**Scholars Journal of Applied Medical Sciences (SJAMS)** **ISSN 2320-6691 (Online)**
**Sch. J. App. Med. Sci., 2017; 5(10E):4187-4190** **ISSN 2347-954X (Print)**
©Scholars Academic and Scientific Publisher
(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI:10.36347/sjams.2017.v05i10.074

# Determination of Sexual Dimorphism in Bikaner city population in Rajasthan by Odontometric Study of Permanent Mandibular Canine

**Fulwaria Mukesh[1], Bijaraniya Kuldeep[2]**
[1]Dental surgeon, Ratna Dental Hospital, Bikaner, Rajasthan, India.
[2]Senior demonstrator, Department of Physiology, S.P. Medical College, Bikaner, Rajasthan, India

**Original Research Article**

***Corresponding author**
*Dr. Kuldeep Bijaraniya*

**Article History**
*Received: 10.10.2017*
*Accepted: 20.10.2017*
*Published: 30.10.2017*

**Abstract:** Sexual dimorphism refers to the differences in size, stature, and appearance between male and female. In many species, teeth exhibit sexual dimorphism. Varying degree of sexual dimorphism in human dentition has been shown in many studies. Hence, tooth size standards based on odontometric investigations can be used in sex determination. In many studies on contemporary human population, it has been shown that tooth crowns are larger in males than in females in possibly due to a longer period of amelogenesis for both deciduous as well as permanent teeth in males. 200 subjects, 100 males and 100 females in the age group of 18 – 30 years were selected for this study. The present study was carried out at Ratna dental hospital, Bikaner, India. The mean age for males was 26.14 (±3.08) years and 22.35 (±3.55) years for females. Mean age of males was found to be significantly higher as compared to that of females (p=0.000001). Inter canine distance was found to be significantly higher as compared to that of females (p=0.000001). In present study sexual dimorphism was observed 13.74%.
**Keywords:** Mandibular canine teeth, Odontometric study, Sex determination, Sexual dimorphism

## INTRODUCTION

Sexual dimorphism refers to the differences in size, stature, and appearance between male and female. This can be applied to dental identification also because no two [1] mouths are alike .The determination of gender from skeletal remains is part of archaeological and many medico-legal examinations. The methods vary and depend on the available bones and their condition. The only method that can give a totally accurate result is the DNA technique, but in many cases for several reasons it cannot be used [2].

Pelvis and scull bones are most frequently used for sex determination based on skeleton although the measurement of humerus and femur head diameter enables highly credible sex determination [3,4]. Very frequently, bones of one person cannot be found during exhumations of bodies from mass graves, especially secondary and tertiary, where death remains are quite mixed, and archaeological excavations, therefore, teeth and the scull are the only real material for identification[5]. The analysis of teeth and identification of discovered bodies using teeth characteristics showed as the first, irreplaceable and highly important procedure in determining the identity of unknown human remains[6-8].

In many species, teeth exhibit sexual dimorphism. Varying degree of sexual dimorphism in human dentition has been shown in many studies. Hence, tooth size standards based on odontometric investigations can be used in sex determination[9]. In many studies on contemporary human population, it has been shown that tooth crowns are larger in males than in females in possibly due to a longer period of amelogenesis for both deciduous as well as permanent teeth in males[10]. It has also been suggested that there is slow maturation in males because of Y chromosome[11]. According to some, canines, particularly, mandibular canines are found to exhibit the greatest sexual dimorphism amongst all teeth[12,13]. Usually, canines are the last teeth to be extracted with respect to age since they are least affected with abrasion from brushing, bear lesser occlusal loading and are less severely affected by periodontal disease. Due to these factors, canines, particularly the mandibular canines are considered as the "key teeth" for personal identification [14]. However, cultural, environmental, racial and

genetic factors also have a large influence on the change in tooth size [15].

The aim of our study was to evaluate sexual dimorphism in permanent mandibular canines. It also assessed the inter -canine distance between males and females.

## MATERIALS AND METHODS

Selection Criteria: 200 subjects, 100 males and 100 females in the age group of 18 – 30 years were selected for this study. The present study was carried out at Ratna dental hospital, Bikaner, India from 1 january 2016 to 1 june 2017.

### Inclusion Criteria

Subjects with the following status of teeth were included in the study:

- Caries free teeth.
- Total healthy Periodontium.
- Complete Erupted teeth
- Normal molar and canine relationship.
- Absence of spacing in the anterior teeth.
- No history or clinical evidence of trauma, restorations, orthodontic treatment or prosthesis.

### Exclusion criteria

The exclusion criteria employed for selection of the study sample were age 18 – 30 years, carries teeth, fractured teeth, malalignment, malrotation, malocclusion, spacing, missing incisor, dental restoration, dental wiring and prosthetics, mobile teeth and attrition. Persons suffering from chronic systemic diseases were excluded. After getting consent of the subjects, the following measurements were taken by using a sliding digital Vernier Caliper.

### Inter-Canine Distance (ICD)

- The inter-canine distance was measured using a digital caliper by placing two points of caliper to the medial border of the two maxillary canine teeth. That is X1
- The inter-canine distance was measured using a digital caliper by placing two points of caliper to the lateral border of the two maxillary canine teeth. That is X2
- Actual maxillary intercanine distance is X= X1+X2/2

### Sexual Dimorphism (SD)

Sexual dimorphism was calculated using formula given by Garn and Lewis as follows:

Sexual Dimorphism = [Xm/Xf]-1 × 100

Where: Xm = Mean value for males; Xf = Mean value for females

### Statistics

Analysis was done by statistical analysis. Students‘t’ test (two tailed) has been used to find the significance. P=0.05 was considered as statistically significant.

## RESULTS

**Table-1: showing the inter-canine distance between male and female**

| PARAMETER | MALE | FEMALE | P-VALUE | SEXUAL DIMOPHISM |
|---|---|---|---|---|
| Age (yr) | 26.14±3.08 | 22.35±3.55 | 0.000001 | 13.74% |
| Inter canine Distance | 28.13±1.65 | 24.73±1.48 | 0.000001 | |

The mean age for males was 26.14 (±3.08) years and 22.35 (±3.55) years for females (Table 1). Mean age of males was found to be significantly higher as compared to that of females (p=0.000001). Inter canine distance was found to be significantly higher as compared to that of females (p=0.000001).In present study we assumes a high inter-gender variability and show 100% dimorphism only when value of Xm is twice the value of Xf, moreover in case of value being more than twice, it show a >100% dimorphism which is impractical. For, ICD it was maximum i.e. 13.74%.

## DISCUSSION

Gender determination forms an important part of the process of identification. Identification becomes simplified whenever prediction of sex is possible because then missing persons of only that sex need to be considered.

The study was conducted to determine the sexual dimorphism that exists in the mandibular permanent canines. This was done by measuring the medial and lateral inter-canine distance. Variation in inter-canine distance of mandibular canine between the different populations being characteristic of genetic factor, environmental factors, sex, heredity, race, secular changes and bilateral asymmetry. Maxillary and mandibular canines are the hardest and most stable (indestructible) structures of the body. These characteristics of canine teeth tend to preserve them throughout life; therefore, the canines are usually the last teeth to be lost[16]. These findings indicate that canines can be considered the ‘key teeth’ for personal identification[17]. In the present study the ICD showed a statistically significant difference between males (28.13 ± 1.65 mm) and female (24.73 ± 1.48 mm). In the present study, the SD was maximum for ICD (13.74%).

Many studies have been conducted to study the sexual dimorphism using other teeth (maxillary mandibular incisors, canines, premolars and molars) [18,19]. Canines, among all the teeth have been found to exhibit greatest sexual dimorphism[20]. The involvements of both X and Y chromosomes in establishing sexual dimorphism based on canine size have been found by many workers [21]. Functionally, canine teeth have greatly evolved since primate days from serving as a tool of aggression to a tool of mastication [22,23]. We, hence, chose both maxillary and mandibular canines to be assessed for sexual dimorphism.

Cassidy and co-workers studied 320 adolescent subjects and concluded that the mandibular arch dimensions were significantly larger in males than in females, medio-laterally as well as antero-posteriorly a sex difference largely established prior to the onset of the adolescent growth spurt[24]. In the present study, both maxillary right as well as left canine index (MxRCI, MxLCI) was significantly higher in males than the females. However, no statistically significant value was obtained for mandibular right and left canine indices.

Rao *et al*. calculated the mandibular CI on a sample of on 384 females and 382 males of the South Indian population in the age group of 15-21 years, found significant sexual dimorphism. Mandibular CI values between males and females, in our study were not statistically significant similar to the study by Acharya and Mainali. However, the absolute measurements used to derive the mandibular CI, viz. MD dimension of canines and ICD were both significantly larger in males ($P < 0.01$). Using standard mandibular CI value, Rao et al obtained a healthy 85.9% accuracy in sex identification[25].

In conclusion, though the results are in agreement with most of the previous studies, the present study has its own limitations. Smaller sample size, single examiner might have resulted in few errors or bias in the dimensions and results. This study measured only linear dimensions because of the simplicity, reliability, and inexpensivity. More accuracy could have been obtained by the application of Moire's topography and Fourier's analysis that however require sophisticated equipment and the use of complex mathematical equations, respectively. Future studies have to include larger sample size, multiple observers to check intraobserver variation and interobserver agreement.

## REFERENCES


1. Kaushal S, Patnaik VV, Agnihotri G. Mandibular canines in sex determination. J Anat Soc India 2003;52:119-24.
2. Singh SK, Gupta A, Padmavathi B, Kumar S, Roy S, Kumar A. Mandibular canine index: A reliable predictor for gender identification using study cast in Indian population. Indian J Dent Res 2015;26:396-9.
3. Iscan MY, Kennedy KAR, editors. Reconstruction of life from the skeleton. New York: Alan R. Liss Inc; 1989.
4. Krogman WM, Iscan YM. The Human Skeleton in Forensic Medicine (2ndedition). Charles C. Thomas Pub Ltd, Springfi eld, Illinois, U.S.A. 1986.
5. Brkić H. Određivanje spola. U: Brkić H. i sur. Forenzična stomatologija. Zagreb:Školska knjiga, 2000:55-8.
6. Kaushal S, Patnaik VVG, Agnihotri G. Mandibular Canines in Sex Determination; J Anat Soc India. 2003;52(2):119-24.
7. Kaushal S, Patnaik VVG, Sood V, Agnihotri G. Sex determination in North Indians using Mandibular canine index. JIAFM. 2004;26(2):45-9.
8. Srivastava PC. Correlation of Odontometric Measures in Sex Determination.J Indian Acad Forensic Med. 2010,32(1):56-61.
9. Black GV. Descriptive anatomy of human teeth. 4th edition. Philadelphia: S.S. White dental Mfg. Co., 1902:pp 435-9.
10. Parekh DH, Patel SV, Zalawadia AZ, Patel SM. Odontometric study of maxillary canine teeth to establish sexual dimorphism in Gujarat population. Int J Biol Med Res. 2012 ; 3(3):1935-7.
11. Acharya BA, Mainali S. Univariate sex dimorphism in the Nepalese dentition and use of discriminant function in gender assessment. Forensic Sci Int.2007;173:47 -56.
12. Ibeachu PC, Didia BC, Orish CN. Sexual dimorphism in mandibular canine width and inter canine distance of university of Port-Harcourt student, Nigeria. Asian J Med Sci.2012;4(5):166-9.
13. Vishwakarm N, Guha R. A study of sexual dimorphism in permanent mandibular canines and its implications in forensic investigations. Nepal Med Coll J.2011;13(2):96-9.
14. Mohammed QAR, Abdullah MA, Ashraf I, Khan N. Dimorphism of mandibular and maxillary canine teeth in establishing identity.SDJ,1997;9(1):17-20.
15. Anderson DL, Thompson GW. Inter-relationship and sex differences of dental and skeletal measurements. J Dent Res.1973;52:43-8.
16. Astete JC, San Pedro VJ, Suazo GI. Sexual dimorphism in the tooth dimensions of Spanish and Chilean peoples. Int J Odontostomat. 2009; 3(1):47-50.
17. Kaushal S, Patnaik VVG, Agnihotri G. Mandibular canines in sex determination. J Anat Soc India. 2003; 52(2):119-24.

18. Khangura RK, Sircar K, Singh S, Rastogi V. Sex determination using mesiodistal dimension of permanent maxillary incisors and canines. J Forensic Dent Sci. 2011;3(2):81-5.
19. Ruengdit S , Riengrojpitak S, Tiensuwan M, Santiwong P. Sex Determination from Teeth Size in Thais. The 6th CIFS Academic Day 2011; 14-15 September 2011; Impact Muang Thong Thani, Nonthaburi.
20. Ibeachu PC, Didia BC, Orish CN. Sexual dimorphism in mandibular canine width and inter canine distance of university of Port-Harcourt student, Nigeria. Asian J Med Sci.2012;4(5):166-9.
21. Garn SM, Lewis AB. Bucco-lingual size asymmetry and its developmental meaning. Angle Orthod. 1967;37(1):186-93.
22. Kaushal S, Patnaik VVG, Agnihotri G. Mandibular canines in sex determination. J Anat Soc India. 2003;52(2):119-24.
23. Eimerl S and Devore I. Physical anthropology and primatology. Time-life international, Cambridge University press, UK,1967;9(1):258-60.
24. Cassidy KM, Harris EF, Tolley EA, Keim RG. Genetic influence on dental arch form in orthodontic patients. Angle Orthodontist 1998;5:445-54.
25. Rao NG, Rao NN, Pai ML, Kotian MS. Mandibular canine index-A clue for establishing sex identity. Forensic Sci Int 1989;42:249-54.