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Mesio-distal crown dimensions of permanent teeth in a Nigerian population

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Summary

This study was undertaken to establish normative values for mesio-distal crown dimensions of permanent teeth in some Nigerians. The mesio-distal crown dimensions of permanent teeth of two hundred and fifty secondary school students in Ibadan metropolis were measured. The sample size consisted of 125 males and 125 females selected by modified random sampling technique. Their ages ranged between 12 and 15 years. The mean value for each tooth size was recorded and can be regarded as normal values for the study population. The largest tooth in the mouth was the 1st mandibular molar in males while the smallest tooth was the lower central incisors in females. These normal values could be used as standard reference table for tooth sizes which will be of great importance to the orthodontist for the space analysis, to the prosthodontist for correct choice of teeth and to other disciplines like anatomy and anthropology.

Keywords: *Mesio-distal crown dimensions, malocclusion, occlusion, orthodontics*

Résumé

Cette ètude ètait entreprisèe pour determiner les valeurs des dimensions normales des dents mèsio distales de courone permanent de quelques nigèrians. Les dimensions des dents permanent mèsiodistale couronnè de deux cent ciquante collègiens (125 males et 125 femeles) selectionès au harzard dans le mètropole d'Ibadan ètaient detrminèes. Leurs ages variaient entre 12-15 ans. La valeur moyenne par chaque dimension de dent etait relevè et peut etre regarde comme la valeur normalepour la population ètudièe. La plus large dent dans la bouche ètait la première molaire mandibulaire chez les garcons et le plus petit ètait le plus petit insicive central chez les femeles. Ces valeurs normales pourraient etre utilisèes comme table standard de reference aux dentistes pour anlayser d'espace entre ; les dents, aux futur orthodentistes pour le meilleur choix des dents et a d'autres diciplines comme l'anatomie et l'anthropologie.

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Introduction

Information concerning tooth size in human population is of importance to clinical dentistry as well as other sciences such as anthropology and anatomy.

In orthodontics, the diagnosis and treatment of malocclusion require accurate knowledge of tooth dimensions, as a stable occlusion is often reliant on the correct intercuspation of the teeth [1]. Correct space analysis is essential if an optimal occlusion is to be achieved during orthodontic treatment [2] and the goal of an ideal static and functional occlusion is to be reached. In prosthetics, a knowledge of mesio-distal crown dimension assists the practitioner in correct choice of tooth.

There is an abundance of literature on tooth sizes of Caucasians, yet a thorough search of the literature reveals a paucity of reliable data on mesio-distal crown dimensions of permanent teeth in Nigerians. Some of the studies done in Nigerians have been comparative studies [4,5] with those of Caucasians. Therefore, the purpose of this study is to establish normative data on tooth sizes of permanent teeth in some Nigerians.

Materials and methods

Two hundred and fifty secondary school children in Ibadan metropolis with age ranging between 13 and 15 years were randomly selected from different secondary school within Ibadan metropolis. They were matched for sex (125 males and 125 females). Consent to conduct the studies was obtained from the school authorities. Impressions of their jaws were taken with stock trays and alginate impression material within the school premises under aseptic technique. The impressions were taken to a dental laboratory and immediately cast in dental stone to avoid dimensional changes the cast were then numbered for easy identification. Only teeth that fell into the category of selection were measured.

Case selection criteria

These included:

1. Presence and complete eruption of all permanent teeth except the 3rd molars which were not included considering the age group selected
2. Intact dentition with no fracture.

3. No conservative treatment except class I occlusal cavities.
4. No deformed or congenital defect of teeth.
5. No developmentally missing teeth in any of the arches.
6. No history of previous orthodontic treatment.

The teeth were measured with the aid of a Vernier callipers to the nearest 0.1 mm under clear light. The mesio-distal width of each individual tooth was measured under clear light with the aid of a Vernier callipers with Vernier scale to read to the nearest 0.1 mm. The mesio-distal width was recorded as the maximum distance between the two sides of tooth (proximal) on a line parallel to the occlusal and buccal surface. To avoid error, the casts were re-measured. When the difference in readings for the same tooth varied by 0.2 mm or less the measurements were averaged. In a few instances where the two measurements differed by more than 0.2 mm the teeth were re-measured.

Statistical analysis

The data were subjected to statistical analysis using a computer software package (EPI-INFO Version 6.0).
The mean, standard deviation and co-efficient of variance were calculated.

$$\text{Co-efficient of variance} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Results

The descriptive statistics on mesio-distal crown dimensions of male and female teeth in a Nigerian population are shown in (Tables 1 and 2).

Table 1: Descriptive Statistics for Mesio-Distal Crown Dimension in **males** showing the Mean, Standard Deviation and Co-efficient of Variance

Maxilla					Mandible			
Tooth	No.	Mean size (mm)	S.D.±	C.C.	No.	Mean size (mm)	S. D. ±	C. V.
C.I.	237	9.67	0.66	6.82	219	5.96	0.47	7.88
L.I	240	7.72	0.62	8.03	225	6.52	0.49	7.51
C	206	8.26	0.80	9.68	214	7.67	0.59	7.69
P_1	223	7.85	0.60	7.64	219	7.86	0.58	7.40
P_2	200	7.14	0.63	8.82	207	7.72	0.61	7.90
M_1	245	11.05	0.66	5.97	229	11.71	0.74	6.32
M_2	140	9.96	0.62	6.22	144	9.78	0.74	7.56

C.I. = *Central Incisor* M_1 = *Fist Molar*
L.I. = *Lateral Incisor* M_2 = *Second Molar*
C = *Canine* S.D. = *Standard Deviation*
P_1 = *First Premolar* C.V. = *Co-efficient of variance*
P_2 = *Second Premolar*

Table 2: Descriptive statistics for mesio-distal crown dimension in **females** showing the mean, standard deviation and co-efficient of variance.

Maxilla					Mandible			
Tooth	No.	Mean size(mm)	S.D. ±	C.C.	No.	Mean size(mm)	S. D. ±	C. V.
C.I.	239	9.32	0.72	7.72	223	5.86	0.40	6.82
L.I	231	7.49	0.71	9.48	227	6.44	0.41	6.36
C	220	7.92	0.53	6.69	224	7.33	0.50	6.82
P_1	241	7.61	0.55	7.23	231	7.71	0.49	6.35
P_2	233	7.03	0.60	8.53	221	7.63	0.48	6.29
M_1	247	10.61	0.71	7.16	237	11.67	0.70	5.99
M_2	167	9.64	0.69	7.15	164	9.90	0.70	7.07

The result showed that the largest tooth is the male mandibular 1st molar (11.67 mm) SD ± 0.74 and the smallest is the female mandibular central incisor 5.86 mm SD ± 0.40. The mesio-distal tooth size variability as expressed by co-efficient of variability was found to be least for the mandibular 1st molar (cv 5.99) and highest for female maxillary lateral incisors (cv 9.48), as shown in Table 2.

Discussion

There has been no comprehensive study done on the mesio-distal crown dimensions of Nigerians. The few studies reported on mesio-distal crown dimension had been comparative studies between Nigerian and British sample [3,4].

This present study has established normative values for mesio-distal crown dimension of permanent teeth in a Nigerian population; one of the important factor is the reliability of the data and the sample size. It was easier using school children randomly selected from secondary schools within Ibadan metropolis since they provided a larger sample size. Only those students who presented with normal occlusion were chosen, though patients with malocclusion have been shown not to have any difference in tooth size when compared with those with normal occlusion [5,6]. Measurements were made on dental cast, although measurements made on dental cast are said to be 0.1mm larger than those of actual teeth, dental cast measurement are however more reliable than direct measurement in the mouth [7]. Therefore analysis of study-models seems appropriate for this form of investigation.

Though there has been much disagreement on the relative sizes of the molars to each other, this study agrees with that of Richard and Maholtra [8] stating that the 1st molars are generally larger than the second molars.

The mesio-distal crown dimensions of Nigerians are similar to those of American Negroes [9]. This similarity in dentition can be genetically linked and explained by the fact that the ancestors of Black Americans originated

from Africa [10]. The result of this study indicates that the mean mesio-distal tooth size of the males were generally larger than those for females, with exception of the second mandibular molars. The differences varied between 0.1 mm for the mandibular central incisors to 0.54 mm for the maxillary first molars.

Variability in tooth size may occur according to tooth type and location in the dental arch. In this study, the least variability of tooth dimensions was found in the 1st permanent molars. This is in agreement with the results obtained by other invetigators [11, 12].

The results of the mesio-distal crown dimension of Nigerians could provide a very useful clinical guide to orthodontists and restorative dentists in Nigeria.

Conclusion

Normal mesio-distal crown values have been determined for incisors, canines, premolars and molars. The largest tooth in the mouth being the 1st mandibular molars in males (11.67 mm ± 0.74) and the smallest tooth being the lower central incisors (5.56 mm ± 0.40) in females. These values would be of tremendous importance to the orthodontist, who is constantly faced with the task of space analysis. They will also serve as a standard reference for the orthodontist, prosthodontist, anatomist and even the anthropologist. Further work could be done to compare teeth of Nigerians with those of other races.

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