**Sexual Dimorphism of Mandibular Canine in South Indian population**

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**Abstract**

Sexual dimorphism refers to the differences in size, stature and appearance between male and female, since no two mouths are alike. Teeth are the hardest and chemically the most stable tissues found in the body, are known to resist postmortem, mechanical, chemical, physical and thermal types of destruction. To determine sexual dimorphism of mandibular canine in south Indian population, the present study was conducted on 60 subjects. (male–30, female-30). The mean mesiodistal width of right and left mandibular canines are significantly different in males and females. The t value for mesiodistal width of right mandibular canine is more than the left mandibular canine. Mandibular canine index for right and left canines were also found to be significantly different in male and female. Sexual dimorphism was calculated and left mandibular canine was found to be more dimorphic than right mandibular canine. This study conclusively establishes that there is definite statistically significant sexual dimorphism in mandibular canines in South Indian population.

**Keywords:** Sexual Dimorphism, Inter-canine Distance, Mandibular Canine Width, Mandibular Canine Index
Introduction

Sexual dimorphism, the differences in appearance between males and females of the same species, such as in colour, shape, size, and structure, that are caused by the inheritance of one or the other sexual pattern in the genetic material (1, 2). On the other hand, mandibular canine is the tooth located distally from both mandibular lateral incisors of the mouth but medially (toward the midline of the face) from both mandibular first premolars (3). The mandibular canines begin to show calcification at age 4 months and the enamel of the crown is completely formed by age 7 years (4, 5). Mandibular canines are found to exhibit greatest sexual dimorphism. The mandibular canines have a mean age of eruption of 10.87 years and they are the last teeth to be extracted with respect to age (6). They are less affected by periodontal diseases and are most likely to survive severe trauma such as air disasters, hurricanes or conflagration. These findings indicate that mandibular canines can be considered as the ‘key teeth’ for personal identification. Tooth size standards based on odontometric investigations can be used in age and sex determination (7). Whenever it is possible to predict the sex, identification is simplified because then only missing persons of one sex need to be considered. In this sense identification of sex takes precedence over age 8. Studies on tooth morphology have in the past been conducted using either intra-oral measurements or measurements on casts. Intra-oral measurements are less reliable (3). The mandibular canines to exhibit the greatest sexual dimorphism amongst all teeth (4, 5).

The mandibular canines usually have only one root, but sometimes the root may be bifurcated, or have two roots. When it does, one root faces the tongue (lingual side) and one will face the lip (labial side). Teeth are invaluable elements for identification in living and non-living populations for anthropological, genetic, odontologic, evolutionary and forensic investigations (8). Mandibular canines are found to exhibit the greatest sexual dimorphism amongst all teeth. These teeth are exposed to less plaque, show less abrasion from brushing as well as bear less occlusal loading (9). The canines less severely affected by periodontal disease and also the last teeth to be extracted with respect to age. Canines are also more likely to survive severe trauma such as air disasters, hurricanes or conflagration. Hence, canines are the key teeth that can be used for personal identification (10, 11).

Aim of this study:

The aim of this study was to establish mandibular canine width and intercanine dimensions in south Indian adults of age 17-21 years and to compare these measurements
between males and females for forensic purposes.

Materials and methods:

The subjects for the current study are the students of Madha Dental College. Present study was conducted on 30 male and 30 female subjects in the age group of 17-24 years. This age group was selected, as attrition is minimal in this age group. The inclusion criteria for selection of patients includes presence of incisors and lower canine, Healthy state of gingiva and periodontium, Caries free teeth, Normal overjet & overbite (2-3mm), Absence of spacing in the anterior teeth, Normal molar and canine relationship. The significant exclusion criteria includes presence of partially erupted canine teeth, dental/occlusal abnormalities such as rotation, crowding, teeth showing physiologic or pathologic wear and tear.

The following intraoral measurements were taken by using a Vernier Caliper with resolution of 0.01 mm after getting consent of the subjects. The mandibular impressions of all the subjects were made with alginate and study models were prepared in dental stone (male) and plaster(female). The intraoral periodical radiographs for mandibular canine were traced for the subjects.

1. The mandibular canine width: was taken as the greatest width between the contact points of the teeth on either side of the lower jaw.
2. The inter-canine distance: was measured as the linear distance between the tips of right and left mandibular canine in the lower jaw.
3. Mandibular canine index (MCI): was calculated using the formula – Mandibular canine index:
   Observed mandibular canine Index=
   \[
   \frac{\text{mesiodistal crown width of mandibular canine}}{\text{mandibular intercanine width}}
   \]
   Standard mandibular canine index=\[
   \frac{\text{mean male MCI -SD}}{\text{mean male MCI +SD}}\]

4. Sexual Dimorphism in right and left mandibular canines was calculated using formula given by Garn & Lewis\textsuperscript{9} as follows: Sexual Dimorphism = (Xm / Xf - 1) \times 100 (Xm = mean value of male canine width; Xf = mean value of female canine width).

![Figure 1. Measurement of mesiodistal width of mandibular canine by clinical examination.](image)
2. Measurement of mesiodistal width of mandibular canine on plaster models

**Table 1:** Sex related differences amongst various parameters

| PARAMETERS                              | SEX   | MEAN(mm) | Standard deviation |
|-----------------------------------------|-------|----------|--------------------|
| MESIODISTAL WIDTH OF RIGHT CANINE       | Male  | 7.017    | 0.43               |
|                                         | Female| 6.428    | 0.35               |
| MESIODISTAL WIDTH OF LEFT CANINE        | Male  | 7.030    | 0.44               |
|                                         | Female| 6.446    | 0.34               |
| INTERCANINE DISTANCE                    | Male  | 28.287   | 1.45               |
|                                         | Female| 26.860   | 1.48               |
| RIGHT MCI                              | Male  | 0.259    | 0.003              |
|                                         | Female| 0.246    | 0.002              |
| LEFT MCI                               | Male  | 0.261    | 0.003              |
|                                         | Female| 0.247    | 0.003              |

**Fig 3:** Measurement of inter Canine Distance intra orally
Table 2: Statistical Significance of Difference Parameters Males V/s Females

| Parameters                              | T-stat | P-value | Significance      |
|-----------------------------------------|--------|---------|-------------------|
| MESIODISTAL WIDTH OF RIGHT CANINE       | 4.618  | <0.01   | Highly significant|
| MESIODISTAL WIDTH OF LEFT CANINE        | 4.428  | <0.01   | Highly significant|
| INTERCANINE DISTANCE                    | 5.58   | <0.01   | Highly significant|
| RIGHT MCI                               | 3.009  | <0.01   | Significant       |
| LEFT MCI                                | 4.782  | <0.01   | Highly significant|

Results

The following parameters were determined intraorally as well as on study casts in males and females.
1. Rights Mandibular Canine Width.
2. Left Mandibular Canine Width.
3. Intercanine Distance.
4. Right Mandibular Canine Index.
5. Left Mandibular Canine Index.

The results have been depicted in tables 1, 2, 3.

In the present study, the right canine width, left canine width, and intercanine distance were significantly greater in males compared to females \((P < 0.01)\). The mean widths of the right and the left canines in males were 7.017 ± 0.43mm and 7.030 ± 0.44mm as compared to 6.428± 0.35mm and 6.446±0.34mm in females, respectively. The mean intercanine distance was 28.287 ± 1.45mm in males and 26.860± 1.48mm in females. These values were found to be statistically significant. The right and left mandibular canine index were almost bilaterally symmetrical in both the males and females. From the findings, it can be interpreted that in the left canine is found to exhibit greater sexual dimorphism i.e., 9.16% as compared with left canine 8.05%. From table -3 it is clear that the left canine exhibit more dimorphism as the percentage of correctly predicted cases was up to 87%.

Discussion

The present study establishes the existence of a definite statistically significant sexual dimorphism in mandibular canines. The study on Saudi males and females in the age group of 13-20 years and found that only the canines in both jaws exhibited a significant sexual difference while the other teeth did not as well as on ethnic Chinese population with normal occlusions.
Sexual Dimorphism of Mandibular Canine (12, 13 & 14). Intercanine distance and mandibular canine index are useful parameters in differentiating the sexes (14). In the present study both these parameters as measured in males and females were compared and the difference was found to be statistically significant. The mandibular canine with 6.4% and 5.7%, respectively demonstrates the greatest sexual dimorphism amongst all teeth (15). In the present study the inter-canine distance both in males and females is found highly significant (p value <0.01). It is further observed that mean intercanine distance in males is 28.287 ± 1.45mm and the value in females is 26.860± 1.48mm, thus values in males being higher than those of females. Observations in males and females has been observed (male: 25.873±1.253, female: 25.070±1.197) (9), (male: 26.860±1.48, female: 26.287±1.45), Abdullah13 (male: 26.9552±2.3129, female: 26.4575±2.7790), and (males: 27.0171±2.3168 and females: 26.4615±2.7761 mm). The results of present study are higher than previous studies in case of male as well as female (9). In the present study, We have noted the mean value of right canine width in males and females to be 7.017 ± 0.43 mm and 6.428± 0.35mm respectively and that of left canine width in males and females to be 7.030 ± 0.44 mm and 6.446±0.34mm respectively. These values are found to be highly significant (p <0.01). It is also observed that mean values of canine widths to be higher in males compared to females. Our findings in males and females are supported by Kumar et al. (1989)14, who has reported that mean right canine width in males 7.229±0.280 mm, in females 6.690±0.256 mm, left canine width in males 7.299±0.292 mm and in females 6.693±0.323 mm in their study on 60 subjects (males-30 and females-30) of 17 – 21 years age group.
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