International Journal of Community Medicine and Public Health
Dhoundiyal M et al. Int J Community Med Public Health. 2017 Jun;4(6):2090-2093
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20172182

Original Research Article

Physical growth pattern of school going urban adolescent girls in Bangalore city

Manju Dhoundiyal[1], Renuka Prithviraj[2]*

[1]National Institute of Public Cooperation and Child Development, Regional Centre for South India, Bengaluru, India
[2]Department of Community Medicine, Sapthagiri Institute of Medical Sciences and Research centre, Bengaluru, India

Received: 12 April 2017
Revised: 05 May 2017
Accepted: 06 May 2017

***Correspondence:**
Dr. Renuka Prithviraj,
E-mail: renukaprithvi6@gmail.com

ABSTRACT

Background: With growing prioritization on adolescent health and incorporation of adolescent component in the National programme for mother and child, it is time we develop region wise growth charts for them. The objective of the study was to assess the growth pattern of adolescent school girl's aged 13 and 14 years old belonging to different socio-economic backgrounds using simple anthropometric measurements.
Methods: A cross sectional study was carried out among 468 girl students. The sample comprised 13 and 14 year old girls studying in four schools representative of different socioeconomic backgrounds in Bangalore, Karnataka. Simple anthropometric measurement were performed and compared with WHO/IAP and ICMR reference standards.
Results: The anthropometric measurements (weight, height and BMI of girls) in the four schools showed similar trends but were not comparable with the reference guidelines.
Conclusions: There is a need to revise and develop regional guidelines for growth charts.

Keywords: Adolescent girls, Anthropometry, Growth charts

INTRODUCTION

Adolescence is an amazing natural process of a young girl blossoming into adulthood. It is a significant period of growth and development with establishment of many adult patterns.[1] Their close proximity to adulthood and willingness to learn lessons of life provides rich and final opportunities to implement primary prevention measures to enable them to become healthy citizens of tomorrow.

Adolescence contributes to more than 20% of total growth in stature and up to 40-50% of body weight as somatic growth.[2] There by, it becomes imperative to monitor growth periodically as it is not only an important health indicator but also a predictor of morbidity in the community. Despite the fact that anthropometry is universally applicable, simple, inexpensive and non-invasive technique, yet, its usage has been limited in the development sector. It has a very high potential to be used as a tool for guiding policy makers in health as well as individual clinical decisions.[3]

It is an undisputed fact that pattern of growth of an individual is highly influenced by genetic, demographic, socio economic and environmental factors. Therefore, in the light of the rapid universal changes, it is of paramount importance that norms are redefined from time to time and region-wise norm values are developed on a continuous basis. It is in this backdrop that the Indian academy of paediatrics has attempted to revise growth charts for 5-18 years old based on the findings of nine studies conducted in different regions of India.[4] Growth monitoring being a continuous process, necessitates conduct of ongoing studies on a regular basis to ascertain

this process. It is also to emphasise the fact that there are very few studies using large sample in specific age group which are available on this subject.

This study was conducted with the objective of assessing the growth pattern of adolescent school girls aged 13 and 14 years old coming from different socio-economic backgrounds using simple anthropometric measurements.

METHODS

A cross sectional study was carried out in four different schools in Bangalore, Karnataka during January-February 2016. The four schools were representative of different socioeconomic backgrounds in the society. The data was collected after written informed consent was sought from the respective school principals. The study subjects were all the adolescent girls studying in the eighth and ninth standard of the four schools. Non probability sampling technique was used for the study. However, the students with chronic ailments and those who remained absent and could not be contacted even after two visits were excluded from the study.

Measurements

The age of the students was verified from the school health records. Their height was measured to the nearest one centimetre using a calibrated ruler fixed to the wall. The child stood barefoot with feet parallel and with heel, buttocks and shoulders and back of head touching the wall. The subject was requested to look straight at her eyes level. The arms were hanging at the sides in the natural manner and height was recorded. A thin, wooden scale was placed above the head perpendicular to the ruler and parallel to the ground.[3]

Weight was measured to the nearest 0.1 kilogram using a portable weighing machine, which was standardized before each measurement and followed the standard protocol.

Body mass index (BMI) was computed using the standard equation:

BMI (kg/m^2) = Weight (kg)/Height^2 (m^2).

The revised Indian academy of paediatrics, 2015 growth charts, WHO and ICMR guidelines for height, weight and body mass index were used as reference.[1,4,5] Data was analysed using the SPSS 20 software for Windows. Independent one sample 't' test was used to compare 50th percentile -weight and height of study population with the standard accepted guidelines of WHO, ICMR and Revised IAP.

RESULTS

A total of 468 girls from four schools of Bangalore city constituted the study sample. All the girls studying in eighth and ninth standard aged 13 to 14 years were included in two of the schools. In the other two schools, girls of only either eighth or ninth standard were included.

The mean overall weight (Table 1) at 13 years was 44±7.1 kgs with the weight (mean and the percentile values) being slightly more in school II (which comprised of children from higher socio economic background) when compared to other schools. At 14 years, all the schools showed similar trends in weight gain with the mean weight being 43.8±7.4 kgs. There was no difference in mean weights between the 13 and 14 year olds.

However, the weights of girls in all four schools were not showing the trend of WHO/ Revised IAP guidelines in the 97th percentile for 13 years and, in the 50th (p <0.0001) and 97th percentile for 14 years. Median (50th percentile) values largely coincided with the mean values in both age groups. The ICMR values were less when compared to study group in both ages (p <0.0001).

Table 1: Comparison of study sample (mean, standard deviation and percentile values) with reference guidelines for weight (in kgs).

School	13 years						14 years					
	Total examined	Mean	SD	3rd	50th	97th	Total examined	Mean	SD	3rd	50th	97th
Overall	256	44	7.1	31	44	58	212	43.8	7.4	31.4	43	61
WHO 2006 & IAP 2015	-	-	-	28.9	43.6	67.1	-	-	-	31.3	46.4	70.4
ICMR	1537	34.2	6.9	25.7	35.2	51.2	933	37.5	6.9	28.1	38.3	52.4

The mean height (Table 2) was more (157.3±9cms) for 13 years when compared to 14 years (153±5.9 cms). The reason could be attributed to the fact that, the height (mean and the percentile values) was slightly more in school II (which covered a larger sample in this age group) when compared to other schools.

All the girls in the study sample showed slightly higher values than IAP at 13 years but matched the trend at 14 years (difference between 50th percentiles of study group and WHO/IAP statistically significant for both ages, p <0.0001). The ICMR values were less when compared to study group in both ages (p <0.0001).

BMI charts given by the Revised IAP guidelines were similar to the one proposed by International Obesity Task Force [24] which suggested that 23 and 27 adult equivalent cut offs lines (for risk of overweight and obesity, respectively) were more appropriate for use in Asian children as Asians are known to have more adiposity and increased cardio-metabolic risk at a lower BMI.

Table 2: Comparison of study sample (mean, standard deviation and percentile values) with reference guidelines for height (in cms).

School	13 years						14 years					
	Total examined	Mean	SD	3rd	50th	97th	Total examined	Mean	SD	3rd	50th	97th
Total	256	157.3	9	139	157.6	175.7	212	153	5.9	142.4	153	163
WHO 2006 and IAP 2016	-	-	6.9	138.2	152.2	165.9	-	-	6.6	141.3	154.7	168.2
ICMR	1537	145.1	7.2	131.7	145.4	157.9	933	148.6	6.4	137	149	160.5

Table 3: Comparison of study sample (mean, standard deviation and percentile values) with reference guidelines for BMI.

School	13 years							14 years						
	Total examined	Mean	SD	3rd	50th	75th	95th	Total examined	Mean	SD	3rd	50th	75th	95th
Total	256	17.8	2.6	13.6	17.6	19.2	22.4	212	18.7	2.9	14.2	18.4	20.1	24.9
IAP	-	19.2	3.2	13.9	18.8	21.1	25.2	-	19.7	3.4	14.3	19.4	21.8	25.9
WHO	-	-	-	15.1	18.8	20.7	24.4	-	-	-	15.6	19.6	21.6	25.5

Table 4: Distribution of study population with respective percentiles of IAP /ICMR guidelines.

Guidelines	Weight			Height		
	<3rd (%)	3rd to 97th (%)	>97th (%)	<3rd (%)	3rd to 97th (%)	>97th (%)
13 years						
IAP	-	256 (100)	-	7 (2.7)	208 (81.3)	41 (16)
ICMR	-	223 (87)	33 (13)	4 (1.6)	142 (55.4)	110 (43)
14 years						
IAP	5 (2.4)	207 (97.6)	-	2 (0.9)	209 (98.6)	1 (0.5)
ICMR	-	189 (89.2)	23 (10.8)	2 (0.9)	190 (89.6)	20 (9.4)

The mean BMI (Table 3) was 17.8±2.6 among 13 years old and increased to 18.7±2.9 for 14 years. This result was slightly less than the IAP and WHO guideline value probably because of regional variation. At both ages, the BMI values were less than the IAP values at 50th (p <0.0001), 75th and 95th percentiles.

When revised guidelines of IAP were applied, there were 26 (10%) girls in overweight and 2 (0.8%) girls in obese category among 13 years old. Among 14 years old, the numbers were 21 (9.9%) and 7 (3.3 %) girls respectively. Overall, the burden of overweight was 10% and obesity 1.9 % in the study population.

On considering IAP /ICMR guidelines as reference population (Table 4), majority of girls were between 3rd and 97th percentile for both weight and height.

Only 9 (2%) girls were below the 3rd percentile (stunted) and 42 (9%) above the 97th percentile (tall) in both the age groups together. And, only 2.4% girls had their weights below the 3rd percentile of IAP for 14 years. Hence, almost all the girls had their anthropometry measures between 3rd and 97th percentile of IAP values.

DISCUSSION

Growth chart committee of Indian Academy of Paediatrics (IAP) has revised growth charts for 5-18 year old Indian children in January 2015.The anthropometric measurements (weight, height and BMI of girls) in the four schools of the present study show similar trends but are not in line with the revised IAP /WHO or ICMR guidelines. The weight, height and BMI were less than IAP/WHO (except height of girls in 13 years) and more than ICMR guideline values. But, almost all the girls were between the 3rd and 97th percentile values of IAP.

Our study also reflects the role of socio economic status on anthropometry as shown by the increase in weight and height of girls from school II which had children coming from affluent background.

Weight and BMI values at 14 years, was less than IAP guidelines but similar to that observed by Patil et al in Satara district, Maharashtra.[6] However, the values for weight and height at 13 years as observed by Patil et al in her study was lesser than this study. The reason for more values obtained in this study could be that School II had children coming from affluent background. But, BMI value for both ages of her study was comparable to our study.

The burden of overweight was 10% and obesity was 1.9% in our study population. A systematic review done by Ranjani et al showed that overweight prevalence varied between 3 to 24.7 per cent and obesity ranged from 1.5 to 14 per cent in 28 studies highlighting the wide variability in their prevalence in India.[7]

CONCLUSION

The present study stresses the need for developing regional norms on a regular basis for physical growth of adolescents. Also, studies using large samples in each specific age group of the adolescent period needs to be encouraged. This practice will make it easier to develop growth charts for different age groups and to revise guidelines periodically. This will enable policy makers to evaluate the programmes directed at adolescent growth and development in a more realistic manner.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. 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.
2. Agarwal KN, Saxena A, Bansal AK, S Agarwal DK. Physical growth assessment in adolescence. Indian Pediatr. 2001;38:1217-35.
3. Haboubi GJ, Shaikh RB. A comparison of the nutritional status of adolescents from selected schools of South India and UAE: A cross-sectional study. Indian J Community Med. 2009;34:108-11.
4. Indian Academy of Pediatrics Growth Charts Committee, Khadilkar V, Yadav S, Agrawal KK, Tamboli S, Banerjee M, et al. Revised IAP growth charts for height, weight and body mass index for 5 to 18year old Indian children. Indian Pediatr. 2015;52:47-55.
5. Longitudinal study on growth of Indian children during adolescence (10-16 years). An ICMR task force study. 1996.
6. Patil SS, Patil SR, Durgawale PM, Kakade SV. Study of physical growth standards of Adolescents in the age group of 10 to 15 years from Satara district of Maharashtra, India. J Krishna Institute Med Sci. 2015;4(4):42-56.
7. Ranjani H, Mehreen TS, Pradeepa R, Anjana RM, Garg R, Anand K, et al. Epidemiology of childhood overweight & obesity in India: A systematic review. Indian J Med Res. 2016;143(2):160-74.

Cite this article as: Dhoundiyal M, Prithviraj R. Physical growth pattern of school going urban adolescent girls in Bangalore city. Int J Community Med Public Health 2017;4:2090-3.