

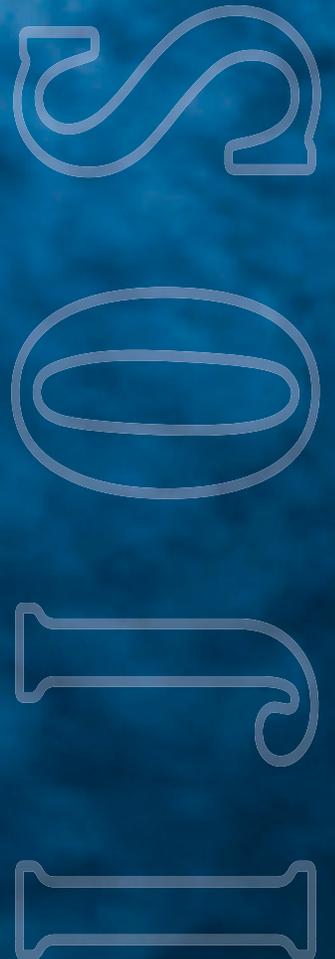
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# Sexual dimorphism in buccolingual diameter of canines in North Indian population

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## ABSTRACT

**Introduction:** Teeth are the most durable part of the skeleton. Under most conditions occurring in nature like putrefaction, mutilation, fire and prolonged immersion in water, teeth are the least destructible part of the body as these may readily survive all these changes. Teeth are useful in determination of the gender by using different odontometric techniques. Among all the teeth, the canines are found to exhibit greatest sexual dimorphism.

**Materials and Methods:** In the present study, 53 male and 56 female volunteers of North Indian origin; in the age group of 18-25 years were selected to observe the sexual dimorphism in the buccolingual crown diameter of the maxillary and mandibular canines. Dental casts of the volunteers were made after getting their written consent. The buccolingual diameter of the canines was measured on the study casts as the greatest distance between the buccal and lingual surface of the canine crown with a digital vernier calipers.

**Results:** It was found that the buccolingual diameter was significantly larger in the males as compared to the females and the difference was highly statistically significant. The sexual dimorphism in the buccolingual diameter of maxillary canines was found to be 8.88% on the right side and 7.78% on the left side. In the mandibular canines, the sexual dimorphism was 9.26% on the right side and 8.94% on the left side.

**Conclusion:** The study defines the morphometric criteria for canines in North Indian population and the results indicate that the dimorphism in canines can be of immense medico-legal use in identification and gender determination.

**Key words:** Bucco-lingual diameter, mandibular canines, maxillary canines, sexual dimorphism

## Introduction

Teeth are the most indestructible part of the body. They exhibit least turnover of natural structure, are readily accessible for examination and do not need special dissection. Hence, teeth provide excellent material in living and non-living populations for anthropological, genetic, odontological and forensic investigations.<sup>[1]</sup> Teeth are more resistant to destructive agents than any other structure and are well protected however dietary acids present in soft acidic drinks influence the erosion the enamel and dentine.<sup>[2]</sup> Among the teeth, the canines differ from other teeth with respect to function and show the greatest sex differences.<sup>[3]</sup> Sexual dimorphism

in canines can be determined by using linear dimensions like the bucco-lingual, mesio-distal and the inter-canine diameters.<sup>[4,5]</sup> Bucco-lingual diameter was considered a better indicator of tooth size than other parameters.<sup>[6]</sup> The present study was thus conducted to observe the sexual dimorphism in bucco-lingual diameters of maxillary and mandibular canines in North Indian population.

## Materials and Methods

The study was conducted on 109 volunteers (53M: 56F) in the age group of 18-25 years. This age group was selected, as attrition of teeth is minimal in this age group.<sup>[7]</sup> The subjects were student volunteers from

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Government Medical and Dental College, Patiala. A written consent was taken from the subjects after explaining the details of the procedure. The cases were picked up randomly after the cases met the above-mentioned criteria without any consideration whether they were vegetarians or non-vegetarians. The study included both vegetarians and non-vegetarians. All the subjects fulfilled the inclusion criteria.

### Inclusion criteria

- Healthy state of gingiva and periodontium
- Caries-free teeth
- Normal overjet and overbite
- Absence of spacing in the anterior teeth.

### Study casts

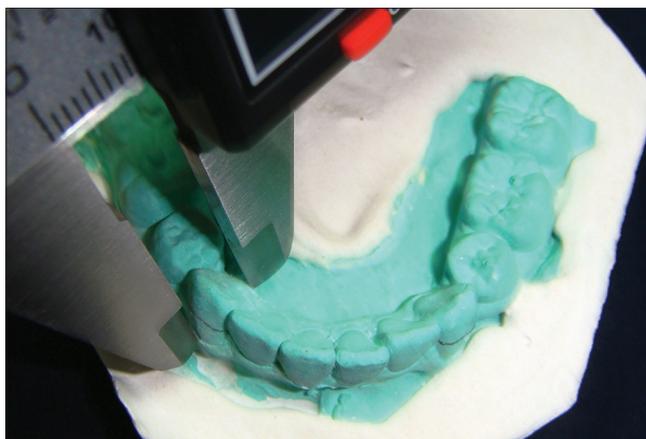
The study casts were prepared using alginate impression material (irreversible hydrocolloid) and stone plaster. Measurements were taken using digital vernier calipers. Measurements were taken immediately after making the casts to avoid shrinkage of the casts. Each reading was taken three times and the mean was considered as the final one.

### Bucco-lingual diameter of canines

The bucco-lingual diameter of canines was measured as the greatest distance between the buccal and lingual surface of the crown of the mandibular canines [Figure 1] and maxillary canines [Figure 2]. This method was adopted from a study by Bishara.<sup>[8]</sup>

### Observations

The bucco-lingual diameters of the mandibular and maxillary canines were measured and the findings were analyzed statistically. The mean diameters of the mandibular canines [Table 1] and of the maxillary canines [Table 2] exceeded in the males and the difference was statistically significant.



**Figure 1:** Mandibular Bucco-lingual diameter

The range of the bucco-lingual diameters of the mandibular and maxillary canines were observed [Table 3] and sexual dimorphism was calculated [Table 4]. The sexual dimorphism was significantly more in the males.

### Calculation of sexual dimorphism

Sexual dimorphism was calculated by the following formula (Garn 1967)<sup>[9]</sup>:

$$\text{Sexual dimorphism} = \frac{X_m - 1}{X_f} \times 100$$

$X_m$  = Mean of diameter of males

$X_f$  = Mean of diameter of females

### Result

The mean of bucco-lingual diameters exceeded in males with existence of statistically significant sexual dimorphism in maxillary and mandibular canines. From the range of bucco-lingual diameters, it can be concluded that whenever the width of either canine is greater than 8.5 mm, the probability of gender being male is more.

### Discussion

The bucco-lingual diameter has been studied earlier either on maxillary canines or mandibular canines in various populations by other authors. Biviji<sup>[10]</sup> conducted a study in Americans, Garn<sup>[11]</sup> in Ohio adolescents, Axelsson and Kirveskari<sup>[12]</sup> in Northeast Iceland population, Lund and Mornstad<sup>[13]</sup> in Swedish population, Pratibha<sup>[14]</sup> in South Indian Population and Zorba<sup>[15]</sup> in Greek population. In spite of the tooth size variability factors like race, heredity, nutrition and environment, all the studies



**Figure 2:** Maxillary Bucco-lingual diameter

**Table 1: Mandibular Bucco-lingual diameter**

Side	Sex	Mean (mm)	±S.D.	t stat	P	Statistical Significance
Right	Males	7.789	0.3750	6.732	<0.0001	Highly Significant
	Females	7.120	0.5194			
Left	Males	7.770	0.3444	7.5387	<0.0001	Highly Significant
	Females	7.132	0.5179			

S.D: Standard deviation

**Table 2: Maxillary Bucco-lingual diameter**

Side	Sex	Mean (mm)	±S.D.	t stat	P	Statistical Significance
Right	Males	8.092	0.5862	6.7385	<0.0001	Highly Significant
	Females	7.439	0.4415			
Left	Males	8.033	0.5745	6.1669	<0.0001	Highly Significant
	Females	7.450	0.4732			

S.D: Standard deviation

**Table 3: Range of Bucco-lingual diameters**

Bucco-lingual diameter	Gender	Right	Left
Mandibular canines	Males	7.17-8.96	7.10-8.79
	Females	5.91-8.2	5.93-8.17
Maxillary canines	Males	6.98-9.20	6.85-9.43
	Females	6.28-80.31	6.38-8.51

**Table 4: Sexual dimorphism in canines**

Bucco-lingual diameter	Right side (%)	Left side (%)
Mandibular canines	9.26	8.94
Maxillary canines	8.88	7.78

presented that the bucco-lingual diameter exceeded in the males than the females.

In primates and carnivores, the chief function of the canines is not masticatory, but related to threat of aggression and actual aggression. Survival was thus dependent on canines especially in the males.<sup>[3]</sup> Thus, in the present day humans, sexual dimorphism in mandibular canines can be expected to be based on functional activity.

It was proposed by Moss and Salentijn<sup>[16]</sup> that a longer period of amelogenesis in the males probably contributes to the larger size.

Permanent teeth of 12 individuals with a 47, XYY chromosome constitution were examined. The tooth sizes of 47, XYY males were found to be larger than those of control males and females with statistically significant differences. It was then proposed that Y chromosome intervenes most in the size of teeth.<sup>[17]</sup>

## Conclusion

In cases where postcranial bones are fragmented or unavailable, measurements of the canine teeth using bucco-lingual diameter may provide a means of determining sex. These teeth are considered as the “key tooth” for the purpose of personal identification. The canine measurements can be of immense significance in gender determination and Forensic dentistry.

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