SUBNASALE TO GNATHION DISTANCE AND NASOSPINALE HEIGHT CORRELATION OF NIGERIAN CHILDREN

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ABSTRACT

BACK GROUND

This study was carried to determine the relationship between the nasospinal height and that of the subnasale to gnathion distance. Normal values of nasospinale height and subnasale to gnathion distance from parameters measured are important tools in revealing phenotypic information that relates to measures of racial variations.

METHOD

A total of one thousand two hundred children (1100); aged 2-17years comprising of 550 males and 550 females who are students and pupils of some kindergarten, primary and Secondary Schools in Port Harcourt metropolis. Nasospinal height and subnasale to gnathion distance were measured and were statistically analyzed for sexual dimorphism and correlation.

RESULT

Both nasospinale height and subnasale to gnathion distance recorded a statistical significant difference between the males and females in age groups 11-14 and 15-17years. More importantly, there was a high degree of correlation between nasospinale height and subnasal to gnathion distance in both sexes.

CONCLUSION

The results of this study revealing a correlation between the nasospinale height and subnasal to gnathion distance will be of use in forensic and craniofacial related surgeries.

Key words: *Anthropology, population, generation, sex*

BACKGROUND

The use of measurements in physical anthropology began as early as 1800 [1]. This has greatly enhanced subtle differences in body size and form in relation to function. Several studies had demonstrated the cephalometric variations between populations [2]. Values of anthropometric measurement of people all over the world vary and standard methodologies of taking measurements both on the skeleton and on the living have been documented in several literatures [3,4]. The need has been felt for new measurements to be devised to be able to answer questions about form and its relationship to function [5]. Hence, anthropometry is still relevant in present day studies.

Classification of people using physical measurements involved the assemblage of inheritable physical characteristics such as head and nasal forms, proportions of arm and leg and other areas which showed great stability [6]. These measurements could be treated mathematically to secure the average or mean of any group and also deviations from normal. To be consistent and valuable, the measurements must be taken from well defined points of the body by trained observers and by internationally accepted methods. From results obtained from these measurements, ratios and proportions that facilitated descriptions have been worked out. Abnormalities such as gigantism and malnutrition could affect statures but indices such as cephalic and nasal remain relatively unchanged over many generations [7]. However, there is evidence of considerable plasticity in ethnic groups due to effect of environment and other factors such as secular trend.

Anthropometric data are useful in analyzing localized aspects of body composition with the hope that such sites are representative of the entire body. The development in the last 25 years of techniques for estimating the components of body composition for the whole body has given a significant boost to research in body composition. Human biologists have in particular been interested in finding such parameters of the body's composition such as density, fat and muscle weight, lean body mass, total body water etc [8]. These have correlated significantly with

anthropometric indicators such as mid arm circumference, skin fold thickness, basal metabolic index, relative weight etc.

Anthropometry has been incorporated into research methodologies in Anthropology and Archeology to determine sex and age of skeletons, in Anatomy, Nutrition, Physiology, Endocrinology, Paediatrics, Community Medicine etc.

Proportion of parameters within the face such as inter-orbital distance, nasal height, maxillary height and mandibular height change with age and according to sex in any given population owing to variations in skeletal dimensions and muscle development [9]. They are also dependent on factors such as diet, health and climatic influences, which are known to be important determinants of growth and development [10].

There have been several reports on Nigerian facial dimensions. Oladipo and others reported the nasal parameters of the Ogonis population and documented the nasal height to be 3.99 cm and 3.91 cm in men and women, respectively [7]. Akpa and colleagues reported that the nasal heights for Igbos males and females were 6.31 cm and 6.04 cm, respectively [11]. In the same vein, Erika and colleagues reported that the mean nasal and facial heights were 5.87 cm and 12.41 cm in males, and 5.67 cm and 11.76 cm in females [12]. There are no reports in respect to correlation of nasal height and subnasal to gnathion distances of children. The present study is designed to document the statistical correlation between subnasale to gnathion distance and nasal height of Nigerian children.

METHODS

Study Population

Measurements were carried out in the class rooms that are not in teaching session. Craniofacial Anthropometric Measurements were taken from a total of 1,100 subjects aged 2-17 years in a Longitudinal Study between January and February, 2007. Measurement was taken from growing children who are pupils of the University of Port-Harcourt Kindergarten, Demonstration Primary and Secondary Schools as well as First International Academy Secondary School, Rumuokoro, Port Harcourt.

Children with craniofacial malformations were excluded from the study. The Biodata of the Children which include their Names, Sex and Age were obtained and recorded from the School register and by direct oral questioning of their Parents. The measuring techniques followed internationally accepted standards in Anthropometry and were taken to the nearest 0.01 cm.

Measurement procedure

(a.) Measurement of the subnasale-to-gnathion distance was carried out using a sliding caliper by using method previously described by Farkas and Lindsay [13]. The subnasale (sn) is a frequently used reference point that is located at the junction of the columella and the upper lip while the gnathion (gn) is the most inferior midline point on the mandible, located where a line tangent to the pogonion intersects a line tangent to the mention.

(b)The nasospinale height was also taken using a sliding caliper using method previously described by Farkas and Lindsay [13]. To determine the nasal height, measurement was taken of the distance from a point approximately one-half centimeters above the area that is in the centre between the eyes or the point of intersection between the frontonasal suture and the midsagittal plane (nasion) to the point where the nasal septum merges with the skin of the upper lip (nasospinale). This is also called the nasion (n) nasospinale (ns) height. The nasospinale is also the point where a line drawn between the inferior most points of the nasal (piriform) aperture crosses the midsagittal plane. This point is not necessarily located at the tip of the nasal spine. Both nasospinal height and subnasal to gnathion distance measurement are illustrated in fig.1 below.

These measurements are taken in the absence of any form of facial expression which can alter the size and position of the nose.

Ethical Considerations

We obtained permission to conduct the study from the authorities of the selected schools and the parents of the participating students were properly briefed on the purpose and procedure of the research. Only verbally consenting volunteers were included.

Analysis of Data

The statistical analysis was performed using the *z* score. A value for *P* less than 0.05 was considered to be significant while the correlation coefficient was determined by Pearson Product Movement Correlation formula [14].

RESULTS

Mean values for subnasale to gnathion distance and

nasospinale height for both sexes are presented in table 1 and 2 respectively. There was a statistical significant difference in both the subnasale to gnathion distance and nasospinale height between male and female subjects in only age groups 12-14 and 15-17years. Table 3 showed the degree of correlation between the subnasale to gnathion distance and nasospinale height in both sexes. In all the age groups, there was a very strong correlation between the subnasale to gnathion distance and nasospinale height.

DISCUSSION

The relationships between the mean values and the coefficients of correlation
(r^2) between nasospinale height and subnasale to gnathion distance of Nigerian children between the ages of 2-17years at the 95 per cent confidence level are given in this study.
The facio- metric dimensions provide a measure of form of facial anatomical structures. A higher ratio indicates a long-thin form, whereas a lower ratio indicates a wider and shorter form. The knowledge of surface facial dimensions is relevant in both forensic and plastic/maxillofacial surgery as it relates to reconstruction, classification and identification.

Absolute dimensions of facial soft tissues are equally important as earlier highlighted by Jain et al., and Kale-Varlk [15,16]. Although it has previously been suggested that facial forms are important in Caucasian subjects with its embryologic relationship with upper respiratory tract abnormalities, it remains unclear whether this observation is a cause or effect phenomenon [17,18]. Future studies in larger populations may be able to address the relevance of different facial metric forms and its relationship in upper respiratory in the Nigerian population.

These results support the hypothesis that facial phenotype is determined collectively by the size and morphology of skeletal, muscular, and adipose tissues, together with surface facial forms. Although these structures may have unique genetic determinants, some shared embryologic origin [19-21].It is possible through these common embryologic links that surface facial forms remain closely associated in humans.

The differences which exist between tribes and population groups, as phenotypic expressions of a diversity of genotypic heredity which is an insurmountable obstacles could not be achieved in this current study of correlation between subnasal to gnathion distance and nasospinale height as more work has to be done involving different population. To the best of our knowledge, there have been no known previous investigations in this area of correlation between subnale to gnathion distance and nasospinale height of different children population so as to compare and contrast our findings. We still have to bear in mind that variation in the craniofacial skeleton may occur secondary to soft-tissue stretching or soft tissue-induced osteogenic reaction and growth [22,23].

Fig.1. Schematic representation of the measurement of nasospinal height, A; subnasaal to gnathion distance B.

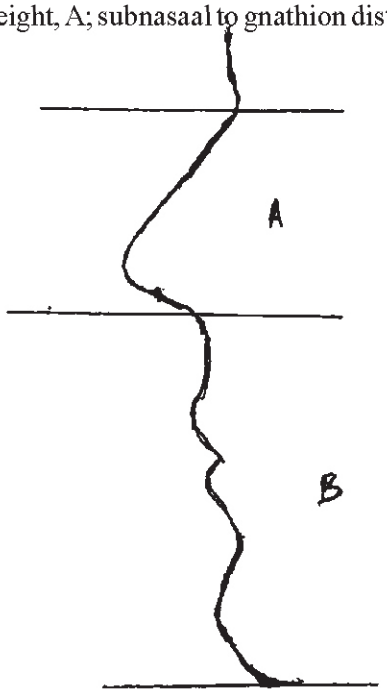

Table 1: Subnasale to gnathion distance in male and female children.

Age Group	male children			female children		
(Years)	N	Mean	SD	N	Mean	SD
2-6	159	5.73	0.26	167	5.69	0.23
7-10	133	5.90	0.30	154	5.88	0.36
11-14	165	6.10	0.23	152	6.40	0.37*
15-17	93	6.24	0.43	77	6.26	1.01*

N=sample size, SD=standard deviation *=p<0.05

Table 2. Nasospinale height in male and female children.

Age Group	male Children			Female children		
(Years)	N	Mean	SD	N	Mean	SD
3-6	159	1.80	0.57	167	1.87	0.32
7-10	133	2.35	0.92	154	2.11	0.33
11-14	165	2.79	0.69	152	2.67	0.42*
15-18	93	3.90	0.39	77	3.69	0.66*

N=sample size, SD=standard deviation *=p<0.05

Table 3: Correlation coefficient between subnasale to gnathion distance and nasospinale height

Age Group (Years)	N	Male children r^2	N	Female children r^2
3-6	159	0.84	167	0.94
7-10	133	0.97	154	0.95
11-14	165	0.98	152	0.95
15-17	93	0.99	77	0.98

N=sample size, r^2= correlarion coefficient

CONCLUSION

This study has shown that there is a correlation between between subnasale to gnathion distance and nasospinale height of Nigerian children. However, further research work is required to be carried out to determine this correlation in adult.

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