"STUDY OF DIET AND NUTRITIONAL STATUS OF SCHOOL GOING RURAL ADOLESCENT BOYS IN ALLAHABAD"

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Abstract :

Research question: What is the prevalence of malnutrition among school going rural adolescent boys?

Objective: To assess the diet and nutritional status of school going rural adolescent boys.

Study design: Cross sectional study.

Setting: Rural Intermediate Colleges.

Participants: 660 study subjects (adolescents boys, 10-19 years), of classes 6th to 12th from 8 rural intermediate colleges in two blocks of Allahabad.

Study period: One year (From April 2002 to May 2003).

Statistical Analysis: Chi square test.

Results: Overall mean height, BMI and Haemoglobin level of adolescents were 1 56.97$\pm$9.84cm, 18.59$\pm$2.20 kg/m2 and 12.12$\pm$1.31 gm/dl respectively. Prevalence of malnutrition in terms of Stunting (24.1%) Thinness (10.5%) and Overweight (1.4%) was observed. Maximum calorie deficit was seen in thirteen-year-old boys, it was 42.5% below the RDA and minimum deficit (25.7%) was observed among nineteen-year-old boys. Overall mean calorie deficit among 10 to 19 years' adolescents was 839.57 Kcal/day. Prevalence of anaemia was observed in 371(56.3%) adolescent boys. Prevalence of Vit. A deficiency, Vitamin B - complex and Vitamin C deficiency were found to be 3.5%, 25.3% and 6.8% respectively.

Conclusion: Nutritional status of school going adolescent boys in rural areas of Allahabad is not satisfactory and there is a strong need for a programme especially for adolescent boys to fulfill their nutritional needs.

Key words: Diet, Nutritional status, Adolescent boys, Rural, School going.

Introduction:

Adolescence is the most critical period of the human life during which foundation of healthy adulthood is laid. It is the period during which a child goes through tremendous physical, emotional cognitive and social growth and development. Except in the new born and early infancy, no period of human life span encompasses more dramatic changes than does adolescence. Nutritional needs are greater during this period. Adolescents gain 30 percent of their adult weight and more than 20 percent of adult their height (**Planning Commission, GOI, 2003**). Almost 48 percent of skeletal muscle mass is attained during and after the adolescent growth spurt. Being a period of growth spurt, exceptionally rapid rate of growth occurs with unique changes during this phase of life.

The health of the adolescents attracted global attention in the past decade. Though the issues like sexually transmitted diseases, reproductive health etc. have been given due importance, limited work has been done on their nutritional status (**Rao VG 2003**).

Scanty information exists on the health status of rural adolescents especially on rural adolescent boys who are already disadvantaged socio economically and face a slow pace of growth.

In view of the above considerations studies on adolescent boys need more emphasis and public attention. Therefore, present study has been planned to assess the nutritional status of school going rural adolescents boys.

Material & Methods :

This study was carried out during April 2002 to May 2003. Stratified Multistage Random Sampling Technique was adopted in this study. The whole study area of rural Allahabad was divided into two broad geographical strata ie Trans Ganga and Trans Yamuna. Within each stratum one block was selected at random as first stage unit. Within each first stage unit a sample of 4 schools imparting education upto twelfth standard were selected randomly as second stage unit. Within each selected second stage unit a sample of optimum size adolescent boys studying in 6th to 12th class were selected randomly as third stage unit, ensuring the representation of all classes. Sample was selected by proportional allocation from different classes to ensure a minimum sample size of 631. The school survey was conducted and finally a total of 660 adolescent boys were covered during the study.

Anthropometric measurements in the form of weight and height were taken using standarized techniques by trained interns and technicians. Nutritional status was assessed adopting percentile classification using **NCHS/WHO** reference data.

The mean height & weight of adolescents were compared with the NCHS, condition. Anthropometric indicators recommended for adolescents are stunting (height for Age < 3rd percentile) and thinness (BMI for Age < 5th percentile). Weight for age has been found to be unreliable & therefore has not been included in this analysis **(National Centre for Health Statistics (NCHS), USA/WHO reference data 1995).**

Dietary history was taken by oral questionnaire method. Inquiry was made retrospectively about the nature (quality) and amount (quantity) of food eaten by adolescent boys during the previous 24 hrs. Calculations of calorie intake per day, was done accordingly. Nutritional intake was compared with Indian Council of Medical Research recommended dietary allowance s (RDA).

Hemoglobin was estimated by personal Sahli's hemoglobinometer. Anaemia was considered to be present if the Hb value was below 12gm/dl for adolescent boys upto 14 years of age and below 13gm/dl for adolescent boys above 14yr as proposed by **WHO** (1968).

Vitamin A deficiency was mainly assessed by clinical examination of eye following WHO criteria (1982). Vitamin B-complex and Vit. C deficiencies were also diagnosed clinically.

All the data was entered into computer in the Dbase package. Body Mass Index (BMI) was calculated from measured height and weight by a self-written computer programme. The analysis was performed by using SPSS software package.

Results:

TABLE - 1 : HEIGHT, BMI & CALORIE INTAKE DISTRIBUTION BY ADOLESCENCE PHASES

Adolescence phases	Number of boys	Height (cm) Mean±SD	BMI Mean±SD	Calorie intake Mean±SD
Early Ado. [10- 14 years]	218	148.17±8.93	16.92±1.84	1389.84±305.15
Mid Ado. [14-17years]	268	159.62+6.61	18.91±1.85	1666.67±358.98
Late Ado. [17-19years]	174	163.92±6.63	20.16±1.67	1846.62±348.52
Total	**660**	**156,97±9.84**	**18.59±2.20**	**1627.02±392.64**

Table 1 shows that Out of total 660 adolescents, maximum (268) boys were from mid adolescence followed by 218 and 172 boys from early and late adolescence respectively.

The mean height among early adolescents was 148.17+8.93 cm, in mid adolescents 159.62±6.61cm while in late adolescents it was 163.92±6.63 cm and overall mean height of adolescents was 156.97+9.84cm. Growth rate from early to middle adolescence was higher (11.45 cm) than from middle to late adolescence (4.30 cm). The mean BMI in early adolescence was 16.92±1.84 Kg/m2, in middle adolescence 18.91±1.85 Kg/M2 and in late adolescent period it was 20.16±1.67 Kg/M2 The overall mean BMI of adolescent boys was 18.59±2.20 Kg/M2. In this study the mean calorie intake among boys in early adolescence was 1389.84±305.15 Kcal/day, in mid adolescence it was 1666.67+358.98 Kcal/day while in boys in late adolescence it was 1846.62±348.52 Kcal/day. Overall mean calorie intake among adolescents was 1627.02±392.64 Kcal/day.

TABLE-2 : PREVALENCE OF STUNTING IN RELATION OF ADOLESCENCE PHASES

Adolescence phases	Stunting	Normal	Total
Early	13(6.0)	205(94.0)	218(100.0)
Middle	5520.5)	213(79.5)	268(100.0)
Late	91(52.3)	83(47.7)	174(100.0)
Total	**159(24.1)**	**5011(75.9)**	**660(100.0)**

(Figure in parenthesis indicates percentage) $X^2 = 116.75, df=2, p<0.001$

Table2 represents the growth phase wise prevalence of Stunting. Maximum prevalence of stunting (52.3%) was seen in late adolescence followed by (20.5%) in mid adolescence and (6.0%) in early adolescence. There was significant association between adolescence growth phases and prevalence of stunting (P<0.001).

TABLE- 3 : PREVALENCE OF THINNESS IN RELATION OF ADOLESCENCE PHASES

Adolescence phases	Thinness	No thinness	Total
Early	34(15.6)	184(84.4)	212(100.0)
Middle	25(9.3)	243(90.7)	268(40.6)
Late	105.7)	164(94.3)	174(100.0)
Total	**69(10.5)**	**591(89.5)**	**660(100.0)**

$X^2 = 10.64$, df=2, p<0.005

Table 3 shows the prevalence of thinness among adolescent boys by their growth phases. Thinness as defined by a BMI < 5th percentile was present in 69(10.5%) adolescent boys. Maximum prevalence of thinness (15.6%) was seen among boys in early adolescence followed by 9.3% among boys in middle adolescence and minimum 5.7% among those belonging to late adolescence phase. Prevalence of thinness in relation to growth phases was found to be statistically significant. (P<0.005)

TABLE - 4 : DISTRIBUTION OF RESPONDENTS BY THEIR CALORIE INTAKE, CALORIE DEFICIT & PERCENTAGE CALORIE DEFICIT

Age (Years	No. of adoles cents	RDA (ICMR) (Kcal/day)	Actual calorie intake (Kcal/day)	Deficit (Kcal/day) Deficit	%age Calorie
10	7	2190.00	1347.14±165.55	842.86	38.5
11	31	2190.00	1418.45±375.22	771.55	35.2
12	82	2190.00	1365.78±266.82	824.22	37.6
13	77	2450.00	1407.82±324.16	1042.18	42.5
14	71	2450.00	1648.31±354.39	801.69	32.7
15	108	2450.00	1678.42±374.23	771.58	31.5
16	69	2640.00	1667.17±343.32	972.83	36.8
17	104	2640.00	1838.36±367.74	801.64	30.4
18	47	2640.00	1880.96±422.57	759.04	28.8
19	17	2425.00*	1802.24±391.60	622.76	25.7
Total	**613****		**1627.02±392.64**	**MCD=839.57 Kcal/day**	

*Boys aged more than 18 years are considered as adult with moderate work.

**47 adolescent boys did not give any history of food intake either due to no recall or due to being on fast.

Table 4 shows the distribution of respondents by their calorie intake, Calorie deficit & Percentage calorie deficit. Maximum calorie deficit (1042.18 Kcal/day) was seen in thirteen year aged adolescents and minimum (622.76 Kcal/day) in nineteen year aged adolescents. Overall mean calorie deficit (MCD) among 10 to19 years' respondents was 839.57 Keal/day.

Maximum calorie deficit was seen in thirteen-year-old boys, it was 42.5% below the RDA and minimum deficit (25.7%) was observed among nineteen-year-old boys.

TABLE - 5 : PREVALENCE OF ANAEMIA AMONG ADOLESCENT BOYS

Age in years	Total boys	Number of anaemic boys	Prevalence of anaemia	Mean Hb (±SD) (gm/dl)
10-14 years	295	137	46.4	11.85±1.38
15-19 years	365	234	64.1	12.33±1.21
Total	**660**	**371**	**56.2**	**12.12±1.31**

Table 5 shows the distribution of anaemia among adolescent boys. Amongst the 660 adolescent boys covered in the study majority 371(56.2) boys were found to be anaemic. Prevalence of anaemia among 10-14 years and 15-19 year adolescents were found to be 46.4% and 64.1% respectively. Mean haemoglobin level among10-14 years and 15-19 years was 11.85±1.38 gm/dl & 12.33±1.21 gm/dl respectively.

Table - 6 : Prevalence of Vitamin deficiencies among adolescent boys.

Vitamin deficience	Number of adolescents	Prevalence
Vit. A deficiency	23	3.5
Vit. B. complex deficiency	167	25.3
Vit. C deficiency	45	6.8
Base=660	235	35.6

Table-6 shows the prevalence of Vitamin deficiencies among adolescent 'boys. Overall vitamin deficiency was seen 235(35.6%) boys. Vit. A deficiency, B-complex deficiency and Vit.C deficiency was found in 3.5%, 25.3%, and 6.8% respectively.

Discussion :

The overall mean height of adolescents in the present study was found to be 156.97 cm. Gradual increase in height was seen from 137.5 cm in 10 year to 166.0 cm in 19-years of age, which reflects that growth process was still going on till 19 year of age. Mean age at peak height velocity was 14 year and peak height velocity was 7.55 cm / year.

Mean BMI in adolescence was 18.59±2.20 kg/M2. Increasing trend of BMI with age was also seen except in thirteen year aged adolescent where it was less than that of 12-year age. The possible reasons may be the growth spurt, the relative decrease in calorie intake because maximum 42.5 % percentage calorie deficit was seen in this group and date of birth may not have been told correctly at the time of registration, other than this no other feasible explanation can be given.

Actual calorie intake was calculated only for 613 boys, as the rest did not give satisfactory response. Actual calorie intake in every age group was far less than recommended daily allowances (RDA) advocated by ICMR. The mean calorie intake among boys in early adolescence was 1389.84±305.15 Kcal/day, in mid adolescence it was 1666.67+358.98 Kcal/day while in boys in late adolescence it was 1846.62±348.52 Kcal/day. Overall mean calorie intake among adolescents was 1627.02±392.64 Kcal/day.

Only 10.5 per cent of adolescents had thinness (defined as BMI < 5th centile of WHO recommended reference). Maximum prevalence of thinness (24.4%) was observed among boys aged 13 year and minimum prevalence zero percent was seen among 10 year age group as all 8 boys in this age group

were in normal range. As per NCHS norm the prevalence of thinness varies between 0% -24.4% without any clear trend.

The prevalence of stunting (height for age < 3rd percentile NCHS/WHO) was found to be 24. 1 % among rural adolescent boys in our study. Prevalence of stunting showed more or less increasing trend from zero at 10 year of age to 54.7 % at 17 year of age. The prevalence of stunting dropped down sharply at 14 year of age. This may be due to pubertal growth that occurs at this age as is also evident from the maximum 7.55 cm increase in mean height from 13 years to 14 years.

Prevalence of Vit. A deficiency was found to be 3.5 %, which is similar to the results of **Ananthakrishnan S et al (2000)** who reported 3. 1 % prevalence of vitamin A deficiency among rural school children.

B-complex deficiency (Riboflavin deficiency) reported by other studies was 26.6% in New York City Lopez R, (1980), 32.9% in rural Tamil Nadu **Ananthakrishnan S et al (2000)** and 43.6% in rural **Rajasthan Chaturvedi S et al (1997)** etc. which can be compared with the results of present study ie.25.3%. Prevalence of Vit. C was found to be 6.8 % in the present study.

Conclusion:

Adolescence, a period of growth spurt, is a high-risk period for nutritional deficiency disorders. Nutritional status of rural adolescent boys is not very satisfactory, there is a strong need to initiate intervention measures in rural adolescent boys not only to increase the total food intake but also ensure a judicious combination of foods so that requirement of calorie, iron and vitamins are met. High prevalence of anaemia calls for need of an IEC campaign to promote iron intake during adolescence and should be considered serious and calls for an action.

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