



# Assessment of Anthropometric measurements of the Adolescents studying in MadhyamikShala of Khadia, Junagadh

Alpa D. Odedra, Dr. Shital R. Sodha, Prof. Dr. Nilambari Dave (HOD of Home Science Department, Saurashtra University)

Smt. S.B. Gardi Institute of Home Science, Saurashtra University, Rajkot (Gujarat) India

## ABSTRACT

Adolescence, a period of transition between childhood and adulthood, occupies a crucial position in the life of human beings. The primary causes of under nutrition in India are its large population, socio-economic differences and inadequate access to health facilities. Nutritional assessments among adolescents are important as they are the future parents and constitute a potentially susceptible group. Studies on the assessment of nutritional status of adolescents are less in number and a National database has not yet been developed.

Adolescence is a period of growth and maturation in human development. The nutritional status of adolescents, contributes significantly to the nutritional status of the community. This period is characterized by an exceptionally rapid rate of growth. Adolescents have the lowest mortality among the different age groups and have therefore received low priority. A cross sectional based – study covering over 100 adolescents aged 13-17 years were enrolled for the study in MadhyamikShala of Khadia of Junagadh district. Nutritional status of study subjects were assessed by using various parameters viz, Weight for Age, Height for Age and BMI at different age points were compared with the corresponding reference values in addition to the anthropometric measurements. According to the nutritional assessment nearly 68% of adolescents were underweight whereas, only 32% of adolescents were normal weighted. There were no obese or over weight adolescents seen in the study. Out of those 68 % of Underweight adolescents, 40% were from the age group of 13-15 years and 28% of adolescents were belonging to the age group of 16-17 years.

**Key Words:** Adolescence, Nutritional status, Adolescents, MadhyamikShala, Kahdia

## INTRODUCTION

Adolescence is the foundation of the youth. As Adolescence is healthy and nourished, so do the youth and their communities and it's our society's duty to ensure that Adolescents are well fed. Adolescence is the period age of potential opportunities. Adolescence is the most important time in one's life as it is the transitional period of the childhood to the adulthood, whereas various physical, psychological, and emotional changes occur. These drastic change demands the ample amount of energy and other nutrients. The intake of nutrients play a major role in the rapid growth spurt which occurs during the adolescence period. WHO defines 10-18 years of children as adolescents<sup>16</sup>.

### **Physical and Psychological changes in adolescents:**

There are specific stages of development which both the gender experience during this period of age. Significant changes occur in both the gender variedly.

#### **Boys:**

**Physical change:** Each adolescent is unique in its own way of growth but few changes are gradual rather than one single event. During adolescence, boys experience the rapid increase in height. The voice become rough and loud. They develop the Adam's apple during puberty. The gradual process of sexual maturation starts in this age due to the hormonal swifts. Among them, the enlargement of sexual organs are the very first thing. Appearance of pubic hair and on underarms and on face is also noticeable during this period of age.

**Psychological change:** Adolescents boys feel attraction towards the opposite sex. They feel pressure and the social stress, which is quite usual in this age. Seek the attention and acceptance from friends.

#### **Girls:**

**Physical change:** During adolescence, girls' growth is on peak; rather their growth is faster than adolescent boys. The increase in height is significant. Sexual maturation (puberty) is the sequence of events. Breast budding is noticeable. They develop hair on genitals and underarms are evident. The voice becomes sharper and thinner. Menstruation cycle starts during this stage of life which lasts until age of around 50 which differs individually.

**Psychological change:** Adolescents girls feel attraction towards the opposite sex. They feel shame, hesitant, conscious about their appearance.

Some common psychological changes can be seen in both the gender. They are susceptible to emotional pleas so they may be manipulated easily. Unpredictable mood swings are natural in this period. They develop the capability to deliberate conceptually. They start comparing own self with friends and class-mates. They long for freedom or independence from parents.

Hence, adolescence is the period of fastest growth and development which requires higher amount of nutritional support.

## MATERIALS AND METHODS

The researcher collected data from MadhyamikShala of Khadia to conduct this study.

The study samples consisted of randomly selected 100 adolescent boys and girls from standard 9<sup>th</sup> and 10<sup>th</sup>.

The cross-sectional method was designed in such a way that subjects from all socio-economic classes were included. Since time and resources made it obligatory to study the subjects from educational institutions rather than from the community, it was necessary to choose particular school that consisted of subjects from all socio-economic groups as reflected in Khadia, the rural part of Junagadh City to reduce bias. The consent from the school Principal has been acquired before the study. Specially designed questionnaires were used to elicit information from the participating subjects about their age, sex, date of birth, family/personal background, medical history, socio-economic and nutritional status, family size, parent's occupation and educational status. The questionnaires were kept anonymous as well as confidential in order to encourage good response. The ages of the subjects were pertained from the schools register.

Anthropometric measurements such as height, weight were measured using standard methods.

### Weight Measurements

Using bathroom scale weighing balance the weight of 100 adolescents was taken. Weight was measured for the individual under basal conditions with minimum clothing and without shoes. The zero error of the weighing scale was checked before taking the weight and corrected when required.

### Height Measurements

The height of the selected adolescent girls was measured using a Stadiometer. The subjects were asked to stand straight on a levelled surface with heels together and toe apart, without shoes. The moving head piece of the Stadiometer was lowered to rest flat on the top of the head and reading was noted. Height nearest to ¼ or 0.5cm was taken as the final measurement.

### Body Mass Index

Body Mass Index (BMI) is an anthropometric index of weight and height that is defined as body weight in kilograms divided by height in meters squared.

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$

**Table 1 Parameters of Body Mass Index (Cole et al, 2000)<sup>8</sup>**

BMI	Interpretation of BMI Category
<18.5	Underweight
18.5-22.9	Normal
23-24.9	At risk for obesity
25-29.9	Obese I
>30	Obese II

Anthropometric measurements are the standardised indicator to assess the nutritional status of an adolescent. The anthropometric nutritional status was assessed by Height-for-age (stunting), Weight-for-height (wasting) and Weight-for-age (underweight) as per ICMR/WHO standards.

The height-for-age index is an indicator of linear growth retardation and cumulative growth deficits. Children whose height-for-age Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age (stunted) and are chronically malnourished. Children below minus three standard deviations (-3 SD) from the median of the reference population are considered to be severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height-for-age, therefore, represents the long-term effects of malnutrition in a population and does not vary according to recent dietary intake. The weight-for-height index measures body mass in relation to body length and describes current nutritional status. Children whose Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered thin (wasted) for their height and are acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Children whose weight-for-height is below minus three standard deviations (-3 SD) from the median of the reference population are considered to be severely wasted. Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below minus two standard deviations from the median of the reference population are classified as underweight.

Children whose weight-for-age is below minus three standard deviations (-3 SD) from the median of the reference population are considered to be severely underweight.

The collected data were tabulated and analysed statistically.

## RESULTS AND DISCUSSIONS

### Anthropometry measurements:

The results of the anthropometric measurements of the girls and boys of 13- 15 years of age have been compared with the values ICMR (2009) standards in table 2 and in table 3 the same measurements of girls and boys of 16-17 years of age have been compared with the reference values.

**Table 2 Anthropometric measurements of adolescents (13-15 y)**

Anthropometric Measurements	Girls (n= 33)		Boys (n=29)	
	Reference	Observed	Reference	Observed
	Value(ICMR)	value	Value	Value
<b>Height (cm)</b>	156.5	152.7±7.9	162.1	159.8±9.5
<b>Weight (cm)</b>	46.6	41.0±6.8	47.6	42.5±8.9
<b>Body Mass Index (kg/m*m)</b>	19.0	17.6±2.9	18.1	16.6± 3.0

Values are Mean ±SD

Reference values ICMR (2009)

### Height:

The mean height of school going adolescent girls( 13-15y) was 152.7 which was significantly lower than the reference value while the mean height of boys (13-15 y) was 159.8 which was also significantly lower than the reference value.

### Weight:

The data indicated the mean weight of school going adolescents. The mean weight of girls and boys of 13-15 years of age was 41.0 and 42.5kg, respectively. Both the girls and boys had significantly lower than the reference values.

### Body Mass Index:

It was found that the mean values of BMI of girls and boys (13-15y) were 17.6 kg/m<sup>2</sup> and 16.6 kg/m<sup>2</sup>, respectively.

**Table 3 Anthropometric measurements of adolescents (16-17 Y)**

Anthropometric Measurements	Girls (n=17 )		Boys (n=21)	
	Reference	Observed	Reference	Observed
	Value	value	Value	Value
<b>Height (cm)</b>	159.9	154.2±4.7	169.1	165.4.±7.8
<b>Weight (cm)</b>	52.1	43.6±5.8	55.4	48.2±3.7
<b>Body Mass Index (kg/m*m)</b>	20.3	18.34±1.9	19.4	17.62±1.1

Values are Mean± SD

Reference values ICMR (2009)

**Height:**

The mean height of girls and boys of 16-17 years has been depicted in table --- and it was found that the mean height of the girls was 154.2 cm. Mean height of boy was 165.4cm; the values of height for both the girls and boys were significantly lower than the reference values.

**Weight:**

Similar trend was observed for the weight in adolescents of 16-17 years of age. The mean weight of the girls was 43.6 kg while the mean weight of the boys was 48.2 Kg.

**Body Mass Index:**

Whereas the mean values of BMI of girls and boys (16-17y) were 18.34 kg/m<sup>2</sup> and 17.6 kg/m<sup>2</sup>, respectively. The recorded values of BMI in both the male and female adolescents of both the age groups were significantly lower than the reference values.

**PREVALENCE OF WASTING AND OVERWEIGHT:****Table 4 Age wise Distribution of Adolescents according to BMI**

		BMI		Total
		<18 =UW	≥18 TO ≤24.9 = NW	
<b>AGE</b>	13	12	4	16
	14	20	13	33
	15	8	5	13
	16	15	6	21
	17	13	4	17
<b>Total</b>		68	32	100

Above given table indicated the prevalence of wasting and overweight among adolescents. The data of BMI for age showed out of 100 adolescents 68% were underweight and the rest of the adolescents 32% were normal weight and 0% were overweight.

**Table 5 Gender Wise Frequency Distribution of Adolescents according to BMI**

	Normal	Wasted	Overweight	Obese
<b>Boys (n=50)</b>	31(62%)	19(38%)	0(0%)	0(0%)
<b>Girls (n=50)</b>	27(54%)	23(46%)	0(0%)	0(0%)

Gender-wise comparison of a score BMI for age indicated that prevalence of wasting and overweight in boys was 38% and 0%, respectively. The prevalence of wasting, overweight and obese however, in girls was 46% and 0% respectively. The boys had 8 % lower prevalence of wasting than girls.

**Table 6 Gender wise frequency distribution of stunting (height for age) among adolescents**

	Normal	Stunted	Severely stunted
<b>Boys (n= 50)</b>	38(76%)	10(20%)	2(4%)
<b>Girls (n=50)</b>	40(80%)	7(14%)	3(6%)

Gender wise comparison of frequency distribution of height for age indicated that prevalence of stunting and severely stunting in boys was 20% and 4% respectively. The prevalence of stunting and severely stunting however in girls was 14% and 6% respectively. The prevalence of stunting was significantly higher (6%) in boys than girls.

## DISCUSSION

The mean height of school going adolescent girls( 13-15y) was 152.7 which was significantly lower than the reference value while the mean height of boys (13-15 y) was 159.8 which was also significantly lower than the reference value.

The mean height of girls and boys of 16-17 years has been depicted in table 4.3 and it was found that the mean height of the girls was 154.2 cm. Mean height of boy was 165.4cm; the values of height for both the girls and boys were significantly lower than the reference values.

Similar trend was observed for the weight in adolescents of 16-17 years of age. The mean weight of the girls was 43.6 kg while the mean weight of the boys was 48.2 Kg.

The data indicated the mean weight of school going adolescent girls and boys of 13-15 years of age was 41.0 and 42.5kg, respectively. Both the girls and boys had significantly lower than the reference values.

It was found that the mean values of BMI of girls and boys (13-15y) were 17.6 kg/m<sup>2</sup> and 16.6 kg/m<sup>2</sup>, respectively. Whereas the mean values of BMI of girls and boys (16-17y) were 18.34 kg/m<sup>2</sup> and 17.6 kg/m<sup>2</sup>, respectively. The recorded values of BMI in both the male and female adolescents of both the age groups were significantly lower than the reference values.

Regarding the prevalence of wasting and overweight among adolescents, the data of BMI for age showed out of 100 adolescents 68% were underweight and the rest of the adolescents 32% were normal weight and 0% were overweight.

Gender-wise comparison of a score BMI for age indicated that prevalence of wasting and overweight in boys was 38% and 0%, respectively. The prevalence of wasting, overweight and obese however, in girls was 46 % and 0% respectively. The girls had 8% higher prevalence of wasting than girls, which is significantly high.

Gender wise comparison of frequency distribution of height for age indicated that prevalence of stunting and severely stunting in boys was 20% and 4% respectively. The prevalence of stunting and severely stunting however in girls was 14% and 6% respectively. The prevalence of stunting was significantly higher (6%) in boys than girls.

## Conclusion

The above research study assessed the nutritional status of the adolescent boys and girls studying in MadhyamikShala of Khadiya, Junagadh. The parameters such as height, weight and BMI were observed and noted that the mean of height and weight are significantly lower than the standard values of ICMR. Encourage the adolescents to develop the healthy choice by educating them about the various benefits to have a healthy diet and stay healthy for the rest of their lives. School and community based intervention measures are necessary to develop a healthy lifestyle during adolescence.

## REFERENCES

1. Amirthaveni, M. Barikor, C.W. (2001). *Nutritional status of the Meghalaya Preschool -children*. Indian Journal of Nutrition Diet. 39:262-268.
2. Aneja, S. (1997). *Assessment of Nutritional Status of Adolescents*. Indian Paediatrics, 34, 70-71.
3. Anwer, I., Awan, J. A. 2003. *Nutritional status comparison of rural with urban school children in Faisalabad District, Pakistan*. Journal of Rural and Remote Health. 1-7.
4. Baker JP, Detsky AS, Wesson DE, et al. *Nutritional assessment: A comparison of clinical judgment and objective measurements*. N Engl J Med 1982; 306:969-72.
5. Beghin, I. Cap, M. and Dujardin, B. *A Guide to Nutritional Assessment*. World Health Organization, Geneva, Switzerland (1988).
6. Bose, K. and Mukhopadhyay, A. *Nutritional status of adolescent Bengalee Boys*. Indian Pediatrics, 41: 633 (2004)
7. Choudhary Seema, C.P. Mishra C P, Shukla K P ; *Nutritional Status Of Adolescent Girls In Rural Area Of Varanasi*, Indian J. Prev. Soc. Med Vol 34 No.1&2, Jan - June, 2003
8. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. *Establishing a standard definition for child overweight and obesity worldwide: international survey*. BMJ. 2000; 320:1240-1243.
9. Gibson R. In: *Principles of Nutritional Assessment, 2nd Edition*. New York: Oxford University Press, 2005: 41-64.
10. Gopalan, C. *Women and Nutrition in India. General Consideration*. In *Women and Nutrition in India*. (1989).
11. Gopalan and S. Kau (et al). New Delhi: *Nutrition Foundation of India Special Publication*.
12. ICMR. *Recommended dietary intakes for Indians, Hyderabad: National Institute of Nutrition, Indian Council of Medical Research*, 1984; 40-41



13. Jelliffe DB. *The Assessment of Nutritional Status of the Community*. World health Organization, Geneva, 7-233, 1966.
14. Mukhopadhyay, A., Bhadra, M., Bose, K. 2005. *Anthropometric assessment of nutritional status of adolescents of Kolkata, West Bengal*. Journal of Human Ecology. 18 (3): 213-216.
15. National Institute of Nutrition. *Report on Diet and Nutritional Status of Adolescents*. NNMB. Vol. 20. NNMB Technical Report No.20. NIN ICMR Hyderabad; 2000. p. 1-25. 5.
16. World Health Organization: *Physical status - the use and interpretation of anthropometry. Report of the WHO Expert Committee*. Technical Report Series No. 854, Geneva, World Health Organisation, 1995; 263-311.
17. World Health Organization: *Measuring nutritional status*. World Health Organization, Geneva (1985).
18. WHO. *Handbook of Human Nutritional Requirement*. World Health Organization, Geneva, 1985; 125-7
19. WHO. *Measuring change in nutritional status*. World Health Organization, Geneva, 1983
20. World Health Organization. *Adolescent Friendly Health Services – An agenda for change, Geneva*, WHO Publications, 2002; 5–9.
21. WHO Expert committee (1996) Anthropometric reference data for International use: Recommendations from WHO expert committee. *Am J Clin Nutr* **64**:650-8.
22. Zia-ud-Din and Paracha P I *Assessment of nutritional status of adolescents*. (2003)

