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### NUTRITIONAL STATUS OF ADOLESCENTS FROM ANANTAPUR IN SOUTH INDIA

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#### ABSTRACT

**Objective:** To study the nutritional status of adolescents in Anantapur district of Andhra Pradesh, South India.

**Method:** This is a community based cross sectional study with 360 school going children to determine the anthropometric profile and nutritional status based on body mass index. Data was collected by interviewing the adolescents using predesigned, pretested, semi- structured schedule. Anthropometric measurements are recorded using standardized methodology as recommended by world health organization. **Results:** Prevalence of chronic energy deficiency was found based on BMI (Grade 1, Grade 11, Grade 111) for boys were 17.6%, 13.2%, and 42.3% respectively, 25.2% were found within the normal range and 1.6% were overweight. Among the girls based on BMI 15.2%, 13.5%, and 25.8% were suffering from mild, moderate and severe under nutrition. Only 39.9% of the girls were found normal and 3.9% were found over weight and 1.7% was found obese. **Conclusion:** It is concluded that a high prevalence of under nutrition among the school going adolescence in the community.

#### KEYWORDS

Body Mass Index, Nutritional status, Anthropometric measures and Under nutrition.

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#### INTRODUCTION

The word Adolescence is derived from Latin word 'Adolescere' means to 'grow into maturity'. Adolescence period is characterized by rapid increase in height, weight and hormonal changes (Gupta, 1990). According to world health Organization (WHO) adolescence is a period from 10 to 19 years of age, defined by physical, psychological and social changes and is classified into two early adolescence between 10-14 years and late adolescence between 15-19 years.

Adolescence period is a period of transition from childhood to adulthood (WHO, 2007). In India

adolescence group constitutes 21.4% of total population comprising one-fifth of the total population (UNFPA, 2011). Adolescent period is a time of preparation for undertaking greater responsibilities and to ensure healthy all-round development (WHO, 1997).

During this period 35% of adult weight and 11-18% of adult height are acquired (Rao, 1985). India being a developing country shows a rapid epidemiological, nutritional transition and demographic transition imposed by the thread of under and over-nutrition (Misra and Khurana, 2008).

Inappropriate nutritional habits and unhealthy life style are important health threatening factors that lead to chronic diseases in adulthood (Eisenmann, 2004). Nutrition is an important factor influencing the quality of human life and nutritional status is an indicator to assess the countries health status. As per WHO, the intension of nutritional assessment is to improve human health (Mahajan and Srivastav, 2013).

Anthropometric measurements are used in diagnosis of under nutrition. It is an inexpensive and noninvasive technique for the assessment of body size and proportion (WHO, 1995).

However, there is very little information about diet and nutritional status of adolescents particularly from Anantapur district. In view of the above facts, the present study is an attempt to assess the nutritional status of adolescents in six schools of Anantapur district, Andrapradesh.

## **MATERIAL AND METHODS**

An Anthropometric study involving 182 adolescent boys and 178 adolescent girls (13-15years) attending six schools in Anantapur town was selected for the study.

### **Study design and study population**

A school based descriptive study; cross sectional in design was carried out in six schools of Anantapur District, Andhra Pradesh during 2009 after obtaining the consent from school authorities. An Anthropometric study involving 182 adolescent boys and 178 adolescent girls in the age group of 13-15 years studying in class VIII and class XI formed the study population.

### **Inclusion criteria**

Adolescents of both the sexes studying in class VIII and Class IX between 13-15 years of age who were not ill and present during the study period and was willing to participate were included in the study.

### **Exclusion criteria**

Students of class VIII and class IX who were seriously ill or absent during the study period or non-willing to participate were excluded from the study.

### **Study tools**

A predesigned, pretested, semi structured questionnaire was used to collect the information. The schedule had information regarding socio-demographic status i.e. age, sex, religion, type of family, family size, and income. The second section consisted of study subjects anthropometric measurements.

### **Study variables**

Age, sex, class, religion, type of family, family size, per capita income, anthropometric measurements (height, weight, BMI) were the study variables.

### **Measurements**

Anthropometric measures of participants including height and weight were taken. Height was recorded using standard non-stretchable measuring tape with 0.1 cm precision. Before measurements, students stood straight next to the wall without shoes. The students without shoes and in light clothes were weighed by using a weighing machine having a precision of 0.5 Kg. Checks on the scale were made routinely before recording the weight measurement of each student and the pointer adjusted to zero using the screw provided. Body mass index (BMI) was calculated as per the formula  $\text{Weight (Kg)} / \text{Height (m}^2\text{)}$ .

### **Statistical analysis**

The physical growth data obtained from the school children was processed and statistically analyzed by comparing with NCHS and ICMR standards. Data was entered in micro soft office Excel and analyzed using SPSS version of 21 for windows. Mean standard deviation along with percentile values were calculated for weight, height and BMI for all ages.

## RESULTS

Socio- economic background of 360 school going adolescents were given in Table No.1.

The study revealed that 44.5% of the children were 13 year old males, 48.4% were 14 year old and 7.1% were 15 year old boys. Similarly among the girls 54.5% were 13 year old, 41% are 14 years and 4.5 % are 15 year old. Maximum students belong to Hindu religion (boys 89.9% and girls 83.1%) followed by Muslims (14.8% and girls 11.9%), Christians (3.8% boys and girls 3.9% and jains (boys 0.5% and girls 1.1%) respectively. Higher percentage of students belongs to nuclear family. Among boys, 79.1% and girls, 74.7 % belong to nuclear family and 20.9% of boys and 25.3% belong to joint family system. Maximum number of students belongs to small family size that is family size less than 4 members (boys 59.3% and girls 52.3%). Medium family size consists of 5-6 members and large family size consist  $\geq 7$  members consists of 25.3% and 15.4% of boys and 27.5% and 20.2% girls respectively. Prashant and Chandran (2009) observed that 87.7 % adolescent girls in urban slum area of Andrapradesh belong to large family size, more than 5 members. Monthly income of the family was categorized in the current study and the study reveals 20.3% of boys and 19.1% girls belong to low income group and 38.5% of boys and 41.6% of girls were in Rs 5000-10,000 range and 25.3% boys and 23.6% girls were in Rs,10,000-15,000 category, 15.4% boys and 15.2% girls belong to more than Rs 15,000. The mean distributions of weight of the adolescents are given in Table No.2.

The mean weight of adolescent boys and girls was significantly lower than the ICMR and NCHS reference value ( $p < 0.05$ ) for 14 and 15 years. Thirteen year boys revealed no significant difference among standard weight of ICMR and mean weight of study sample. However significant difference was observed when compared to NCHS standards. The mean weight of adolescent girls at 13 and 14 years was significantly lower (0.01) than ICMR and NCHS reference value. In 15year olds no significant difference was found between standard weights of ICMR and mean weight of the girls, whereas significant difference was observed compared to

NCHS standards. The mean height distributions of students are given below (Table No.3).

The mean height of adolescent boys in 13, 14 and 15 years was significantly lower than ICMR and NCHS reference value. The mean height of adolescent girls was significantly lower than ICMR values at 13 and 14 years and not significant at 15 years. Compared to NCHS standards significant difference was observed at 14 years and no significant difference was observed at 13 and 15 years. This is in accordance with Anand *et al* (1999) where in prevalence of stunting (height for age) as 41 percent and 19.9 percent as per NCHS and Indian standards among rural north Indian adolescent school children. The anthropometric measurements of adolescents were not satisfactory compared to standards. BMI reflects the positive association between weight and height of individual (Khan *et al*, 2004).

BMI for age acts as a good indicator for assessing the nutritional status of adolescents. From Table No.4 it is evident that 42.3% of boys were severely under nourished and 13.2 % were moderately malnourished and 17.6% mildly malnourished. However 25.2% had normal BMI for age and 1.6% were overweight.

Among girls, 39.9% had normal BMI for age which was significantly higher than boys. However 25.8% of girls were severely under nourished which was significantly lower than the boys and 13.5% were moderately malnourished and 15.2% mildly malnourished and not significant compared to boys. Only 3.9% of girls were overweight and 1.7% were obese. This pattern of the nutritional status was reported by Poh Siang (1990) on the nutritional status of 104 Indian children in the rubber plantation sector of Malaysia and the study revealed 42% of male and 37 % of female children were under weight, while 39% male and 27% of females were stunted. Deshmukh *et al* (2006) observed 54% as lean in the rural area of Wardha.

## DISCUSSION

Diet is one of the important and modifiable life style determinants of health. Malnutrition includes both under and over nutrition, plays a major role in morbidity and mortality. Assessment of nutritional

status acts as a corner stone to improve the health of individuals and population. In the present study under nutrition was more prevalent in boys than girls. Similar observation was reported by Venkaiah *et al* (2002) who observed prevalence of under nutrition in boys (56%) and girls (40%) and Hasan *et al* (2011) observed boys (53.85%) and girls (49.25%) respectively. Singh *et al* (2014) also reported that gender specific prevalence was greater

in boys (28.06%) than girls (23.92%). Ferro-Luzzi and Sharma (2005) revealed a relationship between BMI and socio-economic status. The children suffering from thinness are more likely to develop into lean adults with lower BMI that affects the work efficiency and work output that has an impact on percapita income. They are also more prone to morbidity and mortality (WHO, 1995; Strickland, 2002).

**Table No.1: Socio - economic distribution of adolescents**

Particulars	Gender			
	Male		Female	
Age	Number	Percentage	Number	Percentage
13	81	44.5	97	54.5
14	88	48.4	73	41.0
15	13	7.1	8	4.5
Total	182	100	178	100
<b>Religion</b>				
Hindu	147	80.9	148	83.1
Muslim	27	14.8	21	11.9
Christian	7	3.8	7	3.9
Jain	1	0.5	2	1.1
<b>Type of family</b>				
Nuclear	144	79.1	133	74.7
Joint	38	20.9	45	25.3
Total	182	100	178	100
<b>Family size</b>				
Small (1-4)	108	59.3	93	52.3
Medium ( 5-6)	46	25.3	49	27.5
Large (>7)	28	15.4	36	20.2
Total	182	100	178	100
<b>Monthly income</b>				
< 5000	37	20.3	34	19.1
5,000-10,000	70	38.5	74	41.6
10,000-15,000	46	25.3	42	23.6
10,000-15,000	46	25.3	42	23.6
>15,000		100	178	15.2
<b>Not working</b>	1	0.5	1	0.5
<b>Total</b>	182	100	178	100

**Table No.2: Distribution of mean weight (Kg) of adolescents by gender in comparison to ICMR and NCHS data**

Age	Mean weight $\pm$ SD	ICMR standard	P value	NCHS standard	P value
<b>Boys</b>					
13	39.06 $\pm$ 9.45	40.9	0.084	45.0	0.001
14	41.01 $\pm$ 10.11	47.0	0.001	50.8	0.001
15	42.61 $\pm$ 8.40	52.6	0.001	56.7	0.001
<b>Girls</b>					
13	40.58 $\pm$ 9.95	44.0	0.001	46.1	0.001
14	42.84 $\pm$ 8.79	48.0	0.001	50.3	0.001
15	44.25 $\pm$ 10.25	51.5	0.091	53.7	0.038

**Table No.3: Distribution of mean height (cm) of adolescents by gender in comparison to ICMR and NCHS data**

Age	Mean height $\pm$ SD	ICMR standard	P value	NCHS standard	P value
<b>Boys</b>					
13	148.47 $\pm$ 18.62	153.0	0.001	156.5	0.031
14	155.27 $\pm$ 8.53	160.0	0.001	163.1	0.001
15	157.03 $\pm$ 12.64	166.0	0.005	169.0	0.025
<b>Girls</b>					
13	149.64 $\pm$ 15.69	150.0	0.001	157.1	0.824
14	151.88 $\pm$ 8.19	155.0	0.001	160.4	0.002
15	152.62 $\pm$ 11.19	161.0	0.054	161.8	0.072

**Table No.4: Distribution of mean body mass index of adolescents by gender**

S.No	Body Mass Index	Boys		Girls		Total	
		Number	(%)	Number	(%)	Number	(%)
1	Severe under nutrition	77	42.30	46	25.8	123	34.2
2	Moderate under nutrition	24	13.2	24	13.5	48	13.3
3	Mildly undernourished	32	17.6	27	15.2	59	16.4
4	Normal	46	25.2	71	39.9	117	32.5
5	Over weight	3	1.6	7	3.9	10	2.8
6	Grade 1 obesity	0	0	3	1.7	3	0.8
7	Total	182	100	178	100	360	100

## CONCLUSION

The high incidence of malnutrition may be due to low per capita income, improper and inadequate food consumption, unawareness of food guide pyramid and balanced diet concepts and poor prenatal nutrition.

Adolescent friendly health services such as health and nutrition education and nutrition interventions could be used to improve the overall nutritional status of adolescents.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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