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Sexual Dimorphic Study On the Maxillary and Mandibular Canine Indices and Upper Lip Length of the Ijaw Ethnic Group of Nigeria

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Abstract

Background: Identification of living persons and the dead bodies is of great importance in the practice of forensic medicine. This study aims at comparing the upper lip length, the mesiodistal crown widths of maxillary and mandibular canines, the inter-canine arch width of maxilla and mandible between male and female Ijaw ethnic group of Nigeria. **Methodology**: One hundred and eighty-four subjects (104 males and 80 females) within the age range of 18-35years were used for the study. The subjects were then divided into two groups of males and females. Using a measuring tape and veneer calliper, the upper lip length, the mesiodistal crown widths of maxillary and mandibular canines, the inter-canine arch width of maxilla and mandible, between male and female Ijaw ethnic group of Nigeria were measured. From these, the mean maxillary and mandibular canine index as well as the standard -maxillary and -mandibular canine indices were derived and their reliability in predicting individual's sexuality was done. **Results:** The Upper lip length, canine index and the mesiodistal crown widths of canines of both jaws were shown to be greater in males than females with a statistically significant difference. **Conclusion:** There is sexual dimorphism in the upper lip length, canine index and the mesiodistal crown widths of the canines of both jaws in gender in the Ijaw ethnic group of Nigeria. However, the mandibular intercanine arch width has not shown any significant difference in gender.

Keywords: *Mandibular canine index, Sex determination, Upper lip length, intercanine arch.*

Introduction

The moral and professional obligation of a dental surgeon to mankind is not only to serve in examination, investigation, diagnosis and treatment of oral and oro-facial lesions of local origin and oral manifestations of systemic diseases, but to serve the community by their services and also render their opinion in legal matters [1].

A dental surgeon has to be actively involved in various objectives of forensic dentistry like age and sex determination, personal identification of unknown deceased person, analysing bite marks as evidence, participating in mass disaster, studying lip prints, giving evidence in child abuse and in civil and criminal litigation. His role in personal identification and criminal investigation is very much important, as his evidence would be very much useful in law and justice [2]. Dentist's role in criminal investigation includes collection of information from bite marks, lip prints and teeth found in the crime sites like quarrel, robbery, murder and rape [3].

Establishment of a persons individuality is important, both for legal as well as humanitarian purposes. In forensic odontology the sum total of all the characteristics of teeth and their associated structures provide a unique totality and forms the basis for personal identification [3].

Usually, personal identification is made by comparing an already prepared ante mortem record which includes details of teeth, rugae pattern, any restorations, with that of post mortem records in which the investigating dental surgeon records number of teeth, teeth changes, restorations and dentures in unknown deceased persons or of a living person

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whose identity is required [4].

Apart from the teeth and their restorations, soft tissues of oral cavity may help for personal identification. Anatomical structures like rugae, pigmentation, lip prints, upper lip length (by cephalometric analysis) remain constantly and can be included in ante mortem records [4].

Many research works have been done on sexual dimorphism on different parts of the world including some ethnic groups in Nigeria. This study would therefore be among such that will be concerned with anthropometric measurement of the upper lip length as well as maxillary and mandibular canine indices among the ljaw ethnic group of Nigerians.

The ljaws (also known by the subgroup ijo or izon) are a collection of poeple indigenous mostly to the forest regions of the Bayelsa, Delta and Rivers States within the Niger Delta in Nigeria. Some are natives of Akwa –Ibom, Edo and Ondo states also in Nigeria. Many are found as migrant fishermen in camps as the West of Sierra Leone and as far east as Gabon along the Western African coastline. They are believed to be some of the earliest inhabitants of Southern Nigeria [5].

Materials and Methods

This study was conducted in Biogbolo, Yenegoa, all in Bayelsa state of Nigeria. One hundred and eighty- four (184) subjects (104 males and 80 females) within the age range of 18-35years were used for the study. The subjects were then divided into two groups of males and females; all of which were pure breeds of the ijaw ethntic group whose parents and grandparents were ljaws. All subjects had complete set of fully erupted morphological, well-formed, periodontal healthy, non-carious, non-attrited, intact and satisfactory aligned maxillary and mandibular anterior teeth with no history of orthodontric treatment and no evidence of cleft palate or crown restoration. The subjects were all measured using the measuring tape and the veneer caliper, with all measurements made and read by a single observer. The following under listed parameters were measured and the data obtained from various measurements was recorded for that individual:

Maxillary and mandibular canine index

The maxillary and mandibular canine index of each subject was determined by ascertaining the greatest maxillary and mandibular mesiodistal canine crown width as well as the maxillary and mandibular intercanine distance or intercanine arch width.

The greatest maxillary mesiodistal canine crown width is the summation of the right and left mesiodistal canine crown width of the maxilla divided by two. Similarly, the greatest mandibular mesiodistal canine crown width is the summation of the right and left mesiodistal canine width of the mandible divided by two.

The right and left mesiodistal canine crown width of either the maxilla or the mandibule was measured by placing one tip of the digital vernier caliper at the incisoral border of the canine and spreading the other tip of the caliper to the premolar border of the canine such that the vernier caliper remains perpendicular to the long axis of the tooth.

The maxillary and mandibular inter-canine arch width were measured as the distance between the tips of the right and left maxillary canines, and the right and left mandibular canines respectively using the digital vernier caliper.

The maxillary canine index (MCI) was calculated as the division between the mean value of the greatest maxillary mesiodistal canine crown width and the mean maxillary intercanine distance. Same was done for the mandibular canine index.

$$\text{MCI} = \frac{\text{Mean of the greatest maxillary mesiodistal canine crown width}}{\text{Mean maxillary intercanine distance}}$$

The standard deviation (SD) of mean maxillary and mandibular canine index for males and females were calculated. Student t-test was then used to test the level of significance. Thereafter, the standard maxillary canine index (SMCI) a well as standard mandibular canine index (SMCI) which is useful in sexual dimorphism was determined by the formula below:

$$\text{SMCI} = \frac{(\text{mean male MCI}-\text{SD})+(\text{Mean female MCI}-\text{SD})}{2}$$

Where MCI=maxillary/mandibular canine index
SMCI=Standard maxillary/mandibular canine index
SD= Standard deviation

Identification with respect to gender was done using the standard maxillary and mandibular canine index values. That is, all canine index values up to the limit of the standard maxillary canine index or standard mandibular canine index

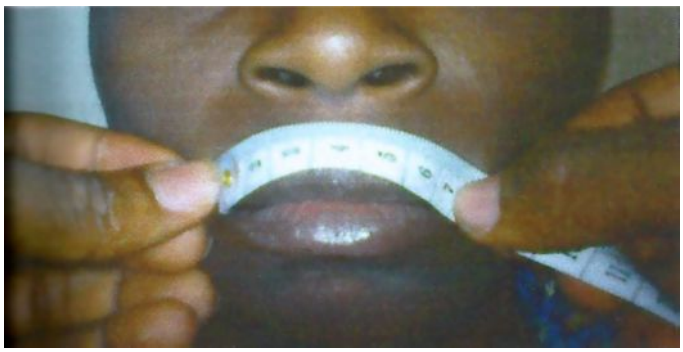

Figure 1: Photograph showing lip measurement

Figure 2: Photograph showing the measurement of the maxillary mesiodistal canine width.

Figure 2: Photograph showing the measurement of the mandibular inter canine arch width.

value were reported as females. However, those values above this limit were reported as males.

Upper lip measurement:

The upper lip length of the subjects was measured using the measuring tape. The subjects were instructed to position their lips in a relaxed position and thereafter asked to look straight ahead to establish the natural head position. The upper lip length was measured from the stomion superius on one lateral end of the lip to the other using the measuring tape. The average upper lip length was calculated along with the standard deviation for males and females respectively.

Results

Table 1: Comparison of Mean Maxillary and Mandibular Right and left Canine widths (mesiodistal diameter) in Gender (in mm).

	Gender	n	Mean RCW	S.D RCW	Mean LCW	S.D LCW
Maxillary	Male	104	7.67	0.43	7.66	0.44
	Female	80	7.42	0.46	7.36	0.47
Mandibular	Male	104	6.77	0.46	6.83	0.43
	Female	80	6.49	0.48	6.50	0.49

Table 2: Comparison of the Mean Greatest Maxillary and Mandibular canine mesiodistal diameter between males and females (mm).

	Gender	n	Mean	S.D	Min	Max
Maxillary	Male	104	7.67	0.43	6.25	9.0
	Female	80	7.39	0.45	6.50	9.0
Mandibular	Male	104	6.80	0.43	5.5	8.25
	Female	80	6.50	0.48	5.5	8.0

Table 3: Comparison of Maxillary and Mandibular Intercanine arch width between males and females (in mm)

Gender	n	Maxillary		Mandibular	
		Canine Mean	Canine S.D	Canine Mean	Canine S.D
Males	104	34.04	2.29	26.57	1.86
Females	80	34.50	2.01	25.64	2.03

Table 4: Comparison of Maxillary and Mandibular Canine Index between males and females (in mm)

	Gender	n	Mean	S.D	Min	Max
Maxillary	Males	104	0.23	0.02	0.18	0.31
	Females	80	0.21	0.01	0.19	0.27
Mandibular	Males	104	0.27	0.02	0.20	0.33
	Females	80	0.25	0.02	0.20	0.32

Table 5: Standard Maxillary and Mandibular Canine Index and accuracy in gender determination

	Gender	n	No. of cases with Gender Prediction	Correct Percentage Accuracy
Maxillary	Males	104	81	77.89
	Females	80	59	73.75
	Total	184	140	75.82
Mandibular	Males	104	85	81.73
	Females	80	63	78.75
	Total	184	148	80.24

Table 6: Standard Maxillary Canine Index and Standard Mandibular Canine Index with comparative values of the percentage accuracy of reporting gender using the indices in males, females and combined data.

Index used for gender Determination	Value of Index Obtained	Percentage Accuracy in gender determination (in %)		
		Males	Females	Combined
Standard Maxillary Canine Index	0.26	77.89	73.75	76.09
Standard mandibular Canine Index	0.21	81.73	78.75	80.09

Table 7: Comparison of upper lip length between males and females (in mm)

Gender	n	Mean	S.D	Min	Max
Males	104	55.93	8.56	41.88	66.28
Females	80	50.86	4.34	40.55	62.49

Discussion

This study, which probably may be the first of its kind to be conducted on the Ijaw ethnic group of Nigeria, intends to analyze the sexual dimorphism in the maxillary and mandibular canine and the inter-canine arch width. Also, to derive the standard maxillary and mandibular canine indices based on the method suggested by Rao *et al.*, [6] and to assess the accuracy of gender determination by using the values obtained.

This study has established the existence of a statistically significant difference in the upper lip length between the males and females. As observed from the result (Table 7), the males had a greater upper lip length (55.93 ± 8.56 mm) than the females (50.86 ± 4.34 mm).

The Standard Mandibular Canine Index from this study provides a higher accuracy in gender determination with a combined percentage of 80.09% as compared to Maxillary Canine Index which gave a combined percentage of 76.09% (Table 6). The results of percentage accuracy in sexual dimorphism using Maxillary and Mandibular Standard Canine Indices revealed that Standard Mandibular Canine Index was more accurate than the maxillary index, with a difference of 3.84% among males, 5% among females and 4.42% when combined data is considered(Table 5). Furthermore, as for the canine index as a useful parameter in sexual dimorphism, the males had a slightly higher mandibular canine index (0.27 ± 0.02 mm) than the females (0.25 ± 0.02 mm) (Table 4), so also a slightly higher maxillary canine index (0.23 ± 0.02 mm) than the females (0.21 ± 0.01 mm). These indices were statistically not significant.

Another useful parameter in sexual dimorphism analyzed was the inter-canine distance. The mandibular inter-canine distance in the males was 26.57±1.86 as against the females of 25.64±2.03. However, the maxillary inter-canine distance in the females (34.50 ± 2.01 mm) was slightly higher as against the males of 34.04 ± 2.29 mm (Table 3). This was also statistically not significant.

Comparing the average or greatest maxillary canine width and mandibular canine width between males and females, the result (Table 2) shows the average maxillary canine width among the males to be 7.67 ± 0.43 mm, as against the females to be 7.39 ± 0.45 mm, . On the mandible, the average mandibular canine width was calculated to be 6.80 ± 0.43 mm in the males as against the females of 6.49 ± 0.48 mm.

The study also establishes the existence of a statistically significant difference in mesiodistal diameter of canines of the jaws (maxillary and mandibular) between the males and females (Table 1). This is in accordance with works carried out by Mohammed *et al.*, [7], who in their study on Saudi Arabian population observed the mean mesiodistal width of maxillary canines having values 7.54 ± 0.68 mm (right) and 7.54 ± 0.67 mm (left) in males, while in females it was 6.8 ± 0.925 mm (right) and 6.83 ± 0.934 mm (left). The present study shows the mesiodistal width of the maxillary canines as 7.67 ± 0.0.43mm (right) and 7.66 ± 0.44mm (left) in males, and 7.42 ± 0.46 mm (right) and 7.36 ± 0.47 mm (left) in females in age group 18-35 years, with a statistically significant difference in males and females.

Conclusion

From this study we can conclude that there exist a statistically significant sexual dimorphism in the upper lip length and the mesiodistal crown widths of canines of both jaws in the Ijaw ethnic group of Nigeria amongst the age group of 18-35years. However, the mandibular inter-canine arch width did not show any significant difference in gender. Standard Mandibular Canine Index and mandibular canine index were more accurate than the maxillary canine index in gender determination. These findings could be used in personal identification and in criminal investigations among the ljaw enthnic group of Nigeria.

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