

Variation and Sexual Dimorphism in Buccolingual and Mesiodistal dimensions of Permanent First Molars in the North Indian Population

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Abstract—Correct attribution of sex in forensic investigations helps in the identification of victims during disasters, accidents or such calamities where there is large number of fragmentary or disfigured bodies. When these fragmentary remains cannot be recognized by visual methods the anthropometric and odontometric techniques offer simple, faster, and cheaper means of identification. The present study was carried out to determine the crown size variations and sexual dimorphism in permanent mandibular first molars. A sample size of 200 individuals (male-100, female-100) of North Indian ancestry between 18 to 24 years of age were selected for this study, and their mesiodistal and buccolingual dimensions of lower permanent molars were measured. The results showed statistically significant sexual dimorphism in male and female tooth dimensions.

1. INTRODUCTION

The post mortem identification of an individual is not only mandatory for the certification of death or for legal reasons but for humanitarian reasons also [1]. Attribution of sex is one of major parameter in the profiling of unknown victim. This is because the correct gender determination not only limits the number of possible matches to half but also subsequent methods for age and stature estimation are often gender dependent. [2, 3]. In this sense identification of gender takes precedence over the other attributes [4, 5]. The resistance of teeth to extreme environments make them indispensable tools for personal identification [6, 7]. The existence of sexual dimorphism in permanent canine teeth is a well-established as reported in literature [8-11]. But the molars provide an advantage over canine, which have greater chances of being impacted and thus they are unavailable for odontometric analysis [12]. There is lack of normative data on the buccolingual and mesio-distal dimensions of the molar teeth, especially the mandibular first permanent molars of the North Indians. The main aim of the present study was to explore the sexual dimorphism in mesiodistal and buccolingual tooth dimensions of mandibular first molars among the North Indian population and to evaluate the accuracy of these measurements in sex determination.

2. MATERIALS AND METHODS

The study was carried out on 200 subjects (100 males and 100 females) with the age group 18-25 years as the attrition is minimal in this age [13]. The subjects were apprised with the nature and purpose of the study and only those who gave their consent participated in the study.

Inclusion criteria

- The subjects with properly formed molar teeth
- Healthy state of periodontium

Exclusion criteria:

- Subjects suffering from chronic systemic diseases
- Teeth with prosthesis and restorations.

The buccolingual (BL) and mesiodistal (MD) diameters of the permanent first molars were measured using digital Vernier calipers (resolution 0.01mm) intraorally.

Mesiodistal diameter of the crown: This measurement is the greatest mesiodistal dimension between the contact points of teeth on either side of jaw [14].

Buccolingual diameter of the crown: This measurement is the greatest distance between buccal and lingual surfaces of the crown, taken at right angles to the plane in which the mesiodistal diameter is taken [14].

The measurements were performed by one researcher and all values were rounded to two decimal places. The mean values of BL and MD dimensions of males and females were subjected to the formula where the extent of dimorphism (percent difference) was calculated as [15]:

$$\text{Sexual dimorphism} = \left(\left[\frac{X_m}{X_f} \right] - 1 \right) * 100$$

(X_m = Mean value for males; X_f = Mean value for female).

3. RESULTS AND DISCUSSION

Tables 1 - 5 show the descriptive statistics (mean, standard deviation and coefficient of variation) for mesio-distal and bucco-lingual widths of mandibular first molar of both sides in both genders and sexual dimorphism using mesio-distal and bucco-lingual widths of mandibular permanent first molar of both sides.

Table 1: Descriptive statistics for the mesiodistal dimensions of permanent right mandibular first molars.

Sex	No. of subjects	Mean MDWR (in mm)	S.D. MDWR	Coefficient of variation (R)	t test	d(f)	p' value
Males	100	11.21	0.506	0.044	24.96	198	<0.0001
Females	100	9.61	0.397	0.042			

Table 2: Descriptive statistics for the mesiodistal dimensions of permanent left mandibular first molars.

Sex	No. of subjects	Mean MDWL (in mm)	S.D. MDWL	Coefficient of variation (L)	t test	d(f)	p' value
Males	100	11.184	0.554	0.049	23.21	198	<.0001
Females	100		0.404	0.041			

Table 3: Descriptive statistics for the buccolingual dimensions of permanent right mandibular first molars

Sex	No. of subjects	Mean BLWR	Coefficient of variation	S.D. BLWR	t test	d(f)	p' value
Males	100	10.26	0.047	0.496	20.3	198	<.0001
Females	100	8.83	0.056	0.506			

Table 4: Descriptive statistics for the buccolingual dimensions of permanent left mandibular first molars.

Sex	No. of subjects	Mean BLWL	Coefficient of variation	S.D. BLWL	t test	d(f)	p' value
Males	100	10.73	0.048	0.511	21.68	198	<.0001
Females	100	8.79	0.059	0.527			

Table 5: Percentage Sexual Dimorphism in Permanent Mandibular first molars.

Measurements	Side	Sexual dimorphism
Mesiodistal Width	Left	16.98%
	Right	16.63%

Buccolingual Width	Left	17.44%
	Right	16.21%

The studies on the sexual dimorphism in tooth size have been carried out by the various anthropologists on the different populations. These results validate other scientific researches which reported that males have larger teeth than females. The variations among the different populations can be attributed to genetic, environmental, and geographical and nutrition or factors as they are known to affect tooth size. As a means of determining sex, Odontometric features have been the subject of research for a long time [10]. The similar studies on Turkish population and South Nigerian population discovered a statistically significant difference between males and females in the maxillary and mandibular canine, and the mandibular second premolars [10, 14]. In another study on Indian Population the study involving the Odontometric analysis of maxillary first molar teeth, statistically significant difference was found between males and females [15].

The findings of this study can be helpful during sex determination of skeletal remains, because some of dental traits can disappear due to tooth abrasion, but the mesio-distal and bucco-lingual crown dimensions can still be unchanged.

4. CONCLUSIONS

The present study provides normative morphometric data for the mandibular first molars among the North Indians. It will be useful in archaeological and forensic scenarios as this method is relatively simple, economical and reasonably accurate. Since there are currently very few studies of sex estimation using odontometric data from mandibular molar teeth in Indian populations, the present study makes a significant contribution to the development of the standards of sex assessment in this population.

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