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# SEX IDENTIFICATION FROM THE SKULL OF THE HAUSA/FULANI IN NORTHERN NIGERIA

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**Abstract**
*Background:* The Hausa / Fulani is one of the major races in Nigeria, with scanty craniometrical records for sex identification, a useful resource in forensic study and anthropometry.
*Methods:* Craniometry of non-pathologic radiographs of the skull was done to evaluate the sexually dimorphic characteristics in the bones.
*Results:* Statistical analysis of the figures revealed significant higher dimensions in the male over the female in the parameters considered except in the nasal height and orbital bones; sex discrimination was also illustrated in the craniometrical indices except in the nasal bone. Possible factors responsible for these observations were discussed.
*Conclusion:* It is suggestive that the findings could possibly serve as indicator of sex identification in this race.

**Key words:** Hausa/Fulani, skull, sex identification, craniometry

## Introduction

Most times, particularly in forensic studies, one is confronted with the identification of sex of the individual from a skeletal remains. The skull appears to be the main reliable bone apart from the pelvis exhibiting sexually dimorphic features. [1] Other bones such as clavicle, calcaneous, radius and ulna had also been found useful in some cases, although there exist regional and racial variations in the skeleton. [2] Whereas preadolescent bones are almost useless in sex identification as they show little or no dimorphic features or dimension due to the fact that the secondary sexual characteristics do not develop safe for hormonal influence at puberty. [3, 4] Moreover, supposing one finds him / herself among this populace, the Hausa / Fulani, and has only the skull to assess sex from? It is on this basis the present work was designed, to assess dimorphism in the skull, adopting the craniometrical methods of El-Najjar and McWilliams. [5]

## Materials and methods

Three hundred and fifty plain radiographs of non-pathologic cases and known identity comprising 185 males and 165 females showing either frontal or lateral view, ageing between 25 and 50 years, obtained from the Radiology Unit of the Ahmadu Bello University Teaching Hospital, Zaria were used for the study. The radiographs were taken from anode – film distance of 100cm. They were placed on dust free illuminator and with the aid of veneer calipers the following dimensions were measured directly and recorded (Figures 1 and 2, Table 1); Cranial Length (Figure 1, A – B): The greatest antero-posterior diameter from glabella to the most posterior point in the mid-saggital plane on the occipital bone; Cranial Breadth: (Figure 2, F – G): the greatest horizontal or transverse diameter of the cranium taken at a point above the auditory meatus or the supramastoid crest; Nasal breadth (Figure 2, K – L): the maximum distance between the points of the intersection of the naso-frontal and the naso-maxillary sutures on the right and left sides; Nasal height (Figure 2, H – I): From the nasion to the lowest tip of the nasal spine on the lower border of the nasal aperture; Orbital height (Figure 2, M – N): the maximum distance between the upper and lower margin of the orbital cavity taken perpendicular to the orbital breadth; Orbital breadth (Figure 2, O – P): From the mid-point on the medial margin of the orbit to the mid-point on the lateral orbital margin; Facial height (Figure 2, H – J): the distance from nasion to the menton with the lower jaw in place and the teeth in apposition; Mandibular length (Figure 1, D – E): from the menton to a line perpendicular to the most posterior point on the condyle; Mandibular breadth (Figure 1, C – D): between the gonion and the uppermost point on the condyle.

The maximum and minimum values obtained were recorded as range and the mean values worked out for each parameter in both sexes. Student's t-test was used to compare the values and a P – value of 0.05 or less was considered to represent a statistically significant difference. Furthermore, the data were categorized into indices as follows according to El-Najjar and McWilliams; [5]

(i) Cranial index (CI): $= \frac{\max A\text{-}B \times 100}{\max F\text{-}G}$

(ii) Frontal Index (FI): $= \frac{\max H\text{-}J \times 100}{\max O\text{-}P}$

(iii) Orbital Index (OI): $= \frac{\max O\text{-}P \times 100}{\max M\text{-}N}$

(iv) Nasal Index (NI): $= \frac{\max K\text{-}L \times 100}{\max H\text{-}I}$

Figure 1: Lateral view of the skull

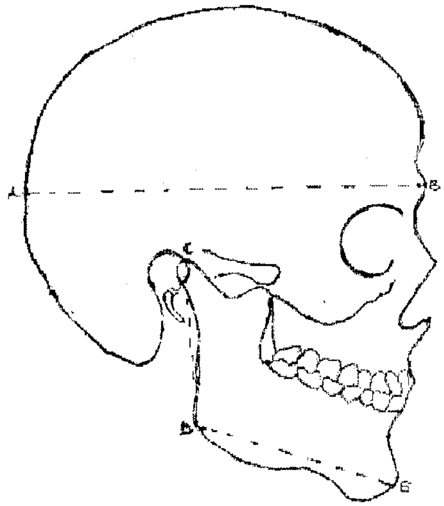
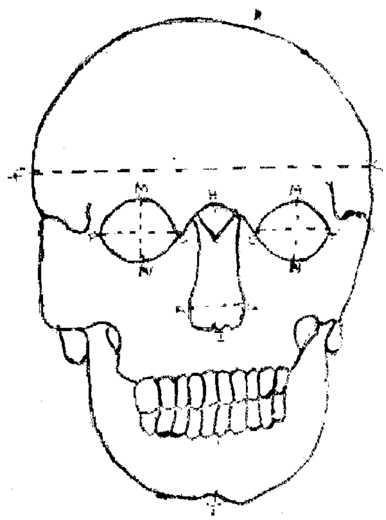


Figure 2: Frontal view of the skull



## Results

Table 1: The craniometrical measurements (mm) (males =185; females =165; No. of FV = 180, No. of LV N=170

| Dimension | Parameter | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CL | | CB | | NH | | NB | | OH | | OB | | FH | | MDL | | MDH | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Min | 186.00 | 67.00 | 145.00 | 51.00 | 44.40 | 40.05 | 30.30 | 33.05 | 33.40 | 34.50 | 35.00 | 37.05 | 106.05 | 106.05 | 86.05 | 80.42 | 67.23 | 65.08 |
| Max | 210.00 | 210.00 | 161.25 | 155.05 | 64.00 | 45.05 | 45.00 | 35.50 | 48.00 | 55.50 | 45.00 | 38.50 | 135.00 | 135.00 | 131.95 | 98.50 | 84.38 | 78.25 |
| Mean | 208.00 | 202.02 | 152.00 | 151.00 | 58.82 | 46.54 | 47.35 | 34.27 | 42.05 | 34.71 | 39.33 | 37.00 | 128.00 | 118.50 | 89.26 | 86.40 | 74.33 | 70.08 |
| SD | 2.40 | 2.35 | 3.06 | 2.05 | 2.64 | 2.07 | 2.08 | 1.95 | 3.44 | 3.06 | 3.22 | 3.16 | 3.86 | 2.86 | 2.56 | 1.65 | 2.74 | 2.74 |
| P value | N.S | | N.S | | <0.05 | | <0.05 | | <0.05 | | N.S | | <0.05 | | N.S | | N.S | |

FH = Facial Height; MDL = Mandibular Length; MDH = Mandibular Height
M = Male; F = Female; Max = maximum range; Min = minimum range
(Radiographs: FV = Frontal view of skull; LV = Lateral view of skull)

The craniometrical assessment clearly revealed higher dimensions in the male than female subjects in all the parameters except in the nasal height, orbital height and breadth. Statistically significant differences were recorded in the frontal, nasal and orbital bones, indicating that these bones exhibit more of the dimorphic features (Table 1). Distinctive higher figures were recorded particularly in subjects ageing between 30 and 45 years in the males. However, this was less distinct in the earlier ages and appears to decline in latter years. Moreover, the cranial indices recorded in this series could be categorized as follows after El-Najjar and McWilliams[5] (Table 2).

Table 2: The craniometrical indices

| Indices | Sex | Values | Categories |
|---|---|---|---|
| Cranial index | Male | 76.7 | Mesocranic |
| | Female | 73.8 | Dolichocranic |
| Orbital index | Male | 93.7 | Hypsiconch |
| | Female | 69.3 | Chamaeconch |
| Nasal index | Male | 72.0 | Hyperchamerrhine |
| | Female | 70.3 | Hyperchamerrhine |
| Facial index | Male Male | 97.0 | Hyperleptoprosopic |
| | Female | 87.7 | Mesoprosopic |

## Discussion

The implication of the skull in racial identification had been well documented.[6 – 8] More so, the usefulness of the bone in the assessment of sex had been receiving attention since Pendergrass [9] suggested some criteria such as the unusual thickness of the cranial bones such and the persistence of the metopic suture into adulthood in the females. El-Najjar and McWilliams [5] listed other features in the female skull such as the prominence of the brow ridges, sharpness of the orbital rims, height of the mandible, size of the mastoid process and the acuity of the gonial angle as some of the reliable parameters in sex identification; and from the present observation. However, subsequent to the work of Montague[10] who reported that the osteometric assessment of some cranial land marks are useful indicators of sex determination, the present work extends the findings of El-Najjar and McWilliams[5] in the Caucasians skull and appendicular skeleton in which almost all the dimensions considered in the bones recorded higher values in the male than in the female subjects. The indices further illustrate the sexually dimorphic features in the bones, safe the nasal in which both sexes fall into same category. This report also adds to the dossiers of existing evidence to substantiate the skull as a useful indicator of sex.

A possible explanation for this finding could probably be due to endocrine influence on post-natal growth of bones[4]. At preadolescent age, bone growth in both sexes is almost at the same rate and of equal dimension.[10 – 13] But with the onset of puberty in the female, the inhibitory effect of the oestrogen on the osteoblast activities at the growing end of the bone appears to retard the bone growth, hence, the lower dimensions recorded in this sex.[14, 15] On the other hand, the socio-cultural attitude of this race most times limits the female physical activity. Could that possibly restrict the skeletal growth in this sex as presently observed? It would rather be too hasty to be conclusive at this point; hence, this study is continuous on the long bones to assess the basis of the seemingly higher physiques of the male subjects in this race.

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