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Research Article

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A population based study to assess the nutritional status of adolescents of Hajipur village of Katihar district, Bihar, India

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ABSTRACT

Background: Adolescents are the future generation of any country. They constitute 22.8 percent of the total population in India. The main nutritional problems affecting adolescent population include undernutrition and iron deficiency anaemia besides other factors. The objective of the study was to assess the nutritional status among adolescents

Methods: A Community based cross sectional descriptive study. Rural field practice area of Department of Community Medicine, Katihar Medical College, Katihar, Bihar. Participants: 400 adolescents (213 boys and 187 girls). Systematic random sampling technique was used. Data collected was entered in Microsoft Office Excel and analysed by using SPSS version 20.0.

Results: Among 400 adolescents, 253(63.25%) adolescents had Body Mass Index less than normal (18.5kg/m2) value. Prevalence of undernutition in the adolescent girls was high (36.75%) and prevalence of overweight in adolescent boys and girls is 1.25% and 1% respectively. Prevalence of chronic energy deficiency (CED) based on BMI (gradeI, II, III) in adolescent girls are 21.25%, 7.25%, 8.25% respectively. And CED grade I, II, III in adolescent boys are 21.75%, 1.5%, 3.25% respectively. Moderate malnutrition is higher in girls (7.25%) than in boys (1.5%) and severe malnutrition is also higher in girls (8.25%) than in boys (3.25%).

Conclusions: If the adolescents are well nourished, they can make optimal use of their skills, talents and energies and would be healthy and responsible citizens.

Keywords: Adolescents, Nutritional Status, Body mass index

INTRODUCTION

Undernutrition is a major public health problem of the adolescents. In certain cultures, from infancy onwards including adolescence, girls are at particularly high risk because of gender discrimination. Poor nutritional status during adolescence is an important determinant of health outcomes. Short stature in adolescents resulting from chronic undernutrition is associated with reduced lean body mass and deficiencies in muscular strength and working capacity. The adolescents were categorized into various grade based on BMI according to WHO

International Standard.^{2,3,4} That is, Grade 3 thinness (BMI < 16 kg/m2), Grade 2 thinness (BMI 16-16.9 kg/m2), Grade 1 thinness (BMI 17-18.49 kg/m2), Normal (BMI 18.5-24.99 kg/m2), Overweight (BMI 25-29.99 kg/m2) and Obese (BMI >30 kg/m2).⁵ Obesity can be seen as the first wave of a defined Cluster of noncommunicable diseases called "New World Syndrome" creating an enormous socioeconomic and public health burden in poorer countries. The health risks include cardiovascular diseases, diabetes, osteoarthritis, gallbladder disease and some sex hormone-sensitive cancers.⁶ Obesity is considered to be a global epidemic, has spread its major

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roots in our children and adolescents. Overweight children have double chances to become obese adult than normal children. Overweight and obesity during adolescent period are associated with risk factors for obesity-related diseases in adulthood. In several countries of Asia, for instance, poorer nutritional status of women becomes apparent during adolescence, with a delay in maturation. The low nutritional status of adolescents is a matter of a serious concern. One third of boys and girls have chronic Energy Malnutrition in India. About 59 percent boys and 37 percent girls are stunted in India. National Nutrition Monitoring Bureau (NNMB) also reported that undernutrition decreased from 78 percent in 10-13 years to 66 percent in 14-17 years.

METHODS

The present population based, cross sectional, descriptive study was undertaken among adolescents (10-19 Years) in Hajipur village of Katihar district, Bihar. The population of the Hazipur village is about 10000. The numbers of houses were approximately 1800. Data will be collected from adolescents (10-19 Years) of Hajipur village in Katihar district, Bihar. The study was undertaken during January to December (2012).

Sample Size

On the basis of this prevalence of undernutrition among adolescents the sample size of the present study has been calculated by adopting the formula:

n =
$$\frac{Z^2 \alpha / 2 \times PQ}{\sum^2}$$

Where,
P= Prevalence rate of the disease= 50%= 0.50
Q = 1 - P, = 0.50
 α = level of Significance (type 1 error)
 $Z^2 \alpha / 2 = 4$
 Σ = Allowable error 10% of P
Then n = $\frac{4x0.50x0.50}{2} = 400$

Hence the required study sample size is 400 adolescents (10-19 Years).

.0025

Sampling technique

Houses that are having at least one adolescent or more will be numbered serially. Then the houses were selected by systematic random sampling technique.

Inclusion Criteria for sampling

The study will be conducted on adolescents who were of both the gender (Adolescent boys and girls), willing to participate in the study and apparently healthy on general physical examination.

Exclusion Criteria for sampling

The study exclude adolescents who were above 19 years of age and below 10 years of age group, not willing to participate in the study, with chronic illness or receiving long term allopathic or indigenous drugs and with history of any severe illness within the past 2 weeks for which they required hospitalization.

Data Collection Method

Written informed consent was taken from the head of the household of adolescents who were below eighteen years, and direct written informed consent was taken from girls who were eighteen years and above. After establishing good rapport with the family, detailed information about socio-demographic characteristics/profile (age, education and occupation of parents, socio-economic status of the family, types of family, family size), dietary intake and contributory factors in relation with health were recorded in the predesigned and pretested questionnaire. Subject suffering from severe morbidity symptoms like URTI, ENT, Eye problems were referred to Katihar Medical College, Katihar for proper treatment.

Clinical Examination

A female attendant was present during examination of girls. Anthropometric measurement i.e., height and weight of each subject will be taken according to the standard procedure. Nutritional status of study subjects will be assessed by using various parameters viz. weight for age, height for age, weight for height, stunting and thinness (BMI for age) will be calculated as per the National Centre for Health and Statistic (NCHS).

Height

Height in centimeters was taken with the help of height measuring rod. The height was recorded to the nearest 1 centimeter.

Weight

A bathroom scale was used. It was calibrated against known weights regularly. The zero error was checked form and removed if present, every day. The clothes of the girls were not removed because adequate privacy was not available. So girls were asked to wear light weighted cloths. Their weight was recorded to the nearest 500 gms.

Body Mass Index

Body Mass Index (BMI) is defined as weight in kg divided by height in square meter (kg/m²). Chronic energy deficiency in adults can be measured by body mass index.

Data analysis

Data collected was entered in Microsoft Office Excel and analysed by using SPSS version 20.0. Dependent variable frequencies, percentage, mean, range and proportion were calculated. Chi-square test and Yate's correction were used for statistical analysis. The differences were considered as significant at a p value of <0.05.

RESULTS

Among 400 adolescents (213 boys and 187 girls) the largest number of adolescents 41.5% belong to 10-14 years of age group followed by 32.5% and 26% in the age group 15-17 years, and 18-19 years respectively. Out of them 53.25% and 46.75% are boys and girls respectively. And 24.75% boys and 16.75% girls are in age group of 10-14 years followed by 17.75% boys, 14.75% girls and 10.75% boys, 15.25% girls in age group 15-17 years and 18-19 years respectively. The mean age of dolescent boys and girls is 14.5±SD2. 89 years and 15.37±SD2. 82 years respectively (Table 1). As can be seen from Table 2 mean weight, mean height and mean Body Mass Index in adolescent boys are 39.37±SD6. 55 kg, 1.43±SD. 1m and 19.21±SD2. 14kg/m² respectively and mean weight, mean height and mean Body Mass Index of adolescent girls are 36.67kg±SD6. 3kg, 1.43±SD. 1m and 17.76 ±1.91 kg/m² respectively. It is clearly seen from Figure 1 prevalence of undernutition in the adolescent girls was high 147 (36.75%) and prevalence of overweight in adolescent boys and girls is 5 (1.25%) and 4 (1%) respectively (χ^2 value= 36.786, df=2,p<0.0001). It appears from Table 3 that 63.25% adolescents are underweight (BMI<18.5) and prevalence of chronic energy deficiency (CED) based on BMI (grade I, II, III) in adolescent girls are 21.25%, 7.25%, 8.25% respectively and CED grade I, II, III in adolescent boys are 21.75%, 1.5%, 3.25% respectively. Moderate malnutrition is higher in girls (7.25%) than in boys

(1.5%) and severe malnutrition is also higher in girls (8.25%) than in boys (3.25%).

Table 1: Distribution of adolescent boys and girls according to age group.

Variables (in Years)	Description	Boys (%)	Girls (%)	Total (%)
10-14	Early adolescent	99 (24.75)	67 (16.75)	166 (41.5)
15-17	Mid adolescent	71 (17.75)	59 (14.75)	130 (32.5)
18-19	Late adolescent	43 (10.75)	61 (15.25)	104 (26)
Total		213 (53.25)	187 (46.75)	400 (100)

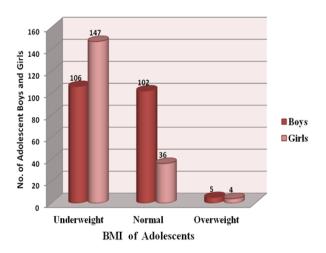


Figure 1: Nutritional status of adolescent boys and girls according to body mass index (BMI).

Table 2: Mean weight, mean height and mean BMI of adolescent boys and girls.

Mean	Boys	Standard Deviation (±SD)	Standard Error (±SE)	Girls	Standard Deviation (±SD)	Standard Error (±SE)
Mean Weight (kg)	39.37	6.55	0.49	36.67	6.3	0.46
Mean Height (m)	1.43	0.1	0.01	1.43	0.1	0.01
Mean BMI (kg/m ²)	19.21	2.14	0.15	17.76	1.91	0.14

Table 3: Malnutrition (chronic energy deficiency) in adolescent boys and girls.

Chronic Energy Deficiency (CED)	BMI (kg/m²) of Adolescents	Boys (%)	Girls (%)	Total (%)
Grade I	Mild thinness (17.00-18.49)	87(21.75)	85(21.25)	172(43)
Grade II	Moderate thinness (16.00-16.99)	6(1.5)	29(7.25)	35(7.25)
Grade III	Severe thinness (<16.00)	13(3.25)	33(8.25)	4611.5)
	Total	106(26.5)	147(36.75)	253(63.25)

It is clearly seen from Figure 2 that 105 (26.25%), 80 (20%) and 68 (17%) of adolescents in age group 10-14

years, 15-17 years and 18-19 years are underweight $(<18.5\text{kg/m}^2)$ respectively. 5 (1.25%) 3 (0.75%) and 1

(0.25%) of adolescents in age group 10-14 years, 15-17 years and 18-19 years are overweight (>25 kg/m²) respectively. Prevalence of under nutrition decreases with increase age group and also observed that the finding of the study lead us to conclude that a significant relation does not exist between the subjects BMI with age group $(\chi^2 \text{ value}=1.486 \text{ df}=4, \text{ p}>0.05)$.

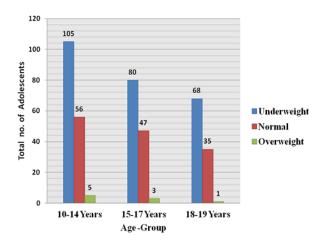


Figure 2: Prevalence of Undernutrition According to Age group.

DISCUSSION

Similar to our study Dambhare et al. 13 found that 68.97% were boys and 31.03% were girls. Mean age of the adolescents was 13.16±1.99. Patil et al. 4 stated that 5.3 % of adolescent girls were in age group 11-14 years, 32.7% in the age group 15-17 years, 61.9 % were in the age group of 17-19 years. The mean age adolescent girls were 16.9 years. Kumar observed in a study that 69 (28.2%) were in early adolescent (10-13 years), 73 (29.8%) were in mid adolescent (14-15 years) and 103 (42%) were in late adolescent (16-19 years) and the mean age of the girls was 15.2.15 Prajapati et al reported that mean weight and height of the adolescents were 45.34 kg (2 SD= 11.08) and 147.35 cm (2SD= 9.99) respectively. Mean BMI was 22.71 kg/m² (2 SD=35.06). 16 Gupta et al observed that mean height and mean weight of the girls 40.69+12.60kg found 151.012+13.36cm, respectively.¹⁷ Jain et al (2010) reported that prevalence of overweight and obesity was found to be19.7% and 5.3% in girls and 18.36% and 10.82% in boys. Obesity was found to be significantly associated with high intake of Junk foods (p<0.05), binge eating, high calorie intake (p<0.05), lower physical activity (p<0.05) and prolonged TV watching (<0.05). Wasnik et al. reported that according to WHO reference standards, 2.9% was found to be overweight and none of the girls was found to be obese. As per new guidelines by the Government of India 5.8% was found to be overweight (BMI >23.5 kg/m²).¹⁹ Dambhare et al. found in a study, that 48.3% of the adolescents were normal and 51.7% were malnourished.¹³ Chowdhry et al reported that BMI less than 19 kg/m² to be as high as 69% in rural Varanasi.²⁰

Sethi and Kapoor reported that prevalence of obesity was 7.8% and 13.4% from Delhi.²¹ Dey et al stated that and only 3% were at risk of overweight while none of them was obese.²² Jayatissa et al. reported that prevalence of over weight was 4.0%. 23 Choudhary et al. reported that 68.52% of the adolescents had BMI less than 18.5 in rural area of Varanasi.²⁴ Shahabuddin et al. observed that 59.0% adolescent girls were thin.²⁵ This higher figure of thinness in their study may be attributed to poor socioeconomic conditions of rural Bangladesh. Shivaramakrishna et al. found in a study that 73.3% girls were under-nourished (BMI< 18.5) and prevalence of chronic energy deficiency based on BMI (grade I, II and III) were 23.0%, 28.3%, and 22.2 % respectively. ²⁶ Garba et al. conducted a study and found that the severe malnutrition was higher in girls (23.8%) than in boys (22.3%), while moderate malnutrition was higher in boys (93.1%) than in girls (86.7%). ²⁷ Dey et al. stated that and only 3% were at risk of overweight while none of them was obese. 40% of the adolescents undernourished and 0.5% had BMI greater than 2SD. Severe malnutrition was found to present in 27% boys and 29% girls.²² Wasnik et al observed that 56.4 % girls were under-nourished (BMI <18.5 kg/m²). Girls suffering from chronic energy deficiency grade I, II and III were 25.2%, 15.2% and 16 % respectively. 19 Maiti et al observed in a study that only 28.2% girls were normal and 25.7%, 30.4%, 13.7%, and 1.9% of adolescent girls were suffering from CED Grade I, Grade II, Grade III and Grade IV respectively. 28 Alam et al observed that the prevalence of undernutition in the adolescent girls was high; 9% were severely thin, 16% moderately thin and 0.3% obese. The prevalence of thinness was higher in early and late adolescence (it was 31% at the age of 13 years, fell to 20% at the age of 15 years, and increased to 33% at the age of 18 years). Of the pre-pubertal girls, 58% were thin, suggesting that under nutrition had delayed puberty.²⁹ Kumar found in a study that prevalence of stunting was 47 (19.2%) and wasting was 69 (28.2%). Prevalence of under nutrition were common among the girls in the late adolescent group, Hindus, those who lived joint family, low monthly income and with the family size more than 7.15 Maliye et al documented in a study that 57% of the adolescent girls were thin and 43% were normal. None of them were overweight or obese. The prevalence of thinness was significantly higher 67.6% in early adolescence than in late adolescence 55.4%. 30 Bisai, et al observed that rate of underweight was more among late adolescents than early adolescents, because it was found that this late adolescent age group was more health conscious related to weight.³¹

CONCLUSION

Poor nutritional status during adolescence is an important determinant of health outcomes. Short stature in adolescents resulting from chronic undernutrition is associated with reduced lean body mass and deficiencies in muscular strength and working capacity.

From infancy onwards adolescent girls are at high risk of undernutrition because of gender discrimination. Due to poorer nutritional status, heavy workload lead to chronic deprivation of food particularly during the period of growth and development leads to chronic malnutrition and short stature of girls.

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Institutional Ethics Committee

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