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A Study on Cormic Index among Semi-Urban Bengalee Boys of West Bengal, India

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A B S T R A C T

Since stature is an additive measurement, it would be useful to examine the pattern of its constituent segments in terms of sitting height and subischial leg length for the evaluation and insight of various growth related issues as well. The aim of the present study was to understand the growth patterns with respect to height (HT), sitting height (SH), subischial leg length (SLL), Cormic Index (CRI) and their relationship with age. The present cross-sectional study includes 162 Bengalee boys aged 6–12 years. Age effect displayed significant positive correlation with HT (r=0.734), SLL (r=0.731) and SH (r=0.637). However, CRI revealed significant negative correlation (r=–0.433) with age. This may be due to the fact that in these ages tempo of growth in SLL was higher than SH. Age-wise correlation between SH and SLL changes dramatically and varies from 0.474 to 0.750 due to the variation in the tempo of growth.

Key words: *anthropometry, Bengalee boys, cormic index, sitting height, subischial leg length*

Introduction

Stature is a composite of linear dimension and is a major indicator of general body size and of bone length. Since, stature is an additive measurement, it would be useful to examine the pattern of its constituent segments, sitting height (SH) and subischial leg length (SLL) and could be used for evaluation and insight of various growth related issues. Kushner[1] (1992) suggested that the segmental methods (trunk measurements in particular) might be preferred for detecting changes in thorasic and abdominal fluid volumes as occur in congestive heart failure, ascites, or peritoneal dialysis[2]. Studies also showed that leg length was more sensitive indicator of malnutrition in childhood than total stature and also more sensitive to childhood socioeconomic circumstances than sitting height. Short leg length in adulthood is significantly associated with an increased risk of coronary heart disease mortality[3–5].

One of the most common indices for body proportion is Cormic Index (CRI), explained by the ratio of sitting height to stature. This ratio provides an estimation of relative trunk length. Factor analysis classification of physique in terms of orthogonal components, trunk length (SH) and relative leg length i.e. SLL could be useful measures[6]. Moreover, measurements of SH, SLL has also been used in the studies of climatic adaptation and there by utilized as differential factor for ethnic comparison[7].

Segmental body measurements may have also an advantage over whole body measurements, for example in regional DEXA or BIA where precession is somewhat greater for regional body composition assessment than for whole body assessment[2]. It has repeatedly been demonstrated that secular increases in stature are predominantly the result of greater lower body rather than upper body growth[5,8]. Relative leg length is also useful in studies of performance and human engineering[7].

There are few studies from India[9–11] with regard to this segment measurements, but studies with regards to Cormic Index is yet to be made in this region. The present investigation was undertaken to investigate the relationship of height (HT), sitting height (SH), subischial leg length (SLL) and Cormic Index (CRI) with age among semi urban Bengalee boys of Eastern India.

Materials and Methods

Sample

The present cross sectional study was undertaken in the District of 24 Parganas (N) of West Bengal, India. Anthropometric measurements were taken from boys

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TABLE 1
MEAN AND STANDARD DEVIATION OF ANTHROPOMETRIC MEASUREMENTS AND CORMIC INDEX ACCORDING TO AGE

Age (years)	N	HT cm (SD)	SH cm (SD)	SLL cm (SD)	CRI (SD)
6+	15	117.22 (8.25)	63.63 (3.95)	53.59 (4.88)	54.33 (1.48)
7+	25	123.78 (6.20)	64.92 (3.58)	58.86 (4.01)	52.68 (1.62)
8+	23	125.59 (6.62)	66.25 (3.86)	59.34 (3.55)	52.58 (1.24)
9+	19	131.94 (8.75)	67.66 (5.01)	64.28 (5.20)	51.29 (1.24)
10+	32	134.20 (7.33)	69.40 (3.89)	64.80 (4.56)	51.24 (1.40)
11+	26	136.80 (5.24)	71.17 (3.04)	65.63 (3.43)	51.23 (1.04)
12+	22	142.79 (7.93)	72.80 (3.35)	69.99 (4.53)	51.01 (1.10)

aged between 6 and 12 years. A total of 162 healthy boys selected at random from the schools were measured for the present study. The information's regarding age was confirmed from school register and related individual were excluded from the study. Written consent was obtained from parents and principles before the work commenced.

Anthropometric measurements

Data regarding anthropometry and other biosocial information were also collected in a specially prepared pre-tested schedule. All anthropometric measurements were done by one of us (JRG) by using standard techniques[7]. Bare footed standing height was measured to the nearest centimeter using Martins anthropometer. Sitting heights were measured after sitting on a flat table with head at eye-ear plane. Subischial leg lengths were obtained by subtracting sitting height from height. Cormic index was also calculated [(sitting height /stature)×100]. All measurements were taken between 12.00 noon and 03.00 p.m.

Statistical analysis

The technical error of measurement (TEM) was calculated and the results were found to be within the reference value as cited by Lohman et al. (1988)[7]. Therefore, TEM was not incorporated in the statistical analysis. Descriptive statistics for anthropometric variables were utilized to understand the variation. On the other hand Pearson correlation coefficient (r) analysis was used to measure the strength of the relationship between the variables. All statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, Version 7.5). A p value of <0.05 (two-tailed) was considered as significant.

Results

Age wise distribution of mean and standard deviation (SD) of the anthropometric characteristic and cormic index (CRI) of the boys are presented in Table 1. Mean values for height increase with age. Sitting height and subischial leg length also increase with age. Contrary to that CRI revealed a gradual decrease with age.

TABLE 2
PEARSON CORRELATION COEFFICIENT OF ANTHROPOMETRIC VARIABLES WITH AGE

Variables	r	p
HT	0.734	0.01
SH	0.637	0.01
SLL	0.731	0.01
CRI	–0.433	0.01

TABLE 3
PEARSON CORRELATION COEFFICIENT BETWEEN SITTING HEIGHT AND SUBISCHIAL LEG LENGTH BY AGE

Age (years)	r	p
6+	0.750	0.01
7+	0.503	0.05
8+	0.578	0.01
9+	0.699	0.01
10+	0.474	0.01
11+	0.564	0.01
12+	0.747	0.01

Pearson correlation coefficient (r) was attempted for understanding the overall relationship of anthropometric variables (HT, SH, SLL, and CRI) with age (Table 2). Examination on Pearson correlation coefficient revealed significant ($p<0.01$) positive correlation between HT ($r=0.734$), SH ($r=0.637$), SLL ($r=0.731$) and age. Table 2 also shows that, overall correlation between age and SLL is higher than SH. On the other hand CRI demonstrated significant ($p<0.01$) inverse relationship ($r=-0.433$) with age. Pearson correlation coefficient (r) was also undertaken in order to understand age wise relation between SH and SLL. The results are summarized in Table 3. The correlation between the two changes dramatically with age. The correlations were relatively higher ($p<0.01$) at the age of 6 and 12 years but relatively lower between the ages of 7 to 11 ($p<0.05$) years.

Discussion

Anthropometric technique apply skinfold thickness, circumferences and other somatic measurements to assess of component mass and have been the subject of growth, maturation, epidemiological and pathophysiologic research related to public health and primary health care. It is also necessary to examine the change in other body segment especially in relation to SH, SLL and CRI for various reasons mentioned elsewhere. Such studies not only help us to understand the contribution of different body segments to the linear growth during development but also to understand the current maturation status of the population.

The result of the present study are in general agreement with earlier studies[10–13] on the relationship of HT, SH, SLL and increased age.

The correlation analysis (Table 2) demonstrated that both SH (r=0.637, p<0.01) and SLL (r=0.731, p<0.01) increased with age but the tempo in SLL was higher than SH. The present study being the first available data on CRI from Indian population, however, demonstrated significant (r=–0.433, p<0.01) inverse relationship with age, as cormic index is a measure of contribution of SH to total stature and in these ages (6 to 12 years) tempo of SLL growth was higher than SH. Studies showed that rapid growth of the lower extremities is the characteristic of the early part of the adolescent spurt in stature, while growth in the sitting height component of stature occurs later. Consequently growth in leg length terminates earlier than growth in sitting height or trunk length, which continues into late adolescence and probably into the 20s[14–16].

The correlation analysis (Table 3) between the SH and SLL showed that, age wise correlation between these two were not same in all ages and changes dramatically, which may be due to the variation in tempo of SH and SLL growth with age[5]. Correlation analysis (Table 3) of the present study also revealed that at the age of 6 and 12 years i.e. both in early and late age correlation between SH and SLL was relatively higher indicating tempo of growth in SH and SLL was nearly same though the tempo of SLL was higher as Table 2 revealed higher correlation (r=0.731, p<0.01) between age and SLL than SH (r=0.637, p<0.01). On the other hand correlation between SH and SLL from the age of 7 to 11 was relatively lower, indicating tempo of growth in SLL was faster than SH in these ages among the studied population.

Comparison of segmental body measurements in terms of SH and SLL with well-off North Western Indian boys[10], the present study demonstrated age wise differences and it was found that on an average semi urban Bengalee boys have higher leg length. The inter population analysis demonstrated that the difference in total stature between these two population was due to the difference in SLL rather than SH. Similar results have been demonstrated in other studies[4,17].

The different exists between well-off North-Western Indian boys[10] and semi urban Bengalee boys of the present study might be due to the difference in environmental as well as ethnic origin. It has been proposed that differences between populations in body size are more likely to represent the influence of environmental factors on growth than the variation in genetic potential for growth of different ethnic groups[4,18].

The finding of the present study may help to understand the effect of age on body segments (SH and SLL) and variation in tempo of growth with age at the developmental periods of semi urban Bengalee boys.

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STUDIJA KORMIČKOG INDEKSA MEĐU SEMI-URBANOM POPULACIJOM DJEČAKA ZAPADNOG BENGALA, INDIJA

S A Ž E T A K

Stas je aditivna mjera, pa bi bilo korisno istražiti uzorak njegovih sastavnica u smislu sjedeće visine i dužine noge, za evaluaciju i uvid u razna pitanja vezana uz rast. Cilj ove studije bio je istražiti uzorak rasta s obzirom na visinu, sjedeću visinu, dužinu noge, kormički indeks i njihov odnos s dobi. Ova presječna studija uključila je 162 dječaka iz Bengala, starosti 6–12 godina. Starost je bila značajno korelirana s visinom (r=0,734), dužinom noge (r=0,731) i sjedećom visinom (r=0,637). Međutim, kormički indeks je pokazao značajnu negativnu korelaciju s dobi (r=–0,433). Uzrok ovome mogao bi biti u drugačijoj brzini rasta sjedeće visine i dužine noge. Njihova korelacija varira od 0,474 do 0,750 zbog različite dinamike rasta.