



**CORMIC INDEX AMONG SCHOOL CHILDREN AND ADOLESCENTS IN  
OGONILAND, RIVERS STATE**

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Article Received on 31/03/2020

Article Revised on 20/04/2020

Article Accepted on 10/05/2020

**ABSTRACT**

Measurement of body proportion is useful not only in studying nutrition-related disorders of clinical and public health concerns such as overweight and obesity but also in determining growth patterns of individuals of a certain category, and in different populations. The aim of this study was to determine the cormic index of school children and adolescents in Ogoni, Rivers State, Nigeria. This study was a cross-sectional survey that made use of three hundred (300) randomly selected school children and adolescents in Ogoni, Rivers State between the ages of 8 - 14 years. Measurements were obtained from subjects in primary and secondary schools in Ogoniland. Standing height of subjects, the maximum distance from the floor to the vertex was measured with subjects standing erect and barefooted in anatomical position whereas sitting height, the measured distance from the vertex to the seated buttocks was measured with the subjects' heads in natural head position. Data obtained was subjected to statistical analysis using SPSS version 23.0 and presented as mean±SD. Result showed Sitting Height (69.82±3.96), Height (140.73±6.84), Subischial Leg Length (73.41±4.67) and Cormic Index (49.53±1.02). All studied parameters increased with increase in age. With the exception of subischial leg length which was higher in females, other parameters were higher in males. Correlation analysis showed a relationship between sitting height, height, subischial leg length, cormic index and age. People with relatively long lower limbs tend to have low cormic index. Variation observed in our finding could be attributed to environmental and racial variations as it has been suggested that differences between populations in body size are more likely to express the impact of environmental factors on growth than the variation in genetic potential for growth of different ethnic groups. Our finding therefore may provide an insight into the influence of age on growth and the role of body segments in body shape and growth assessments.

**KEYWORDS:** cormic index, sitting height, children, subischial leg length, height, Ogoniland.

**INTRODUCTION**

Ogoni people are one of the many indigenous peoples in southeastern senatorial district of Rivers State, Nigeria. They number about over two million people and live in a 404 square-mile (1,050 km<sup>2</sup>) homeland which they also refer to as Ogoni, or Ogoniland. Traditionally, the Ogoni are farmers, also known for livestock herding, fishing, salt and palm oil cultivation and trade.<sup>[1]</sup>

Stature is a composite of linear dimension and is a major indicator of general body size and of bone length.<sup>[2]</sup> Anthropometry is the principal method of assessing growth, and height/length-for-age is the most useful linear measurement that gives an indication of past nutrition.<sup>[3]</sup> The cormic Index expresses sitting height as a proportion of full height. It is a measure of the relative

length of trunk and lower limb and it varies between individuals and groups, and is the most common bivariate index of shape.<sup>[4]</sup> The variations seen in people of different backgrounds are as a result of factors such as age, genes, environment and lifestyle.<sup>[5]</sup> Cormic Index is most commonly used in the correction of variability in body shape when Body Mass Index (BMI) is used to compare the nutritional status in or between different populations.<sup>[6]</sup> For instance, lanky individuals could be erroneously considered underweight by mere observation whereas they have normal body weight while individuals who are hefty could be considered overweight whereas they likewise have normal BMI. Modification of the BMI can therefore be carried out by employing the use of cormic Index to help correct for this variance in shape of the body. Adolescent and prepubertal growth pattern

has revealed that there exists variance in the growth of spinal length compared to limb length. It has been established by other studies that increase in sitting height is relatively faster than leg length in later childhood.<sup>[7,8]</sup> Therefore, growth in leg length terminates earlier than growth in sitting height or trunk length, which continues into late adolescence.<sup>[2,9,10]</sup> Well nourished, healthy children younger than 5 years of age are of similar size and shape worldwide<sup>[11,12]</sup>, school-age children and adolescents may not be.<sup>[5]</sup>

It has been shown severally that secular increases in stature are largely the result of greater lower body rather than upper body growth.<sup>[13,14]</sup> Since, stature is an additive measurement, it would be useful to examine the pattern of its constituent segments, sitting height and subischial leg length and could be used for evaluation and insight of various growth related issues.<sup>[2]</sup>

Studies in Nigeria with regard to cormic index are few to the best of our knowledge and none has been carried out among the Ogonis. It is against this backdrop that we embarked on this study. Use of cormic index has been employed in previous studies on body size across different populations; Nilotic Africans and Australian aborigines<sup>[12]</sup>, the European and Indo-Mediterranean populations, Africans, Asians and far Eastern populations<sup>[15]</sup>, Australian Aborigines<sup>[6]</sup>, and South Eastern Nigeria.<sup>[5]</sup> Since research has shown that well-nourished, healthy children younger than 5 years of age are of similar size and shape worldwide<sup>[11,12]</sup> and school-age children and adolescents may not be, it becomes necessary to carry out this study in order to understand the influence of age on growth and the role of body segments in the assessment of body shape and growth. The present study investigated Cormic Index (CRI) among school children and adolescents aged between eight (8) to fourteen (14) years in Ogoni Land.

## MATERIALS AND METHODS

### Sample

The study was a cross-sectional survey on three hundred (300) school children and adolescents divided into 150 males and 150 females randomly selected in Ogoni, River State whose ages ranged from 8 to 14 years between the months of August to October, 2016. Measurements were obtained from primary and secondary schools. Age was ascertained via school register.

Approval for the study was obtained from the Research Ethics Committee of the College of Health Sciences, University of Port Harcourt and written informed consent was obtained from each parent and head of schools before the commencement of the study.

### Measurements

All anthropometric measurements were done using standard techniques.<sup>[16]</sup> Subjects were asked to take off their shoes to enable us to get measurements of their

appropriate heights. With the subjects barefooted and standing in anatomical position, measurement of height was done using a stadiometer (Harpender Portable Stadiometer (Model 603VR) produced by Holtain Ltd). Similarly, without having any load that would constitute an additional weight either in their hands or pockets with the subjects barefooted, weights were taken. Measurements of weight were taken using the normal bathroom weighing scale to the nearest 0.1Kg.

### Measurement of Sitting Height.

Sitting height was measured on a flat table. Sitting height was measured from the vertex of the head to the buttocks in a sitting position. As described by Carpenter *et al.*<sup>[17]</sup>, the subject's head was in natural head position, eyes level kept in the Frankfort horizontal plane with relaxed shoulders, the back straight, and the head piece brought into firm contact with the vertex.

### Determination of Subischial Leg Length (SLL)

Subischial Leg Length is expressed as the difference between height and sitting height.

### Determination of Body Mass Index (BMI)

Body Mass Index is given as weight in Kg/height in metre<sup>2</sup> (Kg/m<sup>2</sup>).

### Determination of Cormic Index

It is given as (Sitting height/height) × 100 in centimeter (cm).

### Precaution

1. Anthropometric data and other biosocial information were collected by us to avoid inter-observer variability.
2. To minimize error, each linear measurement was taken three times and the mean recorded.
3. Linear measurements were taken to the nearest 0.1 centimeters (cm).
4. All measurements were taken between 12.00 noon and 04.00 P.M due to diurnal variation.

### Inclusion Criteria

1. Participating children were from Ogoniland.
2. Participating children were between the ages of 8-14years.
3. Informed consent was obtained from subjects.

### Exclusion

1. 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.
2. Children above or below the required age bracket.
3. Children whose origins are not Ogoni or those with mixed parentage.

### Statistical analysis

Statistics was done using the Statistical Package for Social Sciences (SPSS, Version 23.0). Continuous

variables were presented as mean±SD. Age was categorized into four groups (8-9, 10-11, 12-13 and >13). The Pearson correlation coefficient (r) analysis was used to measure the strength of the relationship between the variables. Independent sample t-test was carried out to determine significant difference in the measured anthropometric variables between sexes. Confidence interval was set at 95%, therefore  $p < 0.05$  was considered significant.

## RESULTS

Descriptive statistics of anthropometric variables of all subjects is presented in Table 1. Mean values for sitting height, height, and subischial leg length increased with age. Cormic index similarly increased with age. With the

exception of subischial leg length which was higher in females, other variables were higher in males. The difference in mean in all variables between the males and females was statistically significant ( $p < 0.01$ ). Table 3 shows Pearson correlation coefficient (r) to show the relationship between anthropometric variables with age. Pearson correlation coefficient showed significant ( $p < 0.00$ ) strong positive correlation between sitting height ( $r=0.928$ ), height ( $r=0.931$ ), cormic index ( $r=0.924$ ) and age whereas subischial leg length showed a weak positive correlation ( $r=0.131$ ) with age. Therefore, overall correlation between age and height was higher than that between sitting height and cormix index and age.

**Table 1: Descriptive statistics of anthropometric variables of all subjects (cm).**

Age	N	Sitting Height	Height	Subischial Leg Length	Cormic Index	t-test			
						Df	t-value	p value	inference
8-9	60	61.45±3.49	127.43±5.49	65.98±4.68	48.22±1.03	299	4.54	0.000	S
10-11	127	66.93±3.43	137.54±6.96	70.61±4.79	48.66±1.01	299	3.55	0.000	S
12-13	84	72.17±5.37	146.73±7.41	74.56±5.52	49.19±1.01	299	4.84	0.000	S
>13	29	78.71±3.54	151.21±7.51	82.50±3.69	52.05±1.04	299	3.956	0.000	S
Total Mean		69.82±3.96	140.73±6.84	73.41±4.67	49.53±1.02				

S – significant

**Table 2; Descriptive statistics according to sex (cm).**

Sex	Sitting Height	Height	Subischial Leg Length	Cormic Index
Female	69.34±2.92	140.70±5.43	71.36±4.16	49.28±1.03
Male	71.59±5.78	142.16±6.06	70.57±3.16	50.36±1.03

**Table 3: Pearson Coefficient (r) of Cormic Index with Height, Sitting Height and Subischial Leg Length.**

Variables	R	P
Sitting Height	0.928**	0.000
Height	0.931**	0.000
Subischial Leg Length	0.131*	0.001
Cormic Index	0.924**	0.000

## DISCUSSION

Various anthropometric techniques have been employed in studying linear, angular and circumferential body parameters either in relation to growth, description of a population or health care. It is essential to investigate changes in body segments of a young population to understand its growth pattern in terms of their sitting height, height, subischial leg length and cormix index. Such studies provide better insight into the contribution of different body segments to linear growth during development as well as the current maturation status of the population.<sup>[2]</sup>

All variables in our study were found to increase with increase in age. This finding does not completely agree with the finding of Ghosh and Bandyopadhyay<sup>[2]</sup> who demonstrated that cormic index decreases with increase in age. Also, correlation analysis in our study showed a direct positive correlation ( $r=0.924$ ) between cormic index and age, and is agreement with Ukwuma<sup>[5]</sup>,

whereas in the study of Ghosh and Bandyopadhyay<sup>[2]</sup>, it showed an inverse relationship. Ukwuma<sup>[5]</sup> attributed this to the fact that size of the trunk that mainly determines the body cormic index and not the lower limb explaining further that people with relatively long lower limbs tend to have low cormic index.

Sexual dimorphism was observed in our study as the male mean values were higher in all variables than those of the females. Whereas correlation analysis for subischial leg length showed a weak positive correlation (0.131) with age, other variables showed a strong positive correlation (Table 3).

Studies have shown that rapid growth of the lower extremities is the feature of the early part of the adolescent spurt in stature, whereas growth in the sitting height component of stature takes place later. Therefore, growth in leg length is brought to a halt earlier than growth in sitting height or trunk length, which continues

into late adolescence and without much doubt into the 20s.<sup>[9,10,18]</sup>

Previous studies have shown that Africans have proportionally longer legs, in general. Asian and Far Eastern populations have proportionally shorter legs.<sup>[12,15]</sup> Our finding is in agreement with earlier works on the relationship of sitting height, standing height and subischial leg length. The standard value of cormic index lies in a range of ratios from 0.48-0.55 (48 -55cm) found within and between populations.<sup>[5]</sup>

## CONCLUSION

Variation observed in our finding could be attributed to environmental and racial variations as it has been suggested that differences between populations in body size are more likely to express the impact of environmental factors on growth than the variation in genetic potential for growth of different ethnic groups.<sup>[11,13]</sup> Our finding therefore may provide an insight into the influence of age on growth and the role of body segments in body shape and growth assessments.

## ACKNOWLEDGMENT

Authors acknowledge that no external funding was received for this study. No conflicts of interest were reported.

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