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

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Original Research Article

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Abstract: Establishment of a person's individuality is important for legal as well as humanitarian purpose and gender determination is an essential step in identifying an individual. Dental, fingerprint and DNA comparisons are probably the most common techniques used in this context, allowing fast and secure identification processes. 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 width was found to be significantly higher as compared to that of females (p=0.000001). In present study sexual dimorphism was observed 15.82%.
Keywords: Maxillary canine teeth, Odontometric study, Sex determination, Sexual dimorphism

INTRODUCTION

Establishment of a person's individuality is important for legal as well as humanitarian purpose and gender determination is an essential step in identifying an individual. Dental, fingerprint and DNA comparisons are probably the most common techniques used in this context, allowing fast and secure identification processes [1]. In many animals, large maxillary canines are considered to be visual sexual signs of dominance and rank [2].

The carnivore gives rise to the term 'canine'. Maxillary canine teeth are the most useful objects in the field of forensic investigation. Maxillary canine teeth has excellent and extraordinary resistant to putrifaction, postmortem destruction. Maxillary 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. Variation in distance between them gives us clue about differences between the gender male or female [3]. Which makes them valuable elements for anthropological, genetic, odontologic, evolutionary and forensic investigations. In addition, there are common problems with DNA analysis from human remains due to decomposition by microorganisms and contamination. Also simultaneous exposure to environmental factors such as high temperatures, humidity and many organic compounds may result in DNA degradation. Teeth are good material in living and non living population for anthropological, genetic, odontologic and forensic investigations. This is due to the hardness and high resistance of dental tissues to degradation and putrefaction which enable the teeth to survive for longer periods than other human tissues [4]. Moreover teeth were found to have greater resistance to high temperatures more than other parts of the skeleton which makes them of great value for forensic identification of burned bodies [5].

The aim of the present study was to investigate sexual dimorphism in Bikaner city population in Rajasthan by Odontometric Study of Permanent Maxillary Canine. It was also aimed to investigate the accuracy with which these could be employed for the gender determination in a population.

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
- 3. 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

PARAMETER	MALE	FEMALE	P-VALUE	SEXUAL DIMOPHISM
Age (yr)	26.14±3.08	22.35±3.55	**0.000001**	**15.82%**
Inter canine Distance	38.35±4.30	33.11±2.34	**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. 15.82%.

DISCUSSION

The study was conducted to determine the sexual dimorphism that exists in the maxillary permanent canines. This was done by measuring the medial and lateral inter-canine distance. Variation in inter-canine distance of maxillary canine between the different populations being characteristic of genetic factor, environmental factors, sex, heredity, race, secular changes and bilateral asymmetry. Maxillary canine 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 [6]. These findings indicate that canines can be considered the ‘key teeth’ for personal identification [7].

In the present study the ICD showed a statistically significant difference between males (38.35 ± 4.30 mm) and female (26.14 ± 3.08 mm). In the present study, the SD was maximum for ICD (15.82%).

Present study close to Dhara Parekh [8] who studied the people of Gujrat which is near state of Madhya Pradesh India. Similar observations were made by, Kumar *et al.* (1989), who demonstrated that inter canine distance is useful in determination of gender. Aliaa Omar *et al.* (2009) studied that maxillary Inter-canine distance showed statistically significant differences between both sexes [9].

Neelampari Parikh (2013) showed that the most sensitive indictors for gender determination were the maxillary inter- canine distance [10].

Odontometric features that show sexual dimorphism are used in sex determination in cases where sex could not be determined using craniofacial

features. As a means of determining sex, odontometric features have been the subject of research for a long time [11]. Ditch and Rose were the first to prove that teeth diameters can be successfully used in determining sex in poorly preserved and fragmentary skeletal remains in archaeology [12]. Crowns of permanent teeth are formed at an early stage and their dimensions remain unchanged during further growth and development, except in cases when specific changes and disorders in terms of functionality, pathology and nutrition can have affect on the normal dimensions of a tooth [11]. Chromosomes responsible for the sexual difference are in direct connection to growth and development of teeth. The research performed by Stroud et al. Showed that males have larger mesiodistal diameters of single teeth, which is due to a thicker dentin layer [13].

CONCLUSION

To conclude maxillary inter-canine distance of canines can be used as an aid for sex determination. Thereby, they can aid in identifying a person from fragmented jaws. The mean values for maxillary inter-canine widths were less for females than for males and the differences were statistically significant.

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