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Research Article

Study of Maxillary Canine Index as a Forensic Tool

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Abstract

To investigate the potential of odontometric morphometry of maxillary canine along with sexual dimorphism. Thus, the present study intended to evaluate and compare the Mesiodistal dimensions of right and left maxillary canine, Maxillary arch width, Maxillary canine index and standard maxillary canine index in males and females. We studied maxillary canine index on the casts based on Rao., *et al*. method. The acquired data were analysed using unpaired t- test and chi- square test and P value less than 0.05 was taken significant. Both mesiodistal width of right and left maxillary canine were significantly higher in males than females. Male has significantly higher maxillary arch width. There is no significant difference present between males and females in right and left maxillary canine index. Percentage accuracy for correctly predicting sex by MCI method was more in males compared to females and the difference is highly significant. Right maxillary canine shows more sexual dimorphism than left maxillary canine. odontometric analysis is useful in forensic odontology for determining gender.

Keywords: Maxillary Arch Width; Maxillary Canine Index; Sexual Dimorphism; Standard Maxillary Canine Index; Gender Identification

Abbreviations

MCI: Maxillary Canine Index; SMCI: Standard Maxillary Canine Index

Introduction

Forensic odontology can be defined as a branch of dentistry which deals with the appropriate handling and examination of dental substantiation and with proper evaluation and presentation of dental findings in the interest of justice [1].

Human identification is the perception of the physical peculiarity that is particular to an individual. In case of missing persons, child or elder abuse, mass disasters and violent crimes, the forensic anthropologist is usually asked to assist or contribute information that can figure out the individual identity [2].

In forensics gender determination is the first step involved in an identification process. Gender predilection accomplishes the task easier as missing person of either gender is to be evaluated.

Sexual dimorphism refers to those differences in size, elevation and appearance between man and woman that can be applied to dental identification because no two mouths are similar [3].

Anatomical structures like pubic symphyses, nasal aperture, zygomatic extensions, supraorbital ridge have been studied in the literature, but the teeth and odontometric measurements seem to be the most genuine system since teeth represent the most durable and flexible part of the skeleton. Many authors have done

measurements of crowns in the teeth of both male and female and found certain variations. Bossert and Marks stated that the study of the permanent maxillary and mandibular canine teeth has some advantages. These advantages ensue from the fact that canine are the teeth less affected by periodontal disease, least frequently extracted with respect to age and least used in the oral cavity [3-6].

Odontometric parameters show racial, ethnic and to some extent geographic interpretations. Canine being found to exhibit greatest sexual dimorphism among all teeth as:

- Canines are less exposed to plaque and calculus, so less severely affected by periodontal diseases
- Canine are less teeth to be extracted with respect to age
- Lesser pathological migration of canine than other teeth
- Canines are more likely to survive in conditions such as air disasters, hurricanes, or conflagration [2,7].

Mesio-distal diameter of mandibular and maxillary canine provides evidence of sex determination due to dimorphism [8].

Materials and Methods

This study was conducted in the Department of Oral and Maxillofacial Pathology, Faculty of Dental Sciences, Nadiad. Study consisted of 300 maxillary dental casts of randomly selected participants (145 males and 155 females).

Inclusion criteria: patients having healthy periodontium, non-carious teeth, and nonattrited teeth, free of any allergy to impression material and trauma related to the palate. Exclusion criteria: Individuals with malposed teeth, post orthodontic treatment, developmental anomalies, cleft palate and cleft lip, wearing removable partial dentures, fixed partial dentures and history of inflammation were excluded from the study. Description of equipment and instruments: Digital Vernier calliper (resolution 0.01 mm) and metallic scale: measurement of maxillary canine width, maxillary arch width (Figure 1).

Maxillary canine analysis

- **Mesiodistal width:** The mesiodistal crown dimensions of maxillary right and left canines were measured using vernier calliper with the beaks inserted parallel to long axis of tooth (Figure 3, 4).
- **Maxillary arch width:** Maxillary arch width was measured from canine tip on one side to the canine tip on the other side with vernier calliper (Figure 2).
- **Maxillary canine index:** Calculated by dividing the mesiodistal width of the maxillary canine by the maxillary arch width for both sides.

Figure 1: Digital vernier caliper used for measuring mesiodistal canine width, maxillary arch width.

Figure 2: Measurement of maxillary arch width from canine tip on one side to canine tip on other side.

Figure 3: Measurement of mesiodistal width of maxillary right canine.

Figure 4: Measurement of mesiodistal width of maxillary left canine.

Standard MCI: [9]

$$\text{Standard MCI} = \left\{ \frac{\{\text{Mean male MCI} - \text{standard deviation}\} + \{\text{Mean female MCI} + \text{Standard deviation}\}}{2} \right\}$$

Individual was considered to be male, if the observed canine index was more than the standard canine index, and individual was considered to be female, if the observed canine index was less than the standard canine index.

The obtained readings were subjected for sexual dimorphism analysis of maxillary canine using formula given by Garn., *et al*. (1967).

Percentage of sexual dimorphism = (X_m/X_f) -1 x 100

Where, Xm = mean male tooth dimension

X_f = mean female tooth dimension.

Sexual dimorphism gives us the percentage value by which the male tooth dimension is greater than the female tooth dimension [10].

The data collected was statistically analysed using the SPSS (Statistical Package for Social Sciences) statistical program for windows. $P < 0.05$ was considered statistically significant. Unpaired t test was used to compare dimensions measured for males and females for the odontometric data.

Results and Discussion

Table 1 shows mean and standard deviation of mesiodistal canine width of both sexes.

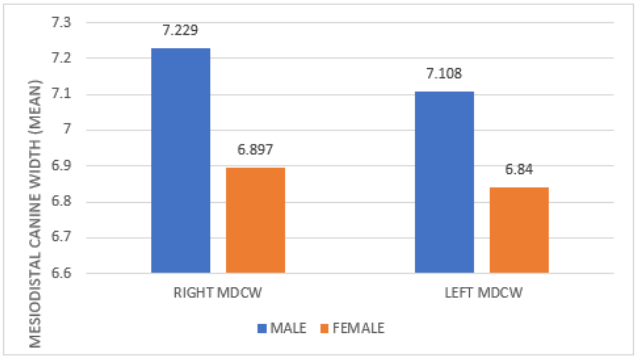
Group	Mean	S.D.		
MD right canine width (MM)			't' value	P value
Male	7.229	0.83	3.71	P < 0.01 HS
Female	6.897	0.71		
MD left canine width				
Male	7.108	0.78	3.08	P = 0.002 HS
Female	6.84	0.72		

Table 1: Mean and S.D of mesiodistal canine width of both sides.

There is highly significant difference present between males and females based on mesiodistal right canine width and left canine width.

Mean and S.D of Mesiodistal width of maxillary right canine in males were 7.229 mm, 0.83 respectively, and mesiodistal width in left maxillary canine were 7.108 mm, 0.78 respectively; and in females mean and SD of mesiodistal width of right and left maxillary canine were 6.897 mm, 0.71 respectively and mesiodistal width in left maxillary canine were 6.84 mm, 0.72 respectively. Males have higher statistical significance in both mesiodistal width of right and left maxillary canine.

Graph 1 show mean values of both right and left mesiodistal canine width are more in males compared to females. Right mesiodistal canine width is more in both the sexes than left mesiodistal canine width.



Graph 1: Mean of mesiodistal canine width (MDCW) of both sides.

Table 2 represents mean and standard deviation of maxillary arch width.

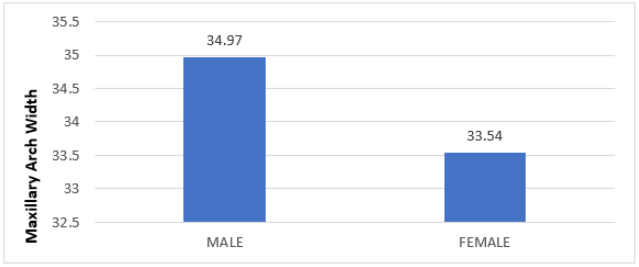
	Mean	S.D.	't' value	P value
Male	34.67	2.27	3.99	P < 0.001 HS
Female	33.63	2.23		

Table 2: Mean and S.D of inter canine distance.

Males are significantly higher in inter canine distance.

Mean and SD of maxillary arch width in males were 34.97mm and 2.24 respectively and in females mean and SD of maxillary arch width were 33.54mm and 2.14 respectively with, statistical significance between males and females.

Graph 2 shows mean value of maxillary arch width is higher in males as compared to females.



Graph 2: Maxillary arch width.

Table 3 shows mean and standard deviation (SD) values of maxillary canine index.

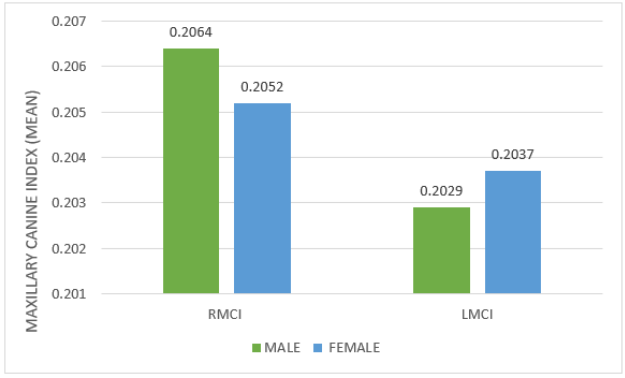
	Mean	S.D.	't' value	P value
RMCI male	0.2064	0.023	0.48	0.63 NS
RMCI female	0.2052	0.02		
LMCI male	0.2029	0.0213	0.32	0.74 NS
LMCI female	0.2037	0.0214		
*RMCI and LMCI- RIGHT and left maxillary canine index				

Table 3: Mean and S.D of maxillary canine index of both sides.

There is no statistically significant difference present between males and females in right and left maxillary canine index.

Mean and SD values for right maxillary canine index in males and females were 0.2064, 0.023 and 0.2052, 0.02 respectively and similarly mean and SD values for left maxillary canine index in males and females were 0.2029, 0.021 and 0.2037, 0.0214 respectively.

Graph 3 shows that right maxillary canine index in males was higher than females and left maxillary canine index was higher in females compared to males. Maxillary canine index for both the sexes were more in right side than left side. No significant difference present between males and females.



Graph 3: Mean of maxillary canine index of both sides.

Table 4 shows standard canine indices of right maxillary canine (0.2043) and left maxillary canine (0.2033).

Parameters	Values of standard canine indices
Right MCI	0.2043
Left MCI	0.2033

Table 4: Standard canine indices by Rao*., et al*. Method.

Table 5 represents percentage accuracy of sex establishment of right canine by MCI method.

Sex	Number of cases studied	Number of cases predicted sex correctly by mci study method	Percentage accuracy
Male	145	94	64.82%
Female	155	77	49.67%
Total	300	171	57.00%

Table 5: Percentage accuracy of sex establishment of right canine by mci method.

Chi square value = 7.01 p = 0.008…. % Accuracy was more in males compared to females and this difference is highly significant.

Out of 145 male casts, 94(64.82%) cast of males were correctly predicted using standard MCI method. Out of 155 female casts, 77(49.67%) cast of females were correctly predicted using standard MCI method. So, out of 300 number of casts 171(57.00%) cast were correctly predicted using standard MCI method. Percentage accuracy was more in males compared to females and this difference is highly significant.

Table 6 represents percentage accuracy of sex establishment of left canine by MCI method.

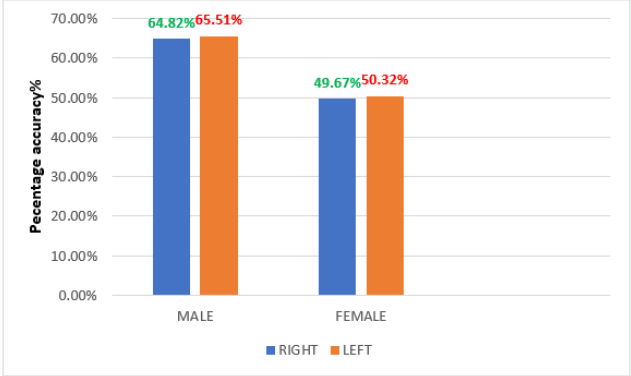
Sex	Number of cases studied	Number of cases predicted sex correctly by mci study method	Percentage accuracy
Left			
Male	145	95	65.51%
Female	155	78	50.32%
Total	300	173	57.66%

Table 6: Percentage accuracy of sex establishment of left canine by MCI method.

Chi square value = 7.01 p = 0.008…. % Accuracy was more in males compared to females and this difference is highly significant.

Out of 145 male casts, 95(65.51%) cast of males were correctly predicted using standard MCI method. Out of 155 female casts, 78(50.32%) cast of females were correctly predicted using standard MCI method. So, out of 300 number of casts 173(57.66%) cast were correctly predicted using standard MCI method. Percentage accuracy was more in males compared to females and this difference is highly significant.

Graph 4 shows left maxillary canine has higher accuracy of predicting sex by standard MCI method compared to right maxillary canine. Both right and left maxillary canine showed males were more correctly predicted in contrast to females.

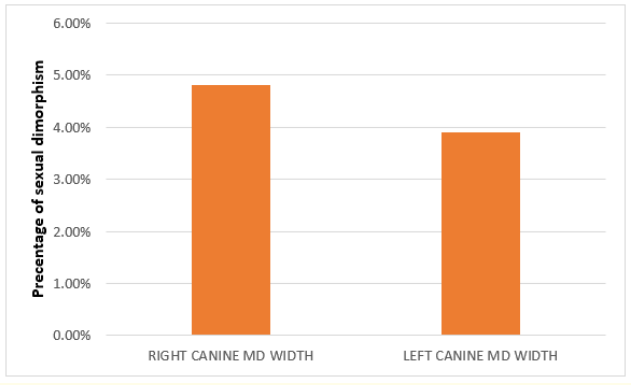


Graph 4: Percentage accuracy of sex establishment by MCI method.

Table 7 and graph 5 shows that sexual dimorphism of right mesiodistal canine width (4.81%) is more than (3.91%) left mesiodistal canine width.

Parameters	Sexual dimorphism %
Right canine md width	4.81%
Left canine md width	3.91%

Table 7: Sexual dimorphism of maxillary canine.



Graph 5: Sexual dimorphism of maxillary canine.

Discussion

Odontometric analysis of teeth helps in identification of sex, apart from skeletal domain. Even teeth also help in anthropology and forensic investigation to estimate age and race of a person even in decomposed and burnt bodies.

Canine differs from other permanent teeth due to its high sexual dimorphism and survival rate, so it can help for sex determination as it is stated by several authors. Hashim HA and Murshid ZA in 1993 evaluated 720 teeth of casts in a Saudi population aged 13-20 years to determine the teeth in the human dentition with the highest possibility of exhibiting dimorphism. Their study showed that the canines were the only teeth to showoff dimorphism. Minzuno (1990) reported that maxillary canine showed a higher degree of sexual dimorphism compared to the mandibular canine in a Japanese population [11,12].

Mesiodistal (MD) and buccolingual (BL) crown diameter of the permanent teeth are the two most commonly used odontometric parameters in determining sex. In several studies of Garn., *et al*. (1967), El Sheikhi and Bugaighis (2016), and Eboh., *et al*. (2019) reported that for certain tooth BL dimension is more dimorphic than MD dimension. But, Liu J., *et al*. (2021) and other researchers observed that mesiodistal dimension is better than buccolingual dimension for sex estimation. Based on this our study used mesiodistal dimension for determining sex [10,13-15].

Several methods were studied for measuring the dimensions of canine teeth which include Moire's topography and Fourier's analysis and measurement of linear dimensions, such as mesiodistal width, buccolingual width and incisocervical height. The use of Moire's topography and Fourier's analysis were limited to small samples whereas measurements of linear dimensions of canine teeth were used in a large population because they are reliable, simple, easy to perform and inexpensive [2].

In the present study we found that mean of the mesiodistal width of right maxillary canine (7.22 mm) and maxillary left canine (7.10 mm) in males were greater than that of mean value of mesiodistal width of right maxillary canine (6.89 mm) and left maxillary canine (6.84 mm) in females. The observed difference of right and left mesiodistal canine width between male and female was statistically significant with a P value of <0.01. Similarly, a

study by Bakkannavar., *et al*. (2012) showed that mean value of the mesiodistal width of maxillary right canine (7.8 mm) and maxillary left canine (7.85 mm) in males was greater than that of the mean value of mesiodistal width of right maxillary canine (7.55 mm) and left maxillary canine (7.6 mm) in females which was statistically significant. Parekh., *et al*. (2012) in their study also found that in males the mean value of mesiodistal width of maxillary right canine(6.92 mm) and maxillary left canine (7.098 mm) were more than that of the mean value of mesiodistal width of right maxillary canine (6.3 mm) left maxillary canine (6.61 mm) in females. H. Sherfudhin., *et al*. also found that mean of mesiodistal width of right maxillary canine (8.27 mm) and left maxillary canine (8.28 mm) in males was greater than that of mesiodistal width of right maxillary canine (6.68 mm) and left maxillary canine (6.69 mm) in females and observation were statistically significant. Al-Rifaiy (1997) and S M Bakkannavar (2015) also showed that mean value of mesiodistal width maxillary canine is more in males compared to females in both right and left side [5,8,16-18].

Al- Rifaiy (1997), Bakkannavar., *et al*. (2012), H. Sherfudhin., *et al*. and Parekh., *et al*. (2012) they found that left mesiodistal width of maxillary canine is more than that of the right mesiodistal width of maxillary canine in both the genders which was contradicted with our study where right mesiodistal width of maxillary canine is more than the left mesiodistal width of maxillary canine [5,8,16,17].

In our study we found that mean of maxillary arch width in males(34.97 mm) was greater than that of the mean of maxillary arch width in females (33.54 mm) and was statistically significant with P value of <0.001. Likewise, Mohsenpour K., *et al*. (2017) found that mean maxillary arch width in males (35.27 mm) is higher than mean of maxillary arch width in females (34.20 mm). Nuhu., *et al*. (2019) in their study of maxillary canine teeth in Nigerian student also showed that mean of maxillary arch width in males (37 mm) was greater than mean of maxillary arch width in females (36.1 mm) and was statistically significant. But, Shastry., *et al*. (2016) in their study found that mean of maxillary arch width in females (34.97 mm) was more than the mean of maxillary arch width in males(34.64 mm) in contrast to our study and difference was not statistically significant [19-21].

Parekh., *et al*. (2012) found that mean of right (0.202) and left maxillary canine index (0.207) in males was greater than that the mean of right (0.198) and left maxillary canine index (0.206) in females. S. Manjunath., *et al*. (2014) also found that mean of right and left maxillary canine index in males is more than the mean of right and left maxillary canine index in females. In the present study also the mean of right (0.206) and left (0.202) maxillary canine index in males is more compared to mean of right (0.205) and left (0.203) maxillary canine index in females and the difference between both male and female was not statistically significant [8,22].

In the present study, standard maxillary canine index was calculated by the method of Rao., *et al*. for correct predictability of gender. So, right standard maxillary canine index was 0.204 and left standard maxillary canine index was 0.203.

Based on right standard maxillary canine index we found that 64.82% males and 49.67% females were correctly predicted and overall accuracy was 57.00%. Similarly, S M Bakkannavar., *et al*. (2014) in their study found that accuracy of sex prediction using right maxillary canine index was 63.2% for males and 33.6% for females with an overall accuracy of 48.8%. Al- Rifaly (1997) also showed that prediction of sex using right maxillary canine index was 66.67% in males and 64.29% in females. So, all the above study concluded that males had greater accuracy of predicting sex compared to females and their difference was highly significant, except in S M Bakkannavar., *et al*. study showed poor statistical significance. In contrast, Pereira., *et al*. (2018) found that accuracy of sex prediction using right maxillary canine index was greater in females (69.00%) compared to males (39.00%) [2,17,22].

The present study also shows that out of 145 males and 155 females, accuracy of sex prediction by left maxillary canine index in males was 65.51% and 50.32% in females and overall accuracy was 57.66%. Pereira., *et al*. (2018) in their study found that 74.00% males and 69.00% females were correctly predicted using left maxillary canine index. S M Bakkannavar., *et al*. (2014) also found that accuracy of sex prediction using left maxillary canine index was 64.00% in males and 33.6% in females. Hence, from both the studies it was observed that males had greater accuracy of sex prediction using left maxillary canine index than females and difference was highly significant [22].

Pereira., *et al*. (2018), S M Bakkannavar., *et al*. (2014) studies and the present study observed that accuracy of sex prediction using left maxillary canine index was somewhat greater than right maxillary canine index [2,22].

H. Sherfudhin., *et al*. (1996) in their study showed high percentage accuracy of sex prediction using maxillary canine index in males and females which were 88.00% and 86.8% respectively [16].

Garn., *et al*. (1967) studied the magnitude of sexual dimorphism in mesiodistal tooth size as well as percentage dimorphism in Ohio subjects, which concluded that on percentage basis dimorphism was greatest for canines specifically to mesiodistal diameter. Furthermore, they studied sexual dimorphism in various populations, which stated that mandibular canine has greater degree of sexual dimorphism than all the permanent tooth in both the arches and also showed that maxillary canine has greater dimorphism than rest of maxillary teeth. Khangura., *et al*. (2011) in their study of sex determination using mesiodistal dimension of permanent maxillary incisors and canines, concluded that maxillary canines (3.39%) exhibit statistical significance for sexual dimorphism than maxillary incisors and can be used for sex determination. Lund and Monstad (1999) also showed dimorphism of maxillary canine [10,23,24].

The present study also aimed to studied sexual dimorphism of maxillary canine. Where, sexual dimorphism of right maxillary canine (4.81%) was greater than that of left maxillary canine (3.91%). Parekh., *et al*. (2012) in their study of Gujarat population, observed that dimorphism of right maxillary canine (8.87%) is greater than the dimorphism of left maxillary canine (7.26%). Pereira., *et al*. (2018) also found that sexual dimorphism of right maxillary canine (7.2%) is more than the dimorphism of left maxillary canine (6.3%). Paramkusam., *et al*. (2014) also showed that right maxillary canine (4.4%) had greater sexual dimorphism than left maxillary canine (4.1%). Similarly, Bakkannavar., *et al*. (2012) also found that sexual dimorphism for right maxillary canine is more than the left maxillary canine. In contrast, Shastry., *et al*. in their study found high percentage of dimorphism in left maxillary canine (13.04%) than right maxillary canine (8.34%) [2,8,5,21,25].

Conclusion

Forensic odontology is an emerging field all over the world. Identification of dead or living individual is very difficult work in forensic science. Hence, gender determination is a basic step to determine identity of human individual. Various methods are used such as odontometric analysis and palatoscopy which shows variable patterns. Our study included 300 randomly collected maxillary cast, out of which 145 were male casts and 155 were of female casts. We studied maxillary canine index on the casts based on Rao., *et al*. method. The statistical analysis was done using unpaired t- test and chi- square test.

The present study was able to make following conclusion based upon the analysis:

- Both mesiodistal width of right and left maxillary canine were significantly higher in males than females.
- Male has significantly higher maxillary arch width.
- There is no significant difference present between males and females in right and left maxillary canine index.
- Percentage accuracy for correctly predicting sex by MCI method was more in males compared to females and the difference is highly significant.
- Right maxillary canine shows more sexual dimorphism than left maxillary canine.

Thus, odontometric analysis is useful in forensic odontology for determining gender.

Conflict of Interest

All authors have declared in the study no conflict of interest.

Bibliography

1. Dayal Pramod K. "Textbook of forensic odontology". Paras' medical publisher, (1998).

2. Pereira Treville., *et al*. "Palatoscopy and odontometrics for sex identification and hereditary pattern analysis in a Navi Mumbai population: A cross-sectional study". *Journal of Oral and Maxillofacial Pathology: JOMFP* 22.2 (2018): 271.

3. Priya E. "Methods of skeletal age estimation used by forensic anthropologists in adults: a review". *Forensic Research and Criminology International Journal* 4.2 (2017): 00104.

4. Nagare Sagar P., *et al*. "Sex determination in forensic identification, a review". *Journal of Forensic Dental Sciences* 10.2 (2018): 61.

5. Bakkannavar Shankar M., *et al*. "Mesiodistal width of canines: a tool for sex determination". *Medicine, Science and the Law* 52.1 (2012): 22-26.

6. Phulari Rashmi GS., *et al*. "Comparative assessment of maxillary canine index and maxillary first molar dimensions for sex determination in forensic odontology". *Journal of Forensic Dental Sciences* 9.2 (2017): 110.

7. Singh Siddharth Kumar, *et al*. "Mandibular canine index: A reliable predictor for gender identification using study cast in Indian population". *Indian Journal of Dental Research* 26.4 (2015): 396.

8. Parekh Dhara H., *et al*. "Odontometric study of maxillary canine teeth to establish sexual dimorphism in Gujarat population". *International Journal of Biological and Medical Research* 3.3 (2012): 1935-1937.

9. Rao Nagesh Kumar G., *et al*. "Mandibular canine index—a clue for establishing sex identity". *Forensic science international* 42.3 (1989): 249254.

10. Garn Stanley M., *et al*. "Genetic control of sexual dimorphism in tooth size". *Journal of Dental Research* 46.5 (1967): 963-972.

11. Hashim H A and ZA Murshid. "Mesiodistal tooth width in a Saudi population sample comparing right and left sides. Part 2". *Egyptian Dental Journal* 39.1 (1993): 347-350.

12. Minzuno O. "Sex determination from maxillary canine by Fourier analysis". *Journal of Nihon University School of Dentistry* 2 (1990): 139-142.

13. El Sheikhi Fatma and Iman Bugaighis. "Sex discrimination by odontometrics in Libyan subjects". *Egyptian Journal of Forensic Sciences* 6.2 (2016): 157-164.

14. Eboh Dennis Erhisenebe O. "Odontometric sex discrimination in young Urhobo adults of South-South Nigeria". *Anatomy and Cell Biology* 52.3 (2019): 269-277.

15. Liu Jialin., *et al*. "Dental measurements based on a three-dimensional digital technique: A comparative study on reliability and validity". *Archives of Oral Biology* 124 (2021): 105059.

16. Sherfudhin H., *et al*. "A cross-sectional study of canine dimorphism in establishing sex identity: comparison of two statistical methods". *Journal of Oral Rehabilitation* 23.9 (1996): 627-631.

17. Al-Rifaiy Mohammed Q., *et al*. "Dimorphism of mandibular and maxillary canine teeth in establishing sex identity". *Saudi Dental Journal* 9.1 (1997): 17-20.

18. Bakkannavar Shankar M., *et al*. "Canine index–A tool for sex determination". *Egyptian Journal of Forensic Sciences* 5.4 (2015): 157-161.

19. Mohsenpour K., *et al*. "Mandibular and maxillary canine as a tool for sex determination". *Journal of Morphological Sciences* 34.04 (2017): 247-250.

20. Nuhu Saleh., *et al*. "Establishment of sexual dimorphism using maxillary canine of the university of Maiduguri students, Nigeria". *International Journal of Forensic Odontology* 4.2 (2019): 68.

21. Shastry Shilpa Padar., *et al*. "Sexual Dimorphism Using Canine Width and Inter-Canine Distance in South Indian Population: A Cross Sectional Study". (2016).

22. Boaz Karen and Chhavi Gupta. "Dimorphism in human maxillary and mandibular canines in establishment of gender". *Journal of Forensic Dental Sciences* (2009): 42-44.

23. Khangura Rajbir Kaur., *et al*. "Sex determination using mesiodistal dimension of permanent maxillary incisors and canines". *Journal of Forensic Dental Sciences* 3.2 (2011): 81.

24. Lund H and H Mörnstad. "Gender determination by odontometrics in a Swedish population". *The Journal of Forensic Odonto-stomatology* 17.2 (1999): 30-34.

25. Paramkusam Geetha., *et al*. "Morphometric analysis of canine in gender determination: Revisited in India". *Indian Journal of Dental Research* 25.4 (2014): 425.