

## Sexual Dimorphism in Maxillary Canine Teeth among Students of Kogi State Polytechnic, Nigeria

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**Abstract:** In forensic medicine, identification of living persons and the dead bodies is of high importance. One of the main factors employed is the establishment of sexual dimorphism. The purpose of this study was to find out whether dimorphism of permanent maxillary teeth as well as intercanine distance plays a key role in establishing sex identity. This study was carried out on 231 healthy subjects comprising of (127 male and 104 female) students from Kogi state polytechnic students Lokoja, Nigeria. Both sexes belong to age group between 18 to 24 years. The greatest mesiodistal width of the canine teeth and the distance between the tips of canines of both arches (intercanine distance) were measured using vernier caliper with 0.02mm resolution. The study conclusively establishes the existence of a sexual dimorphism in maxillary canines.

**Keywords:** Intercanine distance, mesiodistal canine width, Sexual dimorphism.

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### I. Introduction

Teeth are an excellent material in living and non-living populations for anthropological, genetic, odontologic and forensic investigations. These exhibit the least turnover of natural structure and are readily accessible for examination. Being the hardest and chemically the most stable tissues in the body they are selectively preserved and fossilized, thereby providing by far the best record for evolutionary change [1]. Determination of sex is of immense importance in forensic investigations. Establishing sex is one of the main factors employed to know the identity. Teeth form an exceptional material in living as well as dead for forensic investigations. Measurement of mesiodistal width of the maxillary canine teeth and intercanine distance provides evidence of sex identification due to dimorphism [2]. The study of the permanent maxillary canine teeth offers certain advantages, which emanate from the fact that they are the least frequently extracted teeth and being less affected by periodontal disease [3][4]. Sexual dimorphism is the systematic difference in form (shape, size or colour) between different sexes in same species. According to [5] teeth are known to have sexual dimorphism. Tooth crowns being larger in males than in females, may be because of longer period of amelogenesis for both temporary and permanent dentitions in males. Sexual dimorphism in canines is not merely a coincidence but can be expected to be based on functional activity [6].

### II. Materials And Methods:

This study was carried out on 231 healthy subjects comprising of 127 males and 104 females from Kogi state polytechnic students, Lokoja, Nigeria. Both sexes belong to age group between 18 to 24 years. The greatest mesiodistal width of the canine teeth and the distance between the tips of canines of both arches (intercanine distance) were measured using vernier caliper with 0.02mm resolution and a pair of divider.

The inclusion criteria were as follows: (i) Healthy state of gingival and periodontium, (ii) Caries free teeth, (iii) Normal overjet and overbite, (iv) Absence of spacing in the anterior teeth, and (v) Normal molar and canine relationship.

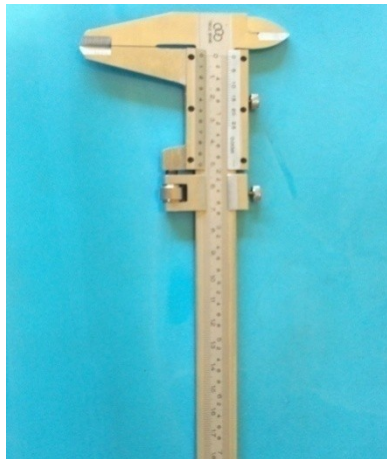
The exclusion criteria employed for selection of the study sample were malalignment, malrotation, malocclusion, spacing, missing incisor, dental restoration, dental wiring and prosthetics, and attrition. Persons suffering from chronic systemic diseases were also excluded. After getting consent of the subjects, the following measurements were taken by using a sliding Vernier Caliper with resolution of 0.02 mm

#### The maxillary mesiodistal crown width

This was taken as the greatest mesio-distal width between the contact points of the teeth on either side of the upper jaw fig. 3.

#### The maxillary intercanine distance

This was measured as the linear distance between the tips of right and left maxillary canine in the upper jaw using a divider fig 4.



**Figure 1: A Sliding Vernier Caliper with resolution of 0.02 mm**



**Figure 2: A Divider**

**Measurement of Mesiodistal crown width:**

Vernier Caliper with resolution of 0.02 millimetres was used for measurement of mesiodistal crown width of individual maxillary canine tooth. To measure distance, fixed flange of sliding vernier caliper is placed to distal end of crown of canine tooth and movable flange of caliper is placed to mesial end of crown of canine tooth. Distance between flange of vernier caliper is recorded in millimetre as mesiodistal crown width of individual canine tooth.



**Figure 3: Showing method of measuring of mesiodistal diameter of maxillary canine width by sliding Vernier Caliper.**

**Measurement of Canine Arch Width [Intercanine Distance]**

Divider was used to measure maxillary canine arch width. To measure distance, tip of one end of divider is kept over the centre of the tip of one side canine tooth and another end of divider is kept over the centre of tip of opposite side canine tooth Fig 4.



**Figure 4: Showing method of measurement of maxillary intercanine distance by Divider.**

Maxillary canine index (MCI) = mesiodistal width of canine/ intercanine distance  
 Sexual dimorphism: Sexual Dimorphism in right and left maxillary canines were calculated using formula given by Garn & Lens (1967). Sexual dimorphism was calculated using the formula:  
 Sexual dimorphism =  $(X_m \div X_f) - 1 \times 100$  ----- (1)  
 Where:  $X_m$  - Mean mesiodistal width in males and  $X_f$  - Mean mesiodistal width in females

**III. Results**

Table 1 shows sex related differences amongst various parameters. When the mean value of intercanine distance of the 131 subjects (127 males and 104 females) were compared, males showed higher value than the females and the difference was statistically considered extremely significant (p value < 0.0001). The width of the maxillary canine was slightly higher for males than females. When the mean values for left and right maxillary canine widths were compared between males and females, the females showed lesser value. The observed difference in the variation of the right and left canine width between males and females was statistically considered extremely significant (p value < 0.0001). When the mean values for left and right maxillary canine index were compared between males and females, the females showed lesser value. There was statistical significance of these observed differences between the genders for right and left maxillary canine indices (p value < 0.0001).

**TABLE 1: Showing sex related differences amongst various parameters**

PARAMETERS	SEX	MEAN	S.D	P-VALUE
Intercanine distance (mm)	MALE (n=127)	37.80	2.138	<0.0001
	FEMALE (n=104)	35.34	2.037	<0.0001
Right mesiodistal width (mm)	MALE (n=127)	7.588	0.471	<0.0001
	FEMALE (n=104)	6.900	0.575	<0.0001
Left mesiodistal width (mm)	MALE (n=127)	7.605	0.459	<0.0001
	FEMALE (n=104)	6.907	0.586	<0.0001
Right maxillary canine index	MALE (n=127)	0.2011	0.0103	<0.0001
	FEMALE (n=104)	0.1952	0.0104	<0.0001
Left maxillary canine index	MALE (n=127)	0.2014	0.0089	<0.0001
	FEMALE (n=104)	0.1953	0.0105	<0.0001

**TABLE 2: Showing sexual dimorphism in maxillary canine.**

SEX MEASUREMENT	SEXUAL DIMORPHISM
Right mesiodistal canine width	9.9710
Left mesiodistal canine width	10.1057
Right maxillary canine index	3.0225
Left maxillary canine index	3.1234
Maxillary intercanine distance	6.9609

**IV. Discussion**

The identification of sex is of significance in cases of mass fatality incidents where bodies are damaged beyond recognition, especially in situations where only fragments of jaw bones with teeth are found, then sex determination is possible only with the help of teeth [5][7]. Although the morphology of the tooth structure is similar in males and females, the size of the tooth does not necessarily remain the same, as the tooth size is determined by cultural, environmental, racial and genetic factors [8]. Sex estimation from skeletal remains still constitutes the most important step for identification in medico-legal examination. Although DNA analysis is the most precise technique to determine the sex, but sometimes lack of facilities and the cost factor may be a hindrance [9]. Measurement of linear dimensions, such as inter-canine distance and mesiodistal width of canine teeth can be used for determination of sex in large population because it is simple, reliable, inexpensive and easy to perform. Moreover, maxillary canines exhibit the greatest sexual dimorphism with respect to high level of survival in dentition.

Considering the fact that there are differences in odontometric features in specific populations, even within the same population in the historical and evolutionary context, it is necessary to determine specific population values in order to make identification possible on the basis of dental measurements. It has already been opined that in the present day humans, sexual dimorphism in maxillary canines is not merely a coincidence but can be expected to be based on functional activity [6].

The present study included volunteer students of age ranging 18 - 24 years since attrition is minimal in this age group. Any measurement of teeth unaccompanied by age, race and sex must be treated with great reserve [10]. Moreover; subjects of this age group are also selected because eruption of canines and growth in width of both the jaws including the width of dental arches are completed before the adolescent growth changes. It has been observed that mean mesiodistal width of maxillary canines was found to be  $6.923 \pm 0.611$  mm (right) and  $7.098 \pm 0.535$  mm (left) in males, while it was  $6.359 \pm 0.526$  mm (right) and  $6.617 \pm 0.51$  mm (left) in females with a statistically significant difference in males and females. Maxillary canine index also show significant difference in males and females (p value  $<0.0001$ ). This finding is in contrast with [11], in his study on Saudi Arabian population observed the mean mesiodistal width of maxillary canines as  $7.54 \pm 0.68$  mm (right) and  $7.54 \pm 0.67$  mm (left) in males, while in females it was  $6.8 \pm 0.925$  mm (right) and  $6.83 \pm 0.934$  mm (left), but the differences in males and females were not statistically significant.

## V. Conclusion

The study conclusively establishes the existence of a definite statistically extremely significant sexual dimorphism in maxillary canines. The mesiodistal width of the maxillary canine teeth was slightly larger in males than in females but the difference was statistically extremely significant. The intercanine distance of the maxilla was greater in males than in females and the difference was statistically significant (Table 1).

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