Assessment of height, weight and BMI of school going children in Varanasi

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■ **ABSTRACT :** The present study was conducted on the growth parameters of school going children of 10 to 15 years of age in urban area of Varanasi. 150 school going children were selected by cluster and purposive random sampling method. Height (cm) and weight (kg) were taken as indicators for nutritional status for the study. BMI was calculated according to WHO criteria. Information was collected on growth pattern of school going children. The study revealed that weight, height and BMI of both boys and girls were comparatively lower in comparison with reference standards of ICMR (Indian Council of Medical Research, 1990) and NCHS (National Council of Health and Statistics, 2007).

■ **KEY WORDS :** Body mass index, Height, Weight, Children

Forty per cent of Indian population is below the age of 18 years which at 400 million is the world's largest child population. At least 35 million children aged 6-14 years do not attend school and 50 per cent of Indian children aged 6 to 18 do not go to school. In school going stage, the children are very active and their physical mental and economical development is regularly improving. Child growth is internationally recognized as an important indicator of nutritional status and health in population (Gelander, 2006).

Growth monitoring is an integral component of preventive an primary care pediatrics to evaluate individual children, and is a useful public health tool to assess child health status and economic development in the society. Interpretation of child growth in a population depends primarily on the growth reference used .The study on growth of children is the most important criterion for recognizing health of children (Navali and Kimiagar, 1992). Increase in height and weight are the clinical sign of growth (Renuka, 1994)

Growth monitoring should effectively be done to ensure optimum development in children. Physical growth of children is reflected by different anthropometric measurements especially weight and height. On the other hand, child height and weight are good index for recognizing the nutritional status. So the comparison of the child height and weight to standard tables can be used for screening or assessing nutritional status of children.

An important feature is that great variability exists in the rate of physical growth in spite of the fact that all children in the world follow a similar growth pattern. However, variation in the growth rate between countries as well as within the country is well documented.Weight for height index (Person's weight compared to his/her own height) is an important indicator which distinguishes acute malnutrition from chronic malnutrition and is also known to be partially age independent in nature. The body building of an individual can be more accurately assessed through this index (Bhalla, 2002). Body Mass Index (BMI) also known as the Quetlet's Index (weight/height) is considered to be the best variable for the anthropometric evaluation in nutritional and the general health screening. On the basis of this index, the relative proportion of normal undernourished and obese people can be assessed (WHO, 1995). The nutritional status of children is a good indicator of the health status of a community. The growth and nutritional status of the children

of various sections of Indian population have been assessed (Chatterjee and Mondal, 1991).

■ RESEARCH METHODS

The present cross-sectional study was conducted from April 11 to May 18 2012 on school going children (boys and girls) in Varanasi. The age of the children was verified from school records. The sample for the study comprised of 150 school going children both boys and girls studying in 6th, 7th and 8th standard. Height and weight were taken according to standard techniques (Jelliffee 1966) and body mass index (BMI) for boys and girls was calculated by using formula BMI =Weight (kg)/Height² (m) according WHO (1995). Further, general information was collected by questionnaire-cum-interview methods from children and schedule was design and pre-tested. Mean and standard deviations were calculated and compared with ICMR and NCHS reference standards.

■ RESEARCH FINDINGS AND DISCUSSION

Table 1 shows mean values of height, weight and BMI of children aged 10 to 15 years. Weight, height and BMI were increased with increasing age. Mushtaq *et al.* (2012) also observed that height, weight and BMI of boys and girls increased with age.

Fig. 1 and 2 show the comparison of weight of boys and girls, respectively. It was observed that curve for boys (Fig. 1) and curve for girls (Fig. 2) run below the ICMR and NCHS standard. Sahoo *et al.* (2011) also observed that mean weight of urban boys and girls was below in comparison with both standards (NCHS and ICMR) at all age groups.

Fig. 3 shows the height of school going boys according to age. It is clear from the mean height of boys in all categories of age were comparatively below the reference standards of NCHS. Height of boys at 10-13 years was
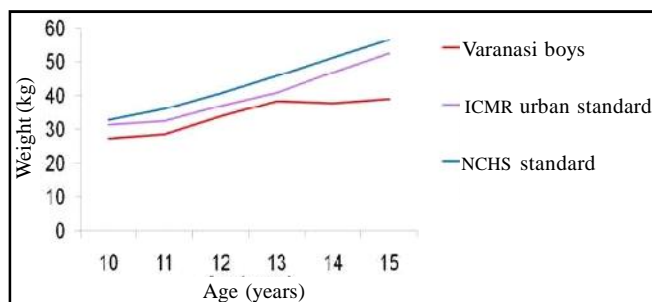

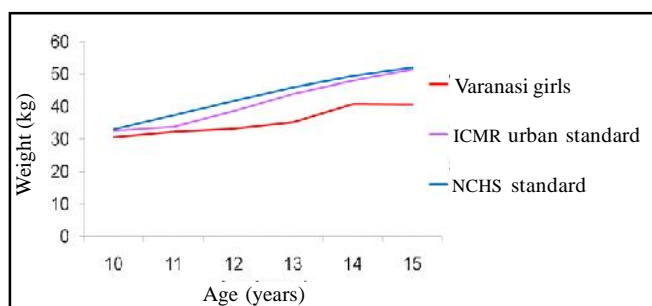Fig. 1 : Comparison of mean weight of sample (boys) with reference standards

Fig. 2 : Comparison of mean weight of sample (girls) with reference standards
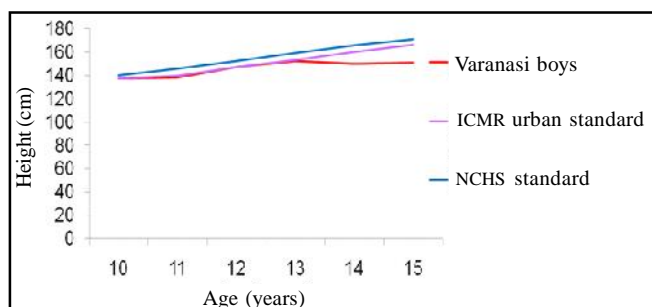

Fig. 3 : Comparison of mean height of sample (boys) with reference standards

Table 1 : Mean height, weight and BMI of children aged 10 to 15 years					(n=150)
Age	Sex	No.	Height	Weight	BMI
10 years	Boys	03	142.00 ±8.18	32.67± 9.29	15.3±2.63
	Girls	07	143.42± 7.15	32.65±6.23	15.75±1.38
11 years	Boys	04	138.50 ± 11.50	28.75±3.30	14.51±2.76
	Girls	05	140.8±6.65	31.6±3.5	15.24±2.60
12 years	Boys	27	148.11 ±12.6	37.25 ±9.87	16.00±2.42
	Girls	22	145.59 ±7.44	34.81±6.89	16.21±2.74
13 years	Boys	25	152.31± 9.16	36.39±5.48	16.66±1.44
	Girls	10	150.50±3.65	31.89±3.39	15.89±1.33
14 years	Boys	22	149.00±4.47	38.54±7.56	17.15±2.34
	Girls	16	149.81±6.53	38.37±4.07	17.31±1.13
15 years	Boys	05	150.00±4.44	38.80±1.54	17.55±0.92
	Girls	03	153.33±7.57	40.67±4.04	17.14±0.45
Total			150 (83 boys and 67 girls)		

observed nearly equal to ICMR. The height of 14 to15 year's age group of boys was found less than ICMR.

Fig. 4 shows the height of girls according to age. It was observed that mean height of girls at10 years of age group was found higher than ICMR but nearly equal to NCHS, at 11 to 13 years of the age, height was of girls was found equal but less to NCHS and at 12, 14 and 15 years the height of girls was found below than ICMR reference standard and all categories of age were comparatively below the reference standards of NCHS.
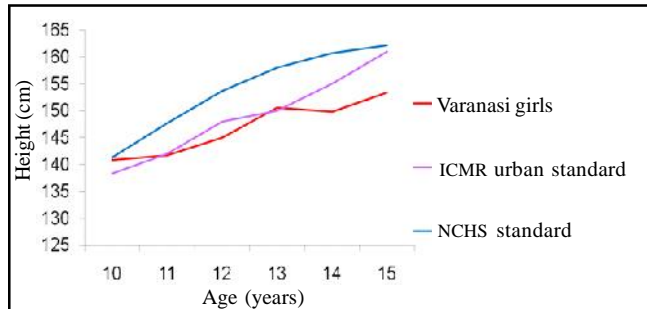

Fig. 4 : Comparison of mean height of sample (girls) with reference standards

Table 2 shows that out of 150 children maximum children (132) were underweight ($\leq$ 18.50 BMI) whereas 18 children were normal, no child was found in overweight category. Hunshal *et al.* (2010) also observed maximum school going children (boys and girls) underweight.

Table 2 : Classification of children according to their BMI			
Classification	BMI	No. of children's	Percentage
Underweight	$\leq$18.50	132	88
Normal	18.50-24.99	18	12
Overweight	$\geq$25.00-$\geq$40.00	-	-
Total		150	100

Conclusion :

During study it was found that maximum (88%) children were underweight .growth parameters of school going children height (cm) and weight (kg) of both boys and girls were comparatively below than reference standard of ICMR and NCHS. All these may be due to lack of motivation to make the boys and girls to know about the importance of nutrition.

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■ REFERENCES

Bhalla, A.K. (2002). The revevance of selected anthropometric techiniques in clinical pediatrics: Human growth and development. Issues and applications, pp.16-35.

Chakraborty Ujjawal (2008). A comparative study of physical growth and nutritional status in santal children of Ghatsila and Bolpur.*Tribes & Tribals*, **2**:79-86.

Chatterjee, S. and Mandal, A. (1991). Physical growth pattern of girls (9-17years) from ruler West Bengal. *Indian J. Med. Res.*, **94** : 346-350.

Cole, T.J. (2006). Growth reference and standards. Human Growth and Development San Diego: Academic, U.S.A.

De Onis, M. (2003). The center for disease control and prevention 2000 growth charts and the growth of breastfed infants. *Acta Paediatr*, **92**:413-419.

Gelander, L. (2006). Children's growth: a health indicator and a diagnostic tool. *Acta Paediatr*, **95** (5) : 517-518.

Hunshal, C. Saraswati (2010). Physical growth status of school going children. *Karnataka J. Agric. Sci.,* **23** (4): 625-627.

Jelliffe, D.B. (1966). The assessment nutritional status of the community. World Health Organization Monograph Series No.53: WHO, GENEVA.

Muhammad Umair Mushtaq, Sibgha Gull, Komal Mushtaq, Hussain Muhammad Abdullah, Usman Khurshid, Ubeera Shahid, Mushtaq Ahmad Shad and Javed Akram (2012). Height, weight and BMI percentile and nutritional status relative to the international growth reference among Pakistani school aged children. *BMC Pediatrics*, **12**:31.

Navali, L. and Kimiagar, M. (1992). The study of weight and height in children of Theran. *Shahaeed Behesthi Univ. Sci., J. Fac.,*18-27.

Renuka A.M. (1994). Growth status and puberty of urban and rural girls.M.H.Sc Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Sahoo, Kaushnapriya (2011). Physical growth of school girls from Dharwad and Khurda. *Karnataka J. Agric. Sci.*, **24** (2) : 221-226.

Victora, C.G. (2008). Maternal and child under nutrition: consequences for adult health and human capital. *Lancet*, **371**:340-357.

World Health Organization (1995). Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. Technical Report Series No. 854, GENEVA, SWITZERLAND.

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