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Various Specific Measures of Phylogenetic Diversity

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Abstract

Cranial dimensions and cranial indices are considered as simplest and most efficient way to indicate facial differences and age variations. Cranial morphology and dimensions are used to evaluate various aspects of growth and development thus helping in population differentiation. The aim of the study is to investigate the craniometric patterns in the Nigerian population based on three dimensional computed tomographic data, with the objectives of determining the age of individuals in the eastern part of Nigeria as well as determining if the skull of individual varies with age using computed tomography. Methodology involves a descriptive study design with age determined using standard ageing techniques. 150 dry adult human skulls cases (male and female both) constituted the material for the present study between age group of 25 - 60 years. Data were scanned in the radiology department and the CT data were processed in a computer workstation at the department. The CT scan acquisition was performed with 1.5 mm slice thickness and reconstruction was done with 1.0m 2m slice thickness. All the CT data were recorded using DICOM 3.0 as a medical image file format into CD-ROM.

Keywords: Craniometry • Anthropometry • Cranial vault • Sex • Endocranial

About the Study

Craniometry being the scientific study and measurement of the skull has been useful in anthropometry for the morphometric and non-morphometric identification of the sex and age and in forensic practice when cranial remains are compared with living photographs. Cranial dimensions and cranial indices are considered as simplest and most efficient way to indicate facial differences and age variations. For instance, cranial volume expresses several aspects of growth and development and permits critical evaluation of unusually large or small crania. Through skull morphology, population differentiation has been explored by recent studies, showing that not only vault features but also various facial characteristics are responsible for both inter and intra-regional differences within a region. These cranial index variations between and within population have been attributed to a complex interaction between genetic and environmental factors. There are several skeletal indicators that are used to estimate age at death for adults such as Cranial suture closure or suture synostosis of which Nawrocki introduced 14 regression equations for determining age at death using these sutures and as Acsadi and Nemeskeri opined in an attempt to create an age estimation method using endocranial suture closure while examining 285 symmetrically closing crania suggest that as age increases so does mean suture closure [1-3].

The aim of the study is to investigate the craniometric patterns in the Nigerian population based on three dimensional computed tomographic data with the objectives of determining the age of individuals in the eastern part of Nigeria as well as determining if the skull of individual varies with age using computed tomography since it enables 3-D reconstruction and assesses the cranium data both inner and outer anatomical landmark for the craniometric study. Methodology involve a descriptive study design with age was determined using standard ageing techniques, as specified in Scheuer and Black and Cox. Normally, the practice consists of taking precise measurements using 'anatomical landmarks' on the skull. The inclusion criteria include individuals within ages 25 to 60 with no incidence of head trauma or abnormality, no loss of teeth from the maxilla and no chronic illness that might affect the cranium [4].

The exclusive criteria include individuals with anatomical deformities and children. The data was collected from a CT SCAN's radiological department in Abia state Diagnostic center, Umuahia and Union diagnostic center, Port Harcourt Rivers State. Patients were scanned in the radiology department and the CT data were processed in a computer workstation at the department. A spiral computed tomography scanner (SIEMEN) was used to obtain data from 150 crania. The CT scan acquisition was performed with 1.5mm slice thickness and reconstruction was done with 1.0m ,2m slice thickness [5,6].

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All the CT data were recorded using DICOM 3.0 as a medical image file format into CD-ROM and subsequently will be imported to the medical imaging software (MIMICKS). The segmentation techniques will be used to identify the region of interest of the computed tomography image based on Hounsfield unit. The selected region was calculated into 3-D modem which enabled determination of the 3-D Craniometric data. During each scanning, each subject was placed in a supine position. Axial scanogram was obtained from the setting that the tube voltage is 120KVP, and tube current be 52 m, with 0.58 rotation time and 1mm slice thickness, the CT scan lateral view 300 applications present in the machine so as to avoid problem of magnification [7,8].

To determine the craniometric data in the present study, the first step was to define the anatomical landmarks which can be classified as median and bilateral types. All landmarks used in the present study were based on the traditional definition with the modification into 3-D model. The most prominent anatomy in 2-D/3-D views were selected to state the proper position of each anatomical landmark. The second step was to calculate the craniometric parameters, which were derived from the two and three coordinate points for linear and angular measurements respectively. The measurement data were typed in Microsoft Excel and then exported to SPSS version 20.0 for the statistical analysis. The anatomical landmarks in craniometric study are categorized into median and bilateral landmarks. The mean landmarks are approximately located on sagittal plane [9].

Each of the three-dimensional models of skull is used to determine the anatomical landmark. Only one investigator locates the entire landmarks in every skull to avoid uncertainty of intra-observer. The measurements are interpreted using statistical analysis and reported in form of comparism of the mean values and mean difference, standard deviation, and confidence interval in respect to the various landmarks. In order to distinguish Craniometric parameters of each age, analysis of variance was utilized for analysis. A p-value 0.005 alpha level of significant that was used to determine the difference. 150 dry adult human skulls cases (male and female both) constituted the material for the present study between age group of 25 - 60 years. In this study, we considered only complete union of the glabella occiput length, basion nasion length, basion bregma height, nasion bregma cord, bregma lambda cord, lambda opisthion length, basion prosthion length sutures instead of taking into account other scoring system of suture closure and compared with standard data mentioned in different previous studies [10].

Result of the study shows that the total number of sample for each landmark group in table 1.1 is 1050 which covers the range value of 6 with a minimum number 1 and maximum number 7. The total sum of all Landmarks d is 4,200. The mean statistics of the seven groups is 4.00 with standard error of 0.62. The total number of length is 1050 with range of 119. The length attracts the minimum and maximum value of 80 and 199 with total sum of 132282. The mean statistics is 125.98 with standard error of 0.740 [11].

Discussion and Conclusion

The conclusion can be drawn that the craniometric data of Nigerians age have statistical significant differences in their mean values. Age of the cranium skulls suture of glabello occiput length, basion nasion length, basion bregma height, nasion bregma cord, brema lambda cord, lambda opisthion length, basion prosthion length suture was matching with standard data given in the table that was analyzed.

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