

ORIGINAL RESEARCH PAPER

Inter-canine width as a tool for sexual dimorphism and stature estimation

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ABSTRACT

Introduction: Identification by means of dental tissue is an easy and helpful tool in forensic Odontology. Dental architecture grows in proportion to the human body and shows some positive correlation. Being hard and resistant to adverse conditions makes it very valuable in scientific studies. Since canine has a longer root in the jaw, it makes it a notifiable structure that can be used in research. Hence, among the dental tissues, canine tooth is chosen most often in studies. **Materials and methods:** study was conducted in Department of Forensic Medicine & Toxicology, Himalayan Institute of Medical Sciences, Dehradun, Uttarakhand, involving 200 subjects (100 males & 100 females) 19 to 24 years of age. Inter-canine width of their maxilla and mandible were measured by manual vernier caliper to determine sex and height; data was analyzed by SPSS software. **Result:** Mean Maxillary and Mandibular Inter-canine width of males was found to be more as compared to females and were statistically highly significant. Sexual dimorphism was more by using Mandibular Inter-canine width as compared to Maxillary Inter-canine width. Percentage accuracy of sex determination was found to be more in Maxillary Inter-canine width. Simple linear regression equations were obtained for predicting height from Inter-canine width. Correlation between Height and Inter-canine width of Maxilla and Mandible was statistically significant in males than females. **Conclusion:** Sexual dimorphism and stature estimation is possible by measuring Inter-canine width. However, better prediction with more accurate height and sex determination requires a combined study of dental tissue along with bones.

Keywords: Forensic Odontology; dental tissue; canine; identification.

INTRODUCTION

Human beings have important characteristics that differ from each other due to uniqueness, and one such feature is the morphology of dentition. It is one of the most durable parts like bone in the body that resist damage under time factors and weather conditions. These unique and strong characteristics of dentition is used for the purpose of research in medico-legal field. An excellent proof of its indestructible property is the presence of teeth in the lower jaw of Tabun man which is approximately about 35,000 years old.¹

In Human jaw, canine's morphology and structure is such that it is less affected by disease, plaque, abrasion from brushing and is also the least extracted tooth.²⁻⁴ Canine can survive even in a hurricane disaster.⁵ In situations, such as flood, earthquakes, cyclones, tsunami etc where body is

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decomposed and identification becomes difficult then, the odontometric parameters helps in identification of the individual. The most reliable, easy, and less time-consuming method in investigation is the measurement of teeth. It was reported that sexual dimorphism^{6,7} and stature estimation from permanent canines and their arch width could be possible. However, using dentition for estimation of stature needs more exploration and with this background, the current study was conducted to establish a relationship between stature, sexual dimorphism and Inter-canine width.

The aims of this study is to find out sexual dimorphism based on Inter-canine width and to find out relationship between Inter-canine width and stature

MATERIALS AND METHODS

A descriptive cross sectional study was conducted in the Department of Forensic Medicine and Toxicology, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Uttarakhand, involving 200 subjects (100 males and 100 females) of age ranging from 19 to 24 years. A written informed consent was duly obtained from all of them, informing about the study, purpose and techniques to be used for the measurements. Only those subjects having normal dental alignment with complete eruption of permanent teeth were included. Subjects having missing teeth, fractured teeth, dental caries, endocrine or any other abnormalities were excluded from the study.

Inter-canine width is defined as the horizontal distance between the two canines. It was measured using a manual Verniercaliper; the subject was asked to open his/her mouth

were placed at the medial borders of right and left canine of both the jaw, then an average value was noted. In order to maintain proper hygiene, after taking these measurements, the tips of Verniercaliper were cleaned before using it on another subject.

For measuring the stature, a stadiometer was used; the subject was asked to stand barefoot in an upright posture with his/her head positioned in Frankfurt plane and with his/her heel, buttocks, scapulae and occiput touching the measuring rod, then by using a movable rod, the reading was taken. To reduce the errors while observing, all the readings were taken twice. The collected data was then analysed using SPSS.

RESULTS

The mean Inter-canine width of males was more than females in both Mandible as well as Maxilla; they were found to be statistically highly significant. Since, T value between males and females was more in Maxillary Inter-canine width than Mandibular Inter-canine width, hence sexual dimorphism is more in Mandibular Inter-canine width. Also, sex can be differentiated on the basis of Inter-canine width of the subjects as P value is less than 0.05, which is statistically highly significant (**Table 1**).

Percentage accuracy to predict the sex on the basis of Inter-canine width is 62 % in males and 70% in females if using maxilla, 68 % in males and 55 % in females if using mandible.

Correlation between the stature and Maxillary Inter-canine width is more positive and stronger as compared to Mandibular Inter-canine width in total subjects as well as

Table 1 Independent t test: for sex differentiation from Inter-canine width

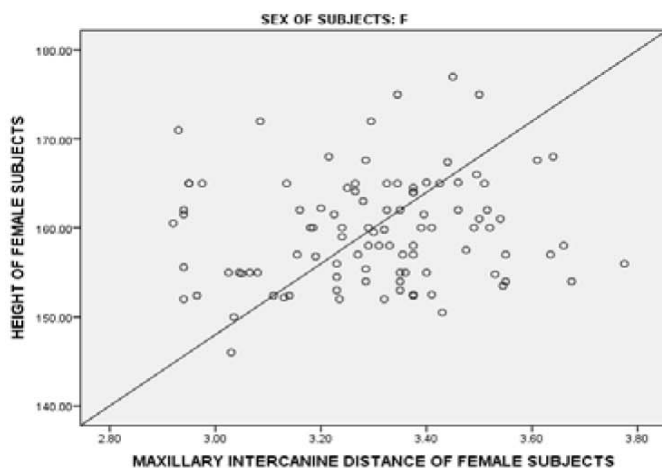
Parameter	sex	Mean $\pm$ SD	T value	P value	Level of Significance	% of sexual dimorphism
Maxillary Inter-canine width	M	3.4512 $\pm$.23568	5.027	.000	Highly significance	5.43 %
	F	3.2980 $\pm$.19336				
Mandibular Inter-canine width	M	2.7042 $\pm$.22900	4.466	.000	Highly significance	6.16 %
	F	2.5712 $\pm$.19036				

and then the two tips of external jaw of manual verniercaliper were placed at the distal borders of right and left canine respectively for measuring the maximum Inter-canine width (max. Id) and for measuring the minimum Inter-canine width (min. Id), the tips of the external jaw of manual Verniercaliper

male and female subjects individually. They were found to be statistically highly significant in total subjects and male subjects as p value is less than 0.05 but not statistically significant in female subjects as p value is more than 0.05 (**Table 2**).

Table 2 Regression analysis for predicting stature (Y) of subjects (dependable variable) considering Inter-canine width as an independent variable

Parameter	Mean	Std. Deviation	Correlation value	P value	R Square	Regression equation
Mean Height of Total Subjects (n= 200)	167.06	9.48231	.368	.00	.135	Y = 115.525 + 15.270 (maxillary Inter canine width in Total Subjects)
Mean Maxillary Inter-canine width of Total Subjects (n =200)	3.37	.22833				
Mean Height of Total Subjects (n= 200)	167.06	9.48231	.332	.00	.110	Y = 129.355 + 14.293 (mandibular Inter canine width in Total Subjects)
Mean Mandibular Inter-canine width of Total Subjects (n =200)	2.64	.22037				
Mean Height of Male Subjects (n=100)	174.42	5.90969	.239	.008	.057	Y = 153.706 + 6.003 (maxillary Inter canine width Of male Subjects)
Mean Maxillary Inter-canine width of Male Subjects (n =100)	3.45	.23568				
Mean Height of Male Subjects (n=100)	174.42	5.90969	.217	.015	.047	Y = 159.258 + 5.609 (mandibular Inter canine width in male Subjects)
Mean Mandibular Inter-canine width of male Subjects (n = 100)	2.70	.22900				
Mean Height of Female Subjects (n=100)	159.69	6.00936	.109	.141	.012	Y = 148.563 + 3.373 (maxillary Inter canine width in Female Subjects)
Mean Maxillary Inter-canine width of Female Subjects (n =100)	3.30	.19336				
Mean Height of Female Subjects (n=100)	159.69	6.00936	.097	.168	.009	Y = 115.525 + 15.270 (mandibular Inter canine width in Female Subjects)
Mean Mandibular Inter-canine width of Female Subjects (n =100)	2.57	.19036				



(a)



(b)

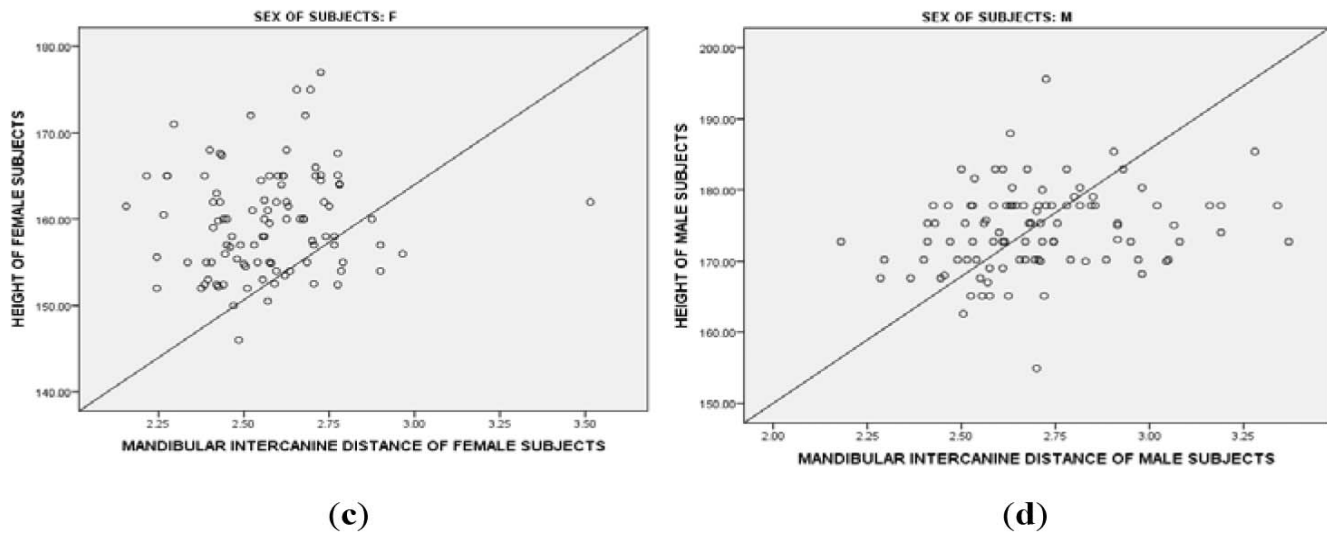


Figure 1 Scatter diagram showing correlation between Inter canine width and stature (a to d)

DISCUSSION

The present study was conducted for sexual dimorphism using Mandibular and Maxillary Inter canine width, thereafter prediction of stature was done by considering Inter canine width as an independent variable. The mean Mandibular Inter canine width was more in males as compared to females; statistically significant difference was found as p value was less than .05. These findings are consistent with most of the studies⁸⁻¹⁷ but inconsistent with study conducted by Dayananda¹⁸ where mean value was more in males but statistically insignificant difference was observed. In the present study, mean Maxillary Inter canine width was more in males as compared to females and statistically significant difference was found between males and females which is consistent with Prakash Chandra Jha¹⁸ and Rao G V¹⁹ but inconsistent with Hamid and Mastooreh²⁰ where statistically insignificant difference was found. Sexual dimorphism using Mandibular Inter canine width in the present study was found to be 6.61 % whereas a slightly higher percentage was found by Fulwaria Mukesh²¹ (13.74 %). The correlation coefficient between Stature and Maxillary inter canine width of the present study was found to be weakly positive (0.368) and a statistically significant relationship was obtained which is consistent with Harshala S Patil's²² ($r = 0.493$ and p value < 0.05).

CONCLUSION

Sexual dimorphism is successfully possible if Inter canine width of Maxilla and Mandible are measured in the jaw. Also, percentage of sexual dimorphism using Mandibular Inter canine width is more than Maxillary Inter canine width. The percentage accuracy to predict the sex, considering Inter canine width is more in females if using Maxilla and more in males if using Mandible. Since, we obtained a positive, weakly strong correlation and not a very high percentage of sex prediction. Hence, there is a need for more research relating to Inter canine width involving a larger population of different age groups. In order to obtain a more reliable, better

and more accurate prediction of stature and sexual dimorphism it suggested to conduct a combined study of dental tissues and bones in contrast to dental issues alone.

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