls, although obesity did not occur to any significant extent even in the affluent section. In addition to nutrition screening of the adolescent girls, health and nutrition education would be an essential component of any preventive intervention programme. The high incidence of endemic goitre in the low income group, stresses the need for continued consumption of iodized salt in Delhi. The alarmingly high incidence of anemia in both the high and the low socio-economic groups makes a strong point in favour of iron supplementation in the adolescent girls and perhaps the National Anemia Control Programme may be extended to include this age group.

REFERENCES

1. Kuppuswamy B. Manual for socio-economic status scale (Urban). Manasayan, Delhi 1976, 5-12.
2. National Centre for Health Statistics: Anthropometric reference data and prevalence of overweight, United States 1976-80. Vital and Health Statistics Series II, No. 238 Public Health Service Washington, US Government Printing Office, 1987, pp 5-41.
3. Committee on Nutritional Anthropometry of the Food and Nutrition Board of the National Research Council. Recommendations concerning body measurements for the characterization of nutritional status. Human Biol 1956, 28: 109-123.
4. Martorell R, Habicht J, Yarbrough C, Guzman G, Klein RE. The identification

and evaluation of measurement variability in the anthropometry of preschool children. Am J Phys Anthropol 1975, 43: 347-352.

5. Fomon Samuel JL. Nutritional disorders of children. Prevention, screening and follow-up. Department of Health Education Welfare Pub. No. (HSA) 77-5104 USA, 1977, pp 31-56.

6. Zerfar Alfred J, Shorr Irwin J, Newmann CG: Office assessment of 'Nutritional status'. Pediatr Clin North Am 1977, 24: 253-272.

7. Wintrobe M. Principle of hematological examination. *In:* Clinical Hematology, 8th edn. Ed Wintrobe MM. Philadelphia, Lea & Febiger, 1981, pp 7-35.

8. WHO: Criteria for the diagnosis of anemia. *In:* Nutritional Anemias. Report of a WHO Scientific group. WHO Technical Report Series No. 405, Geneva, 1968, pp 9-10.

9. Pushpamma P, Geervani P, Lakshmidevi N. Food intake nutrient adequacy and anthropometry of adolescents in Andhra Pradesh. Indian J Med Res 1982, 75: 61-67.

10. Sood AK, Kapil U. Utility of nutritional indices derived from body weight and height, a comparative study. Indian Pediatr 1991, 28: 65-67.

11. Rolland-Cachera MF, Sample M, Guillond Bataille M, Patois E, Pequignot-Guggenbuhl F, Fantrad V. Adiposity indices in children. Am J Clin Nutr 1982, 36: 178-184.

12. Womersley J, Durnin JVGA. A comparison of skinfold thickness method with extent of overweight and various weight-height relationships in assessment of obesity. Brit J Nutr 1977, 38: 271-284.

13. Seltzer CC, Mayer J. A simple criterion of obesity. Postgrad Med J 1965, 38: 101-107.

14. Paige DM. Obesity in childhood and adolescence—special problems in diagnosis and treatment. Postgrad Med J 1986, 79: 233-245.

15. Bray GA. Diagnosis of Obesity. Ann NY Acad Sci 1987, 499: 14-28.

16. Qamra SR, Mehta S, Deodhar SD. Evaluation of anthropometric indices for the assessment of nutritional status in girls III. Indian Pediatr 1990, 27: 1275-1279.

17. Sood AK, Nath LM, Kapil U, Gupta MC. Comparison of different criteria for measurement of obesity in a community. Indian J Med Res 1984, 80: 365-370.

18. Park JE, Park K. Nutrition and Health. *In:* Text Book of Preventive and Social Medicine, 12th edn. Eds Park JE, Park K Jabalpur, Banarsidas Bhanot Publishers, 1989, pp 324-356.

19. Pandav CS, Kochupillai N, Karmarkar NG, Ramachandran K, Gopinath PG, Nath LM. Endemic goitre in Delhi. Indian J Med Res 1980, 72: 81-88.

20. Agarwal V, Srivastava G, Gupta S. Health status of children in an urban community. Indian Pediatr 1976, 11: 415-420.

21. Mathur HN, Jain TP, Jain ML. Dental caries in school girls. Indian J Pediatr 1979, 46: 43-48.

22. National Centre for Health Statistics. Decayed missing and filled teeth among youths, 12-17 years: U.S. Vital and Health Statistics Series-11 No. 144, Public Health Service Washington, US Government Priting Office, 1974, p 33.