Original Article

Assessment of Nutritional Status among Adolescent Boys (10-19 Years) of Secondary Schools in an Urban Area of District Rohtak, Haryana

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Abstract

Background: Census 2011 estimated that there are approximately 253 million adolescents in India, constituting about 20.9% of the total population. Adolescence is an important stage of growth and development in the lifespan of a person. Unique changes that occur in an individual during this period are accompanied by progressive achievement of biological maturity. Inadequate nutrition in adolescence can potentially retard growth and sexual maturation, although these are likely consequences of chronic malnutrition in infancy and childhood.

Methods: This cross sectional study was conducted in the service area of an urban health center, Rohtak during the months of January to March 2015. The participants involved were school going boys (10 to 19 years). The participants were classified on the basis of their health (under-nutritional status), depending upon the Z-score value (WHO growth standards, 2007) of their respective BMI.

Results: A total of 649 boys participated in the study. Overall mean age of study participants was 15.5 years. The proportion of adolescents who were undernourished based on BMI Z Score came out as 36.7% (13.3% severely undernourished and 23.4% moderately undernourished). As education and health are correlated, in the present study, the mothers with higher level of education were having significantly (P = 0.017) least proportion (29.8%) of undernourished participants.

Conclusion: Nutritional status of the studied children is not impressive among adolescent boys. There is a need for health promotion activities among school children by providing an enabling environment. Improving nutritional status of adolescents will go a long way in maintaining the health of the country.

Keywords: Under-nutrition, BMI, Adolescent boys.

Introduction

The World Health Organization (WHO)[1] defines adolescents as individuals aged 10-19 years. The term adolescent is derived from the Latin word “adolescere” meaning “to grow up”. As per World Population Prospects (The 2012 revision),[2] there are around 699 adolescents worldwide, comprising 17.3 % of the global population. Every fifth person in the world is an adolescent. Adolescents and Youth in India-Highlights from Census 2011, estimated that there are approximately 253 million adolescents in India, constituting about 20.9% of the total population.[3]

Adolescence is an important stage of growth and development in the lifespan of a person. Unique changes that occur in an individual during this period are accompanied by progressive achievement of biological maturity. This period is very crucial since these are the formative years in the life of an individual when major physical, psychological and behavioral changes take place. Adolescent may represent a window of opportunity to prepare nutritionally for a healthy adult life, miserably this group of individuals is the most neglected as they are neither children nor

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adults.[4] Yet they experience a variety of health and social problems like early marriage, teenage pregnancy, sexually transmitted diseases, drug abuse, juvenile delinquency, injuries, learning disabilities, mental illness and malnutrition.[5]

Nutrition is the foundation for good health and development. Malnutrition denotes impairment of health arising either from deficiency or excess or imbalance of nutrients in the body. Generally there are two forms of malnutrition one is under-nutrition and other is over-nutrition. In India, nearly 44-47% of adolescents are abnormally thin.[3] Poor nutrition in adolescence can potentially retard growth and sexual maturation, although these are likely consequences of chronic malnutrition in infancy and childhood. Adolescence is also a period of catch-up growth for previously undernourished children.[6]

At the level of community calculation of individual BMI (weight/height^2) for given weight and height remains a valid tool for epidemiological studies to assess nutritional status among adolescents.[7] A large number of national nutritional programs were implemented to combat the menace of malnutrition, but the gap remains the same.[8] There is paucity of studies being conducted among adolescent boys, hence this area needs to be further explored. There is also a need to look at various socio-demographic and lifestyle factors having association with nutritional status of adolescents and such observations could be utilized and improvised into the formulation of programs and policies. Keeping all this in view, the present study was conducted among adolescent boys to assess their nutritional status and to evaluate the associated various factors associated with it.

Materials and Methods

Study Design and the Participants

This cross sectional study was conducted in the service area of an urban health center, Rohtak, which is a field practice area under the aegis of department of Community Medicine, PGIMS, Rohtak, Haryana; during the months of January to March 2015. The participants involved were schools going boys (10 to 19 years). All government and private secondary schools were listed and the school principals were approached to obtain permission for conducting the study. Only two government schools provided permission for conducting study and following which interview dates of study were fixed. Both the schools granted permission to conduct study only from ninth standard onwards. The line listing of students from 9th standard to 12th standard was done for both the schools and total students were about 840. Out of 840 participants, 660 students were included in the study using consecutive sampling. Written informed consent from the parents and assent from the student was obtained.

Data Collection

A pretested, predesigned questionnaire was used by the investigator to interview study participants. Information regarding socio-economic profiles was obtained from parents through telecommunication. Assessment of age is most essential for conducting growth studies. The accurate age of the adolescent boys was recorded from the school registration books. The anthropometric measurements of children were done using WHO guidelines (1995).[7] The weight was measured in kilogram (Kg) using bathroom scale with minimum clothing and without shoes having precision of 0.5 kg. It was calibrated against known weights regularly. Zero error was checked for and removed if present, every day. Height in centimeters (cm) was marked on a wall with the help of a measuring tape. All boys were measured against the wall without foot wear and with heels together and their heads positioned so that the line of vision was perpendicular to the body. A glass scale was brought down to the topmost point on the head. The height was recorded to the nearest 1 cm. The body mass index (BMI) was calculated as weight in kg divided by the square of height in meter (m). Students suffering from an acute illness on the day of study or within a period of 2 weeks prior to the study were excluded. The prevalence of thinning among Indian adolescents in the observation of Adolescents and Youth in India-Highlights from Census 2011was around 44%,[3]so sample size was calculated using prevalence as 40% with allowable error as 10% of prevalence and non-response as rate as 10%, total sample size calculated was 660. Sample size calculation = $(1.96)^2*p*q/(d)^2$, where p (i.e. prevalence) = 0.4, q (i.e. 1-p) = 0.6, and d (i.e. allowable error which is 10% of prevalence) = 0.04. The participants were classified on the basis of their health (under-nutritional status), depending upon the Z-score value of their respective BMI,[9] which was calculated using WHO Anthroplus software. A Z-score <-2 implies moderately thinning, and a Z-score <-3 implies severely thinning. This cutoff point has been utilized by several recent studies worldwide on under-nutrition among adolescents. The socio-economic status was obtained using modified B.G. Prasad socioeconomic status classification (revised for year 2014, CPI 2001 as base). There are five classes under this: upper class (I) (>Rs.5,357), upper middle class (II) (Rs.2652-5356),

middle class (III) (Rs.1570-2651), lower middle class (IV) (Rs.812-1569), and lower class (V) (<Rs.811).[10] The responses by each participant were entered into excel sheet and data was tabulated and for statistical analysis using SPSS 16.0. The percentages were calculated and the Chi-square test was applied wherever necessary and required.

Results

Present study conducted in two government schools had a total of 649 boy participants studying in 9th to 12th standards. Overall mean age of study participants was 15.5 years (Table 1).The mean height and weight were calculated for each class group and for all groups together mean height and weight came out to be 163.5 cm and 50.4 kg. BMI derived from height and weight was also sorted for individual class groups and it was noticed that for 9thstandard, mean value of BMI (17.9) was lowest and it was highest for 12th standard (19.5) This difference was statistically significant (ANOVA test F-value = 8.9, P <0.05). The mean value of BMI for all participants together was 18.7 (Table 1).

The proportion of adolescents who were undernourished based on BMI Z Score came out to be 36.7% (13.3% severely undernourished and 23.4% moderately undernourished). When undernourished status was derived for age groups, it was found that proportion of undernourished adolescent increases significantly (P <0.05) as the age progresses (Table 2). Nearly every fourth participant belonged to dominant caste. The proportion of undernourished adolescents was significantly (P = 0.02) higher among scheduled caste participants when compared to participants of other categories (Table 2); also height (166.6 ± 9.3) and weight (53.1 ± 10.5) were significantly (ANOVA test for height, F-value = 9.6, P < 0.05), (ANOVA test for weight, F-value = 6.4, P = 0.002) higher among general category participants than other category participants (Scheduled Caste: height 162.5 ± 10.3, weight 49.3 ± 11.0), (Dominant caste: height 162.7 ± 8.1, weight 50.1 ± 10.0).

Class	Age (in years)	Height (cm) Mean ± SD	Weight (Kg) Mean ± SD	BMI (Kg/m^2) Mean ± SD (P < 0.05)
9th	14.7 ± 1.3	154.5 ± 9.5	42.6 ± 9.4	17.9 ± 3.1
10th	14.9 ± 1.0	161.4 ± 7.7	49.4 ± 12.0	18.9 ± 3.8
11th	16.1 ± 0.9	167.3 ± 6.9	52.7 ± 9.6	18.7 ± 2.7
12th	16.3 ± 1.3	168.1 ± 7.7	55.3 ± 8.7	19.5 ± 2.9 *
Overall Result	15.5 ± 1.4	163.5 ± 9.7	50.4 ± 10.8	18.7 ± 3.1

*Statistically significant

Table 1.Class wise mean values for age, height, weight and BMI among study participants

Age group (in years)	N = 649 (%)	Undernourished (Thinning) BMI Z Score <-2		Test of significance Chi Square; p value
		YES n = 238 (36.7%)	NO n = 411 (63.3%)	
12-14 years	165 (25.4)	54 (32.7)	111 (67.3)	47.7; < 0.05
15-17 years	449 (69.2)	169 (37.6)	280 (62.4)	
≥18 years *	35 (5.4)	15 (42.1)	20 (57.1)	
Caste				
General	145 (22.4)	42 (28.9)	103 (71.1)	6.49; 0.02
SC/ ST *	328 (50.5)	135 (41.1)	193 (58.9)	
Dominant caste	176 (27.1)	61 (34.7)	115 (65.3)	
Class				
9th	162 (25)	63 (38.9)	99 (61.1)	20.1; < 0.05
10th	87 (13.4)	27 (31)	69 (69)	
11th *	246 (37.9)	102 (41.5)	144 (58.5)	
12th	154 (23.7)	46 (29.9)	154 (70.1)	
Mother's education				
Illiterate *	181 (27.8)	81 (44.7)	100 (55.3)	10.2; 0.017
Primary school	144 (22.2)	56 (38.8)	88 (61.2)	
Middle school	93 (14.4)	32 (34.4)	61 (65.6)	
High school or above	231 (35.6)	69 (29.8)	162 (70.2)	

*Statistically significant

Table 2.Distribution of undernourished study participants for different variables

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Modified B.G. Prasad SES Classification	N=649 (%)	Undernourished (Thinning)		Test of significance Chi square; p value
		Yes n = 238 (36.7%)	No n = 411 (63.3%)	
Class I	3 (0.5)	0 (0)	3 (100)	14.8; 0.005
Class II	109 (16.8)	28 (25.7)	81 (74.3)	
Class III	241 (37.1)	91 (37.8)	150 (62.7)	
Class IV *	287 (44.2)	112 (39.0)	175 (61.0)	
Class V *	9 (1.4)	7 (77.8)	2 (22.2)	
Fruit intake/ week				
No intake *	52 (8)	24 (46.1)	28 (53.9)	7.9; 0.019
1-2 times/ week	537 (82.8)	201 (37.4)	336 (62.6)	
3 or more times/ week	60 (9.2)	17 (28.3)	43 (71.7)	
Food intake outside/week				
No intake *	318 (49)	95 (29.9)	223 (70.1)	18; < 0.05
1-2 times/ week	160 (24.7)	58 (36.2)	102 (63.7)	
3 or more times/ week	171 (26.3)	85 (49.7)	86 (50.3)	
Sleep hygiene				
<4 hours/ day *	36 (5.5)	27 (75.0)	9 (25.0)	24; 0.001
>4 hours/ day	613 (94.5)	211 (34.4)	402 (65.6)	

*Statistically significant

Table 3.Distribution and relationship between under-nutrition and different variables

While comparing class wise, 11th standard followed by 9th standard were significantly (P <0.05) leading the groups in terms of high proportion of undernourished. As education and health are correlated, in the present study, the mothers with higher level of education were having significantly (P = 0.017) least proportion (29.8%) of undernourished participants (Table 2).

The present study showed that most participants belonged to Class III and Class IV of Modified B.G. Prasad SES Classification and it was also revealed that there is a significant (P = 0.005) increase in proportion of undernourished adolescents as we move from higher to lower socio-economic class (Table 3). Adolescents with higher consumption of fruits were having lower under-nutrition rate. Faulty food habits like consumption of food outside/ from hawkers/ streets and poor sleep hygiene, were more prevalent among undernourished adolescents.

Discussion

Adolescence is an important stage of growth and development that requires increased nutrition. The transition may extend over variable periods of time, depending upon socio economic factors. Even in given culture, adolescents are not a homogeneous group, with wide variations in development, maturity and lifestyle. But it has often failed to get increased attention as observed in childhood with regards to health related uses and interpretation of anthropometry. This study highlights the level of under-nutrition among the school adolescents in male population as opposed to earlier studies considering heterogeneous population. In the present study, 649 students participated and out of them, 34.6% were having undernourished status. There is a huge variation regarding prevalence of under-nutrition in India and it could be due to different standards used to judge under-nutrition. The prevalence of under-nutrition in the studies of Banerjee et al. (37.8%), Iyer et al. (30.5%), and Deka et al. (31.5%)[11,12,13] were close to present studies, whereas studies conducted by Vashisht et al. (26.7%) in 2009, and by Bose et al. (20.8%) showed lower prevalence.[14,15] But in studies by Saluja et al. (49.5%) and Dasgupta et al. (47. 3%), the prevalence was comparatively higher.[16,17] While moving to mean BMI, in the present study, it has been clearly observed that, it increases consistently and significantly with progression of age and was in pursue with findings of Dasgupta et al., Kanade et al. and Das et al.[17,18,19] On similar grounds, the prevalence of under-nutrition was significantly more in higher age group than lower age group participants, and this agreement was reflected in Vashisht et al., Haboubi et al., and Deka et al. studies[13,14,20] but was in contrast with those of Das et al. and Deshmukh et al.[19,21] The caste wise distribution of under-nutrition shows a significantly higher prevalence among schedule caste participants (41.1%) in the present study and that by Rajeratnam et al.[22] An attempt was made to look into some of the

variables regarding the prevalence of under-nutrition and the variables studied were socioeconomic status, and literacy levels of mother. With progress in both education levels of mothers and socioeconomic status of families, the decreasing trend of under-nutrition was revealed among adolescents, which was in favor with other studies;[12,13,23] and association was found to be significant, but Bhattacharyya et al.[24] considered the mother's education as a stronger indicator than socio-economic status for association with under-nutrition. The dietary behavior or pattern and sleep hygiene variables among adolescents are being much studied for overweight and obesity in India, but in our present study when participants were interviewed about these variables, the adolescents with faulty dietary habits and deranged sleep among undernourished participants were significantly more concentrated on , which was in accordance with Ahmed et al.'s work.[25]

The study represents an adequate sample size and response rate. The WHO Z-Score for BMI was used to derive the undernourished status (thinning), and inference of under-nutrition with various variables showed statistical significance which reflects the strength of the present study. Also the results were shared with the school health promotion advisory boards to generate information on the stakeholders' perception about the issue and ways to address it. But due to time constraints and conduction of study near the exam months, permission was obtained from very few schools and also the study was limited to only adolescent boys of 9th to 12th standards; so comparison between girls and boys with the various factors was not made. This could be considered as a limitation of this study.

Conclusion

The study has attempted to look at some of the important determinants that characterize the nutrition transition. India is a country of stark inequalities in income and health risks. The determinants identified for under nutrition stresses the role of socioeconomic and dietary factors on nutritional status. So, the variation in proportion and severity of under-nutrition is of obvious importance for the formulation of health and development policies at the community level.

Therefore there is a need for health promotion activities in school children by providing an enabling environment and improving nutritional status of the adolescents, which will go a long way in maintaining the health of the country. In conclusion, nutritional status of the studied participants is not impressive among adolescent boys. There is an urgent need of an intervention strategy through community based nutrition awareness.

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Conflict of Interest: None

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