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Full Length Research Paper

Craniometric patterns of three Nigerian ethnic groups

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The usefulness of craniometry in facilitating proper identification of skeletal remains and in emphasizing a common origin of studied populations is far reaching. Conducting anthropological studies with the aim of obtaining the characteristics of ethnic groups assists not only in understanding the frequency distribution of human morphologies but also in providing the basis for comparison of races. Craniometric patterns were studied in three selected ethnic groups in Nigeria and this study will no doubt form a baseline data for subsequent studies especially as regards the studied populations. This study involved 699 (male 361; female 338) volunteers whose age ranged 18 and over. Respondents were selected along three ethnic groups including Urhobo (male 156; female 147), Ibo (male 141 female 145) and Edo (male 64; female 46) and it was ensured that population for the study was collected using a random stratified method. The cranial volume was measured using standard techniques and it was shown to exhibit strong sexual dimorphism and was useful in differentiating inter and intra population groups. The results showed a significant effect of cranial volume on the measured ethnic groups at 0.05 level of significance. While the Ibo's had an average cranial volume of 1273.39 cm^3, that of the Urhobo's was 1255.89 and 1310.08 cm^3 for the Edo people. Also the cranial capacity of male (1334.34 cm^3) was significantly different from that of female (1204.54 cm^3) in all the studied tribes, male being larger than that of female $p < 0.05$.

Key words: Craniometric patterns, ethnic groups, head length, head breadth, auricular height.

INTRODUCTION

Knowledge of the cranium of either a dry skull or of a living being is of significant importance to the study and comparison of populations with various fundamental differences like racial, geographic, ethnic and dietary characteristics. Cranial volume expresses several aspects of growth and development and permits critical evaluation of unusually large, small or misshapen crania (Haack and Neihoff, 1971).

Craniometric data is used in mainstream science to analyze the evolution of the human species in archeology. Since man's brain is relatively larger than other animals, it is natural for man to conclude that the brain is the hallmark of man and the measurement of it must be the key to the understanding of his unique intellectual capacity (Douglas, 1990).

Measuring of man's potential intellectual capacity from sources other than direct observations and testing is derived from direct, indirect and inferential data. The direct data is obtained from measuring cranial capacity and examining casts which 'expose' the interior of the skull. The indirect evidence comes from the study of comparative brain sizes, which is based on the assumption that there is a correlation between brain size and configuration and behavioral studies. Other indirect evidence comes from the study of fossil remains of non-cranial parts which infer manual dexterity and visual acuity (Douglas, 1990). Very little relationship between cranial capacity and human intelligence has been shown owing to marked variability in man's cranial capacity. Several craniometric studies involving Caucasian, Mongoloid and Americans have been conducted. Attempts at explaining homogeneity of African populations have led to a number of studies. Howells, (1989); Froment, (1992a) and Lahr,

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Table 1. Means, standard deviation, sum and range of cranial capacities of the three populations.

Cranial capacity	N	Mean	Std. dev.	Sum	Minimum	Maximum
Urhobos	303	1256.00	144.65	380535	805.79	1646.00
Ibos	286	1273.00	134.98	364189	926.01	1653.00
Edos	110	1310.00	128.75	14410	1013.00	1611.00
Total	699	1272.00	139.36	888833.00	805.79	1653.00

Table 2. Mean cranial capacity (CC) of the three cultures.

R-Square	Coefficient of variation	Root mean square	CC Mean
0.41	9.37	119.23	1271.58

(1996) suggested that despite the general opinion that Africans did appear to be homogenous in certain morphological characteristics, observed polymorphisms where far from homogenous. In another study, Hiernaux (1976) explained that the variations of craniometric characteristics were distinctly different from the previous racial categorizations of Africans (Leaky, 1935; Coon, 1971). Through skull morphology, population differentiation has been explored previously by three main recent studies (Hiernaux 1976; Howells 1989; Froment, 1992; 1998), showing that not only vault features but also various facial characteristics are responsible for both inter and intra-regional differences within sub-Saharan Africa. Hiernaux (1966, 1968, 1974, 1976) highlighted on inter- and intra-population variability in sub-Saharan Africa.

The present study investigate craniometric patterns in three selected ethnic groups in Nigeria and this study will no doubt form a baseline data for subsequent studies especially as regards the studied populations. As far as we know, very scant study, if any, on cranial capacity has been conducted in the studied populations.

MATERIALS AND METHODS

The population sample for this study included 699 (male 361; female 338) volunteers whose age ranged between 18 and 33 years since little or no morphological change was expected in the skulls of such individuals normally.. Data was obtained from persons whose parents and grand parents were of Nigerian origin and showed no obvious physical cranial defect. Data from closely related individuals were excluded to avoid familiar peculiarities that may occur with such measurements. Respondents were selected along three culture lines of Urhobo (male; female), Ibo (male; female) and Edo (male; female) speaking people and it was ensured that population for the study was collected using a random stratified method (Andy, 1992). Sample size for studies of this nature was determined using a standard formula (Andy, 1992).

Cranial volume (cv) = (0.00037(L-11) (B-11) (HT-11) + 406.01-----males

Cranial volume (cv) = (0.000400(L-11) (B-11) (HT-11) + 206.60----females
(Lee and Pearson, 1901).

The following parameters were obtained: maximum head length (L) (Glabellar to inion length) in (cm), maximum head breadth (B) (distance between the two parietal eminences) in (cm), auricular height (HT) (External acoustic meatus to the highest point of the vertex) in (cm) and cranial capacity (cc).The means obtained from the above variables were then subjected to analyses of variance (ANOVA) for comparison within cultures. Finally, multivariate analyses (MANOVA), between the studied cultures were made for assessment of statistical significance and interactions.

RESULTS

Mean cranial volume was 1271.58 ± 139.36 cm^3 with minimum values of 805.79 cm^3 and maximum values of 1653.00 cm^3 (Tables 1 and 2). Tribe had a significant effect on cranial capacity at 0.05 levels of significance (Table 3). Gender was also observed to have a significant effect on cranial capacity at 0.001 level of significance (Tables 3, 4, 5 and 6). Mean separation showed that the cranial capacity of Ibo and Urhobo tribes were similar and were both significantly different from the Edo people (Table 6).

The mean cranial capacity of the Edo's was 1310.00 ± 128.76 cm^3. The range was from 1013.00 to 1611.00 cm^3 and there was significant difference between female and male values (Tables 4 and 5).

The mean cranial capacity for Ibo's was 1273 ± 134.98 cm^3 with maximum of 1653 cm^3 and minimum value of 926.01 cm^3 (Table 1) .There was a significant effect of gender on cranial capacity ($p < 0.001$) as shown in Table 3 .The mean male cranial capacity was 1323 cm^3 (Table 4) while the mean female value was 1184.63 cm^3 (Table 5).

The mean cranial capacity for the Urhobo's was 1255.89 ± 144.65 cm^3 (Table 1). The minimum cranial

Table 3. Effect of tribe, age and gender on cranial capacity.

Source	DF	Type III sum of squares	Mean square	F Value	Pr > F
Tribe	2	109410.48	54705.24	3.85	0.02
Age	48	833339.10	17361.23	1.22	0.15
Gender	1	563016.68	563016.68	39.61	<.0001

Table 4. Cranial capacity for male for the three populations.

Tribe	Mean	Standard deviation	Maximum	Minimum
Edo	1351.07	103.05	1611.09	1200.49
Ibo	1339.30	99.00	1652.87	1119.01
Urhobo	1334.34	152.48	1645.82	1082.37
Average	1310.65	124.57	1695.20	983.98

Table 5. Cranial capacity of female of the three populations.

Tribe	Mean	Standard deviation	Maximum	Minimum
Edo	1253.04	139.91	1524.88	1013.47
Ibo	1209.29	134.68	1630.42	926.01
Urhobo	1204.54	142.21	1588.62	805.79
Total	1208.77	138.65	1630.42	815.05

Table 6. Variation in gender cranial capacities for the three tribes.

Grouping	Mean	N	Tribe
A	1310.08	110	Edo
B	1273.39	286	Ibo
B	1255.89	303	Urhobo

Means with the same letter are not significantly different.

capacity was 805.79 cm^3 and maximum cranial capacity, 1646 cm^3 (Table 1).

DISCUSSION

The findings in this study are similar to previous studies (Morton, 1839) where the mean cranial volume of the skulls of whites was 1,425 cm^3, while that of the Blacks was 1,278 cm^3. Based on the measurement of 144 skulls of Native Americans, Morton (1839) reported a figure of 1,344 cm^3. Gould (1981) and Rushton (1995) have also showed very similar figures. Tribe had a significant effect on cranial volume at 0.05 levels of significance. Inter-cultural comparisons demonstrated significant variation as reported by Howells (1989), Froment (1992) and Lahr (1996). While the Ibo's had an average cranial capacity of 1273.39 cm^3, that of the Urhobo's was 1255.89 cm^3. The Edo's was 1310.08 cm^3. This may be attributable to a common ancestral origin of the Ibo and Urhobo people or inter marriages which are very common between these cultures with interchange of physical characteristics over the years since these people have been cordial neighbours. Also the cranial volume of male (1334.34 cm^3) was significantly different from that of female (1204.54 cm^3) in all the studied tribes, male being larger than that of female $p < 0.05$. This important characteristic which was also previously observed (Rushton, 1995) is very important in sex determination. Cranial volume has demonstrated strong sexual dimorphic patterns and thus individuals from the studied populations can be differentiated from those of other races and perhaps African groups.

Conclusion

The craniometric patterns of three indigenous Nigerian ethnic groups have been presented highlighting certain features common to Nigerians and perhaps indeed West African populations. It has also been shown that craniometric patterns are significant indices for inter ethnic differentiation of population groups. In spite of these observations, similarities which enabled intracultural differentiation did occur as exhibited by craniometric patterns in this study. Inevitably therefore, craniometric studies are most essential in the study of population dynamics especially with respect to quantitative variables. This study has further demonstrated the well established genealogy that the three studied populations may have evolved from a common ancestral origin.

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