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Tooth size symmetry – a comparative analysis of tooth sizes among secondary school children

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Summary

A study was carried out to determine the mesio-distal crown dimensions of permanent teeth, and to find out if there were any symmetry of the tooth sizes in a population of Nigerian children. The sample consisted of 250 secondary school children (125 males and 125 females) randomly selected from 3 secondary schools within Ibadan metropolis. Their age ranged from 12-15 years the mean age was 12± 0.5 years. The results showed that there were no significant differences (p>0.05) between the right and left sides of the dental arch with the exception of the maxillary second premolars and the female mandibular canines.

Keywords: *Tooth sizes, comparative analysis, dentalarch.*

Résumé

Cette étude a été faite pour determiner les dimmendions des dents distale permanent et de trouver s'il y avait une symetrie de l'epaisseur de la dent dans la population enfantine Nigériane etudiee. Deux centcinquante collegians (125 garcons et 125 filles) etaient selectionnes au harzard de trois etablisemnets secondaires dans le metrople d'Ibadan. Leur age variait entre 12-15 ans avec la moyenne de 12±0.5 ans . Les résultants montraient qu'ils n 'avaient pas de difference significative (P>0.005) entre les cotés droite et gauche du maxillaire secondaire et les canines mandibulaire chez les filles.

Introduction

The study of size and shape of teeth has generated much literature than any aspect of dental anthropology. Though several studies have been done on tooth sizes [1-10]. Tooth size can be said to be affected by a number of factors, this includes sex, race, diet, heredity and environment.

Adeyemi and Isiekwe [3] have reported a sex difference in tooth sizes of Nigerians. Racial differences in tooth sizes have also been reported [2-4]. Tooth size can also be heredity or affected primarily by the process of genetic transmission [5-7]. Environmental changes have also been known to affect tooth size as in the case of Trista dan cunha, an isolated is land in the south Atlantic [8,9]. Attrition which occurs as a result of chewing on hard abrasive food substance has been known to have an effect on the occlusal, incisal and proximal aspects of the tooth thereby reducing the tooth size. Interproximal caries can also affect the mesio-distal width of a tooth [10]. Some studies have been done on tooth sizes of Nigerians [1-4], however none of these studies has reported whether or not there is asymmetry in tooth sizes. Tooth size symmetry plays an important role in orthodontics because the diagnosis and treatment of malocclusion will require accurate knowledge of tooth size and a stable occlusion is often reliant on correct intercuspation of the teeth [11]. .Asymmetry in tooth size may therefore affect orthodontic treatment because correct space analysis is essential if an optimal occlusion is to be achieved [12]. Therefore the aim of this study is to determine if there is symmetry in tooth sizes of Nigerians .

Materials and method

Two hundred and fifty secondary school children with age ranging between 12-15years were selected by modified random sampling from 3 different secondary schools within Ibadan metropolis. Those chosen were 125 males and 125 females. Only those presenting with normal occlusion were selected. Verbal consent was obtained from the vice-principal before conducting the study.

Case selection criteria.

Presence and complete eruption of all permanent teeth except 3rd molars which were not included considering the age group selected.

1. Intact dentition with no fracture.
2. No conservative treatment except class I occlusal cavities
3. No deformed or congenital defect of teeth
4. No developmentally missing teeth in any of the arches
5. No history of previous orthodontic treatment

Impressions of their jaws were taken using Dental alginate impression material .Dental cast were reproduced from the impressions, these were numbered for easy identification. The male casts were separated from the females.

The teeth were measured from the Dental casts with the aid of vernier calipers to the nearest 0.1mm under clear natural light. In order to remove memory bias the measurements were repeated at interval of two weeks and the mean between the 1st and 2nd measurements were taken to represent actual reading. The analysis of the data was done using a computer soft-ware package (EPI-INFO 6) and the comparative analysis was done using the student t test.

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Results

Their age range was from 12-15 years with mean age 12±0.5 The results are represented in tabular form. The comparative Analysis in tooth sizes between right and left side of the Dental arches are shown in tables 1-4.

The mesio-distal dimension of the maxillary central incisors ranged from 9.26mm in females to 9.67mm in the males while that of the maxillary lateral incisors ranged from 7.45mm in females to 7.75mm in males. The maxillary canines of females was 7.92mm while it was 8.23mm in males.

Table 1: Comparative analysis of mesio-distal crown dimension in males maxilla

Tooth	Right maxilla Mean size in mm	Variance	Sample size	Left maxilla Mean Size in mm	Variance	Sample size	P-value	Significance
C.I.	9.67	0.41	115	9.66	0.41	115	0.90	N/S
L.I	7.75	0.35	112	7.72	0.42	118	0.71	N/S
C	8.23	0.47	104	8.23	0.42	100	0.9	N/S
P_1	7.80	0.35	112	7.92	0.6	112	0.13	N/S
P_2	7.07	0.34	101	7.27	8.56	100	0.03	S
M_1	11.24	0.41	125	11.09	0.47	122	0.07	N/S
M_2	9.80	0.46	74	9.95	0.44	61	0.19	N/S

$P>0.05$ = Not significant (NS)

There was a significant difference in the left maxillary second premolar .

C.I. = *Central Incisor*
L.I. = *Lateral Incisor*
C = *Canine*
P = *First Premolar*
P^1_2 = *Second Premolar*
M = *First Molar*
M^1 = *Second Molar*
S.D. = *Standard Deviation*
C.V. = *Co-efficient of Variance*

Table 2: Comparative analysis of mesio-distal crown dimension in females maxilla

Tooth	Mean size	Right maxilla Variance in mm	Sample	Mean size sizein mm	Left maxilla Variance	Sample size	P-value	Significace
C.I.	9.26	0.49	120	9.35	0.48	120	0.31	N/S
L.I	7.45	0.56	116	7.51	0.56	117	0.54	N/S
C	7.92	0.36	111	7.94	0.33	112	0.79	N/S
P_1	7.55	0.33	121	7.67	0.30	122	0.09	N/S
P_2	6.93	0.41	117	7.10	0.37	115	0.03	S
M_1	10.52	0.52	123	10.96	0.55	123	0.06	N/S
M_2	9.70	0.44	87	9.50	0.56	79	0.07	N/S

There was a significant difference in the left maxillary 2nd premolar.

Table 3: Comparative analysis of mesio-distal crown dimension in males mandible

Tooth	Right mandible Mean size in mm	Variance	Sample size	Left mandible Mean Size in mm	Variance	Sample size	P-value	Significance
C.I.	5.96	0.15	112	5.92	0.19	108	0.47	N/S
L.I	6.57	0.21	115	6.49	0.32	108	0.24	N/S
C	7.66	0.32	110	7.67	0.38	102	0.90	N/S
P_1	7.83	0.32	113	7.89	0.32	106	0.43	N/S
P_2	7.66	0.39	118	7.80	0.32	97	0.09	N/S
M_1	11.60	0.56	121	11.72	0.54	121	0.20	N/S
M_2	9.78	0.46	78	9.85	0.67	59	0.58	N/S

No significant difference existed between right and left side of Dental arch.
N/S = *Not significant*

The mesio-distal width of the maxillary 1st premolars was 7.55mm in females and 7.80mm in males. The maxillary 2nd premolars measured 6.63mm in females and 7.07mm in males. The 1st maxillary molars measured 10.52mm in females and 11.24mm in males. The 2nd maxillary molars was 9.5mm in females and 9.80mm in males.

The mandibular central incisors was 5.85mm in females and 5.96mm in males. While mandibular lateral incisor measured 6.44mm in females and 6.57mm in males. The mandibular canine was 7.24mm in females and 7.67mm in males. The mandibular 1st premolars in females measured 7.59mm and 7.80mm in males.

The mesio-distal width of the 1st mandibular molars in females measured 11.55mm and 11.72mm in males. The tooth size of female mandibular 2nd molars was 9.88mm in females and 9.85mm in males.

Generally there was no significant difference between the right and left side of the arches except in maxillary 2nd premolars and the female mandibular canines as seen in tables 2 & 4.

Dental asymmetry has also been known to be exhibited by the Narwhale especially in the size of its central incisors. Experimental studies in mice and rats have also shown that cold, heat, noise and protein deficient diet can induce asymmetry [10]

However, a recent study [9] of tooth size asymmetry has indicated that Tristan da Cunha children exhibits a high degree of dental asymmetry, while Boston Youth exhibited the least. The high degree of dental asymmetry in Tristan da Cunha an isolated Island in the South Atlantic which was evacuated in 1961 was associated with the poor terrain and inhospitable climate, which contributed to the high environment stress.

The sample size of 250 students has been the largest so far in determining tooth sizes among Nigerians and this gave a reliable data for comparison. The age range of 12-15 years was also truly representative because at that age all the permanent teeth excluding the third molars would have erupted and being young permanent teeth they would not present with attrition. The measurements were made on dental cast, though measurements made on

Table 4: Comparative analysis of mesio-distal crown dimension in females mandible

Tooth	Right mandible			Left mandible			P- value	Significance
	Mean size in mm	Variance	Sample size	Mean Size in mm	Variance	Sample size		
C.I.	5.85	0.16	116	5.86	0.18	116	0.85	N/S
L.I	6.45	0.15	117	6.44	0.16	116	0.84	N/S
C	7.44	0.78	115	7.24	0.27	115	0.02	S
P_1	7.76	0.23	112	7.59	0.23	113	0.35	N/S
P_2	7.65	0.23	112	7.59	0.23	113	0.35	N/S
M_1	11.70	0.47	121	11.55	0.52	117	0.10	N/S
M_2	9.98	0.50	86	9.88	0.49	75	0.36	N/S

There was a significant difference in left mandibular canine.

Discussion

Teeth are excellent material in living and non-living population for anthropological, genetic, odontologic and forensic investigations.

They are the hardest and chemically most stable tissue in the body and can be selectively preserved and fossilized therefore producing the best record for evolutionary change. Though dental traits have been largely known to exhibit a high degree of asymmetry. Asymmetry of tooth sizes does occur occasionally, this has intrigued researchers for what they might reveal about the underlying genetics and developmental biology of the teeth. Asymmetry has been known to be directional if there is a distinct right and left bias and a component of directional asymmetry averaging ± 0.06mm has been reported in certain teeth in human dentition [8-9]

Asymmetries in the head region such as found in strabismic children do have association with asymmetry in the dentition depending on the embryonal origin and timing of developmental processes [13].

dental cast are said to be 0.1mm larger than those of actual teeth. Dental casts measurement are more reliable than those made directly in the mouth therefore analysis of study models seemed appropriate for this study.

Though there was a difference of 0.10mm between the right and left maxillary central incisors and about 0.15mm between the maxillary molars, these were however not statistically significant ($P>0.05$). However there was a statiscally significant difference between the right and left maxillary second premolars in both sexes and between the right and left mandibular canines in females

From this study it can then be said that Nigerians do not exhibit statistically significant difference in their tooth sizes with the exception of the maxillary second premolars and mandibular female canines. This difference in the sizes of maxillary second premolars has also been reported by Richard and Malhotra [14]. They measured the mesio-distal crown dimension of 162 American Negroes and reported asymmetry in the size of the second premolars. To the best of the knowledge of the authors there is no literature to confirm asymmetry in the size of the mandibular canine. Further investigation may there-

fore be necessary to confirm this finding. In conclusion, tooth sizes among Nigerians can be said to be symmetrical. Therefore data from either side of the jaw can be taken as the same. Further studies could still be done in an older age group where attrition has occurred.

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