

MEASUREMENT OF MESIO-DISTAL TOOTH DIAMETER OF NEPALESE PERMANENT DENTITION

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ABSTRACT

The study determines the mesio-distal tooth diameter of 100 adult Nepalese subjects aged 17-32 years with equal female to male ratio. The samples were selected according to the inclusion criteria of normal occlusion with full complement of permanent teeth, Class I occlusion, symmetrical dental arch, proportional maxillo-mandibular relationship and acceptable facial profile. The measurement of mesio-distal crown diameter followed the method of Moorrees *et al.*³ Measurements were done on dried dental stone cast using standardized Boley gauze (0.1 mm accuracy).

Tooth size measurement revealed significant differences between the right and left maxillary first molars, maxillary second molars, mandibular central incisors, and mandibular lateral incisors, which were significantly wider on right side. According to the study, mean dimension of all teeth were wider in Nepalese males compared to the females. Average maxillary central incisor, maxillary canine, maxillary first molar, mandibular lateral incisor, mandibular canine, and mandibular first molar were significantly wider in male subjects.

All average crown diameters of the Nepalese females were lesser than those of the Caucasian females except for the maxillary lateral incisor and mandibular canine. Maxillary central incisor, second premolar, and second molar were significantly wider in Caucasian females. All average crown diameters in Nepalese males were significantly lesser than those of the Caucasian males except for maxillary lateral incisors.

INTRODUCTION

Mesio-distal tooth diameters vary between the sides of the same individual, between the sexes and among the racial groups. The predetermination of tooth dimension is a prerequisite for the study of Dental Anatomy, Anthropology, and Orthodontics of any population. Mesio-distal tooth diameter or tooth size is defined as the greatest distance between the approximal teeth surfaces,¹ or the distance between anatomic contact points of the teeth.²

REVIEW OF LITERATURE

Moorrees and Reed³ pioneered the measurement of tooth on dental model. They employed sliding calipers with a vernier scale, measuring the greatest mesio-distal diameter at the contact point parallel to occlusal surface of the teeth and also parallel to the vestibular surface of the model Doris *et al.*⁴ confirmed that the measurement method described by Moorrees and Reed was highly repeatable.

G.V. Black⁵ was one of the pioneer investigators in the field of tooth dimension. He measured a large number of human teeth and established the tables of mean figures of the tooth size. Wheeler⁶ published the standard dimensions of tooth size in order that the teeth may be carved and articulated in an ideal manner. Several studies reported tooth size variations among different racial groups, other factors associated with tooth size variability are gender, hereditary factors, environment, bilateral differences, and secular trends.

Garn and Lewis⁷ in 1958 showed a strong evidence of genetic influence on human teeth. They observed marked racial difference in tooth size. The determinant of tooth size variation is explained by polygenic mode of inheritance. Some researchers propose that the inheritance is purely autosomal, while others suggest the involvement of sex chromosomes. Garn, Lewis and Kerewski⁸ found that the correlations

between sister-sisters pairs were higher than brother-brother pairs, which were in turn higher than those of the brother-sister pairs. These findings suggest the involvement of X chromosome in tooth size variability.

Moorrees and Reed³ in 1964 found high correlations between the right and left teeth. The low values occurred for the premolars. They found that the teeth belonging to the same group showed the highest correlation, while the mesio-distal crown diameters of the canines conformed closest to those of their neighbors and the central incisors. Murshid and Hashim⁹ reported the mesio-distal crown diameters in a Saudi Arabian population. They found that the first molar exhibited the least coefficient of variation while the central and lateral incisors showed the most. The values in the right side of the upper arch were relatively greater than those in the left side, which was not true for the lower arch.

Moorrees, Thomsen, Jensen *et al.*¹⁰ found that the tooth crowns of the males were broader than those of the females in North American subjects. The sex difference was most pronounced in canines. Richardson and Malhotra¹¹ reported tooth size of the males were larger than those of the females for each tooth type in both arches in American Negroes. Doris, Bernard and Kuflinec⁴ determined that the tooth size in North American males were uniformly larger than those in females, but not to a significant level.

Yuen, So and Tang¹² studied the mesio-distal crown diameters of the Southern Chinese population of Hong Kong. According to the authors, none of the teeth showed significant sex difference in bilateral asymmetry, except for the upper primary second molars. The male teeth were larger than the female teeth except for the lower central incisors and lateral incisors. However, the difference was not statistically significant.

Huang, Miura and Soma¹³ conducted a dental anthropological study of Chinese in Taiwan. They compared the data with Japanese, Central and South American Indians and North American Caucasians. The crown size of the

Chinese males was smaller than those of other four races, especially the upper canine, lower central incisor and first molar. The Chinese females possessed smaller upper central incisors and larger upper first premolars compared to those of the North Americans.

Merz, Isaacson, Germane *et al.*¹⁴ found that the Black subject's mean canine, first and second premolar, and first molar diameters were significantly larger than those of the Whites. Otuyemi and Noar¹⁵ compared the mesio-distal crown dimensions of the Nigerian and British population. The result indicated that the crown diameters were consistently larger in the Nigerian sample.

Karanth and Jayade¹⁶ established oriental norms for the average tooth size of a Tibetan population. The study showed that the Tibetan teeth were broad and short. The Tibetans possessed wider teeth than the Caucasians except for the central incisors of both arches and the lower second premolars. The tooth diameters were larger, especially in the case of upper laterals, first premolars, and first molars in both arches.

MATERIAL & METHOD

The materials used in the study consist of maxillary and mandibular dental casts of one hundred Nepalese adults of the age ranging from 17 to 32 years with equal female to male ratio. The sampling was based on the inclusion criteria established for the research. The inclusion criteria for the selection of the samples were; presence of all permanent teeth with or without third molars, Angle's Class I molar and Class I canine relation, overjet and overbite ranging from 1 to 3 mm, symmetrical dental arch forms, orthognathic maxillo-mandibular skeletal relationship, and straight or acceptable facial profile.

The subjects were excluded from the study if they possessed marked proximal or occlusal attrition, dental crowding of any severity, spacing or presence of diastema, cross-bite relation, presence of any deciduous tooth, presence of extensively decayed tooth, and subject undergone orthodontic treatment in the past.

The measurements were performed using standard Boley gauge with vernier caliper (Munchner model No. 042-721-00, Dentaurem, Germany) of 0.1 mm accuracy directly on the dental casts. The measurement followed the method described by Moorrees *et al.*³ The caliper beaks were inserted and held occlusally parallel to the long axis of the tooth. The beaks were then closed until a gentle contact with tooth was felt. The measurements were made on all permanent teeth excluding the third molars. The mean mesio-distal crown diameters of the Nepalese adults were analyzed for statistical difference between the right and left sides, difference between the sexes and difference between the Nepalese and Caucasian (American White) samples. The data were also compared with Negroid (American Blacks), Australian Aborigines and Chinese races.

ERRORS OF MEASUREMENT

To minimize the measurement errors, double measurements were performed on different occasions by single researcher. The intra-examiner reliability was predetermined at 0.2 mm. In case of discrepancy greater than this limit, a new set of measurement was done and the nearest two measurements were averaged. Paired t-test was done to verify the statistical difference between the two sets of measurement of twenty randomly selected samples. At the 0.01 level of significance, the test showed no significant difference.

DATA ANALYSIS PROCEDURE

Student's t-test was performed for the comparison of the difference between the mean dimensions. Paired t-tests were used for the right-left side comparisons. The difference between the mean values of

male and female subjects; and between the Nepalese and Caucasian subjects were compared using independent t-tests. The hypotheses were tested at the level of significance at 0.05 for quantitative analyses. A probability < 5 per cent ($P \geq 0.05$) was taken as not significant (NS), < 5 per cent ($P \leq 0.05$) as significant (*); < 1 per cent ($P \leq 0.01$) as highly significant (**); and < 0.1 per cent ($P \leq 0.001$) as very highly significant (***)

RESULT

Descriptive statistics for the mesio-distal crown diameter of Nepalese female, male, and combined female and male subjects are presented in Table 1, Table 2, and Table 3 respectively. Student's t-test revealed highly significant difference ($P \leq 0.01$) between the right and left maxillary first molars in combined female and male subjects. Likewise, maxillary right second molars, mandibular right central incisors, and mandibular right lateral incisors were also significantly wider ($P \leq 0.05$) than their left counterparts in combined female and male subjects (Table 4).

Table 1.
Descriptive statistics for mesio-distal tooth diameter of Nepalese females

(in mm)		Right			Left			Average		
		X	SD	Range	X	SD	Range	X	SD	Range
Maxillary	I ₁	8.14	0.50	2.90	8.18	0.46	2.50	8.16	0.47	2.55
	I ₂	6.58	0.53	2.60	6.60	0.54	2.70	6.59	0.53	2.65
	C	7.46	0.42	2.20	7.46	0.42	1.90	7.46	0.41	2.05
	P ₁	6.76	0.36	1.80	6.78	0.38	1.90	6.77	0.36	1.85
	P ₂	6.35	0.36	1.60	6.34	0.36	1.40	6.35	0.35	1.50
	M ₁	9.88	0.45	2.00	9.81	0.42	1.70	9.84	0.43	1.85
	M ₂	9.32	0.52	2.30	9.28	0.51	2.80	9.30	0.50	2.45
Mandibular	I ₁	5.02	0.29	1.20	4.98	0.27	1.30	5.00	0.27	1.20
	I ₂	5.55	0.30	1.50	5.52	0.28	1.40	5.54	0.29	1.40
	C	6.50	0.35	1.40	6.50	0.35	1.60	6.50	0.35	1.50
	P ₁	6.75	0.34	1.90	6.75	0.36	2.10	6.75	0.34	2.00
	P ₂	6.70	0.41	2.30	6.67	0.36	2.00	6.69	0.38	2.15
	M ₁	10.60	0.60	2.60	10.62	0.58	3.10	10.61	0.58	2.85
	M ₂	9.64	0.56	2.50	9.65	0.56	2.30	9.65	0.54	2.35

Table 2.*Descriptive statistics for mesio-distal tooth diameter of Nepalese males*

(in mm)		Right			Left			Average		
		X	SD	Range	X	SD	Range	X	SD	Range
Maxillary	I ₁	8.35	0.48	2.20	8.35	0.48	2.40	8.35	0.48	2.30
	I ₂	6.73	0.47	1.70	6.76	0.45	1.80	6.75	0.44	1.75
	C	7.72	0.37	1.50	7.68	0.34	1.50	7.70	0.35	1.50
	P ₁	6.86	0.38	1.70	6.87	0.40	1.80	6.87	0.38	1.75
	P ₂	6.39	0.37	1.80	6.38	0.40	1.90	6.38	0.38	1.85
	M ₁	10.12	0.49	2.10	9.97	0.66	4.50	10.05	0.53	3.10
	M ₂	9.43	0.59	2.90	9.37	0.59	3.00	9.40	0.57	2.95
Mandibular	I ₁	5.08	0.27	1.20	5.05	0.25	1.30	5.07	0.26	1.20
	I ₂	5.69	0.35	1.60	5.68	0.37	1.70	5.69	0.35	1.65
	C	6.71	0.37	1.50	6.70	0.36	1.50	6.71	0.36	1.50
	P ₁	6.86	0.42	1.90	6.87	0.43	1.80	6.87	0.42	1.85
	P ₂	6.71	0.39	2.30	6.73	0.42	1.90	6.72	0.40	1.80
	M ₁	10.96	0.50	2.90	10.97	0.47	2.40	10.97	0.47	2.65
	M ₂	9.83	0.56	2.60	9.85	0.48	2.40	9.84	0.50	2.50

Table 3.*Descriptive statistics for mesio-distal tooth diameter of combined Nepalese female and male subject*

(in mm)		Right			Left			Average		
		X	SD	Range	X	SD	Range	X	SD	Range
Maxillary	I ₁	8.25	0.50	2.90	8.26	0.48	2.50	8.26	0.48	2.55
	I ₂	6.65	0.50	2.70	6.68	0.50	2.70	6.67	0.49	2.65
	C	7.59	0.42	2.20	7.57	0.40	1.90	7.58	0.40	2.05
	P ₁	6.81	0.37	1.90	6.82	0.39	1.90	6.82	0.37	1.90
	P ₂	6.37	0.36	1.90	6.36	0.38	1.90	6.36	0.36	1.85
	M ₁	10.00	0.48	2.70	9.89	0.56	4.50	9.94	0.49	3.10
	M ₂	9.38	0.55	2.90	9.32	0.55	3.10	9.35	0.54	3.00
Mandibular	I ₁	5.05	0.28	1.20	5.02	0.26	1.30	5.03	0.27	1.25
	I ₂	5.62	0.33	1.70	5.60	0.34	1.80	5.61	0.33	1.70
	C	6.60	0.37	1.60	6.60	0.37	1.70	6.60	0.37	1.65
	P ₁	6.81	0.38	2.20	6.81	0.40	2.30	6.81	0.38	2.25
	P ₂	6.71	0.40	2.30	6.70	0.39	2.10	6.70	0.39	2.20
	M ₁	10.78	0.58	3.20	10.80	0.55	3.20	10.79	0.58	3.20
	M ₂	9.74	0.56	2.60	9.75	0.53	2.40	9.74	0.53	2.50

Table 4.*t*-Test of significance for the difference between right and left tooth size of the combined Nepalese females and males

		Right		Left		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.25	0.50	8.26	0.48	0.346	NS
	I ₂	6.65	0.50	6.68	0.50	0.195	NS
	C	7.59	0.42	7.57	0.40	0.293	NS
	P ₁	6.81	0.37	6.82	0.39	0.549	NS
	P ₂	6.37	0.36	6.36	0.38	0.566	NS
	M ₁	10.00	0.48	9.89	0.56	0.002	**
	M ₂	9.38	0.55	9.32	0.55	0.047	*
Mandibular	I ₁	5.05	0.28	5.02	0.26	0.013	*
	I ₂	5.62	0.33	5.60	0.34	0.039	*
	C	6.60	0.37	6.60	0.37	0.828	NS
	P ₁	6.81	0.38	6.81	0.40	0.845	NS
	P ₂	6.71	0.40	6.70	0.39	0.725	NS
	M ₁	10.78	0.58	10.80	0.55	0.307	NS
	M ₂	9.74	0.56	9.75	0.53	0.586	NS

(NS = not significant, * $P \leq 0.05$, ** $P \leq 0.01$)

When comparing crown diameters between the sexes on right side; maxillary canines ($P \leq 0.001$), maxillary first molars, mandibular canines, mandibular first molars ($P \leq 0.01$), maxillary central incisors and mandibular lateral incisors ($P \leq 0.05$) of the males were significantly greater than those of the females (Table 5). Likewise, mandibular first molars ($P \leq 0.001$), maxillary canines, mandibular canines ($P \leq 0.01$), and

mandibular lateral incisors ($P \leq 0.05$) of the males were significantly greater than those of the females on left side (Table 6). When comparing the average of the right and left sides between the sexes; maxillary second molars, mandibular central incisors, and mandibular lateral incisors ($P \leq 0.05$) of the males were significantly greater than those of the females (Table 7).

Table 5.*t*-Test of significance for the difference between the sexes for right mesio-distal crown diameters.

		Female		Male		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.14	0.50	8.35	0.48	0.037	*
	I ₂	6.58	0.53	6.73	0.47	0.136	NS
	C	7.46	0.42	7.72	0.37	0.001	***
	P ₁	6.76	0.36	6.86	0.38	0.182	NS
	P ₂	6.35	0.36	6.39	0.37	0.644	NS
	M ₁	9.88	0.45	10.12	0.49	0.010	**
	M ₂	9.32	0.52	9.43	0.59	0.314	NS
Mandibular	I ₁	5.02	0.29	5.08	0.27	0.272	NS
	I ₂	5.55	0.30	5.69	0.35	0.035	*
	C	6.50	0.35	6.71	0.37	0.005	**
	P ₁	6.75	0.34	6.86	0.42	0.144	NS
	P ₂	6.70	0.41	6.71	0.39	0.900	NS
	M ₁	10.60	0.60	10.96	0.50	0.002	**
	M ₂	9.64	0.56	9.83	0.56	0.083	NS

(NS = not significant, * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$)

Table 6.*t*-Test of significance for the difference between the sexes for left mesio-distal crown diameters.

		Female		Male		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.18	0.46	8.35	0.48	0.075	NS
	I ₂	6.60	0.54	6.76	0.45	0.099	NS
	C	7.46	0.42	7.68	0.34	0.005	**
	P ₁	6.78	0.38	6.87	0.40	0.258	NS
	P ₂	6.34	0.36	6.38	0.40	0.598	NS
	M ₁	9.81	0.42	9.97	0.66	0.147	NS
	M ₂	9.28	0.51	9.37	0.59	0.404	NS
Mandibular	I ₁	4.98	0.27	5.05	0.25	0.173	NS
	I ₂	5.52	0.28	5.68	0.37	0.020	*
	C	6.50	0.35	6.70	0.36	0.006	**
	P ₁	6.75	0.36	6.87	0.43	0.129	NS
	P ₂	6.67	0.36	6.73	0.42	0.513	NS
	M ₁	10.62	0.58	10.97	0.47	0.001	***
	M ₂	9.65	0.56	9.85	0.48	0.065	NS

(NS = not significant, * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$)**Table 7.***t*-Test of significance for the difference between the sexes for average mesio-distal crown diameters

		Female		Male		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.16	0.47	8.35	0.48	0.049	*
	I ₂	6.59	0.53	6.75	0.44	0.108	NS
	C	7.46	0.41	7.70	0.35	0.002	**
	P ₁	6.77	0.36	6.87	0.38	0.211	NS
	P ₂	6.35	0.35	6.38	0.38	0.612	NS
	M ₁	9.84	0.43	10.05	0.53	0.037	*
	M ₂	9.30	0.50	9.40	0.57	0.344	NS
Mandibular	I ₁	5.00	0.27	5.07	0.26	0.210	NS
	I ₂	5.54	0.29	5.69	0.35	0.024	*
	C	6.50	0.35	6.71	0.36	0.005	**
	P ₁	6.75	0.34	6.87	0.42	0.128	NS
	P ₂	6.69	0.38	6.72	0.40	0.692	NS
	M ₁	10.61	0.58	10.97	0.47	0.001	***
	M ₂	9.65	0.54	9.84	0.50	0.065	NS

(NS = not significant, * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$)

When comparing the mean tooth size of the Nepalese females with Caucasian females, maxillary second premolars, maxillary first molars, maxillary second molars, mandibular central incisors, mandibular lateral incisors,

mandibular second premolars and mandibular second molars ($P \leq 0.001$), and maxillary central incisors ($P \leq 0.01$) were significantly wider in Caucasian subjects (Table 8). When comparing the mean tooth size of the Nepalese males with

Caucasian males, all teeth except maxillary lateral incisors were significantly wider in Nepalese subjects; which was however, not statistically

significant (Table 9). Table 10 shows the comparative mesio-distal crown diameters of Nepalese and other racial groups.

Table 8.

t-Test of significance for the difference between the average tooth size of Nepalese and Caucasian females

		Caucasian (Moorrees ¹⁰ , 1957)		Nepalese (Shrestha ²⁰ , 2004)		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.40	0.53	8.16	0.47	0.008120	**
	I ₂	6.47	0.62	6.59	0.53	0.248256	NS
	C	7.53	0.37	7.46	0.41	0.300769	NS
	P ₁	6.85	0.42	6.77	0.36	0.256167	NS
	P ₂	6.62	0.43	6.35	0.35	0.000204	***
	M ₁	10.52	0.51	9.84	0.43	0.000000	***
	M ₂	9.81	0.49	9.30	0.50	0.000000	***
Mandibular	I ₁	5.25	0.36	5.00	0.27	0.000031	***
	I ₂	5.78	0.38	5.54	0.29	0.000149	***
	C	6.47	0.32	6.50	0.35	0.605770	NS
	P ₁	6.87	0.38	6.75	0.34	0.063975	NS
	P ₂	7.02	0.40	6.69	0.38	0.000004	***
	M ₁	10.74	0.56	10.61	0.58	0.193159	NS
	M ₂	10.34	0.71	9.65	0.54	0.000000	***
n		93		50			

(NS = not significant, * P ≤ 0.01, *** P ≤ 0.01)

Table 9.

t-Test of significance for the difference between the average tooth size of Nepalese and Caucasian males

		Caucasian (Moorrees ¹⁰ , 1957)		Nepalese (Shrestha ²⁰ , 2004)		p-value	Significance
		X	SD	X	SD		
Maxillary	I ₁	8.78	0.46	8.35	0.48	0.000001	***
	I ₂	6.64	0.63	6.75	0.44	0.275052	NS
	C	7.95	0.42	7.70	0.35	0.000471	***
	P ₁	7.01	0.38	6.87	0.38	0.038128	*
	P ₂	6.82	0.37	6.38	0.38	0.000000	***
	M ₁	10.81	0.56	10.05	0.53	0.000000	***
	M ₂	10.35	0.63	9.40	0.57	0.000000	***
Mandibular	I ₁	5.42	0.31	5.07	0.26	0.000000	***
	I ₂	5.95	0.38	5.69	0.35	0.000103	***
	C	6.96	0.36	6.71	0.36	0.000125	***
	P ₁	7.07	0.35	6.87	0.42	0.002992	**
	P ₂	7.29	0.52	6.72	0.40	0.000000	***
	M ₁	11.18	0.47	10.97	0.47	0.012215	*
	M ₂	10.76	0.62	9.84	0.50	0.000000	***
n		91		50			

(NS = not significant, * P ≤ 0.05, P ≤ 0.01, *** P ≤ 0.001)

Table 10.

Comparative mesio-distal crown diameters of Nepalese and other racial groups

(in mm)			Caucasian (Moyers ¹⁸ , 1976)		Negroid (Richardson ¹¹ , 1975)		Australian Aborigine (Barrett ¹⁹ , 1963)		Chinese (Yuen ¹² , 1997)		Nepalese (Shrestha ²⁰ , 2004)		
			X	SD	X	SD	X	SD	X	SD	X	SD	
Maxillary	I ₁	M	8.91	0.59	9.12	0.67	9.35	0.58	8.73	0.51	8.35	0.48	
		F	8.67	0.57	8.72	0.58	9.00	0.58	8.66	0.46	8.16	0.47	
	I ₂	M	6.88	0.64	7.26	0.64	7.65	0.63	7.18	0.60	6.75	0.44	
		F	6.78	0.64	7.08	0.56	7.34	0.63	7.12	0.50	6.59	0.53	
	C	M	7.99	0.42	8.19	0.53	8.31	0.57	8.30	0.41	7.70	0.35	
		F	7.49	0.36	7.74	0.38	7.95	0.41	8.02	0.40	7.46	0.41	
	P ₁	M	6.76	0.47	7.66	0.49	7.69	0.46	7.76	0.42	6.87	0.38	
		F	6.60	0.46	7.37	0.43	7.53	0.41	7.54	0.43	6.77	0.36	
	P ₂	M	6.67	0.37	7.25	0.49	7.19	0.43	7.24	0.42	6.38	0.38	
		F	6.50	0.46	6.94	0.39	7.01	0.44	7.07	0.47	6.35	0.35	
	M ₁	M	10.58	0.56	11.04	0.64	11.34	0.52	10.41	0.50	10.05	0.53	
		F	10.18	0.58	10.57	0.52	10.92	0.50	10.11	0.45	9.84	0.43	
	M ₂	M	9.50	0.71	10.74	0.63	10.70	0.71	NA	NA	9.40	0.57	
		F	8.79	0.73	10.35	0.73	10.31	0.61	NA	NA	9.30	0.50	
	Mandibular	I ₁	M	5.54	0.32	5.53	0.39	5.87	0.40	5.48	0.33	5.07	0.50
			F	5.46	0.34	5.38	0.39	5.68	0.43	5.53	0.32	5.00	0.27
I ₂		M	6.04	0.37	6.13	0.44	6.60	0.42	6.10	0.33	5.69	0.35	
		F	5.92	0.34	5.99	0.46	6.36	0.41	6.13	0.35	5.54	0.29	
C		M	6.96	0.40	7.37	0.57	7.49	0.46	7.29	0.37	6.71	0.36	
		F	6.58	0.34	6.86	0.42	7.01	0.38	6.92	0.43	6.50	0.35	
P ₁		M	6.89	0.63	7.76	0.51	7.49	0.54	7.58	0.36	6.87	0.42	
		F	6.78	0.70	7.41	0.50	7.36	0.41	7.44	0.47	6.75	0.34	
P ₂		M	7.22	0.47	7.85	0.55	7.56	0.51	7.44	0.38	6.72	0.40	
		F	7.07	0.46	7.61	0.50	7.31	0.44	7.28	0.40	6.69	0.38	
M ₁		M	10.71	0.60	11.76	0.72	12.04	0.61	11.30	0.54	10.97	0.47	
		F	10.29	0.74	11.28	0.62	11.62	0.55	11.15	0.44	10.61	0.58	
M ₂		M	9.98	0.67	11.53	0.86	11.45	0.68	NA	NA	9.84	0.50	
		F	9.50	0.59	10.94	0.73	11.07	0.65	NA	NA	9.65	0.54	
n			NA		162		253		112		100		

(NA = data not available)

DISCUSSION

The present study shows that the maxillary and mandibular molars, as well as the maxillary incisors are the most variable teeth in dimension as shown by their high standard deviation in both right and left categories. This is in agreement to Murshid et al.⁹ who also found maxillary and mandibular molars as well as maxillary incisors

as the most variable teeth in Saudi population sample. The present study shows mandibular incisors as the least variable teeth in size.

The statistical analysis shows significant difference between the sides among certain teeth. They include maxillary first molars, maxillary second molars, mandibular central incisors, and

mandibular lateral incisors, which are significantly larger on right side. Many authors including Lavelle *et al.*¹⁷, Murshid *et al.*⁹ found teeth on right side were wider than on the left. Despite the statistically significant difference between the right and left pairs in certain teeth, if we look at the descriptive statistics, the reflected difference may not be considered significant clinically. The apparent differences are measured in a fraction of a millimeter, which may not be appreciated in practice.

In all categories of right, left, and average of the right and left sides, all mesio-distal crown dimensions of males are wider than those of the females. Some of which are statistically significant. They include maxillary central incisor, canine, and first molar; mandibular lateral incisor, canine, and first molar among the right side; maxillary canine, mandibular lateral incisor, canine, and first molar among the left side; and maxillary central incisor, canine, first molar, and mandibular lateral incisor, canine and first molar among the average of the right and left sides. The present study confirms the previous findings of Moorrees,¹⁰ Richardson,¹¹ Yuen,¹² and Huang¹³ who found tooth sizes greater in males compared to female subjects. The difference in tooth size between the sexes could be attributed to the apparent anatomical difference in body size, which is generally greater in males.

When comparing the mean tooth size of the Nepalese females with Caucasian females, all teeth are wider in Caucasian subjects. Also, Caucasian males possess significantly wider teeth than the Nepalese males except for the maxillary lateral incisors. This difference could be attributed to the apparent difference in body size among the races. When comparing Nepalese adults with other racial groups the mean tooth sizes of the Nepalese adults were lesser than those of the Australian aborigines, Negroids and Mongoloids. The considerable variation among the populations reflects the ongoing process of evolution.

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