Anthrop. Közl. *32*; 225–229. (1989/90)

A CROSS-SECTIONAL GROWTH STUDY OF TRANSVERSE AND ANTEROPOSTERIOR DIMENSIONS IN BENGALI BOYS OF CALCUTTA, INDIA

P. Dasgupta

Anthropometry and Human Genetics Unit, Indian Statistical Institute, Calcutta, India

Abstract: *This is the first report on cross-sectional growth of six nonlinear dimensions, namely, biacromial diameter (N = 775), bi-iliocristal diameter (N = 755), transverse chest (N = 757), anteroposterior chest (N = 762), bicondylar femur (N = 773), and wrist breadth (N = 775) in the Bengali boys of Calcutta from 7.0 to 16.0 years. In four transverse traits, the age interval of peak annual increment (12.0 – 13.0 years), together with ages of increased standard deviation (12.0 – 14.0 years), give some indirect evidence for the onset of adolescent growth spurt from 12.0 years. Calcutta boys are similar to the Indian boys (ICMR 1972) in hip width, but larger than the semi-urban Bengali boys (Das 1985) in both shoulder and hip width. The results presented could be utilized as a reference data for the contemporary Bengali urban boys.*

Key words: *Body measurements; Cross-sectional growth study; Bengali boys.*

Introduction

In the nation-wide growth survey of the Indian children, carried out by the Indian Council of Medical Research (ICMR 1972), the Bengali children were not included. Therefore, in 1982–83, a cross-sectional growth study of 25 anthropometric measures was undertaken following Weiner and Lourie (1969) on 825 Bengali boys in Calcutta from the Indian Statistical Institute. We partly presented before, growth data of thirteen anthropometric variables so obtained, on the Bengali boys between 7.0 to 16.0 years (Pakrasi, Dasgupta and Dasgupta 1987, Pakrasi, Dasgupta, Dasgupta and Majumder 1988, Dasgupta and Das, unpublished).

The present communication deals with cross-sectional growth of six more anthropometric variables, namely biacromial diameter, bi-iliocristal diameter, transverse chest, anteroposterior chest, bicondylar femur and wrist breadth in the same sample of Bengali boys.

Subjects and Methods

The anthropometric data were collected from one school situated at the northern part of the city of Calcutta. The socio-economic and demographic characteristics of the sample boys and their families, method of age grouping of data, the reason for occurring unequal sample size in different measurements, etc. have been mentioned in details in Pakrasi, Dasgupta and Dasgupta (1987) and Pakrasi, Dasgupta, Dasgupta and Majumder (1988).

All the six anthropometric measurements (in cm) were taken by the author following the techniques suggested in Weiner and Lourie (1969). Biacromial and bi-iliocristal diameter, transverse and anteroposterior chest were measured by the anthropometer, while bicondylar femur and wrist breadth were measured by the sliding caliper on the left side of the subjects with wearing light pants only.

Technical error of the anthropometric measurements $(\sqrt{\frac{\Sigma D^2}{2N}})$ as computed on double observations, were 0.10 for biacromial diameter, 0.04 for bi-iliocristal diameter, 0.10 for anteroposterior chest, 0.17 for transverse chest, 0.03 for bicondylar femur, and 0.02 for wrist breadth.

Age specific means, standard deviations were calculated for all the six anthropometric characters. The whole year increments have been calculated by substracting the mean of the preceding age from that of the succeeding years which gave us the presented mean annual gain.

Processing of data tabulation and statistical analysis were performed by a Russian third generation computer (EC 1033) by using the BMDP package programme (Dixon and Brown 1978).

The results were compared, where possible, with the mixed-longitudinal data of the Bengali boys (Das 1985) analysed cross-sectionally at the Brussels Computer Centre (CDC CYBER 858). In addition, the present findings have also been compared with the boys from other parts of the country, wherever possible.

Results and Discussion

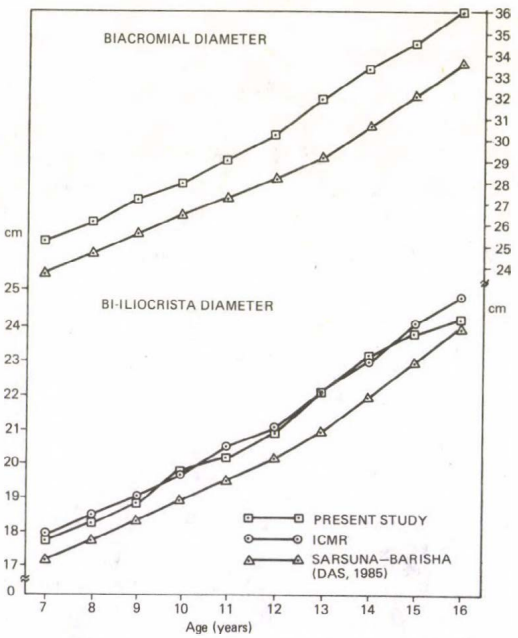

Fig. 1: Mean biacromial and bi-iliocristal diameters of the Calcutta boys (present study) compared with the means of indian (ICMR 1972) and semi-urban Bengali boyls (Das 1985)

Age specific sample size, mean, standard deviation and mean annual increments of the six anthropometric characters from 7.0 to 16.0 years are presented in Table 1.

The results show that the mean values of all other traits increase with age, except anteroposterior chest, where from 7.0 to 8.0 years only the value decreases slightly. As biologically expected, the yearly increments, as a whole, are greater for biacromial diameter than bi-iliocristal diameter. It is also observed that the curve of bi-iliocristal diameter (Fig. 1) tends to become flat from 15.0–16.0 years while between the same ages biacromial diameter still tends to increase. The greater annual increments as well as duration of growth in biacromial than bi-iliocristal diameter among the boys, are established masculine characteristics, used for explaining the phenomena of sexual dimorphism (Tanner 1962, 1978).

Table 1. **Age specific sample size (N), means (x), standard deviations (SD) and annual increments (cm) in six anthropometric characters of the Bengali boys from 7.0 to 16.0 years**

Age (years)	(i) *Biacromial diameter* n	$\bar{x}$	SD	Increment	(ii) *Bi-iliocristal diameter* n	$\bar{x}$	SD	Increment	(iii) *Transverse chest* n	$\bar{x}$	SD	Increment
7.0	59	25.35	1.56		58	17.86	1.10		58	17.04	1.20	
				0.80				0.40				0.36
8.0	82	26.15	1.36		79	18.26	1.03		79	17.40	0.96	
				1.12				0.62				0.60
9.0	93	27.27	1.61		88	18.88	1.05		91	18.00	1.22	
				0.73				0.92				0.68
10.0	69	28.00	1.66		65	19.80	1.72		68	18.68	1.85	
				1.10				0.39				0.50
11.0	92	29.10	1.96		89	20.19	1.26		91	19.18	1.46	
				1.08				0.78				0.69
12.0	92	30.18	2.08		91	20.97	2.00		92	19.87	1.43	
				1.70				1.13				1.04
13.0	94	31.88	2.50		91	22.10	1.47		91	20.91	1.53	
				1.47				0.99				0.58
14.0	90	33.35	2.51		91	23.09	1.58		87	21.49	1.65	
				1.14				0.73				0.73
15.0	71	34.49	1.98		71	23.82	1.51		69	22.22	1.53	
				1.42				0.29				0.52
16.0	33	35.91	1.98		32	24.11	1.40		31	22.74	1.67	
All ages	775				755				757			

Age (years)	(iv) *Anteroposterior chest* n	$\bar{x}$	SD	Increment	(v) *Bicondylar femur* n	$\bar{x}$	SD	Increment	(vi) *Wrist breadth* n	$\bar{x}$	SD	Increment
7.0	58	11.99	1.04		59	7.19	0.45		59	3.65	0.30	
				−0.11				0.24				0.18
8.0	82	11.88	0.77		83	7.43	0.43		83	3.83	0.28	
				0.46				0.22				0.12
9.0	93	12.34	1.02		92	7.65	0.42		94	3.95	0.26	
				0.41				0.18				0.11
10.0	66	12.75	1.04		68	7.83	0.45		68	4.06	0.30	
				0.41				0.28				0.14
11.0	90	13.16	1.15		95	8.11	0.54		95	4.20	0.35	
				0.32				0.17				0.12
12.0	93	13.48	1.42		93	8.28	0.58		93	4.32	0.35	
				0.38				0.35				0.27
13.0	90	13.86	1.20		92	8.63	0.45		92	4.59	0.25	
				0.50				0.17				0.20
14.0	89	14.16	1.32		89	8.80	0.45		89	4.79	0.36	
				1.01				0.11				0.15
15.0	70	15.17	1.35		69	8.91	0.38		69	4.94	0.27	
				0.02				0.13				0.06
16.0	31	15.19	1.17		33	9.04	0.45		33	5.00	0.31	
All ages	762				773				775			

Moreover, in this cross-sectional sample 4 transverse characters, namely, biacromial diameter, bi-iliocristal diameter, bicondylar femur and wrist breadth have exhibited the maximum annual gain consistently between 12.0 to 13.0 years. Similarly, standard deviation values in these four characters, are also noticed to be relatively higher in and around 12.0 to 14.0 years. This phenomena has occurred probably due to the presence of early, average and late maturing type of boys during these ages in this sample (Pakrasi, Dasgupta, Dasgupta and Majumder 1988). After these age periods, the increments as well as standard deviations tend to decline gradually in the succeeding ages.

Despite the cross-sectional nature of the data, these two criteria together give some indication for the occurrence of adolescent spurt in the transverse traits from 12.0 years, as also noticed previously for all the five linear traits (Pakrasi, Dasgupta, Dasgupta and Majumder 1988, Dasgupta and Das, unpublished).

In transverse chest, although the maximum yearly gain is noticed between 12.0–13.0 years, however, the pattern of standard deviation over the ages, differ in it from the pattern of the other four transverse characters. On the contrary, in anteroposterior chest, although, unlike the transverse dimensions, the maximum yearly gain is noticed later between 14.0–15.0 years, nevertheless, the trends of variability are more or less alike with four of the five transverse dimensions (Table 1).

Hip width of the Bengali boys of Calcutta are more or less similar to the Indian boys (ICMR 1972) at the corresponding ages (Fig. 1). But they are with wider shoulder and hips than the Sarsuna–Barisha boys (Das 1985). In these two dimensions, the Calcutta boys have also exhibited earlier onset of maximum annual gain with greater peak values than the Sarsuna–Barisha boys. The difference in size between the two Bengali sample may be attributed to the socio-economic conditions. The Sarsuna–Barisha boys are closer to the socioeconomic class III of the ICMR (Hauspie, Das, Preece and Tanner 1980 lwhile the Calcutta boys represent middle to upper middle class urban families.

In both the dimensions of chest, considered here, the Calcutta boys are larger than the Gaddi Rajput boys (Singh 1980) during the corresponding ages.

Due to paucity of age specific data of the anthropometric characters studied, the results generated in the paper for the first time, may be utilized as a reference population data for the urban middle class Bengali boys. Goldstein and Tanner (1980) have recently emphasized that such studies are better prefered than where there are no available standards at all.

*

Acknowledgements: The author is grateful to Prof. S. R. Das for developing the project, kindly giving training in anthropometrics and permitting to use the Sarsuna–Barisha mixed-longitudinal data for comparison. Dr. Roland Hauspie has kindly analysed the Sarsuna–Barisha data. The work has been supervised by Prof. K. B. Pakrasi (the late) and K. C. Malhotra whereas Dr. P. P. Majumder has kindly rendered the statistical assistance.

*

Received 3 April, 1990.

References

Das SR (1985): *Mixed longitudinal growth data for 22 measures. The Sarsuna–Barisha series, West Bengal, India, Vol. 1 Boys.* – Anthropological Survey of India, Calcutta.

Dasgupta P, Das SR (1990): Growth in trunk, limbs, and skinfolds of the Bengali boys of Calcutta from 7.0 to 16.0 years: A cross-sectional study. – *Unpublished manuscript.*

Dixon WJ, Brown MB (1978): *BMDP–79: Biomedical Computer Programmes, P-series.* – University of California Press, Berkeley.
Goldstein H, Tanner JM (1980): Ecological considerations in the creation and use of child growth standards. – *Lancet, 1;* 582–585.
Hauspie RC, Das SR, Preece MA, Tanner JM (1980): A longitudinal study of the growth in height of boys and girls of West Bengal (India) aged six months to 20 years. – *Annals of Human Biology, 7;* 429–441.
Indian Council of Medical Research (ICMR 1972): *Growth and Physical Development of Indian infants and children. Technical Report Series No. 18.* – ICMR, New Delhi, India.
Pakrasi K, Dasgupta P, Dasgupta I (1987): Arm circumference and fatfolds at triceps in Bengali boys of Calcutta, India. – *Indian Journal of Physical Anthropology and Human Genetics, 13;* 111–120.
Pakrasi K, Dasgupta P, Dasgupta I, Majumder PP (1988): Growth in height, weight and skinfold thickness of Bengali boys of Calcutta, India. – *Anthropologischer Anzeiger, 46;* 1–16.
Singh SP (1980): Physical growth of the Gaddi Rajputs of Dhaula Dhar Range of the Himalayas. – *Zeitschrift für Morphologie und Anthropologie, 71;* 65–81.
Tanner JM (1962): *Growth at adolescence.* – Blackwell Scientific Publications, Oxford.
Tanner JM (1978): *Foetus into man.* – Harvard University Press, Cambridge, Massachussetts.
Weiner JS, Lourie JA (1969): *Human Biology. A guide to field methods.* IBP Handbook 9. – Blackwell, Oxford.

Mailing address: Dr. Parasmani Dasgupta
Anthropometry and Human Genetics Unit
Indian Statistical Institute
203, Barrackpore Trunk Road
Calcutta – 700 035, India