Mesiodistal Crown Dimensions of the Permanent Dentition in a Nigerian Population

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ABSTRACT Mesiodistal crown dimensions of the permanent dentition were assessed in a Nigerian population. The study sample consisted of 54 dental casts of Nigerian subjects (33 males; 21 females) with a mean age of 26.6 (sd = 2.1) years. The subjects had their permanent teeth present and fully erupted from first molar to first molar, no interproximal caries or restorations and no abnormal tooth sizes or shapes. Descriptive statistics are provided. Sex differences in the means and comparisons with the means from other population were evaluated using t-tests. Results revealed no statistically significant difference in mesiodistal crown dimensions between the sexes and no left to right side tooth size discrepancy in the sample. The study provides normative data on the mesiodistal crown dimensions of Nigerian subjects. Compared to African Americans, crown dimensions tended to be smaller in these Nigerians, especially in males. *Dental Anthropology* 2010;23(2):57-60.

The availability of information about the size of individual tooth types and groups of teeth in the maxillary and mandibular arches is of importance in clinical orthodontics as it facilitates orthodontic diagnosis and treatment planning (Richardson and Malhotra, 1975). The desire to achieve stable occlusion during and after orthodontic treatment also necessitates the need for knowledge about tooth crown dimensions and ratios since without coordination between the sizes of the upper and lower teeth, it would not be possible to have correct intercuspation of the teeth, overjet, overbite and optimal occlusion (Andrews, 1972; Ballard, 1944; McLaughlin, 2001; Smith *et al*., 2000).

An early study on the mesiodistal widths of teeth was conducted by Black (1902) who also provided data on mean tooth dimensions. Presently, a lot of data are available in the literature for tooth dimensions of different populations and some variations in tooth sizes between gender and among different racial and ethnic groups have been reported (Richardson and Malhotra, 1975; Moyers *et al*., 1976; Moorrees *et al*., 1957; Santoro *et al*., 2000; Bishara *et al*., 1989; Merz *et al*., 1991; Singh and Goyal, 2006).

There is dearth of information on mesiodistal tooth size in Nigerians and the few studies available were conducted in the southwestern region of the country (Mack, 1981; Otuyemi and Noar, 1996; Adeyemi and Isiekwe, 2003). Presently, there are no data on mesiodistal crown dimensions of the permanent dentition of Nigerians in the southern and eastern regions of Nigeria. It is therefore desirable to determine standards for mesiodistal tooth size for the Nigerian population who invariably constitute the largest congregation of Black people in the world.

The purposes of this study were to establish normative data on the mesiodistal crown dimensions of the permanent dentition in a Nigerian population, identify any gender differences, and compare their mean mesiodistal crown dimensions to other racial groups.

MATERIALS AND METHODS

The sample for this study consisted of 54 Nigerian students made up of 33 males (61%) and 21 females (39%) with a mean age of 26.6 years (sd = 2.1) selected among the 74 final year students at the School of Dentistry of University of Benin, Benin City. The selection criteria included being a Nigerian, permanent teeth present and fully erupted, particularly from the first molar to first molar, no missing teeth, no teeth with abnormal sizes or shapes, no interproximal caries or excess tooth material as a result of restorations, and no presence of dental attrition. The 54 subjects who met the selection criteria were born of Nigerian parents and they predominantly belong to the major ethnic groups of the southern and southeastern regions of Nigeria.

Impressions of the upper and lower arches were taken for each subject in alginate and poured immediately in dental stone to prevent dimensional changes. The dental casts were measured with a digital vernier caliper. The

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TABLE 1. Comparison of mean, range and standard deviation for mesiodistal crown dimension of permanent dentition of Nigerian males and females

	Males (n = 33)			Females (n = 21)			
Tooth†	mean	range	sd	mean	range	sd	P-Value
			Maxillary				
I1	8.80	7.38 - 10.48	0.70	8.81	7.10 - 9.98	0.67	ns‡
I2	7.21	5.66 - 8.46	0.58	7.16	5.64 - 8.18	0.55	ns
C	8.07	7.18 - 9.12	0.43	7.85	7.05 - 9.10	0.51	ns
P1	7.51	6.92 - 8.38	0.40	7.43	6.68 - 8.08	0.35	ns
P2	7.01	6.04 - 8.12	0.46	7.13	6.10 - 8.18	0.52	ns
M1	10.55	9.60 - 12.1	0.61	10.37	9.60 - 10.92	0.36	ns
			Mandibular				
I1	5.58	4.62 - 6.37	0.38	5.62	4.70 - 6.18	0.35	ns
I2	6.19	5.18 - 6.98	0.42	6.08	5.18 - 6.66	0.37	ns
C	7.24	6.15 - 8.24	0.45	7.04	6.00 - 7.66	0.43	ns
P1	7.57	6.82 - 8.30	0.43	7.43	7.06 - 8.30	0.33	ns
P2	7.54	6.74 - 8.32	0.39	7.39	6.62 - 8.10	0.33	ns
M1	11.24	10.36 - 12.1	0.32	11.13	10.68 - 11.80	0.26	ns

†I1 - central incisor, l2 - lateral incisor, C - canine, P1 - first premolar, P2 - second premolar, M1 - first molar
‡ns, not significant; *significant difference at P < 0.05

maximum mesiodistal widths of the incisors, canines, premolars, and first molars were measured. The caliper was placed parallel to the occlusal plane of each tooth with its sharp points at the greatest distances between the contact points on the proximal surface of each tooth and measurement taken and rounded to the nearest 0.1 mm. Each tooth was measured twice by a single investigator and intra-examiner precision was set at 0.2 mm. Differences greater than this limit caused a new set of measurements to be taken, and the nearest two measurements were averaged.

TABLE 2. Descriptive statistics for mesiodistal crown dimension of permanent dentition of Nigerian sample

Tooth	Mean	Range	sd	CV
		Maxillary		
I1	8.80	7.10 - 10.48	0.68	7.75
I2	7.19	5.64 - 8.46	0.56	7.85
C	7.99	7.05 - 9.12	0.47	5.92
P1	7.48	6.68 - 8.38	0.38	5.08
P2	7.06	6.04 - 8.18	0.48	6.79
M1	10.48	9.60 - 12.1	0.53	5.05
		Mandibular		
I1	5.60	4.62 - 6.37	0.36	6.51
I2	6.15	5.18 - 6.98	0.40	6.52
C	7.16	6.00 - 8.24	0.45	6.29
P1	7.52	6.82 - 8.30	0.40	5.30
P2	7.48	6.62 - 8.32	0.37	5.00
M1	11.20	10.36 - 12.10	0.30	3.00

Data analysis was carried out with the Statistical Package for Social Sciences software version 16 (SPSS, Chicago, Illinois). Descriptive statistics including means, standard deviation, range, and coefficient of variation were calculated for each tooth dimension. The possibility of significant statistical differences in the tooth dimensions between the left and right side of the arch in the maxilla and mandible was evaluated using paired t-tests. Existence of a statistical difference between the sexes or between this sample and another racial group was evaluated with unpaired t-tests. Statistical significance was regarded when P < 0.05.

RESULTS

There was no statistical difference in the tooth dimensions between left and right sides of the arches (P > 0.05). The means, range, standard deviation, and statistical comparison of crown size dimensions in male and females are shown in Table 1. There was no statistically significant difference for mesiodistal crown dimensions between males and females (P > 0.05), so statistics for the combined data are provided in Table 2.

The sex-specific mean mesiodistal measurements obtained for these Nigerian subjects were compared with the mean values of African Americans. Table 3 shows that there were similarities in tooth sizes of the maxillary lateral incisor and canine and mandibular central incisor, lateral incisor and canine between Nigerian and African American males while the other 7 dimensions were statistically different (P < 0.05). There was a greater similarity in maxillary tooth sizes of Nigerian and African American females as shown in Table 4, except the

TABLE 3. Comparison of mean, range and standard deviation of Nigerian males with African American males

Tooth	Nigerian subjects mean	sd	African Americans† mean	sd	P-value
			Maxillary		
I1	8.80	0.70	9.12	0.67	<0.05
I2	7.21	0.58	7.26	0.64	ns‡
C	8.07	0.43	8.19	0.53	ns
P1	7.51	0.40	7.66	0.49	<0.05
P2	7.01	0.46	7.25	0.49	<0.01
M1	10.55	0.61	11.04	0.64	<0.001
			Mandibular		
I1	5.58	0.38	5.53	0.39	ns
I2	6.19	0.42	6.13	0.44	ns
C	7.24	0.45	7.37	0.57	ns
P1	7.57	0.43	7.76	0.51	<0.05
P2	7.54	0.39	7.85	0.55	<0.001
M1	11.24	0.32	11.76	0.72	<0.001

†From Richardson and Malhotra (1975).
‡ns, not significant

maxillary first molar that was highly significantly larger in African American females ($P < 0.001$). The mandibular central incisor, second premolar, and first molar also were statistically different ($P < 0.05$) between the two groups.

DISCUSSION

The university students evaluated in this study provide a suitable sample of Nigerian subjects who belong to the predominant ethnic groups in the southern and southeastern regions of Nigeria where there were no normative data on the mesiodistal crown dimensions of the permanent dentition. There was no significant gender difference in the mesiodistal crown dimensions of permanent teeth in this sample of Nigerians. Mean values of the males were, however, slightly larger than females in both the maxillary and mandibular arches, and this observation was consistent with findings in African American (Richardson and Malhotra, 1975), Dominican American (Santoro *et al*., 2000), and Indian populations (Singh and Goyal, 2006).

In the maxilla, mean width of the central incisor was larger than lateral incisor and, similarly, mean width of the first premolar was larger than the second premolar, which was consistent with findings in an earlier Nigerian study (Adeyemi and Isiekwe, 2003) and in other populations (Richardson and Malhotra, 1975; Santoro *et al*., 2000; Singh and Goyal, 2006; Uysal and Sari, 2005). In the mandibular arch, the mean width of the central incisor was smaller than the lateral incisor while mean width of the first premolar was also smaller than the second premolar as reported elsewhere (Richardson and Malhotra, 1975; Uysal and Sari, 2005).

The maxillary and mandibular first molar show least variability in mesiodistal tooth size in this sample. The variability of central and lateral incisors in the mandible are similar but show less variability than the maxillary incisors. The lateral incisor has the highest variability in the maxillary arch and should be of interest during clinical examination because of its location in the anterior maxillary segment and the possibility of crowding or spacing.

The normative mesiodistal crown dimensions of the maxillary and mandibular permanent teeth for these Nigerians were only similar to a few of those of African American sample reported by Richard and Malhotra (1975). For males, the sex-specific measurements for the Nigerians compared to those of African Americans revealed statistically significant differences in 7 of the 12 variables, with the African Americans being larger. However, there was greater similarity between Nigerian and African American females with the exception of the maxillary first molar, mandibular central incisor, second premolar, and first molar, which were significantly larger in the Nigerian sample. These group differences in tooth sizes could be attributed to racial differences as previously observed in another comparative study of tooth sizes (Bishara *et al*., 1989), but it is also important to note that the African American population is an admixture of multiple racial groups.

This study re-emphasizes the importance of evaluation of mesiodistal tooth dimensions in different populations. A previous study involving Nigerian children reported that the mesiodistal crown dimensions of the Nigerian sample were significantly larger than a British Caucasian sample (Otuyemi and Noar, 1996). Also, some other studies have

TABLE 4. Comparison of mean, range and standard deviation of Nigerian females with African American females

Tooth	Nigerian adults mean	sd	African Americans† mean	sd	P-value
			Maxillary		
I1	8.81	0.67	8.72	0.58	ns‡
I2	7.16	0.55	7.08	0.56	ns
C	7.85	0.51	7.74	0.38	ns
P1	7.43	0.35	7.37	0.43	ns
P2	7.13	0.52	6.94	0.39	ns
M1	10.37	0.36	11.04	0.64	<0.001
			Mandibular		
I1	5.58	0.38	5.38	0.39	<0.01
I2	6.08	0.37	5.99	0.46	ns
C	7.04	0.43	6.86	0.42	ns
P1	7.43	0.33	7.41	0.50	ns
P2	7.54	0.39	7.61	0.50	<0.01
M1	11.13	0.26	11.28	0.62	<0.05

†From Richardson and Malhotra (1975).
‡ns, not significant

shown that American blacks have significantly larger tooth crowns and arch dimensions than American whites (Richardson and Malhotra, 1975; Merz *et al*., 1991; Burris and Harris, 2000). It is important that ethnic and individual variations and treatment needs be taken into consideration in the evaluation of patients, diagnosis, and treatment planning in order to achieve desired treatment objectives and optimal occlusion.

CONCLUSION

The study provided normative data on the mesiodistal crown dimensions of Nigerian subjects. The males and females exhibited similar patterns of tooth size even though the mean values of the tooth size of the males were slightly larger. The mean tooth sizes of Nigerian and African American population were only comparable for a few teeth in the maxilla and mandible.

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