

Nasofacial and canthal morphometric analysis of Benue Indigenes in central Nigeria

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Abstract

Aim: Interest in facial morphology continues to increase due to its importance in establishing identity within the human population among other things. This study was conducted to establish nasofacial and canthal types in indigenes of Benue State in Central Nigeria.

Materials and Methods: Measurements of face height and width, nasal height and width and inner and outer canthal distances were taken from a sample of 210 subjects (mean age 23.11±3.45 years). The measurements were made using a 30cm sliding calipers and a 150mm electronic digital caliper.

Results: Showed that mean facial height and width in males were 110.40±8.50mm and 132.16±7.15mm respectively while females had 103.61±7.60mm and 128.32±6.95mm correspondingly. Consequently, the facial form for both genders was euryprosopic. Mean nasal height in males was 42.99±3.94mm while mean nasal width was 41.59±5.07mm. Similarly, mean nasal height in females was 39.39±3.82mm and mean nasal width was 38.44±4.43mm. The resulting nasal type was platyrrhine in both males and females. Mean inner and outer canthal distances in males were found to be 33.63±3.61mm and 104.20±9.11mm respectively. In females, these distances were found to be 32.68±3.39 and 102.71±5.76 respectively. Accordingly, closed type of canthal index was established.

Conclusion: Both genders had the same face, nose and canthal types. Sexual dimorphism exists in the measured parameters, except with inner and outer canthal distances.

Keywords: Benue of Nigeria; facial identification; facial morphometry

INTRODUCTION

Various professions have demonstrated interest in the morphology of the human face for a long time and this interest continues to increase (1-2). This is consequent upon the realization that the face best identifies and distinguishes an individual (3), especially now that personal identification is assuming an all-time high importance. However, numerous factors such as genetics, geography, environment, gender etc. are known to influence the morphology of the face (4). As personal identification continues to garner more importance, periodic evaluation of facial anthropometry within and between populations across races and ethnicities is particularly crucial (5). Results of facial anthropometric studies have already found application in human day-to-day activities including clinical, criminal, arts, forensics science and cosmetology (6). The study investigated and establishes facial, nasal and canthal indices in indigenes of Benue State, central Nigeria.

MATERIAL and METHODS

Facial anthropometric dimensions comprising of facial length and width, nasal length and width, inner and outer canthal distances were measured in Benue State, Central Nigeria. Subjects recruited for the study had no obvious facial, nasal and canthal deformities and whose parents are both Calculation of Indices of Benue origin. Subjects who did not meet the above criteria were excluded from the study. Subjects were drawn from school of nursing and midwifery Mkar and colleges of health technology at Agasha and Otukpo all located in Benue State. Out of the 250 students who consented to participate in the study, 40 did not meet the inclusion criteria. Subjects were between 17-38 years with a mean of 23.11±3.45 years.

The anthropometric dimensions were measured using a 30cm Godmarc steel vernier caliper and a 150mm electronic digital caliper. While taking the measurements, subjects were seated upright and heads held out straight.

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Landmarks were determined on the basis of anatomic descriptions by Kolar et. al. (7). Facial height was measured as vertical distance between the nasion and gnathion while facial width was measured as distance between the zygions (bizygomatic distance). Nose height was taken as the distance between nasion and subnasale while nose width was taken as interalar distance (alar-alar). The inner canthal distance was taken as distance between the medial canthus of both eyes while the outer canthal distance was taken as distance between the lateral canthus of both eyes.

Ethical approval was sort and obtained (Protocol Number: 034/09/2018) from the Ethics Review Committee of the University of Nigeria, Enugu campus while consent was obtained from participants before measurements were taken.

Measurements were recorded for analysis and statistical analysis was done using Microsoft Excel and SPSS (Statistical Package for Social Science) for Windows, Version 23 (Armonk, NY: IBM Corp.). The results were expressed as mean and \pm standard error of the mean. The differences were considered statistically significant at 95% confidence level ($P \leq 0.005$) (Table 1).

Table 1. Nasofacial and canthal indices and classifications

Face Index	Face Form
<79.9	Hypereuryproscopic (Very broad face)
80 – 84.9	Euryproscopic (Broad face)
85 – 89.9	Mesoproscopic (Round face)
90 – 94.9	Leptoproscopic (Long face)
>95	Hyperleptoproscopic (Very long face)
Nasal Index	Nose Type
≤ 69.9	Leptorrhine (Fine nose)
70.0-84.9	Mesorrhine (Medium nose)
≥ 85	Platyrrhine (Broad nose)
Canthal Index	Canthal Type
≥ 46.1	Far apart
37-46	Intermediate
≤ 36.9	Close

Calculation of Indices

Facial Index= (Facial Height X 100)/Facial Width

Facial width: The maximum horizontal breadth of the face as measured between the zygomatic arches (Zygion-Zygion).

Facial height: The distance as measured from the menton landmark to the sellion landmark (Nasion-Gnathion).

Nasal Index= (Nasal Width X 100)/Nasal Height

Nose width: The straight-line distance as measured between the right and left alare landmarks (alare-alare).

Nose Height: The straight-line distance between the subnasale landmark and the sellion landmark (nasion-subnasale).

Canthal Index= (Inner canthal distance X 100)/ Outer canthal distance

Inner canthal distance: The distance between the medial canthus of both eyes.

Outer canthal distance: Distance between the lateral canthus of both eyes.

RESULTS

Table 2 shows the range, mean and p-value of the nasofacial and canthal parameters of both genders while Table 3 contains the facial, nasal and canthal indices calculated from the results obtained from Table 2. Mean values for facial height in males was 110.40 ± 8.50 mm compared to 103.61 ± 7.60 mm in females. Similarly, facial width was recorded as 132.10 ± 7.15 mm for males and, females 128.32 ± 6.95 mm. Sexual dimorphism existed in both facial height and width with males having higher values. Males had higher values than females for nasal height and width with ($p=0.001$). In males, nasal height and width were 42.99 ± 3.94 mm and 41.59 ± 5.07 mm respectively. In females, mean values of nasal height and width were 39.39 ± 3.82 mm and 38.44 ± 4.43 mm respectively. Inner canthal distance in males and females was 33.63 ± 3.61 mm and 32.68 ± 3.39 mm respectively while outer canthal distance was recorded as 104.20 ± 9.11 mm in males and 102.71 ± 5.76 mm in females. Even though males had higher measurements than females, the differences were not statistically significant for inner ($p=0.053$) and outer canthal distances ($p=0.160$).

Table 2. Range, mean and p-value of the nasofacial and canthal parameters of both genders

Parameter (mm)	Male (n=105)		Female (n=105)		P value
	Range	Mean \pm SD	Range	Mean \pm SD	
Facial Height	88.1-127.0	110.40 \pm 8.50	86.9-133.6	103.61 \pm 7.60	0.001
Facial width	114.6-148.0	132.16 \pm 7.15	111.4-146.9	128.32 \pm 6.95	0.001
Nasal height	22.9-51.7	42.99 \pm 3.94	23.7-50.8	39.39 \pm 3.82	0.001
Nasal width	23.4-51.5	41.59 \pm 5.07	30.5-49.4	38.44 \pm 4.43	0.001
Inner canthal distance	25.2-44.1	33.63 \pm 3.61	25.2-45	32.68 \pm 3.39	0.053
Outer canthal distance	92.7-119.3	104.20 \pm 9.11	92.3-126.1	102.71 \pm 5.76	0.160

$P \leq 0.005$

Table 3. Facial, nasal and canthal indices of the study population

	Gender	Value	Classification	
Indices	Facial index	Males	83.54	Euryprosopic
		Females	80.74	Euryprosopic
	Nasal index	Males	96.74	Platyrrhine
		Females	97.59	Platyrrhine
	Canthal index	Males	32.27	Close
		Females	31.82	Close

P≤0.005

DISCUSSION

Facial dimensions are fundamental in establishing race, gender and identification (8). This study measured facial dimensions of Benue indigenes and established facial forms, nose type and canthal type.

Sexual dimorphism was noted in all facial parameters with males having higher values than females except in canthal parameters. Statistical significance was also noted in the facial and nasal parameters except the inner and outer canthal distances ($p=0.053$ and 0.160 respectively). The results agreed with an Indian study (9) which found that facial height in an Indian population was 112.84 ± 6.23 mm in males and 108.84 ± 5.21 mm in females. In the same study (9), facial width was 124.70 ± 7.61 mm and 121.51 ± 7.35 mm in males and females respectively. Mean values for facial height of the present study were recorded to be 110.40 ± 8.50 mm in males and 103.61 ± 7.60 mm in females. Ahmed et al. (10) confirmed that indeed males have larger dimensions than females in parameters of the head which are consistent with the findings of this study.

A study in Gombe state, Nigeria reported that facial forms in males and females of Fulani ethnic origin were hyperleptoprosopic while the Tangale male and females were leptoprosopic and Tera males, leptoprosopic while the females were hyperleptoprosopic (11). This contrasted the present study where face type among the indigenes of Benue was euryprosopic.

With regards to nasal index, mean nasal index of Kalabari, Andonis and Okrika peoples of southern Nigeria was reported as 94.10 ± 1.18 mm (12), 81.86 ± 2.25 mm and 86.38 ± 1.35 mm (13) respectively. Based on the nasal index values, the Kalabari and Okrika tribes had platyrrhine nose type, which agrees with the present study conducted among Benue indigenes. However, Andonis had characteristic mesorrhine nose type.

A study of inner and outer canthal distance among Ijaws young adults of southern Nigerian, put the mean as 42 ± 5 mm and 111 ± 14 mm in males accordingly and 39 ± 3 mm and 120 ± 7 mm in females respectively (14). The results of that study differ from the findings of this present study which reported significantly lesser values. However, another author in Pakistan reported values for canthal distance that are similar to the present study (15). Several

factors have been suggested as factors influencing facial morphology but the most potent is genetic inheritance and to a lesser extent environmental factors (16). The mean values of his study were 34 ± 4.0 mm (inner canthal) and 107 ± 3.9 mm (outer canthal) (15). The Isokos of Delta State, southern Nigeria were reported to have mean inner canthal distance of 34.63 ± 2.84 mm (males) and 36.98 ± 1.96 mm (females) (16). In the same study, mean outer canthal values in males and females were 106.17 ± 3.73 mm and 107.13 ± 2.98 mm correspondingly (17). Their results slightly differed from those of the present study their having slightly higher values. Therefore, facial, nasal and canthal distances substantially differ amongst people of different geographical, ethnic and cultures.

CONCLUSION

Significant differences were noted in the facial and nasal parameters except canthal distances. This indicates sexual dimorphic patterns with the males having higher values than females which are consistent with other studies. Facial index was found to be euryprosopic in both males and females with the subjects having a closed canthal. Nasal index was platyrrhine. The results further supported the notion that variations in body dimension occur across races and even amongst different ethnicities of the same race.

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