A Study Of The Cormic Index In A Southeastern Nigerian Population

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Citation

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Abstract

Since Body shape is generally influenced by a complex array of factors ranging from genes to environment; sequential growth patterns have been expressed by particular peoples. This study therefore aims at estimating and understanding the racial features of the south eastern Nigerians with respect to body shape and to evaluate how Height (HT), Sitting Height (SH), Subischial Leg Length (SLL), interrelate with Cormic Index (CI). The cross-sectional study includes 1200 southeastern Nigerian adults: 600 males and 600 females aged 18-48 years. The mean CI was found to be: 48.6% in males and 47.9% in females. Cormic index displayed significant positive correlation with SLL (r=0.631), SH(r=0.608) in males and SLL (r=0.178), SH (r=0.812) in females; and a weak correlation with HT (r=0.42) and (0.367) in males and females respectively. However, Age-wise correlation was non existent as growth had ceased in adults; who now express racial and genetic differences in body shape. In adult males and females, a direct positive correlation exists between CI and sitting height, while SLL shows an inverse correlation.

INTRODUCTION

The cormic index which is sitting height to stature ratio is the most common bi-variate index of shape. It is a measure of the relative length of trunk and lower limb and it varies between individuals and groups.[2]

Cormic index has been defined as the ratio of the sitting height to the total height[2] and as a measure of body shape; which is, sitting height divided by standing height. Thus, cormic index can be said to be the percentage of the sitting height of the total height or the stature.[3]

Cormic Index provides an estimate of relative trunk length. It is expressed as":

(Sitting height/stature) x 100

There is a racial or ethnic variation in the mean cormic index; Cormic index has been used as a valid means to study body size as has been observed in many populations. These include in Nilotic Africans and Australian aborigines[4]; for the European and Indo-Mediterranean population, it is about 52% (0.52). Africans have proportionally longer legs in general with cormic index value around 51% (0.51). Asians and far Eastern populations have proportionally shorter legs with cormic index of 53-54% [5]. Australian Aborigines who are relatively long legged exhibited low mean cormic index ratio of 0.48±0.02 (48%) ranging from 0.41-0.54 (41-54%) [6].

These differences observed in people of varying backgrounds are due to the determining factors which grossly include age, genes, environment and lifestyle. Well-nourished, healthy children younger than 5 years of age are of similar size and shape worldwide[7, 4], school-age children and adolescents may not be. Cormic Index declines throughout childhood because leg length increases faster than trunk length during prepubertal growth [8, 4]. This has been described in Semi-Urban Bengalee Boys of West Bengal, India; who showed significant negative correlation (r=–0.433) with age. This may be due to the fact that in ages 6-12 years, tempo of growth in subischial leg length was higher than standing height. Age-wise correlation between standing height and subischial leg length changes dramatically and varies from 0.474 to 0.750 due to the variation in the tempo of growth[9].

Studies showed that rapid growth of the lower extremities is the characteristic of the early part of the adolescent growth spurt in stature, while growth in the sitting height component of height occurs later. Consequently, growth in leg length terminates earlier than growth in sitting height or trunk length, which continues into late adolescence[10, 11, 12]. Thus, because the adolescent growth spurt is made up disproportionately of growth in the trunk, it produces a rise in Cormic Index in later adolescence [8, 13-14, 4.] Certain studies have shown a sharp change in the Cormic Index with onset of the adolescent growth spurt [4, 14].

Older adolescents who have completed their growth spurt and have essentially become adults may reflect adult differences in body shape.

Genetic factors also have a part to play in the specific growth patterns that occur in various ethnicities and tribes. This could be due to evolutionary adaptation as a result of climate and environment [15-25].

Influence of environment and lifestyle on the cormic index over time have been described in some populations, such as in Greek students [26] and boys and girls in southeast England[27]. Increase in cormic index was observed in both cases and this was attributed to better living conditions or the modern way of life. While it has been noted that human beings growing-up in adverse biocultural environments, including childhood health, diet and family circumstances: parental height, divorce and death.[25] ; as well as under nutrition, exposure to infection, economic oppression/poverty, heavy workloads, high altitude, war, racism, and religious/ethnic oppression, may be stunted, have asymmetric body proportions, be wasted, be overweight, and be at greater risk for disease.[17]

Positive correlations have been found between cormic index and Body mass index in Indians [28] and among Post-Pubertal Nigerian Subjects. The mean Cormic index obtained for the post pubertal males: 49.86% while that for the females: 50.45% for the north central geopolitical zone of Nigeria [1].

METHODS AND MATERIALS

SAMPLE

Data were collected from the southeastern geopolitical zone of Nigeria. This region includes five states: Enugu state, Abia state, Imo state, Rivers state, Anambra state and Ebonyi state. A total number of 1200 healthy adult individuals were selected at random. This comprised of 600 males and 600 females; aged between 18 and 48 years.

Measurements were obtained from higher institutions and religious centers. The sample included individuals from a multi-social and multi-religious background of ethnic Nigerian parentage. The acutely-ill and the physically challenged were excluded. Children on any form of continuous medication or those with various types of poor health conditions or immune disorders that manifest with signs of stunted growth or physical emaciation were excluded [29]. Consent of all subjects was freely given before measurements were taken.

ANTHROPOMETRIC MEASUREMENTS

ANTHROPOMETRIC DATA AND OTHER BIOSOCIAL INFORMATION WERE COLLECTED BY THE RESEARCHER TO AVOID INTEROBSERVER VARIABILITY. STANDING AND SITTING HEIGHTS WERE MEASURED USING A STADIOMETER MODEL ZT 120. ALL MEASUREMENTS WERE TAKEN TO THE NEAREST 0.1 CENTIMETERS (CM). THE MEASUREMENT OF STATURE WAS CONDUCTED FOLLOWING ANTHROPOLOGY PROTOCOLS AS PRESCRIBED BY AND

Height was measured with subjects standing barefoot, heels together, arms at sides, legs straight, and shoulders relaxed. The subjects` head were positioned such that their eyes are looking straight forward, without lifting their chin or in a horizontal Frankfort plane. Just before taking the measurement, subjects were asked to take a deep breath and hold it.

The head piece was lowered to the highest point of the head, ensuring that the hair is compressed. In measuring sitting height; subjects were asked to sit on a flat stool of a known height. With subjects sitting in a standard position, measurements were taken.The sitting height was then obtained by subtracting the height of the stool from the reading on the stadiometer.

All measurements were taken between 12.00 noon and 04.00 p.m. This is due to Diurnal Variation – which refers to variation of a measurement during the course of the day. Stature and body weight show diurnal variation [33-34].

STATISTICAL ANALYSIS

The Statistical Package for Social Sciences (SPSS, Version 15.0) was used for data analysis. Descriptive statistics was used to present anthropometric variables. Cormic index was calculated for each individual followed by calculation of central tendency viz. mean and standard deviation for each measurement per state. The Pearson correlation coefficient (r) analysis was used to measure the strength of the relationship between the variables. A p value of <0.05 (two-tailed) was considered as significant

RESULTS

Mean values for age is 34.2 years for the female subjects and 31.62 years for the male subjects; while it is 32.91 years for total population. The mean cormic index (CI) or proportion of sitting height to stature was found to vary between 0.47 and 0.50; while the mean cormic index for male subjects is 0.4860, it is 0.4798 for female subjects.

Figure 1

TABLE 1: MEAN, STANDARD DEVIATION AND STANDARD ERROR OF MEAN OF HEIGHT, SITTING HEIGHT AND SUBISCHIAL LEG LENGTH AND CORMIC INDEX IN MALE AND FEMALE SUBJECTS.

	HEIGHT	SEM	SITTING HEIGHT	SEM	SUBISCHIAL LEG LENGTH	SEM	CORMIC INDEX	SEM
MALES	179.56(1.81)	±0.81	89.40(2.93)	±1.28	92.14(2.36)	±1.06	0.49(0.02)	±0.01
FEMALES	167.72(1.79)	±0.80	81.78(2.19)	±0.32	87.22(1.15)	±0.51	0.48(0.002)	±0.01

Figure 2

TABLE 2: SHOWS MEAN, STANDARD DEVIATION AND STANDARD ERROR OF MEAN OF CORMIC INDEX AND AGE IN MALE SUBJECTS

	MEAN	Std. Deviation	Std. Error Mean
CI	.486000	.0151658	.0067823
AGE	31.6200	2.67058	1.19432

Figure 3

TABLE 3: SHOWS MEAN, STANDARD DEVIATION AND STANDARD ERROR OF MEAN OF CORMIC INDEX AND AGE IN FEMALE SUBJECTS.

	MEAN	Std. Deviation	Std. Error Mean
CI	.479800	.0019235	.0008602
AGE	34.2000	2.05426	.91869

Student`s T-test was employed to determine any significance between cormic indices in both male and female populations as well as between age and cormic index in both populations as shown in tables 2 and 3.

There exist, no statistically significant differences (p=0.05) in the mean value of cormic index obtained for the male and female populations of the south eastern Nigerian states.

No statistically significant relationship was found between age and cormic index in southeastern Nigerian adults.

Pearson correlation coefficient (r) was attempted for understanding the overall relationship of anthropometric variables: Height (HT), Sitting Height (SH), Subischial Leg Length (SLL), with Cormic Index (CI). This has been appropriately represented in Table 4 below.

Figure 4

TABLE 4: PEARSON COEFFICIENT(r) OF CORMIC INDEX WITH HEIGHT, SITTING HEIGHT AND SUBISCHIAL LEG LENGTH

	MALES			FEMALES		
VARIABLES	MEAN(SD)	R	P	MEAN(SD)	R	P
HEIGHT	179.6(1.81)	0.042	0.05	167.7(1.79)	0.367	0.05
SITTING HEIGHT	87.4(2.86)	0.608	0.05	80.5(0.72)	0.812	0.05
SUBISCHIAL LEG LENGTH	92.2(2.36)	0.631	0.05	87.2(1.15)	0.178	0.05

*correlation is significant at the 0.05 level (2-tailed)

Examination on Pearson correlation coefficient revealed significant (p<0.05) positive correlation between Height (r=0.042), SH (r=0.608), SLL (r=0.631) and Cormic Index in males; and Height (r=0.367), SH (r=0.812), SLL (r=0.178) and Cormic Index in females. Table 4 also shows that, overall correlation between cormic indices and SH is higher than SLL.

DISCUSSION

Previous studies have presented data which clearly establishes that Africans have proportionally longer legs, in general, with ratios around 0.51. Asian and Far Eastern populations have proportionally shorter legs and means of 0.53-0.54[5]. Thus, the result of the present study (mean CI) is in general agreement with earlier works on the relationship of HT, SH and SLL.

The standard value of cormic index lies in a range of ratios from 0.48-0.55 found within and between populations[35]. The result of this study falls within this range. This study therefore determines the mean cormic index for the south eastern Nigerian population: 48.6% for males and 47.89% for females. There is currently no data for comparing these results with.

No statistically significant correlation was found between cormic index and age in adult southeastern Nigerians. A previous research demonstrated a (r=-0.433, p<0.01) significant inverse relationship with age in Semi-urban Bengalee boys aged 6-12 years[9] and this probably explains why southeastern Nigerian adults do not exhibit any correlations; because growth has ceased both in SLL and probably in SH.

According to the t-test results; the cormic index for the male and female populations shows that no statistically significant difference exist between the 2 means ($p>0.05$, two-tailed). This agrees with the findings of a work on the post pubertal male and female populations within Ilorin Metropolis located in the north central geopolitical zone of Nigeria[1]. Thus, cormic index does not show any sexual dimorphism in southeastern Nigerian adults.

The correlation analysis (table 4) expressed the overall relationship of anthropometric parameters: Height (HT), Sitting Height (SH), and Subischial Leg Length (SLL), with Cormic Index (CI). Significant positive correlation ($p<0.05$) exists between Height and cormic index in males ($r=0.042$) and in females ($r=0.367$), although this correlation is weak. This may be due to the longer legs generally presented by Africans. In the present study, the mean SLL is 92.14±1.0567 in males and 87.22±0.5132 in females; when compared to the mean sitting height in southeastern Nigerians: 89.40±1,280 in males and 81.78±0.322 in females. SH shows a greater correlation when compared to SLL with mean coefficient correlation values of: SH: ($r=0.71$) and SLL: ($r=0.4045$). Thus, while cormic index has a direct relationship with SH, it has an inverse relationship with SLL. That is to say that it is the size of the trunk that mainly determines the body cormic index and not the lower limb. People with relatively long lower limbs tend to have low cormic index.

Thus, the finding of this study may help to understand the contributions of the various body segments in assessing body shape especially in adult individuals of south eastern Nigerians.

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