

ODONTOMETRIC ANALYSIS OF MAXILLARY 1ST MOLAR PARAMETER FOR SEX DETERMINATION

Dr. Mohammad Abdurrahman Khan*

Assistant Professor Department of Forensic Medicine and Toxicology, Hind Institute of Medical Sciences, Barabanki; Lucknow. *Corresponding Author

Dr. Manisha Verma

Senior Resident Department of Periodontology, King George's Medical University, Faculty of Dental Sciences, Lucknow.

Dr. Mousami Singh

Additional Professor, Department of Forensic Medicine and Toxicology King George's Medical University, Lucknow.

Dr. Anoop Kumar Verma

Professor and Head Department of Forensic Medicine and Toxicology King George's Medical University, Lucknow.

ABSTRACT

Introduction: Teeth are highly indestructible often preserve even when bony skeleton degraded or destroyed and give out minimal turnover of natural substance hence teeth can be choice for sex determination. Mesiodistal parameter of maxillary 1st molar is appropriate teeth for sex determination due to its early eruption and little impaction than other teeth. **Aim:** The aim of our study was determining the sex by odontometric analysis of mesiodistal width of maxillary 1st molar. **Materials and methods:** Study was conducted on 112 subject (56 male and 56 female) of both the sex having age group between 20 to 30 years. Impression of the teeth were made using irreversible hydrocolloid (alginate) material and cast poured in dental stone. Mesiodistal dimension of maxillary 1st molar of both right and left side were measured by digital caliper. **Result:** Mean of right and left mesiodistal maxillary 1st molar width was slightly higher in male than female and were statistically not significant. Little sexual dimorphism shown by right and left maxillary 1st molar. **Conclusion:** The present study didn't find any statistically significant difference in mesiodistal width of maxillary 1st molar among male and female on both side of maxillary jaw. Therefore, this study unable to established maxillary 1st molar as tool for determination of sex.

KEYWORDS : MD: Mesiodistal, SD: Standard deviation, mm: millimetre.

INTRODUCTION:

Identification of an individual is necessary in cases of fire, explosions, road, railway or aircraft accidents, mutilated body, decomposed body or in skeleton remains¹. Determination of sex is the initial step of identification of an individual². Sex determination from skeletal remain is important aspect of medicolegal and archaeological examinations³. Among various available tools of sex determination like odontometry⁴, cheiloscopy^{5,6,7}, DNA analysis⁸ and osteometry⁹ only DNA analysis gives absolute proof of sex determination, but such tools are exorbitant, comprehensive, and time-consuming involving difficult DNA extraction approach^{10,11}. Reliable sex assessment can be obtained from analysis of pelvic bone, skull and long bone but these are not always found intact¹². Teeth are highly indestructible often preserve even when bony skeleton degraded or destroyed and give out minimal turnover of natural substance hence teeth can be choice for sex determination not only in living but also in mutilated bodies, decomposed bodies or from fragmentary skeletal remains^{12,13}.

Sexual dimorphism is difference in size and appearance in teeth among male and female that can be employed for sex determination¹⁴. Mesiodistal parameter of maxillary 1st molar is appropriate teeth for sex determination due to its early eruption and little impaction than other teeth¹⁵. The aim of our study was determining the sex by odontometric analysis of mesiodistal width of maxillary 1st molar.

MATERIAL AND METHODS:

Material required

1. Alginate
2. Dental stone
3. Maxillary Impression Trays
4. Mandibular Impression Trays
5. Rubber Bowl
6. Spatula

The alginate dental impression forms an imprint (i.e., a 'negative' mould) of those teeth and gums, which can then be used to make a cast or 'positive' model of the patient's dentition.

Sample Size

Sample Selection:

sample size was calculated by formula

$$N = Z_{\alpha}^2 p(1-p) / E^2$$

Where Z_{α} is critical value of z-score at α level of significance (at $\alpha = 5\%$, $Z_{\alpha} = 1.96$) p is proportion and E is permissible error. 0.749% of sexual dimorphism observed by maxillary 1st molar mesiodistal width (0.893% by right maxillary 1st molar width and .606% by left maxillary 1st molar width parameter. Average of sexual dimorphism shown by maxillary 1st molar mesiodistal width = 0.749%¹⁶. So, $p = 0.749\%$, i.e., .00749, $1-p = .99251$, $E = 1.6\%$ i.e., .016 So, $n = (1.96)^2 \times 0.00749 \times 0.99251 / (.016)^2 = 111.52 \approx 112$.

Study was conducted on 112 volunteer subject (56 male and 56 female) of both the sex having age group between 20 to 30 years. Informed consent was taken from all participants.

Inclusion Criteria:

1. Age between 20 to 30 years.
2. Fully erupted with complete set of teeth.
3. No history of orthodontic treatment or any type of prosthesis
4. Non-carious, non-hypoplastic, non-traumatic, non attrited and periodontally healthy teeth.

Exclusion Criteria:

1. Age below 20 years and above 30 years.
2. Misaligned, spacing teeth, diastema, or crowded teeth
3. Carious teeth, restored teeth, fractured teeth, hypoplastic teeth, teeth with prosthesis, attrited teeth, mobile teeth.

Methodology And Tooth Measurements:

Impressions of the teeth were taken using irreversible hydrocolloid (alginate) material and poured by dental stone (Figure 1). Mesiodistal (MD) dimensions of maxillary 1st molar of both right and left side, were measured on the casts using a digital caliper calibrated to 0.01 mm. The MD dimension was defined as the greatest distance between contact points on the approximate surfaces of the tooth crown and was measured with the caliper beaks placed occlusally and aligned with the long axis of the tooth (Figure 2). If any teeth were rotated or misaligned, measurements were taken between points on the approximate surfaces of the crown where it was considered that contact with adjacent teeth would normally occur. Sexual dimorphism calculated by following formula¹⁷.

Sexual Dimorphism in percentage (%) = [(Xm/Xf)-1] × 100, where Xm is the mean value of mesiodistal width of 1st maxillary molar for males and Xf is the mean value of mesiodistal width of 1st maxillary molar for females.



Figure 1- Image of dental cast



Figure 2: Measuring mesiodistal dimension of mandibular canine teeth by the digital caliper

RESULTS:

Data obtained were quantified and analysed statistically using SPSS (Statistical Package for the Social Sciences). All description were shown in table 1 and 2. Data were summarized as Mean and standard deviation (SD). Groups (in Gender Male vs female) were compared by unpaired or independent Student's t test. In our study mean value of right and left mesiodistal maxillary 1st molar width (Table 1, chart 1) was slightly higher in male (for right mesiodistal maxillary 1st molar width was 8.550714±.667571 and for left mesiodistal maxillary 1st molar width 8.560357±.634353) than female (for right mesiodistal maxillary 1st molar width 8.422321±.759208 and for left mesiodistal maxillary 1st molar width 8.34375±.858043) and were statistically not significant ((p value=.344034 for right side and p value=.131864 for left side). Little sexual dimorphism shown by right and left maxillary 1st molar. For right maxillary 1st molar it was 1.5% and for left maxillary 1st molar it was 2.5% (table 2 and chart 2).

Table 1. Calculation of mesiodistal width of right and left maxillary 1st molar in male and female

Sex	Mesiodistal width of right maxillary 1st molar			Mesiodistal width of left maxillary 1st molar		
	Mean	Standard deviation	p Value	Mean	Standard deviation	P Value
Male	8.550714	.667571	.3440	8.560357	.634353	.1318
Female	8.422321	.759208	34	8.34375	0.858043	64

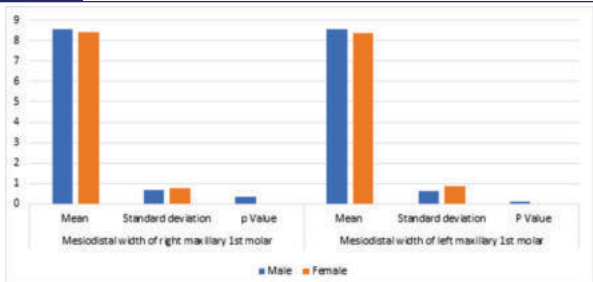


Chart 1 showing mean, standard deviation and p value of right and left mesiodistal width of maxillary 1st molar among male and female

Table 2. % Sexual dimorphism shown by right and left maxillary 1st molar

Parameters	% Sexual dimorphism
Mesiodistal width of right maxillary 1st molar	1.5 %
Mesiodistal width of left maxillary 1st molar	2.5 %

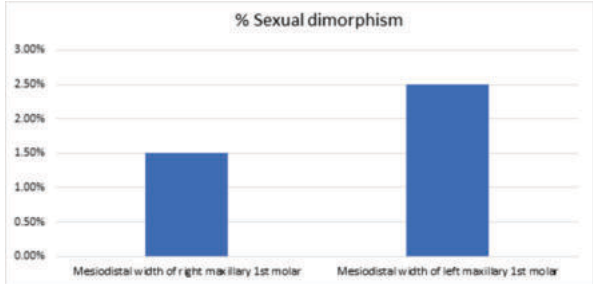


Chart 2 showing % Sexual dimorphism by right and left maxillary 1st molar

DISCUSSION:

Identification of an individual by means of teeth and gender determination is consider as top priority because tooth is very decisive in identification when other evidence is lacking¹⁷. Analysis of tooth parameter are simple, non-invasive, rapid and less time consuming compared to DNA analysis¹⁸. In present study the mean value of mesiodistal width of maxillary 1st molar of both right and left side was compared in male and female. Mean mesiodistal width of maxillary 1st molar was slightly higher in male compared to female in both right and left side but the difference was statistically not significant (with p value > .05). These finding were similar with study done by, Dahal S. et al¹⁶ in Nepali population, Deo et al¹⁹ in Nigerian population, Suresh Sharma & Shantanu Sharma²⁰, Aditya Jain²¹, Babu et al²² and Sharma et al²³ in Indian population. The present study was contradicted with the finding of Ghose and Baghdady²⁴, Ghodosi et al²⁵, Stroud et al²⁶, Hattab et al²⁷, Perzigian²⁸, Rai et al²⁹ and Sonika et al³⁰ who found male had larger teeth parameter than female in all dimension with statistically significant difference (p value) in mean value of mesiodistal width of maxillary 1st molar between male and female. Y chromosomes in male promotes dentinogenesis and increases mitotic strength of teeth germ which is responsible for more thickened dentine, resulting higher parameter in male whereas X chromosomes only promotes amelogenesis³¹.

In the present study minimal sexual dimorphism shown by mesiodistal width of maxillary 1st molar. Sexual dimorphism shown by right and left maxillary 1st molar was 1.5 % and 2.5% respectively which is approximately similar with the finding of Ayesha Shireen & Syeda Arshiya Ara¹⁸ who found sexual dimorphism of 1.92 and 1.92 by right and left maxillary 1st molar respectively and by Suresh Sharam & Shantanu Sharma²⁰ who observed sexual dimorphism of 2.71% and 0.51% by right and left maxillary 1st molar respectively. Lower sexual dimorphism than our study was observed by Dahal S.

et al¹⁶ who reported sexual dimorphism of 0.893% and 0.606% by right and left maxillary 1st molar respectively and by study of Ghose and Baghdady²⁴, who observed sexual dimorphism of 0.8% in the study of Iraqi population. Higher sexual dimorphism than our study was shown by results of Sonika et al³⁰ who found sexual dimorphism of 4.74% and 4.84% in the right and left maxillary 1st molar, Narang et al³² and Ahmed et al³³ observed 6.9% and 4.4% of sexual dimorphism on right and left sides of maxillary 1st molar respectively. The variations in sexual dimorphism among various populations may be due to genetical and racial variations probably linked with separate ethnicity or may be related to different sample size of the study and selections.

CONCLUSION:

The present study didn't find any statistically significant difference in mesiodistal width of maxillary 1st molar among male and female on both side of maxillary jaw. Therefore, this study unable to established maxillary 1st molar as tool for determination of sex.

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